

Appendix 13

Noise

Proposal

The applicant's Environmental Statement and further information assesses the noise and vibration impacts from the project and their effects on the surrounding sensitive receivers.

Baseline noise levels have been established by a measurement survey. This data is used to assess the potential significance of any effects. The site is in a rural location.

Different stages of the project will have different noise levels. The applicant says the noisiest activities are most likely to occur within the first two to three years of the project. However, the noise levels for all stages of the project have been assessed.

The applicant proposes to mitigate noise impacts by only operating the pumps used (only for up to 3 hours at a time during hydraulic fracturing) during the daytime. In addition a range of measures is proposed to reduce the noise impacts from drilling at night time.

Vibration impacts have been ruled out by the applicant because of the nature of the project, method of construction for the well pad, arrays and pipeline connection for the extended flow testing.

The nearest properties are: Old Orchard Farm which is approximately 280m to the south and Roseacre Farm is to the north.

Assessing existing noise levels and ensuring control of noise at Old Orchard Farm will ensure that other (more distant) noise sensitive premises are protected from noise from the site.

Consultee responses and representations

The following concerns have been raised about noise:

The County Council's Director of Public Health: Has provided specific advice to inform the planning process and provide public health advice to protect and improve the health of local residents living near the proposed shale gas exploration sites of Preston New Road (planning application numbers LCC/2014/0096 and 0097) and Roseacre Wood (planning application numbers LCC/2014/0101 and 0102). The advice was published as a Health Impact Assessment (HIA) in November 2014.

The Health Impact Assessment makes 45 recommendations to a broad range of agencies, suggesting actions before, during and after any permissions or permits are granted. Appendix J contains 16 specific recommendations to inform the determination of this application. Recommendation number one relates to noise:

1. *Consider the need for further noise assessment, particularly on the proposed Roseacre Wood site and if necessary, require additional mitigation measures to reduce noise associated with the development of the sites and more particularly the drilling and hydraulic fracturing phases of the development and which could be controlled by conditions attached to any planning permission.*

Fylde Borough Council: Objects to the proposal on the grounds that it is contrary to Policy DM2 of the Minerals and Waste Local Plan and Policies EP12, EP26, EP27 and EP28 of the Fylde Borough Local Plan, which are considered to be in conformity with the provisions of the National Planning Policy Framework.

The proposed drilling operations would result in the introduction of considerable traffic onto the rural highway network and would require alterations that would detract from the character of the rural area and cause significant environmental harm, particularly given the distance from the primary highway network and the uncertainty surround the alternative access arrangement through HMS Inskip. In addition to the noise and general disturbance from 24hour drilling operations and associated activity that would be significant, as would the impact on Roseacre Wood.

The County Planning Authority should be also be satisfied that the below and above ground operations will not have any significant adverse impacts in respect of Policies SP2, TR9, TREC10, EP10, EP11, EP13, EP14, EP15, EP18, EP19, EP21, EP22, EP23, EP24 and EP25.

Fylde Borough Council also resolved that the following summarised noise related comments of the Council's Environmental Protection Team be considered:

- The exclusion of a sensitive noise receptor in the applicants noise report may mean current calculations are artificially elevated resulting in the prediction that noise levels will not exceed current background levels.
- Recommend that the applicant ensures that there are continuous sound level monitoring at the nearest residential property to ensure sound levels accord with WHO guidelines.
- The sound levels are currently less than WHO guidelines so residents may experience an increase in noise. Ideally criteria should be set such that “as a result of the activity at the site no dwelling shall experience sound levels that are more than 5dB above current background levels between 07.00 – 23.00 and no increase in background level between 23.00 and 07.00”.
- Recommend that no HGVs arrive at or leave the site between 23:00 and 07:00.

Fylde Borough Council subsequently provided a copy of a noise impact assessment on wintering birds, at the Annas Road Exploration Well site, which concludes that the noise from drilling operations will be essentially steady in character, producing decreasing levels from 58 – 42dB(A) in relation to increasing distances between 50m to 500m from the boundary of the well site. The Environmental Protection Team have noted that the survey data shows that the impulsive sound could be up to 16dB greater than the background noise in addition to the drilling operation.

Medlar-with-Wesham Parish Council and Kirkham Town Council: The Council's object to the proposal as submitted and requests that it be refused planning permission for the following reasons:

- Increase in ambient noise levels from the continuous operation of this site and any future sites in the parish.
- Impact on local Wildlife including wintering and migrating birds, birds of prey, game birds, garden birds and bats from increased noise, traffic and lighting.

Roseacre, Wharles and Treales Parish Council: Objects to the proposal on a range of issues including the following grounds related to noise:

- Contrary to Policy EP27 and SP9 as it will not meet required noise limits and will have an adverse impact on the amenity of local residents.
- The baseline noise measurement is inadequate and the minimum approach for assessment of noise impact should be BS4112.
- Noise impacts on Stanley Mews have not been considered.
- There is no need for 24hr a day drilling, as per the UKOOG website guidance
- Drilling noise levels might be exceeded, so need real time monitoring, with immediate enforcement if levels are exceeded.
- HGVs will have significant noise impacts causing health and wellbeing impacts including daytime nuisance and sleep disturbance.
- Light, noise and dust pollution will be significant.
- The wrong noise standards are used.
- Impulsive noise is unacceptable and is not addressed.

Roseacre Awareness Group: Representations received on behalf Roseacre Awareness Group object to the proposal on a range of issues, including the following noise grounds:

- Contrary to SP2, SP9 and EP27 due to harm from drilling noise pollution. It will seriously affect residents living close to the site, affecting quality of life resulting in health issues. Noise levels cannot be mitigated.
- Elswick site operations are not representative of a live fracking site.
- No consideration of cumulative effects of onsite machinery (generators, separators, compressors) with noise from drilling, fracking, flaring and HGVs
- Noise assessment should have used BS4142 and not BS5228, to be relevant to a quiet rural area and not a construction site.
- Actual increase in noise level should be no more than 5db, proposal higher.
- No adequate baseline surveys or assessment of sensitive local receptors (Stanley Farm mews) No information to demonstrate that residential amenity will not be significantly affected.
- A noise assessment was commissioned and concluded that the ES and other supporting documents submitted for review have raised a number of significant concerns throughout, from the assessment methods, measurements and prediction uncertainty and conclusions drawn. The review indicates that the worst case noise impact is most likely to have been significantly underestimated. Although Jacobs' peer review sought to clarify and resolve some key points, and has assisted the local authority in pursuing

a lower noise control target, it has not highlighted the significant uncertainty or the unsupported dismissal of concerns over noise characteristics. RAGs expert opinion, supported by recent practical experience of similar activities is that the anticipated noise levels are likely to be exceeded, and the levels of community disturbance will be considerably higher due to poorly quantified, and likely high levels of both tonality and impulsivity for which an assessment penalty should have been applied. As the assessment hinges on the assertion that no character penalties apply, this should be enforced by a planning condition (if consent were to be granted) that no tonal or impulsive character is allowed

- Noise and light pollution will affect health.

Friends of the Earth (FOE): Object to the proposal on a range of issues including the following summarised reason on noise:

- Several years of disruption to the local community with 14 months of drilling 24hours a day, 8 months of hydraulic fracturing and 12 months of flaring with dust, light and noise emissions.
- Noise limits of 30dB are needed for a 'good night's sleep'.
- The noise exceedances over background are big.

Residents of Roseacre

- Noise impacts and traffic impacts will be substantial.

Other representations

A large number of other representations raise concerns in relation to the following summarised noise concerns:

- There will be noise pollution.
- Noise assessment results and analysis is disputed.
- The noise assessment should have used BS4142 (nuisance on local receptors) instead of BS5228 for construction sites.
- Receptors at Stanley Mews have not been considered.
- The noise levels will severely and adversely affect people's right of a quiet enjoyment of their homes.
- Will be able to hear the noise from Inskip.
- Predicted noise levels may be ok in an urban area with ambient noise but will be loud and intrusive in a rural area.
- Area around Roseacre Wood is extremely quiet, development will be loud and intrusive in the rural area.
- 24 hours a day, 365 days a year of noise from site operations of drilling, traffic noise will affect people's physical and mental health.
- Concerned about fracking noise from 7am to 7pm during the week and from 7am at weekends for 365 days of the year.
- Noise from HGV, heavy drilling and fracking will destroy communities
- Moved to area to enjoy the peace and quiet, but this will be disrupted by HGV passing in front of house.
- Peace and quiet will be shattered by noise from fracking.

- Not acceptable to have drilling 24 hours a day, 7 days a week, it will destroy the peaceful fabric of the village.
- Increased daytime noise.
- Increased night-time noise.
- Impact of constant noise to migraine sufferer will significantly affect quality of life.
- Noise will affect pets and horses, including livery yards in Elswick and Wharles.
- Cuadrilla exceeded set noise levels at Balcombe.
- The proposal will be contrary to FBLP Policy EP27 as constant noise will be detrimental to health.
- Noise will be intrusive. Can already hear firearms activity from Weeton in Elswick when wind is coming from that direction.

Policy

Paragraph 109 of the NPPF states that the planning system should contribute to and enhance the natural and local environment by *inter alia* preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability.

Paragraph 123 of the NPPF states that *planning policies and decisions should aim to:*

- *avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;*
- *mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions;*
- *recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established; and*
- *Identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.*

Assessment of 'significant adverse impacts' is directed to the DEFRA publication *Explanatory Note to the Noise Policy Statement for England*.

In the accompanying practice guidance for the NPPF the management of the noise associated with particular development types is considered in a number of separate documents. For minerals development there is *National Planning Practice Guidance: Minerals (PPG)*.

In relation to noise the PPG states that applicants *should carry out a noise impact assessment, which should identify all sources of noise and, for each source, take account of the noise emission, its characteristics, the proposed operating locations, procedures, schedules and duration of work for the life of the operation, and its likely impact on the surrounding neighbourhood.*

Proposals for the control or mitigation of noise emissions should:

- *Consider the main characteristics of the production process and its environs, including the location of noise-sensitive properties and sensitive environmental sites.*
- *Assess the existing acoustic environment around the site of the proposed operations, including background noise levels at nearby noise-sensitive properties.*
- *Estimate the likely future noise from the development and its impact on the neighbourhood of the proposed operations.*
- *Identify proposals to minimise, mitigate or remove noise emissions at source.*
- *Monitor the resulting noise to check compliance with any proposed or imposed conditions.*

The PPG continues by adding that *Mineral planning authorities should take account of the prevailing acoustic environment and in doing so consider whether or not noise from the proposed operations would:*

- *Give rise to a significant adverse effect.*
- *Give rise to an adverse effect; and*
- *Enable a good standard of amenity to be achieved.*

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.

The PPG recommends appropriate noise standards and advises that *Mineral planning authorities should aim to establish a noise limit, through a planning condition, at noise-sensitive property that does not exceed the background noise level ($L_{A90,1h}$) by more than 10dB(A) during normal working hours (0700-1900). 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 set should be as near that level as practicable. In any event, the total noise from the operations should not exceed 55dB(A) LAeq, 1h (free field). For operations during the evening (1900-2200) the noise limits should not exceed the background noise level ($L_{A90,1h}$) by more than 10dB(A) and should not exceed 55dB(A) LAeq, 1h (free field). For any operations during the period 22.00 – 07.00 noise limits should be set to reduce to a minimum any adverse impacts, without imposing unreasonable burdens on the mineral operator. In any event the noise limit should not exceed 42dB(A) LAeq, 1h (free field) at a noise sensitive property.*

Where the site noise has a significant tonal element, it may be appropriate to set specific limits to control this aspect. Peak or impulsive noise, which may include some reversing beepers, may also require separate limits that are independent of background noise (e.g. L_{max} in specific octave or third-octave frequency bands – and that should not be allowed to occur regularly at night.)

For particularly noisy short term events such as soil stripping and road construction the PPG advises:

Increased temporary daytime noise limits of up to 70dB(A) LAeq 1h (free field) for periods of up to eight 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.

Where work is likely to take longer than eight weeks, a lower limit over a longer period should be considered. 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. Within this framework, the 70 dB(A) LAeq 1h (free field) limit referred to above should be regarded as the normal maximum.

Policy DM2 of the Joint Lancashire Minerals and Waste Local Plan (JLMWLP) states that development for minerals operations will be supported where it can be demonstrated that all material social, economic or environmental impacts that would cause demonstrable harm can be eliminated or reduced to acceptable levels. In assessing proposals account will be taken of the proposal's setting, baseline environmental conditions and neighbouring land uses, together with the extent to which its impacts can be controlled in accordance with current best practice and recognised standards.

Policy EP27 of the Fylde Borough Local Plan states that development which would unnecessarily and unacceptably result in harm by way of noise pollution will not be permitted. Where appropriate, planning permission will be granted subject to conditions to minimise or prevent noise pollution. This policy is considered not to be in conflict with the NPPF.

Assessment

The noise assessment in the Environmental Statement (ES) was undertaken using the methodology set out in British Standard BS5228: Part 1: 2009+A1: 2014.

Following the issuing of the recommendation to the Development Control Committee to refuse the application because of the predicted noise impact at night, two papers, entitled 'Noise Mitigation Proposals - Preston New Road Exploration' and 'Noise Mitigation Proposals – Roseacre Wood' were submitted by the applicant in January 2015.

Drilling is required to be a 24-hour process. With additional mitigation, noise at night from drilling operations at the proposed site would be further reduced to a level below the World Health Organization (Europe) Night Noise Guideline (NNG). With regard to Government noise policy, the NNG is described by WHO (Europe) as Lowest Observable Adverse Effect Level (LOAEL).

The applicant then provided more information on the additional mitigation measures. This includes: details of the noise modelling procedures and assumptions; refinements to the noise models submitted in the ES; description of how the efficacy of the noise mitigation measures has been calculated; details of additional noise mitigation proposed; and an outline noise management plan. A further period of public consultation took place on this information.

The County Council commissioned a specialist noise consultant from Jacobs to undertake an assessment of the applicant's mitigation together with an assessment of the concerns raised by several objectors.

An overview of the proposed drilling rig, hydraulic fracturing pumps, ancillary equipment and processes is provided by the applicant. This includes descriptions of proposed equipment, details on the number of each equipment, typical layouts, and for the drilling activities some detail on proposed operational procedures and methods of working. The primary sources of noise emissions are identified for both hydraulic fracturing and drilling.

The information provided is detailed and clear. The survey was undertaken by two experienced Members of the Institute of Acoustics, and included both near-field measurements of specific noise sources, and far-field unattended measurements of the overall drilling rig noise levels.

The sound power levels used by the applicant in the drilling noise model are based on near-field sound pressure level measurements made at the Horse Hill drill site in Horley, East Sussex. However, the sound power levels derived from this survey have been adjusted so that the far-field noise levels produced by the model correlate with more distant measurements of the Horse Hill drill site. The resulting 'calibrated' model results show good agreement with the measured values, with differences in the range -1.1 to +2.8. According to Jacobs, this gives confidence that the base noise model produced realistic results, and in fact predicts marginally higher noise levels at six of the nine measurement locations used for the calibration than were actually measured.

Impulsivity

Noise with prominent impulses (e.g., bangs and clangs) is more annoying than continuous types of noise. Impulsive sounds are characterised by a sudden onset, which makes them more prominent than continuous noise types.

Impulsive events were identified by the applicant during the Horse Hill drilling noise survey but are described as "occasional" rather than "regular". Based on this, impulsivity is not portrayed to be a prominent characteristic of the noise, particularly for the fracturing operation.

It is noted that the term "regular" can imply that an event occurs according to a defined pattern, and it is not expected that impulsive events from such activities would ever be regular in this sense. For the purpose of this assessment it has therefore been taken to mean how frequently an impulsive event might occur.

The applicant's data (Figure C1-4) shows the time history of the noise levels recorded at the NE corner of drill site on the perimeter bund would appear to support the applicant's view; it can be seen that for protracted periods of time the 1 minute samples show relatively small variation in level. If the drilling noise had a prominent impulsive characteristic, it would result in spikes in the time history which are not present.

However, with any form of construction, drilling or other open site activity, there will always be potential for impulsive noise events arising from activities. National Planning Practice Guidelines for assessing noise impacts from minerals extraction considers this and advises:

*“Peak or impulsive noise, which may include some reversing beepers, may also require separate limits that are independent of background noise (e.g. L_{max} in specific octave or third-octave frequency bands – and that should not be allowed to occur regularly at night.)
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”.*

It is therefore recommended that, should planning permission be granted, a condition is imposed limiting the number of noise events exceeding a certain threshold level at night. The exact requirements of any condition should be carefully considered, as there are practical difficulties in measuring impulsive noise events, particularly at receptors which are near roads or other noise sources which may also generate impulsive noise.

Tonality

Noise can be described as tonal if it contains a noticeable or discrete, continuous note. This includes noises such as hums, hisses, screeches, drones, etc. and any such subjective description is open to discussion and contradiction when reported.

The applicant discuss tonality in section 4.2 of the further information report. The discussion notes that the Spectrum Acoustics reports on hydraulic fracturing and drilling noise do not indicate that tonality was an issue and also reviews the measurements undertaken in close vicinity of the noise sources at the Horse Hill site. It was considered that subjectively much of the plant had no tonal quality, but that the measurement results show tonal effects associated with the hydraulic power unit and radiated from the hydraulic pipework. It is stated that this could be readily mitigated if the tonal characteristics were to exist and be discernible at the nearest properties.

Measurements in the near vicinity of the noise sources are unlikely to replicate the frequency spectrum at sensitive properties some distance away, particularly if the noise sources are screened, as different frequency noise is attenuated at different rates. It is possible that the noise model could provide some indication as to whether tonal noise is likely at receptors, but even this should not be relied upon too greatly

Since the applicant claims that the potential source of tonal noise can be easily addressed if it turns out to be an issue, it is recommended that, should planning permission be granted, a condition to ensure tonal noise does not occur, with assessment based on the methodology set out in BS 4142: 2014.

Source Directivity

Directivity is a measure of the directional characteristic of a sound source. Directivity is important because it helps indicate how much sound will be directed towards a specific area compared to all the sound energy being generated by a source.

Source directivity is considered by the applicant. The Spectrum Acoustics (SA) measurement reports provided by the applicant for drilling and hydraulic fracturing set out approximate directivity corrections for the main items on site during these works. These corrections are in the range -1 to +3 dB for different equipment, with the greatest positive directivity being applicable to the drilling generators.

For the hydraulic fracturing noise model, the applicant has applied a positive correction of +5 dB (i.e. increasing noise at receptors) which is substantially greater than the directivity corrections suggested by SA for any direction. These values have been determined so that the noise levels in the model match the far-field measurements conducted by Spectrum Acoustics, and are applied universally to the noise emission from these sources regardless of direction.

The applicant has followed a similar procedure for the drilling noise model, although the corrections applied to the noise sources are based on their own measurements at Horse Hill. As discussed above, the resulting noise predictions slightly over-estimate the noise levels at six of the nine measurement locations used to calibrate the model.

Low Frequency Noise

Sounds in this frequency range would typically be heard as a low rumble. Sometimes there is also a sensation of vibration or pressure on the ears.

Low frequency noise (LFN) is discussed briefly in section 4.3 of the applicant's further information. The applicant concludes *"In view of the nature of the noise sources and the low levels of noise predicted it is concluded that low frequency noise is very unlikely to give rise to any adverse effect."*

Jacob's advise that in assessing whether low frequency noise is causing a disturbance reference is frequently made to the document prepared for Defra "Procedure for the assessment of low frequency noise complaints" by Dr Andy Moorhouse, Dr David Waddington, Dr Mags Adams, published by the University of Salford. Within the objectives section, this document states:

"The procedure is intended to assist in the evaluation of existing problems. It is not intended as a means of predicting when disturbance might occur, for example in a planning situation and would not be reliable to use as such. This is because disturbance by LFN depends on a number of factors, such as the character of the sound, whose effects are neither well understood, nor readily predictable. Levels of sound above criteria based on the average threshold of hearing are frequently found to be acceptable and levels falling marginally below can occasionally cause disturbance, so no generic approach to prediction of disturbance appears to be possible" ..

Hence, whilst acknowledging the potential for low frequency noise disturbance may exist, this is considered to be very unlikely and it is not considered that this should be a material planning issue.

Mitigation Measures

The County Council's appointed noise specialist from Jacob's has assessed the mitigation measures.

For hydraulic fracturing noise, the solution proposed is a solid noise fence located 2m from the generators, 5m high and topped with a 1m return angled at 45° projecting into the enclosure. Predicted noise levels of 53dB and 52dB were reported for Preston New Road site and Roseacre Wood site respectively at the closest sensitive receptors.

For the drilling noise, the proposed mitigation measures are set out in Tables 9 and 10 of the applicant's further information report. These are summarised as follows.

Mitigation	Benefit / noise reduction	Justification
7m high sound barrier around the main rig and hydraulic power unit	5dB(A)	Based on PowerClad17 system (900gsm) transmission loss data. The applicant's proposals are a more substantial system, so 5dB is likely to be a cautious estimate
4m high noise barrier fence	Variable	Noise barrier calculation
Interventions to the hydraulic power unit (e.g. acoustic louvres); attenuators to generator exhausts, etc.	1dB(A)	Model includes a modest reduction for additional mitigation to various elements. BS5228-1 Table B.4 shows even an open sided shed (at the open side) treated with sound absorbing material will reduce noise emission by 1dB
Sound absorption in enclosures to drilling rig shale shakers (doors closed)	Source level reduced by 5dB	Horse Hill measurements were with shale shaker doors open; these would be closed. The BS5228-1 guidance on enclosures is as below
Sound absorption in enclosures to generators, including louvres	Assumed 4dB	Generators as measured were partially enclosed. Mitigation taken to be lower than the reductions quoted by BS5228-1
Enclosures to drilling rig mud pumps	No reduction included in the model but some effect expected	BS5228-1 Table B.1 5-10dB for engine enclosures BS5228-1 Table B.4 gives ≥6dB for partial enclosures (with sound absorption)
Rubber bushings to reduce	Not quantifiable but some	No reduction made in source

pipework vibration

beneficial effect expected

noise levels. Any reduction would be over and above that assumed

In implementing these measures, the applicant indicates that noise levels of 39dB and 37dB can be achieved at the closest receptor to the Preston New Road and Roseacre Wood sites respectively.

Jacobs have replicated these calculations using the ISO 9613-2 broadband method for point sources, and applying the claimed noise reductions of the mitigation measures to the source levels. The result calculated by Jacobs for the mitigated scenario at Staining Wood Cottage is within 1dB of the level predicted by the applicant.

Jacobs consider that the noise reduction measures set out by the applicant are reasonable. In particular, the calculation of noise barrier performance is based on an accepted International Standard methodology implemented in noise modelling software which is widely adopted in the UK. Similarly, the sound reductions assumed for the proposed generator and shale shaker enclosures are in accordance with the guidance set out in BS 5228-1. There is no reason to believe that these reductions cannot be achieved in practice, although it is noted that the barrier effect is dependent on geometry and if the drilling rig is arranged differently to the representation in the noise model then the barrier design may need to be altered accordingly.

A framework for a noise management plan is provided by the applicant. If it is decided to grant planning consent for the application, it is recommended that a noise management plan covering the areas identified in the framework be required by condition. This should include long term noise monitoring to demonstrate that the noise levels predicted by the applicant are being achieved at noise sensitive receptors.

Sensitive Receptors

The use of substantial noise barriers to control drilling and hydraulic fracturing noise raises the issue of the noise sensitive receptors considered by the applicant. The location of Old Orchard Farm as the closest sensitive receptor to the development, and focusing on this sensitive receptors is therefore not unreasonable. However, screening effects from barriers may be reduced at dwellings on elevated ground in relation to the site.

It is therefore recommended that, if the applicant is granted planning consent, a noise limit condition be stipulated which applies to all dwellings rather than just the receptors selected for the noise assessments.

Significance Criteria

The applicant's further information details that a noise level of 37dB at night can be achieved at the nearest noise sensitive receptor (Old Orchard Farm) during drilling operations with the additional mitigation measures detailed in the report. The information references the WHO guideline of 40 dB L_{night} , outside and quotes "The

LOAEL of night noise, 40 dBL_{night} outside can be considered a health based value of the night noise guidelines (NNG) necessary to protect the public, including the most vulnerable groups such as children, the chronically ill and the elderly, from the adverse health effects of night noise.” The predicted noise level of 37dB is below the WHO guideline.

The predicted noise level of 37dB is also considered to be in accordance with Planning Practice Guidance which states that:

“For any operations during the period 22.00 – 07.00 noise limits should be set to reduce to a minimum any adverse impacts, without imposing unreasonable burdens on the mineral operator. In any event the noise limit should not exceed 42dB(A) LAeq,1h (free field) at a noise sensitive property

Clarke Saunders Associates report

Clarke Saunders Associates (CSA) was appointed by the Roseacre Awareness Group (RAG) to undertake a technical review in relation to the planning application for drilling and hydraulic fracturing for the proposed Roseacre Wood Site. In turn, the County Council's specialist noise consultant at Jacobs has assessed the concerns raised in the CSA review.

Assessment Methods

The CSA review correctly details that assessment of the proposed operational noise at the site based on the criteria detailed in BS5228 would not be appropriate. The review details that an assessment to the criteria in BS4142:2014 would show a “*clear and significant impact*”. However, for minerals development the appropriate guidance and noise standards are contained within PPG guidance on assessing environmental impacts from minerals extraction. BS4142:2014 states that it is not intended to be applied to the rating and assessment of sound from “*other sources falling within the scopes of other standards or guidance*”. Hence, given the guidance in PPG which is specifically intended for minerals extraction, noise from this development is not considered to fall within the scope of BS4142:2014.

Measurement and Uncertainty

Consideration is given to the uncertainty in the prediction of likely noise impact. A potential precision of +7.5dB/-7dB is detailed, which would appear to be extreme, given that reasonable worst case assumptions were acknowledged by CSA. No substantiating error analysis was presented for this range of error. Of particular concern to CSA was the use of “*similar*” plant. It has been confirmed by the applicant that the same drilling rig that provided the basis of the assessment will be used at the Roseacre site (and Preston New Road). Nonetheless, it is acknowledged that there is uncertainty in the likely noise impact, and it has been recommended that this is addressed through the implementation noise limits and a noise monitoring plan in the planning conditions if it is decided to grant consent to the application.

Tonality

Third octave measurements undertaken at the Horse Hill site indicated that there were some tonal elements to some sources. Arup detailed that these tonal elements could be mitigated if necessary. CSA are concerned that there was no detail of the mitigation measures that could be incorporated and whether it was necessary. If it is decided to grant consent to the application it is recommended that a condition be attached requiring measurements be undertaken to determine any tonal characteristics and requiring the applicant to provide further mitigation if tonal characteristics are observed.

CSA detail that only a subjective appraisal of impulsivity at sensitive receptors has been undertaken. Jacobs have acknowledged that this is an issue which must be addressed and have suggested if it is decided to grant planning permission that a suitable condition be attached limiting the number of L_{Amax} noise events exceeding a certain threshold at night.

Subjective Receptor Impact

CSA reiterated concerns regarding uncertainty, tonal and impulsivity effects which could potentially increase the subjective receptor impact. However, due consideration has been given to these factors and if it is decided to grant consent to the application suitable conditions would be drafted to limit those effects.

Conclusions

CSA summarise their concerns with regard to uncertainty and increased noise impact due to the character of the noise. CSA concludes with *“As the assessment hinges on the assertion that no character penalties apply this should be enforced by a planning condition (if consent were to be granted) that no tonal or impulsive character, is allowed, as assessed under BS4142 “reference methods” especially at night”*.

This is broadly consistent with Jacobs’ suggested approach (which recommends that four noise related conditions be included) if consent were to be granted.

In conclusion the concerns raised are not inconsistent with those raised by Jacobs, however, it is considered that if it is minded to grant consent to the application suitable planning conditions can be set to alleviate those concerns.

Various submissions by a resident of Wharles.

The County Council has received several lengthy submissions on the subject of noise impacts from a resident of the village of Wharles, which is adjacent to Roseacre. In turn the County Council has sought assessment of the issues raised from its noise specialist at Jacobs. The main points raised are considered below:

Unreasonable Burdens

Fylde Borough Council recommends that no dwelling shall experience sound levels that are more than 5dB above current background levels between 07.00 – 23.00 and no increase in background level between 23.00 and 07.00. The resident's submission states the mitigation from the applicant has not achieved this, and so the application should be rejected. However, it is the view of Jacobs and County Council

officers that achieving such levels would place an unreasonable burden on the applicant and would not be consistent with national advice.

There is historical precedence in respect of appropriate noise limits. West Sussex County Council set an evening and night-time noise limit of 42 dB $L_{Aeq,1h}$ at properties near a drilling site at Balcombe (also operated by Cuadrilla). The Balcombe site is in a rural area, and noise levels were shown to fall to below 30dB(A) L_{A90} at night prior to commencement of drilling operations; the noise environment at the Balcombe site is therefore considered to be quite similar to the Preston New Road and Roseacre sites which also experience very low noise levels at night.

The 42dB $L_{Aeq,1h}$ noise limit at Balcombe is based on Government guidance on appropriate noise standards for mineral operators which states:

“For any operations during the period 22.00 – 07.00 noise limits should be set to reduce to a minimum any adverse impacts, without imposing unreasonable burdens on the mineral operator. In any event the noise limit should not exceed 42dB(A) $L_{Aeq,1h}$ (free field) at a noise sensitive property.”

This guidance is based on achieving an internal noise level of 30 dB $L_{Aeq,1h}$ in bedrooms with the window partially open, which is in accordance with World Health Organisation guidance. There are many other drilling and minerals extraction sites in the UK where a similar noise limit of 42 dB $L_{Aeq,1h}$ at night has been applied. It is considered that explicit Government guidance on noise from minerals extraction at night carries greater weight than a British Standard, and there are other reasons which will be examined in the section below, as to why BS4142 is not appropriate for determining “*acceptably low levels of noise pollution*”.

The applicant has committed to achieving noise levels of 37 dB $L_{Aeq,1h}$ at Old Orchard Farm at night during drilling operations. These levels are 3-5 dB below the maximum level recommended in the guidance.

To achieve these levels, the applicant is providing:

- 1) A 7m to 10m high sound barrier around the major parts of the drilling rig
- 2) Additional enclosures to the following components of the drilling rig:
 - a) Hydraulic unit
 - b) Hydraulic pipework
 - c) Generator Exhaust
 - d) Generator fans

Despite a willingness to provide these mitigation measures, the applicant has noted that “*these additional measures will be onerous and, we believe, go beyond the limits set in all available precedents in planning decisions*”.

The applicant has also indicated a willingness to provide continuous, real-time, noise monitoring throughout the proposed operations so that any noise limits can be enforced.

Given that the noise levels that the applicant has committed to achieve are well below the maximum limit value set out in Government guidance, and that the extensive mitigation measures go beyond all available precedents in prior planning decisions, it is thought that further reductions in permissible noise levels could be considered to place an unreasonable burden on the applicant.

Use of BS4142

The resident's submission suggests that BS4142 provides a robust mechanism for the assessment of noise from the proposed development and should be used to assess the impacts.

Specific Government guidance on appropriate noise standards for mineral operators for normal operations is provided in the Planning Practice Guidelines (PPG Paragraph: 021 Reference ID: 27-021-20140306).

BS4142:2014 describes methods for rating and assessing sound of an industrial and/or commercial nature, but is not intended to apply to sources falling within the scopes of other standards or guidance, or the determination of noise amounting to a nuisance under the Environmental Protection Act (or Control of Pollution Act).

Whilst the results of a BS4142:2014 assessment may in part inform an officers' decision on nuisance, other factors such as whether the noise level meets the absolute noise criteria set out by the World Health Organization (and replicated in BS8233:2014) should be considered in reaching a conclusion.

Furthermore, it should be noted that the BS4142:2014 assessment method no longer relies on the simple difference between the rating level and the background noise level. Now the level difference is used to arrive at an initial estimate of the impact, which then needs to be modified due to context. The standard recommends that all the pertinent factors be taken into consideration, including:

“1) The absolute level of sound. For a given difference between the rating level and the background sound level, the magnitude of the overall impact might be greater for an acoustic environment where the residual sound level is high than for an acoustic environment where the residual sound level is low.

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 background sound levels around the Roseacre site is considered low, and therefore absolute levels should be considered as, or more, relevant than the margin by which the rating level exceeds the background.

Other pertinent factors which should also be considered include whether the character of the specific sound will be different from the character of the residual sound. This is likely to be the case, although the applicant has provided assurances that the sound will not contain significant tonal or impulsive components, and is willing to be conditioned on these issues and enter into continuous noise monitoring to ensure this is the case.

Not specifically noted, but certainly relevant, is the duration for which the sound will be present. Whilst not short-term, the drilling operations are temporary rather than permanent, and this should be considered.

In summary, there is specific Government guidance on acceptable noise emissions from minerals activities, and reliance on the BS4142:2014 level difference alone for the determination of impacts is not advised.

Impulsive noise events measured at Horse Hill

The resident's submission contains a detailed consideration of the noise time-history graphs produced for the applicant's unattended noise measurements at the Horse Hill site in Surrey (measurements from the drill rig at Horse Hill are used in the PNR and RW noise predictions). The submission contends that between 23:00 and 07:00 twelve impulsive events are determined rather than the four indicated in the applicant's report. This survey was undertaken to determine that the applicant's predictions of LAeq would be consistent over time. It is unfortunate that the measurement was not attended, and therefore there are no records of the events which caused these peaks. There are vehicles passing along roads in the vicinity of this monitoring location. The measurement location is also within 3km of Gatwick Airport, and there are agricultural fields nearby from which farm equipment or cattle noise may be a possibility.

It is not possible to confirm the cause of impulsive noise events registered during unattended measurements. This is a well-known drawback to this type of data collection unless a full audio recording is also made which can assist in the identification of particular sounds.

Whilst the distance to the nearest road is substantial, the measurement location on the north east perimeter bund is within 100m of the site access track, and is adjacent to a stockpile of drill string casings. If the impulsive noise did originate within the site, it is still not clear what caused it, and how far the source was from the microphone which is essential information to calculate what the resultant noise level might be at more distant receptors.

The resident's submission contends that impulsive noise events can cause sleep problems and a value of 45dB L_{Amax} is cited from a WHO report as a threshold where sleep disturbance can occur.

The value of 45 dB L_{Amax} is an indoor level, which is equated to an external level of 60 dB L_{Amax} with a partially open window in the 1999 version of the WHO noise report.

Nevertheless it is recommended that a planning condition be set in relation to impulsive noise events and that permanent noise monitoring be established at the applicants cost to provide evidence that they are operating within the bounds of the planning conditions.

The resident's submission disputes that any planning condition could be set and implemented that would protect residents.

A night-time noise limit of 42 dB L_{Aeq} was set by West Sussex County Council at the Balcombe drilling site. Subsequent measurements indicated that Cuadrilla may have been close to exceeding this level; as a result the drilling was halted until a solution was found. This is a relevant precedent which demonstrates that planning conditions can provide effective protection to residents.

Drilling Rig

The resident's submission requests that noise data from the Horse Hill drilling rig should be made available. Measurements from this rig have been used to model the expected noise emissions at Roseacre Wood and Preston New Road.

The applicant states in section 3.2 of the further information report (ie, Regulation 22 report) (AAc/230382-03/R03 Issued 3 March 2015) that the noise measurements were made at "the same HH-220 drilling rig that is proposed for use in Lancashire". The results of these measurements are well documented in the appendix to their report, and are used in the refined noise modelling.

Conclusion

The applicant's noise models for drilling and hydraulic fracturing noise have been revised using more detailed inputs, particularly in relation to the drilling noise based on measurements of the actual rig proposed for the application site. The adopted noise prediction methodology is appropriate, and is implemented in widely used noise modelling software.

The majority of the noise model inputs are clearly set out in the report, and simplified noise predictions undertaken by Jacobs using the same input data produce similar results to those calculated by the applicant.

For hydraulic fracturing noise, the solution proposed is a solid noise fence located 2m from the generators, 5m high and topped with a 1m return angled at 45° projecting into the enclosure. Predicted noise levels of 52dB were reported for Roseacre Wood at the closest sensitive receptor. For the drilling noise, the proposed mitigation measures are set out in the applicant's further information. This includes a 7m high sound barrier around the rig together with various other interventions.

Implementing these measures, the applicant indicates that noise levels of 37dB can be achieved at the closest receptor to the site.

The County Council's specialist noise consultant at Jacobs has replicated these and, the result calculated is within 1dB of the level predicted by the applicant. It is considered that the noise reduction measures are reasonable. There is no reason to believe that these reductions cannot be achieved in practice, although it is noted that the barrier effect is dependent on geometry and if the drilling rig is arranged differently to the representation in the noise model then the barrier design may need to be altered accordingly.

A framework for a noise management plan is provided by the applicant. It is recommended that a noise management plan covering the areas identified in the framework be required by condition. This should include long term noise monitoring to demonstrate that the noise levels predicted by the applicant are being achieved at noise sensitive receptors

The Lowest Observed Adverse Effect Level (LOAEL) of night noise from the World Health Organisation (WHO) is $40_{\text{dB}_{\text{Lnight, outside}}}$ and can be considered a health based value of the night noised guidelines (NNG) necessary to protect the public, including the most vulnerable groups such as children, the chronically ill and the elderly, from the adverse health effects of night noise. The predicted noise level of 37dB is below the WHO guideline.

The predicted noise level of 37dB is also considered to be in accordance with Planning Practice Guidance which states that:

“For any operations during the period 22.00 – 07.00 noise limits should be set to reduce to a minimum any adverse impacts, without imposing unreasonable burdens on the mineral operator. In any event the noise limit should not exceed 42dB(A) LAeq,1h (free field) at a noise sensitive property”.

Noise from the site is not expected to have a prominent impulsive character. Nevertheless it is recommended that, should planning permission be granted, consideration be given to a condition limiting the number of L_{Amax} noise events exceeding a certain threshold level at night.

Noise from the site is not expected to have a tonal character. Nevertheless it is recommended that, should planning permission be granted, consideration be given to a condition to ensure tonal noise does not occur.

With the additional mitigation measures proposed by the applicant, it is considered that efforts have been made to reduce any adverse noise impacts that would arise from the drilling and hydraulic fracturing activities to a minimum. Furthermore, the resulting noise levels from the activities are considered to be in accordance with relevant government guidance.

The proposed development is therefore consistent with Policy DM2 of the JLMWLP and Policy EP27 of the Fylde Borough Local Plan. It has been satisfactorily demonstrated that noise impacts would be reduced to acceptable levels and would not result in harm to the amenity of neighbouring properties by way of noise pollution.