Appendix 13

Noise

Proposal

The applicant's Environmental Statement contains a chapter that 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. However the proximity of the M55 to the north and A583 to the south means that during the day time road noise is a particular feature of the current environment.

Different stages of the project will have different noise levels. 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 says there is potential to result in a significant noise effect when hydraulic fracturing occurs during night time where noise limits are at their most stringent.

The applicant proposes to mitigate this by only operating the pumps used (only for up to 3 hours at a time during hydraulic fracturing) during weekday daytime and Saturday mornings.

Since the application was first submitted, the applicant has submitted further mitigation measures to reduce the levels of noise caused by drilling at night time. The applicant states the further mitigation will reduce noise levels at night to 39 dB at the nearest property.

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 to the site are at Staining Wood Cottages (270m south of the site) and Plumpton Hall Farm which includes two residential properties. It is approximately 380m to the east of the well pad boundary. There are a small number of other properties very near to Staining Wood Cottages at Foxwood Chase. These are a small distance further from the site than Staining Wood Cottages.

Assessing existing noise levels and ensuring control of noise at Plumpton Hall Farm and Staining Wood Cottages will ensure that other (more distant) noise sensitive premises are protected from noise from the site.

Consultee responses and representations

LCC 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 for the following summarised reasons:

- The proposed drilling operations would be in relatively close proximity to residential properties and the noise and general disturbance from 24 hour drilling operations and associated activity would be significant.
- Contrary to Policy DM2 of the Minerals and Waste local Plan.
- Contrary to Policies EP26, EP27 and EP28 of the Fylde Borough Local Plan, which is considered to be in conformity with the provisions of the NPPF.

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.

Westby-with- Plumptons Parish Council: Recommends the application be refused because of noise pollution day and night from the 24hour operation.

Kirkham Town Council: Objects to the proposal on a number of grounds including noise.

Medlar-with-Wesham Parish Council: Objects to the proposal on a number of grounds including noise.

CPRE Lancashire: Is concerned about noise levels during the night for local residents and wildlife and is reassured by the commitment by the applicant not to frack outside normal working hours (viz. between 19.00 and 07.00) due to pumping equipment. To minimise noise pollution, they suggest the use of generators which emit less than an agreed level of perceived decibels 200 metres outside the site boundary and by not using drilling equipment overnight during the period 1900-0700 hours. They also suggest that planning approval, if given, should be subject to a condition requiring these noise reduction standards.

Friends of the Earth: Local resident groups believe that the applicant may have failed accurately to identify baseline noise levels, meaning those impacts on wintering birds (and other ecology) and the steps proposed to mitigate are called into question. Concerned that the very limited ambient noise level monitoring undertaken would not be expected to fully characterise the average noise climate. People living nearby would be exposed to clearly audible noise levels at night and could legitimately find the noise disturbing. FOE therefore contend that even with the mitigation proposed by the developer, that reported sleep disturbance (and therefore the possible attendant health risks particularly for vulnerable groups) may be felt as it is technically impossible for the developer to reduce the noise level to below 35dB, and above 35dB is when impacts could start to be felt.

Preston New Road Action Group: Residents of Foxwood Chase appointed a noise consultant to undertake a review of the Noise sections of the Environmental Statement. The conclusions of the review can be summarised as follows:

- The applicant is trying to mitigate noise down to a level which is most likely still above PPG due tothe time-period Jacobs conducted their survey.
- This level does not take into account the highly intrusive tonal aspects of the noise source.
- This level is the MAXIMUM change that is considered acceptable in PPG. It may be appropriate inan environment that already has a high level of background noise, but NOT appropriate in this quiet rural setting.
- As the applicant is struggling to meet the maximum noise level now, and effectiveness of proposed mitigation is hypothetical – they are therefore likely to exceed these limits and any planning conditions applied.
- Mitigation measures may impact other aspects of the application and these need to be fully considered.

Defend Lytham: Unacceptable levels of noise and vibration that would be felt a considerable distance away.

Little Plumpton Awareness Group: Current regulations are designed for off shore, not on shore and are inadequate.

Frack Free Fylde: Would cause damage to roads and health shouldered by the tax payer.

RAFF: Public health is a material consideration.

Other representations

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

- There will be an unacceptable level of noise / noise pollution.
- The proposed times and duration for hydraulic fracturing are excessive in an area people have chosen to live in for the peace and quiet.
- A 50db noise level during fracturing is too loud to be acceptable.
- 24 hours a day of drilling, compressor and generator noise alongside associated traffic noise will disturb residents and have negative impacts on shift workers.
- Carr Bridge residential park, residents aged 55-90 years old of which many are not in good health. They chose to live on the site for the pleasant, quiet, rural location but are greatly concerned about drilling and traffic noise.
- The impact of 24/7 noise for a local autistic child will be unbearable.
- How far away will compressor stations be heard? The thump of compressors could be sensed up to 2 miles away.
- Traffic noise will affect the peace and quiet, with HGVs thundering past properties.
- The applicants EIA site noise assessment is incorrect for Foxwood Chase as the majority of residents are retired so if the noise exceeds acceptable limits it will have a significant effect on their daily enjoyment of homes and gardens.
- The applicants EIA traffic noise assessment is incorrect for Foxwood Chase as the properties are in close proximity to the site entrance and will hear HGV's and other vehicles decelerating and accelerating on entry and exit to the site, resulting in varying noise levels not constant as reported in the EIA.
- The applicants EIA traffic assessment is incorrect as the increase in traffic noise will be significant as the noise from one HGV is equivalent to noise from 10-15 cars and there will be 100 lorries per day.
- There will be a detrimental effect from noise in Great Plumpton, due to the prevailing wind blowing from the west carrying noise to the village. The ES has not provided information on noise levels for the village.
- There will be negative impacts from noise to the nearby dog kennels and the horse welfare centre.
- There is no information regarding noise from explosives detonation and impact on residents.
- The proposed site is a quiet field so the noise will be new and concentrated
- The noise of the site will impact on local residents and visitors enjoyment of the site for leisure including walking.
- There needs to be baseline and continuous acoustic monitoring at neighbouring houses.
- Cuadrilla exceeded set noise levels at Balcombe.
- The proposal will be contrary to Noise Policy Statement for England, Defra 2010 and NPPF 2012 Paragraph 144 due to observed adverse effects from large scale, long term noise duration.
- The proposal will be contrary to FBLP Policy EP27 by emitting unacceptable constant noise in a relatively quiet rural area.
- There will be unacceptable noise impacts on wildlife

- Jacobs found the background noise level at Staining Wood Cottages to be 6dB lower than that found by Arup, despite the Jacobs survey being taken at a noisier period of the night.
- The question regarding BSI 5228-1 being a suitable standard has not been satisfactorily answered.
- It is not clear if low-frequency noise generated by all aspects of the site construction and operation, and their effects on the health and well-being of nearby residents has been taken into account.
- There are still outstanding questions arising from Jacobs review of Arup's Environmental Statements.
- Baseline traffic volumes have been overestimated in the Environmental Statement throwing doubt on their findings.
- It is not clear if the change in traffic profile, and particularly the effect of accelerating and decelerating HGV's on noise and annoyance has been fully and correctly taken into account.

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 bleepers, may also require separate limits that are independent of background noise (e.g. Lmax 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 has provided 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 (eg, 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 bleepers, may also require separate limits that are independent of background noise (e.g. Lmax 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 tern 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 locations of Staining Wood Cottages and Plumpton Hall Farm are the closest sensitive receptors to the development, and focusing on these sensitive receptors is therefore not unreasonable. However, screening effects from barriers may be reduced at dwellings on elevated ground in relation to the site, such as the dwellings at Great Plumpton to the north-west of the Preston New Road 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 39dB at night can be achieved at the nearest noise sensitive receptor (Staining Wood Cottage) 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 39dB is below the WHO guideline.

The predicted noise level of 39dB 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*

Residents Consultants report

The County Council has received a detailed representation from a specialist noise consultant (the consultant) on behalf of certain local residents. It is not clear who commissioned the noise consultant. But an earlier representation (January 2015) from the same consultant was commissioned by a local resident at Foxwood Chase, and it is assumed this is the case again.

In turn, the County Council asked its noise specialist from Jacobs to review this and other representations on noise.

The consultant explains that their report dated 20th January 2015 provided comments on the earlier information provided by the applicant in support of the application. The report raised concerns over the applicant's proposed noise limits, and the potential for noise impacts should noise from the development be 42 dB L_{Aeq} at night. They expressed concern that this noise level would be 12dB above the background noise level at Staining Wood Cottages and hence intrusive. MAS state "*The 42dB L_{Aeq} criterion is derived from the upper or maximum limit set out in Planning Practice Guidance (PPG) on noise from mineral operations at night. The noise limits imposed on minerals operation are generally generous in the context of the areas they typically occur on the basis that such operations are inherently noisy and it needs to reflect the need for mineral extraction. They are normally temporary in nature unlike this proposed development which may be extended past 2 years.*"

Jacobs do not regard the PPG noise limits imposed on minerals operations as overly generous; they are intended to balance the competing demands of preserving residential amenity without placing unreasonable burdens on the minerals operator. Furthermore, opencast mining and quarry operations, which are clearly within the intended scope of the PPG noise limits, are often consented for far longer than two years. It is therefore not considered that the duration of the proposals are at odds with the PPG noise limits for minerals extraction.

The consultants discuss the potential for greater noise impacts where noise emissions have particular characteristics in relation to tonality and impulsivity. Noise emissions with tonal and impulsivity characteristics would be far more intrusive.

Where these characteristics exist the consultant states that a "*noise character penalty*" should be applied. 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, then suitable planning conditions can be set to address those concerns.

The consultant details that the re-working of the noise predictions results in a 3dB reduction in night time noise, which is described as a just perceptible change in noise level. The consultant welcome the reduction in night time noise level but do not consider that it goes far enough to give residents a reasonable level of protection when compared to the night time background noise level.

During the Jacobs noise survey that was commissioned by the County Council last year, undertaken between 00:00 and 03:00 at Staining Wood Cottages, background noise levels as low as 29.5dB were recorded. However, the consultant has not considered the L_{Aeq} (ambient noise levels) and L_{Amax} (maximum noise levels) recorded during that period. Between 00:00 and 03:00 L_{Aeq} noise levels varied between 46.2 - 56.2 dB with an averaged noise level of 52.2dB L_{Aeq}. Based on the results of the Jacobs noise survey existing night time ambient noise levels are approximately 7 to 17 dB higher than the predicted 39dB L_{Aeq} from the Preston New Road site. In addition during the Jacobs survey between 00:00 and 03:00 maximum noise levels varied between 62.8 - 73.9dB L_{Amax}. Notes taken during the survey detailed that "*Noise at Staining Wood Cottages was dominated by frequent passing cars on A583 with distant background noise from motorway traffic. Plumpton Hall Farm was dominated by frequent cars passing on A583 and with distant background noise from motorway traffic. Other occasional noise was distant helicopters, farm animals, and infrequent birdsong*." Noise from the site would not significantly increase existing ambient L_{Aeq} noise levels experienced at Staining Wood Cottages. Hence, the noise impact would not be as great as is suggested by merely comparing the predicted operational noise level with the background noise level.

The consultant further details concerns regarding the applicants use of the World Health Organisation (WHO) night time guideline of 40 dB $L_{night,outside}$ as the assessment LOAEL. They do not consider this appropriate as the WHO guideline is set in the "*context of transport noise which is considered a benign and anonymous source devoid of any intrusive character recognised as arising from commercial neighbours*". The consultant maintains that noise characteristics must be taken into account in determining the LOAEL. They also consider that the LOAEL is in relation to critical health effects rather than amenity.

As previously stated, if it is decided to grant consent to the application, planning conditions can be set in relation to tonal and impulsive noise characteristics. Within this context, Jacobs consider that it is reasonable to adopt the 40 dB $L_{night,outside}$ level as the assessment LOAEL provided that tonal and impulsive noise characteristics are appropriately controlled. However, Jacobs also consider that it would have been more appropriate had the applicant related the LOAEL to PPG minerals extraction guidance on night-time noise rather than WHO guidelines; this guidance states that night-time noise should be set to reduce to a minimum any adverse impacts, without imposing unreasonable burdens on the mineral operation, with an upper limit of 42 dB L_{Aeq} in any event (which could be regarded as the assessment Significant Observed Adverse Effect Level- SOAEL - the level above which significant adverse

effects on health and quality of life occur.). During the Jacobs noise survey the $LA_{90,15min}$ noise levels at the closest receptors (Staining Wood Cottages) ranged from 29.5 - 43 dB with a modal value of 31 dB. The applicant's predicted noise level of 39 dB L_{Aeq} is therefore less than 10 dB above the modal background noise level, and does not exceed the upper limit value of 42 dB $L_{Aeq,1h}$. Given the extensive noise mitigation measures that will be implemented by the applicant, the predicted noise level of 39 dB L_{Aeq} might well be regarded as the minimum achievable without undue burden on the operator, although the applicant has stated achieving this level is onerous and goes beyond the limits set by precedents in planning decisions.

The consultant correctly states that it is not appropriate to consider night time noise from the site in isolation from other existing noise sources. They further correctly state that the cumulative effect of all sources of noise over an extended period of time would be necessary to establish the actual $L_{night,outside}$ noise level. MAS detail that WHO recommend lower noise limits where vulnerable groups are affected. They detail that when site noise is combined with existing ambient noise the cumulative noise level will exceed the WHO LOAEL (Lowest Observed Adverse Effect Level). However, given the existing ambient noise levels (46 – 56 dB $L_{Aeq,15min}$) and maximum noise levels (63 – 74 dB $L_{Amax,15min}$) recorded by Jacobs at Staining Wood Cottages, the nearest sensitive receptor to the site, the introduction of a night time noise source contributing 39 dB L_{Aeq} with no tonal or significant impulsivity would result in an increase in ambient noise level of less than 1 dB L_{Aeq} during the quietest parts of the night. To put this in context, the consultant describes a 3dB change in noise as 'just perceptible'.

The consultant detail concerns again regarding low frequency noise and tonality of the noise emissions. They correctly detail that measurements in the near vicinity of noise sources may not be reflected in measurements at noise sensitive receptors some distance away from the noise source. If it is decided to grant consent to the application, drafting a condition for the measurements to determine tonality should take into account that measurements near noise sources may not be the same at noise sensitive receptors. In assessing whether low frequency noise is causing a disturbance reference is 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, a University of Salford publication. The 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 noise disturbance, it is not considered that it should be a material planning issue.

The consultant in conclusion detail the following two statements:

> "*The logical conclusion is that night time noise from operations will cross the threshold into significant observed adverse effects resulting in residents*

having disturbed sleep and behavioural changes such as keeping windows closed. Noise problems that manifest during operations may be difficult or impossible to fully resolve due to the inherent nature of the site noise and extensive noise mitigation measures that are demonstrated as unlikely to be extended."

"*Whilst planning is a balance between a number of considerations, and there is a clear objective from central government to push through this type of development on economic grounds, the potential impact in terms of noise pollution upon a number of surrounding dwellings will be unacceptable and contrary to the aims of the National Planning Policy Framework and the PPG and it is recommended that planning permission is refused. It is also my advice to the residents to seek legal advice on what may, prima facie, be an irrational decision that applies guidance plainly out of context and which as a result allows excessive noise impact.*"

Jacob's conclude it is difficult to reconcile the statement from MAS that night time noise from operations will cross the threshold into significant observed adverse effects, based on a night time noise level of 39 dB $L_{Aeq,1h,}$ particularly if conditions controlling impulsive events and tonality are implemented.

The consultant is correct in stating that planning is a balance between a number of considerations. In determining whether to grant consent to an application an objective consideration of the issues is required. Should it be decided to grant consent to the application and noise limit values are achieved with conditions to eliminate tonal characteristic and limit L_{Amax} (impulsive) noise events exceeding a certain threshold at night, Jacob's conclude it is difficult to rationalise the statement "*the potential impact in terms of noise pollution upon a number of surrounding dwellings will be unacceptable and contrary to the aims of the National Planning Policy Framework and the PPG*".

If the application is granted, there will be a noise impact, however, this noise impact is predicted to be in line with PPG advice and it is recommended that the conditions relating to noise suggested by Jacobs be attached to the consent to ensure noise emissions are monitored and controlled.

In conclusion, many of the concerns raised by the consultant have similarities to those raised by Jacobs. It is Jacobs view that if it is minded to grant consent to the application suitable planning conditions can be set to address these concerns and protect residential amenity.

Conclusion

The applicant's noise models for drilling and hydraulic fracturing 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 sites.

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.

During the Jacobs noise survey that was commissioned by the County Council last year, undertaken between 00:00 and 03:00 at Staining Wood Cottages, background noise levels as low as 29.5dB were recorded. Between 00:00 and 03:00 L_{Aeq} noise levels varied between 46.2 - 56.2 dB with an averaged noise level of 52.2dB L_{Aeq}. Based on the results of the Jacobs noise survey existing night time ambient noise levels are approximately 7 to 17 dB higher than the predicted 39dB L_{Aeq} from the applicant's Preston New Road site. In addition during the Jacobs survey between 00:00 and 03:00 maximum noise levels varied between 62.8 - 73.9dB L_{Amax}. Notes taken during the survey detailed that "*Noise at Staining Wood Cottages was dominated by frequent passing cars on A583 with distant background noise from motorway traffic. Plumpton Hall Farm was dominated by frequent cars passing on A583 and with distant background noise from motorway traffic. Other occasional noise was distant helicopters, farm animals, and infrequent birdsong*." Noise from the site would not significantly increase existing ambient L_{Aeq} noise levels experienced at Staining Wood Cottages.

The applicant's predicted noise level of 39 dB L_{Aeq} at night is less than 10 dB above the modal background noise level, and does not exceed the upper limit value of 42 dB $L_{Aeq,1h}$ as set out in national guidance. Given the extensive noise mitigation measures that will be implemented by the applicant, the predicted noise level of 39 dB L_{Aeq} might well be regarded as the minimum achievable without undue burden, although the applicant has stated achieving this level is onerous and goes beyond limits set in precedents in planning conditions.

Moreover, given the existing ambient noise levels (46 – 56 dB $L_{Aeq,15min}$) and maximum noise levels (63 – 74 dB $L_{Amax,15min}$) recorded by Jacobs at Staining Wood Cottages, the nearest sensitive receptor to the site, the introduction of a night time noise source contributing 39 dB L_{Aeq} with no tonal or significant impulsivity would result in an increase in ambient noise level of less than 1 dB L_{Aeq} during the quietest parts of the night. To put this in context, the objector's noise consultant describes a 3dB change in noise as 'just perceptible'.

The proposed noise mitigation measures are therefore considered to be practicable, and the claimed noise reductions achieved by each of the measures are based on guidance in International and British standards.

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.