

## 9.0 NOISE AND VIBRATION

### Introduction

9.1 This chapter of the ES assesses the likely significant effects of the Development in terms of noise and vibration. In particular, the likely significant effects associated with the Development include:

- Noise arising from plant and activities associated with the construction works (*e.g.* the excavation of trenches);
- Noise emitted from the Ebberston Moor South (EMS) Well Site during re-entry of the existing gas well and drilling of the proposed water producing and disposal well;
- Other noise associated with the construction of the Development, including HGV traffic;
- Noise effects which may arise as a result of traffic generation from the completed phase of the Development; and
- Noise associated with the operation of the proposed gas pipeline termination at Knapton Generating Station (KGS).

9.2 The chapter describes the assessment methodology; the baseline conditions at the Site and surroundings; the likely significant environmental effects; the mitigation measures required to prevent, reduce or offset any significant adverse effects; and the likely residual effects after these measures have been employed.

### Policy Context

#### National legislation

9.3 The principal legal control over environmental noise is based on the concept of 'nuisance', contained in Part III of the Environmental Protection Act 1990. The Act empowers local authorities to deal with noise from premises such as homes, pubs, and factories, and from machinery, equipment and vehicles in the street. Before action can be taken, an environmental health professional has to establish that the noise constitutes a statutory nuisance. This means that they have to prove that the noise is causing an unreasonable interference with someone's use of their land or material discomfort to the population at large. Section 79 of the EPA defines statutory nuisances caused by (*inter alia*) noise emitted from premises so as to be prejudicial to health or a nuisance. Where a local authority is satisfied that a statutory nuisance exists, it is to serve an abatement notice requiring the

abatement of the nuisance, restricting its occurrence or recurrence, or requiring steps to be taken as necessary. Where the notice requires work, a period of time will be given to allow it to be carried out. Failure to comply with the notice after that time is a criminal offence, and the person could be prosecuted. Compliance with the legal requirements not to cause a statutory nuisance is normally dealt with by assessing a development proposal using BS.4142:1997, as described below.

- 9.4 Subject to some other provisions, it is a defence to prove that the best practicable means have been used to prevent or counteract the effects of the nuisance. The relevant parts of the Act would apply to all phases of the Development.
- 9.5 In the special case of construction equipment, there has for some years been a European Directive restricting the permissible noise emissions from certain types of machinery. The current Directives are 2000/14/EC, which was later amended by 2005/88/EC. These were enacted into UK law by Statutory Instrument 2001 no.1701 as amended, The Noise Emission into the Environment by Equipment for Use Outdoors Regulations 2001. The regulations restrict the permissible sound power emissions of, inter alia, excavators and tracked dozers.
- 9.6 Some of the provisions of the Control of Pollution Act 1974 relating to construction noise are still in effect: Section 60 allows a local authority to require construction works to be carried out in a particular way in order to control noise as far as is reasonably practicable.
- 9.7 Section 61 allows for a developer to apply for prior consent for construction works in respect of the method by which the works are to be carried out, and the steps proposed in order that noise arising from the works is minimised.

#### National Planning Policy Framework<sup>1</sup>

- 9.8 The National Planning Policy Framework (NPPF) was published in 2012 and replaced Planning Policy Guidance (PPG) 24: Planning and Noise, and Minerals Policy Statement (MPS) 2: Controlling and Mitigating the Environmental Effects of Mineral Extraction in England. It provides the following guidance on noise, planning and minerals.
- 9.9 The NPPF states at paragraph 123 that planning policies and decisions should avoid noise giving rise to "*significant adverse impacts ... on ... quality of life*", and mitigate the adverse impacts through the use of conditions, but recognise that development will often create some noise.
- 9.10 Under Section 13 – Facilitating the sustainable use of minerals, paragraph 143 says that when developing noise limits local planning authorities should

*"Recognise that some noisy short-term activities, which may otherwise be regarded as unacceptable, are unavoidable to facilitate minerals extraction".*

The NPPF also states at paragraph 144, that when determining applications local planning authorities should;

*"Ensure that any unavoidable noise, dust and particle emissions and any blasting vibrations are controlled, mitigated or removed at source".*

#### Planning Practice Guidance (PPG)

- 9.11 The Planning Practice Guidance (PPG) published online in March 2014 states that noise needs to be considered when a new development may create additional noise, and when a new development would be sensitive to the prevailing acoustic environment. It refers to the Noise Policy Statement for England (NPSE) which has three stated aims: to avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development; to mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development; and where possible, to contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development. The concepts of 'no observed effect level', 'lowest observed adverse effect level', and 'significant observed adverse effect level' (NOEL, LOAEL and SOAEL) as applied by the World Health Organisation (WHO) are introduced by the NPSE and referred to by the PPG, although no specific guidance is provided.
- 9.12 The PPG on minerals states that a noise assessment 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.

9.13 The PPG states that proposals for the control or mitigation of noise emissions from minerals sites should consider several factors, including:

- The main characteristics of the production process and its environs including the location of noise-sensitive properties;
- Assessing the existing noise climate around the site including background noise levels at nearby noise-sensitive properties;
- Estimating the likely future noise from the development, and its impact;
- Proposals to minimise, mitigate or remove noise emissions at source; and
- Monitoring noise emissions to ensure compliance with appropriate environmental standards.

#### Local Planning Policy

9.14 The North York Moors Core Strategy and Development Policies (2008) was adopted in November 2008. It supersedes the policies in the North York Moors Local Plan (2003). Development Policy 1, Environmental Protection, states that development will only be permitted where there will be no adverse effects arising from sources of pollution which would impact on the health, safety and amenity of the public and users of the development, and where it will not generate unacceptable levels of noise or vibration.

9.15 Much of the North Yorkshire County Council Minerals Local Plan 1997 became a saved policy which continues to form part of the statutory development plan and provide the local policy framework for development control decisions until replaced. Chapter 7 dealt with oil and gas, but section 7/1 Noise was not saved.

9.16 The Ryedale Local Plan was adopted in March 2002. The Secretary of State issued a Direction in September 2007, identifying those policies which had been 'saved' and therefore remain in force. Policy ENV24 (Noise-generating development) was not saved and therefore, does not apply.

9.17 The current Ryedale Local Strategy was adopted in September 2013 and sets out to encourage new development and manage future growth, whilst ensuring that change across the District is based on a presumption in favour of sustainable development. SP20 Generic Development management Issues states that new development shall have no material adverse impact on the amenity of present or future occupants, the users or occupants of neighbouring land and buildings, or the wider community by virtue of its design, use, location and proximity to neighbouring land uses. Impacts on amenity can include noise. Developers are expected to apply the highest standards outlined in the World Health

Organisation, British Standards and wider international and national standards relating to noise. The reference to the WHO guidance is the same as that in the March 2014 PPG.

#### Relevant Standards

- 9.18 In order that the requirements of the Environmental Protection Act and the PPG can be met (where relevant) it is usual practice to use BS.4142:1997 to make an assessment of the likely noise nuisance resulting from a proposed noise-emitting development. This British Standard, *Method for rating industrial noise affecting mixed residential and industrial areas* provides a methodology for comparing the noise from an industrial undertaking with the pre-existing background noise, and the likelihood that complaints will be precipitated from the local community. The probability that justifiable complaints about noise will arise is taken to be an indication that a noise nuisance will exist. It is based on calculating the excess of the 'rating' noise level over the typical minimum background noise level. The Standard is currently under review and the next issue is expected to be published before the end of 2014. To summarise the current Standard, complaints from local residents are only considered likely where a development gives rise to noise levels that exceed the previous ambient noise by 10dB or more. Where the 'new' noise is 10dB quieter than the present ambient noise levels, this is to be taken as a positive indication that justifiable complaints will not occur. Differences of 5dB are regarded as being of marginal significance. In practical terms this means that there is a band of uncertainty at least 10dB wide, and probably nearer 20dB wide, within which neither developers nor the enforcement authorities have clear guidance on which they may rely. Nevertheless, BS.4142:1997 remains the established method of environmental noise assessment in this context.
- 9.19 Where noise from construction activities needs to be considered, BS.5228-1:2009 'Code of practice for noise and vibration control from construction and open sites' gives recommendations for basic methods of noise control on a construction site. It applies to work activities and operations that generate significant noise levels, and includes industry-specific guidance. The legislative background to noise control is described and recommendations are given regarding procedures for establishing effective liaison between developers, site operators and local authorities. BS.5228-1 provides guidance concerning methods of predicting and measuring noise and assessing its impact on those exposed to it.
- 9.20 Noise from road traffic movements is usually predicted with reference to the Department of Transport's 1988 document 'Calculation of Road Traffic Noise' (CRTN) which is designed to assess the changes in road traffic noise arising from a new road or a modified carriageway. Its usefulness in the assessment of this Development is limited, but equations are given in CRTN which relate the resulting noise levels at housing to the number of vehicle movements

expected. No changes in the highway layout are proposed as part of the Development, so the only potential changes in noise level from the road network are those arising from increases in the numbers of vehicle movements.

### **Assessment Methodology and Significance Criteria**

#### Assessment Methodology

- 9.21 The following scenarios were assumed for noise prediction work. For the drilling phase of the water disposal well at EMS Well Site, a rig of the class likely to be used is assumed to be on site, drilling ahead with the usual noise control features in place. For the construction phase at both EMS and KGS it was assumed that diesel-powered plant such as a small 360° excavator, mobile crane, and generator, as well as welding and power tools, were in use for a typical proportion of each working hour. Chapter 5, Table 5.1 gives a comprehensive list of the construction machinery that may be used at some stage of construction at EMS or KGS: it is not possible to state that certain items of equipment or certain power tools will be used at any particular time, or for any particular duration, so the acoustical modelling includes the noisiest and most frequently used machinery.
- 9.22 During the normal, operational phase at EMS the diesel generator and instrument air compressor are assumed to be operating continuously. For the normal operational mode at KGS, the plant is assumed to operate in its current mode: the additional gas reception facilities will not include any additional noise sources.
- 9.23 In all cases, equipment designated for emergency use only is assumed not to be running.
- 9.24 In order to assess the noise emitted during the pipeline construction, a group of three machines was assumed to be in operation simultaneously at the closest approach of the pipelines route to each of the nearest sensitive receptors (residential properties). This will be the 'worst case' scenario and will apply when there is no wind, or a slight wind from the pipelines route towards the noise receptor. In windier conditions the background noise level can safely be assumed to be higher because of rustling of vegetation and the noise of light objects being blown around.
- 9.25 For both the permanent sites and the temporary pipeline construction works, the noise levels were calculated from first principles, whereby the sound pressure level  $L_{pr}$  at a known distance  $r$  metres from a source is found from the sound power level  $L_w$  using the relationship  $L_{pr} = L_w - 20 \log r - 8$  [dB].

- 9.26 The maximum sound power from a 360° excavator is determined from the expression  $80 + 11 \log P$ , where  $P$  is the rated power output of the machine in kW. Similarly, the maximum sound power from a tracked dozer is  $86 + 11 \log P$  (a sideboom pipelayer is a special modification of such a machine). These noise limits will be used later in this Chapter as the maximum noise levels from construction machinery for predictive work.
- 9.27 In view of the separation distances involved between each group of noise sources and any receiver, there will be additional attenuation of sound as it passes over soft ground. This additional attenuation is dependent on frequency, so in the case of the pipeline construction it was assessed on the assumption that the noise emissions are typical of large diesel engines as used in construction machinery.

#### Noise-sensitive Receptors

- 9.28 The only class of potential noise-sensitive receptors identified in this study is that of dwellings. Agricultural and industrial buildings are not regarded as noise-sensitive in this context, and there are no schools or hospitals close enough to the pipeline route or the EMS Well Site to require consideration in terms of noise. In general, only dwellings within 1km of the pipeline route were considered to be within the scope of the noise prediction. The OS grid coordinates of the noise-sensitive receptors are shown in Table 9.1 and the locations are identified in Figures 9.1 and 9.2. The grid references shown are those of the nearest façade of a residential building to the pipeline.

**Table 9.1: Noise-sensitive Receptors for Predictive Work**

Location	Easting	Northing	Closest Approach, m
Givendale Head Farm	489443	487581	1010 from Well Site, 430 from pipeline
High Scamridge Farm	489640	487688	905 from Well Site, 390 from pipeline
Keeper's Cottage	490758	487518	560 from Well Site and pipeline
Hern Head House	491113	487483	838 from Well Site and pipeline
Warren House	487446	484557	125 from pipeline
Cliff Edge Farm	487247	482906	215 from pipeline
Allerston village (south end)	487858	482539	minimum 760 from pipeline
Wilton Carr House	486588	482098	440 from pipeline
New South Farm	487907	481884	820 from pipeline
Wilton Grange	487175	481567	135 from pipeline
Crake Hall	487128	479655	235 from pipeline
Newstead Grange	486534	479401	395 from pipeline
Wath House Farm	487473	478252	375 from pipeline
Knapton Lodge	487226	477549	145 from pipeline

Location	Easting	Northing	Closest Approach, m
Difford Farm	487841	477816	570 from pipeline

### Significance Criteria

9.29 Table 9.2 shows the definitions of significance criteria applied in this assessment, ranging from 'critical' to 'none'. These were formulated with regard to the National Planning Policy Framework (NPPF) which states that the planning system has an environmental role to help use natural resources prudently and minimise pollution. Minerals planning authorities are expected to ensure that plan proposals do not have an unacceptable adverse effect on the natural environment. The levels of no, lowest and significant observed adverse effect levels (NOEL, LOAEL and SOAEL) as defined by WHO are used to define impact.

**Table 9.2: Significance Criteria for Impact Magnitude**

Significance	Criterion
CRITICAL	These effects are generally, but not exclusively, associated with sites and features of national or regional importance. A change in a regional or district scale feature may also enter this category. Mitigation measures are unlikely to remove such effects. It is inconceivable that noise impact would ever fall within this category.
MAJOR	These effects are likely to be important considerations at a local or district scale, but if adverse, are potential concerns to the project, depending upon the relative importance attached to the issue during the decision-making process. Mitigation measures and detailed design work are unlikely to remove all of the effects upon the affected communities or interests.
MODERATE	These effects, if adverse, while important at a local scale, are not likely to be key decision-making issues. Nevertheless, the cumulative effect of such issues may lead to an increase in the overall effects on a particular area or on a particular resource. They represent issues where effects would be experienced but mitigation measures and detailed design work would ameliorate/enhance some of the consequences upon affected communities or interests. Some residual effects would still arise.
MINOR	These effects may be raised as local issues but are unlikely to be of importance in the decision-making process. Nevertheless, they are of relevance in enhancing the subsequent design of the proposed development the consideration of mitigation measures, and the imposition of planning conditions. In terms of noise and vibration, a SOAEL would indicate an impact of minor magnitude.
NEGLIGIBLE	No effects or those which are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error. A change in noise level less than 1dB is regarded as a negligible effect. Noise or vibration at the LOAEL or NOAEL would have no impact magnitude.



### Limitations and Assumptions

- 9.30 The public response to noise arising from the Development depends mainly on the pre-existing level of background noise, the amount by which the 'new' noise exceeds it, and the duration of any increase in noise levels. Noise from short-term activities is more acceptable than noise at the same level from more permanent activities. Noise during the evening and at night is less acceptable than the same noise occurring during the normal working day.
- 9.31 The likelihood of complaints about noise in mixed industrial and residential areas is covered by BS.4142:1997, as described above, but this standard is under extensive revision and may not give reliable results in this situation, which is a rural area with two small pockets of industrialisation (EMS and KGS). The context of industrial noise in the environment is likely to be central to the new issue of the Standard.
- 9.32 In order to predict the typical worst-case noise levels occurring during re-entry of the gas well and drilling of the water producing and disposal well at the EMS Well Site, part of the construction phase of the Development, the noisiest likely rig is assumed to be on site in the same orientation that was adopted when the gas well was drilled in 2008. This rig, the BDF28, is regularly contracted on UK sites and ACIA holds noise data which enable the worst-case noise emissions from the rig to be characterised. The actual noise emissions may be lower depending on the ancillary equipment brought onto site, which tends to be project-specific. However, if a different drilling rig were to be used, since the availability of BDF28 cannot be guaranteed in advance, it is unlikely to emit higher noise levels to the environment.
- 9.33 Operational noise from the KGS will not change as a result of the additional gas reception facility, which is simply a new connection into existing facilities. Current operational noise varies according to the demand for electricity from the grid.
- 9.34 Noise from pipeline operation will not be discernible even to an observer directly above the pipe route. The gas flow will be in a 12" diameter steel pipe buried at least 1m below ground level.

### Vibration

- 9.35 Given that the separation distances between the Development and the nearest residential properties are of the order of hundreds of metres, vibration effects would not be perceptible, so only a brief qualitative vibration assessment was conducted. The levels of vibration depend not only on the input excitation, but also on the ground conditions close to

the surface (in the unconsolidated layer) and the nature of the property in which vibration might be detected. None of these can be predicted other than in terms of the order of magnitude.

### **Baseline Conditions**

- 9.36 Studies of the background noise typical of the area of the Development have been undertaken by ACIA staff on a number of occasions in recent years. In view of the absence of significant developments apart from those associated with the gas exploration and development, there is no reason to suppose that the daytime or night-time background noise levels have changed. A brief survey of background noise at a number of key locations was undertaken during March 2010. The weather conditions were characterised by little or no wind, and no precipitation, and (during the daytime) an absence of extraneous noise sources which might temporarily increase the background levels. Additional noise measurements were made at night on 1 May 2014.
- 9.37 Rather than make noise measurements close to houses, which can be unrepresentative because of extraneous noise from heating systems, domestic animals and other sources, locations were chosen for noise measurements on the public road network or on rights of way.
- 9.38 Night-time noise levels were measured near the locations shown in Table 9.3 in the early hours of Friday 5 March 2010 in connection with a previous project, and on 1 May 2014 with respect to the Development. In all cases a Class I (precision) integrating sound level meter to IEC 61672-1: 2013 Electroacoustics - Sound level meters - Part 1: Specifications or its predecessor standard was used to make measurements over five-minute sample periods, and the equivalent continuous noise levels  $L_{Aeq,5min}$  and the  $L_{A90,5min}$  percentile exceedance levels were measured. The microphone was always positioned 1.5m above ground level and a proprietary windshield was fitted for all measurements. The calibration of the instrument was checked before and after the sequence of measurements using an appropriate electronic calibrator, and no drift was observed.
- 9.39 Daytime noise levels were measured near the locations shown in Table 9.3 on Thursday 11 March 2010 using the same instrumentation, and following exactly the same method. Occasionally the readings were affected by distant agricultural activity, birdsong or animal noise, and these sources were eliminated from the measurements whenever practicable by use of the meter's 'pause' function. In the case of Givendale Head Farm, the presence of an operational waste recycling facility means that the local noise levels are often considerably higher as refuse disposal and recycling vehicles arrive to discharge materials. Such vehicles

turn left into the farm directly in front of the dwelling, and leave the premises using the same route, turning right (southwards) onto the lane.

**Table 9.3: Background Noise Sampling Locations**

	Location	Easting	Northing
1	entrance to EMS Well Site	489615	487173
2	Pheasant Hill	484734	485018
3	near Warren House	487523	484267
4	north of Wilton village	486020	483140

9.40 The night of 4 to 5 March 2010 was particularly calm and quiet, and can be taken to represent the minimum likely ambient noise levels in the area of the Development. The minimum night-time air temperature was -3°C and there was no precipitation. Only occasional distant road traffic movements were audible at any location.

9.41 The afternoon of 11 March 2010 was also very calm, with no significant wind and 7/8 cloud cover. The air temperature was 8°C, there was no rainfall, and road surfaces were dry.

9.42 The night of 30 April to 1 May 2014 was subject to very light westerly winds not exceeding 2ms<sup>-1</sup>, a minimum air temperature of 10°C, and no rain.

9.43 The results of the background noise surveys are summarised in Table 9.4.

**Table 9.4: Summary of Background Noise Levels**

	Date	Time	Minimum L <sub>A90,5min</sub> dB	Minimum L <sub>Aeq,5min</sub> dB	Comments
1	5 March 2010	0130-0135	20	27	
2	5 March 2010	0140-0145	18	21	
3	5 March 2010	0210-0215	19	22	
4	5 March 2010	0235-0240	21	24	
1	11 March 2010	1335-1340	22	27	
2	11 March 2010	1350-1355	24	28	
3	11 March 2010	1425-1430	28	39	lambs bleating, birds
4	11 March 2010	1455-1500	26	30	distant farm machinery
1	1 May 2014	0015-0020	21	24	
2	1 May 2014	0030-0035	20	24	
3	1 May 2014	0100-0105	21	25	
4	1 May 2014	0140-0145	21	23	

9.44 It is clear from the results of the background noise survey that the Development is in a very quiet rural area. However, it has been noted in the past that within about 1km of Knpton Mill the ambient noise levels can, in adverse wind directions, be elevated by noise from the mill itself, especially its ventilation fan systems. Measurements carried out on 26 June 2012

showed that the night-time ambient noise level at Knapton Station House, close to Knapton Mill, was 48dB  $L_{Aeq,5min}$  but at Ochre Farm, the nearest dwelling to KGS but more distant from the Mill, the ambient noise level was 28dB  $L_{Aeq,5min}$ .

### **Likely Significant Effects**

- 9.45 Noise arising at the EMS Well Site during construction will be sporadic. A drilling rig has previously been used on the Well Site and minimal modifications will be necessary to accommodate a temporary drilling rig on two separate occasions, to allow re-entry to the gas well and construction of the proposed water producer/disposal well. The re-entry will occupy approximately 30 days, and it will require 60 days of rig time on site to drill and complete the second well. The second wellhead is likely to be near the existing well head, so ancillary equipment such as generators, mud pumps and solids control equipment will effectively be in the same locations for noise prediction purposes.
- 9.46 Construction of the new permanent facilities at EMS Well Site will be limited to minor groundworks to provide mountings or foundations for the local equipment room, hydrate inhibitor package, corrosion inhibitor package, wellhead water separator, pig launcher for the new pipeline, and a diesel generator. The relevant noise sources will be a temporary power generator, fabrication equipment, the occasional use of other diesel powered plant such as a JCB backhoe loader, crane or telescopic handler, and movements of HGVs delivering materials to site.
- 9.47 The construction of the pipeline termination and gas reception facilities at KGS will occupy a period of some 30 days, during which the relevant noise sources will be a power generator, deliveries and offloading of materials and equipment (during daytime working hours only), ancillary lifting equipment, fabrication equipment and contractors' plant.

#### Drilling rig noise from EMS Well Site

- 9.48 The typical worst case drilling rig for this type of project in the UK is the BDF28, which is a rotary rig fitted with a top drive system, together with diesel generators and mud pumps, all of which are fitted with effective acoustical housings. These have specially-built air inlet and outlet attenuators and high performance exhaust silencers. It is not practicable to enclose solids control equipment and mud tanks, and the type of machinery used may vary according to the requirements of a particular project, but the standard shale shakers and mud cleaners are included in the noise 'signature' used for predictions.

- 9.49 The calculated noise level at High Scamridge Farm, 390m distant, is 27dB  $L_{Aeq,5min}$ , and at Givendale Head Farm, 430m distant, it is 26dB  $L_{Aeq,5min}$ . These levels are slightly above the likely background levels on a quiet night but at all other times will be subsumed into the general levels of ambient noise. The effect is therefore of minor adverse significance. The calculated noise level at Keeper's Cottage, 560m distant, is 22dB  $L_{Aeq,5min}$  having allowed for directivity and attenuation owing to land form. The effect here and at Hern Head House, 838m distant, is negligible.
- 9.50 The shale shakers located next to the drilling rig itself, and forming part of the solids control equipment, are significant sources of vibrational energy since their operation, as the name implies, depends on passing the returned drilling fluids through a set of reciprocating (vibrating) screens. This vibration is detectable on the solids control structure itself, and can sometimes just be detected by an observer standing on the ground next to the machinery. This vibration is dissipated within a matter of a few metres and is undetectable beyond the confines of the site. There will be no sources of significant ground vibration during rig operations which will be detectable inside neighbouring properties.
- 9.51 Vibration arising at the drill bit, hundreds of metres below ground level, can occasionally be detectable on the drill floor because of direct transmission up the drill string. None of this vibration passes through the ground to areas beyond the rig itself, and no ground vibration during rig operations will be detectable to a human observer inside neighbouring properties. The levels of vibration inside these properties will be several orders of magnitude lower than the architectural damage criteria given in BS.7385-2:1993, and at least two orders of magnitude below the levels perceptible to a human observer. This impact effect is negligible.

#### Construction noise from EMS Well Site

- 9.52 The typical daytime noise levels at High Scamridge Farm and Givendale Head Farm during daytime construction work will be 36dB  $L_{Aeq,1h}$  and 35dB  $L_{Aeq,1h}$  respectively, based on three diesel-powered construction machines (JCB backhoe loader, 360° excavator and a small crane or telescopic handler) each operating for 50% of the time, and a packaged diesel generator set operating continuously. These levels will be discernible at the two receptor locations in the absence of masking noise, but will not exceed the levels typically emitted by agricultural tractors or (in the case of Givendale Head Farm) the noise from refuse disposal and recycling vehicles offloading. The diesel generator by itself will be inaudible during the daytime and will not be run at night. The impact effect is negligible. The typical daytime noise levels at Keepers Cottage and Hern Hill House will be 29dB  $L_{Aeq,1h}$  and 27dB  $L_{Aeq,1h}$

respectively, on the same basis but allowing for screening effects. The impact effect is again negligible.

#### Construction noise from KGS

- 9.53 The nearest noise-sensitive locations (dwelling) to the KGS are Ochre Farm, 715m to the north-north-east, and Guild Farm East Knapton, 935m to the south-west. All other dwellings are located more than 1km from KGS and can be disregarded. The effects of three diesel-powered construction machines (JCB backhoe loader, 360° excavator and a small crane or telescopic handler) each operating for 50% of the time, and a packaged diesel generator set operating continuously during the daytime, will be an  $L_{Aeq,1h}$  of 39dB at Ochre Farm and 36dB at Guild Farm, before any allowance for screening because of intervening buildings. These levels may be discernible at the two receptor locations in the absence of masking noise from other sources (not KGS), but they will not exceed the levels typically emitted by agricultural machinery. The impact is negligible.

#### Assessment of Pipeline Construction Noise

- 9.54 Noise from the pipelines construction will typically arise from the operation of three types of machine: a 360° excavator, a sideboom pipelaying machine (a modification of a tracked dozer), and a single HGV (either a low-loader or an articulated goods vehicle). In addition, from time to time a 50T mobile crane will be deployed instead of the pipelaying machine, but it is unlikely that both types of machine would be at their closest approach to any given residential property at the same time. For the great majority of pipeline construction work (trenching, pipelaying and joining, and backfilling) the separation distances between operational equipment and noise-sensitive properties will be much greater, and fewer machines will be in operation at a given location.
- 9.55 The maximum aggregate noise levels from these machines, operating simultaneously at the nearest approach of the pipeline to the noise-sensitive receptors, are shown in Table 9.5.

**Table 9.5: Maximum Noise Levels at Noise-sensitive Receptors**

Location	Distance, m	$L_{Aeq,1h}$ dB
Givendale Head Farm	430	52
High Scamridge Farm	390	53
Keepers Cottage	560	50
Hern Hill House	838	46
Warren House	125	63
Cliff Edge Farm	215	58
Allerston village (south end)	760	47
Wilton Carr House	440	52

Location	Distance, m	L <sub>Aeq,1h</sub> dB
New South Farm	820	46
Wilton Grange	135	62
Crake Hall	235	57
Newstead Grange	395	53
Wath House Farm	375	53
Knapton Lodge	145	61
Difford Farm	570	50

- 9.56 Noise from the construction of the pipeline will be transitory and limited in duration with respect to any single noise receptor. Because the works will be progressive it is unlikely that any individual dwelling will be subject to increased noise levels for more than a few days. Only five properties will be subject to daytime noise levels L<sub>Aeq,1h</sub> in excess of 55dB. On those few days the noise level may be significant according to the WHO Guidelines, so there will be a minor adverse impact.

#### Assessment of Road Traffic Noise

- 9.57 The maximum additional road traffic movements expected during the construction phase of the Development are shown in Table 9.6. These are derived from Chapter 8, Table 8.9 and take into account two separate mobilisations and demobilisations of the drilling rig to EMS Well Site.

**Table 9.6: Construction Traffic Movements**

Site and Activity	HGV	Others	time
<b>EMS Well Site: re-entry</b>			
drilling rig mobilisation/demobilisation	126	20	over 7 days
drilling rig operation	1	5	daily
installation of production equipment	4	7	daily
<b>Pipeline</b>			
installation	18	48	daily
<b>KGS</b>			
site preparation, installation and commissioning	2	10	daily
<b>EMS Well Site: water disposal/injection well</b>			
drilling rig mobilisation/demobilisation	126	20	over 7 days
drilling rig operation	1	5	daily

- 9.58 Noise from road traffic movements is usually predicted with reference to Calculation of Road Traffic Noise, which relates the noise level at a roadside property to the number and types of vehicles flowing along it, the average speed of such movements, and the proportion of 'heavy' vehicles (*i.e.* HGVs) in the flow. Table 9.6 can be used to show that the daily increase

in traffic, all assumed to be travelling along the A170, will be 1.5% compared with the annual average daily traffic. It is known that the daily traffic on the A170 primary route increases by approximately 33% in the summer (see Chapter 11), and a temporary increase of 1.5% is very small in comparison. The noise level from traffic flowing on the road in terms of the  $L_{A10,18h}$  value, taking into account the increase resulting from the project in comparison with the annual average daily flow, would increase by 0.06dB, which is so small as to be undetectable: there would be negligible impact.

- 9.59 Vehicle movements on the unclassified road to Givendale Head will be perceived as individual events rather than a change in the general levels of long-term road traffic noise.

#### Assessment of Noise Emissions from Operational Plant

- 9.60 The estimated noise levels on-plant of each item of permanent equipment are shown in Table 9.7. At the time of writing no frequency spectrum information was available for any individual item of plant, and the detail design had not advanced sufficiently to make reliable estimates of the likely frequency content of the noise emitted to atmosphere. However, the worst-case overall noise emissions in dB(A) were derived from previous experience of similar equipment, and the noise level resulting from the operation of each was calculated at appropriate distances.

**Table 9.7: Noise Levels from Operational Plant**

<b>Plant description</b>	<b>Estimated Noise Level at 1m, dB(A)</b>
<b>Ebberston Moor South Well Site</b>	
hydrate inhibitor injection pump	70
corrosion inhibitor injection pump	70
instrument air compressor	70
diesel generator	75
<b>Pipeline</b>	
no noise-emitting equipment	
<b>Knapton Generating Station</b>	
no additional noise-emitting equipment	

- 9.61 The aggregate noise levels from the EMS Well Site under normal operational conditions at the nearest residential properties to the Site will be less than 10dB  $L_{Aeq,5m}$  at both High Scamridge Farm and Givendale Head Farm. These levels of noise will be completely inaudible at all times of day and night.



- 9.62 The 12" diameter steel pipe will be buried at a minimum of 1 metre below the ground and gas flow noise will be attenuated by the pipe wall and the subsoil/topsoil. No operational noise from the pipeline will be measurable even directly above the pipe route, and none will be detectable at any property along the route.
- 9.63 The operational noise levels at the nearest noise-sensitive properties to KGS will be unaffected by the Development and will continued to be governed by the mode of operation on Site.
- 9.64 Table 9.8 summarises the significance of the noise from construction plant, road traffic and operational sources at the EMS Well Site, along the pipeline construction route and at KGS. It is implicit in this significance matrix that construction activities will occur only during a well-defined working day such as 07.00h to 18.00h on weekdays and 07:00j to 13:00h on Saturdays.

#### Construction

- 9.65 Construction and installation of the production equipment at the EMS Well Site will be a relatively short-term project, the noise from which may affect only four isolated locations. During the normal working day, Givendale Head Farm is visited by numbers of heavy goods vehicles bringing materials for recycling, and the noise from the recycling operation itself, albeit intermittent, is at significantly higher levels than the likely noise from construction activities at the EMS Well Site. High Scamridge Farm, as a working farm, can be subject to noise from agricultural vehicles and machinery at any time of year, during extended working days, and thus equipment will be comparable in character and source level with the types of construction machinery likely to be used at the EMS Well Site. Keepers Cottage and Hern Hill House are both protected from construction and installation noise at the EMS Well Site by the intervening landform.
- 9.66 Pipeline construction works will, for the most part, be completely inaudible at distant locations, or will be subjectively unnoticeable because the noise will be similar in character to that from familiar agricultural machinery. The hours of operations will be strictly limited, whereas normal agriculture has no such restrictions. Where pipeline excavation, installation and backfilling occurs at or near the closest approach of the route to noise-sensitive properties, it will be clearly audible, but given its temporary nature the noise impact will be, at worst, minor, with only a few properties possibly affected. The noise levels within Allerston village, which is the largest area of habitation within 1km of the route, will not exceed 47dB  $L_{Aeq,1h}$  which is well within the lowest limit normally applied to construction noise. According to the current PPG the noise in Allerston will fall into the category of

'noticeable but not intrusive', meaning that it can be heard, but does not cause any change in behaviour or attitude. If this slightly affected the acoustical character of the area but not such that there was a perceived change in the quality of life, there would be no observed adverse effect and no specific measures would be required. This is the case because there would be no permanent change in the noise environment.

#### Road traffic noise

- 9.67 There will be no detectable changes in the daily average noise level from road traffic on the A170 primary route. The noise levels from road traffic at all residential properties within earshot of the road are subject to substantial seasonal variation, but when compared with the average annual traffic flows (as opposed to the maximum, summertime flows) the increase on traffic as a result of the Development is not measurable.
- 9.68 Noise from individual vehicle movements on minor roads will be clearly heard by casual observers, but the increase in noise will be limited to single events as the vehicle passes. There will not be large numbers of additional private car movements, compared with normal baseline traffic flows, and movements of HGVs will take place only during the working hours determined by the Local Planning Authority.

#### Completed Development

- 9.69 Noise from the operational EMS Well Site will be inaudible at the nearest residential properties. Noise from the gas flow in the buried pipeline will be completely undetectable at any residential property along the route. Noise from the KGS at its nearest residential neighbours will be unchanged from current operations.

**Table 9.8: Significance of Effects: Noise at Local Residential Properties**

Source	Receptor	Significance
Well Site construction/installation	High Scamridge, Givendale Head	Minor adverse
	Keepers Cottage, Hill Head House	negligible
Well drilling	High Scamridge, Givendale Head	Minor adverse
	Keepers Cottage, Hill Head House	negligible
EMS Well Site operations	High Scamridge, Givendale Head, Keepers Cottage, Hill Head House	negligible
pipeline construction	Warren House, Cliff Edge Farm, Wilton Grange, Crake Hall, Knapton Lodge	Minor adverse
pipeline construction	High Scamridge, Givendale Head, Keepers Cottage, Hill Head House, Allerston village, Wilton Carr House, New South Farm, Newstead Grange, Wath House	negligible

Source	Receptor	Significance
	Farm, Difford Farm	
road traffic during construction	all locations near A170	negligible
pipeline operation	all locations	negligible
KGS construction	all locations	negligible
KGS operation	all locations	negligible
road traffic during operation	all locations	negligible
EMS Well Site decommissioning and restoration	High Scamridge, Givendale Head, Keepers Cottage, Hill Head House	negligible

#### Decommissioning and Restoration

- 9.70 The levels of noise arising during decommissioning (dismantling and removal of plant) and site restoration (primarily earthworks) at EMS Well Site will at worst be no greater than those arising during site construction, with earthmoving machinery being the greatest sources of sound power. The values in paragraph 9.52 also represent the maximum  $L_{Aeq,1h}$  from levelling and grading the site after operational equipment has been removed. The predicted noise levels are of negligible impact in terms of their effect on the amenity of local residents.
- 9.71 During the decommissioning phase there will be an increase in vehicular traffic along Ebberston Common Lane and some noise from heavy goods vehicles travelling on the public highway is unavoidable. At this stage it is not possible to state exact numbers, because the programme of decommissioning, dismantling and site works is unknown. However, it is very unlikely that the numbers of vehicles involved will exceed those during the construction phase.

#### Mitigation Measures

##### Construction

- 9.72 Construction noise is best mitigated by careful implementation of BS.5228-1 *Code of Practice for noise and vibration control from construction and open sites*. This ensures that the maximum noise levels from construction and fabrication activities remain within acceptable limits (normally 55dB  $L_{Aeq,1h}$  at the nearest noise-sensitive properties) and only arise during 'social' hours. This means that evening and night-time work on noise-making activities is eliminated. Liaison will be established and maintained with local residents or their representatives, and a point of contact provided, so that should the noise received by a resident be unacceptable, steps can quickly be taken to establish the cause and prevent recurrence. The Code of Practice also provides for a temporary increase in noise over the

55dB limit and this would be applicable to the few properties where the maximum pipeline construction noise levels are predicted to exceed 55dB but not 65dB during the daytime.

#### Completed Development

- 9.73 No additional noise mitigation measures are required. The only noise-emitting plant will be acoustically treated by design and noise limits for individual items of plant will be included in the specification at the tender stage.

#### **Residual Effects**

- 9.74 Construction noise will be of minor adverse significance at a few locations for very limited periods of time. In the worst case for pipeline construction, there will be periods of a few days at the affected locations where daytime noise levels are elevated, but this will never occur never at levels that would be regarded as significant adverse effect levels according to the WHO Guidance. Effects at all other locations will be negligible.
- 9.75 Drilling noise from the EMS Well Site, will be of temporary minor adverse significance at just two properties, and these circumstances will prevail for periods of no more than a few weeks at a time. Effects at all other locations will be negligible.
- 9.76 Operation of the completed Development will have no residual effects as the noise emissions of the KGS will not change.
- 9.77 Traffic noise emissions associated with the operation of the pipeline, EMS and KGS are negligible, as there will only be very small numbers of additional vehicles associated with the operational phase of the Development.

#### **Cumulative Effects**

- 9.78 Two schemes have been considered for possible cumulative effects: these are the Ebberston Early Development Scheme (EDS) and the York Potash Scheme. The latter is too far distant from any noise-sensitive locations potentially affected by the Development and can be disregarded in terms of its cumulative noise and vibration impact. The EDS is considered below.

- 9.79 The worst case for cumulative noise impact would be if the EDS were under construction concurrently with the Development. In such a case the noise levels at Givendale Head Farm and High Scamridge resulting from construction activities on site would not be increased above the daytime ambient levels, and would not affect the worst-case construction noise from EMS Well Site. The cumulative construction noise impact would therefore be negligible.
- 9.80 The operational phase of the EDS would potentially affect the three closest noise-sensitive locations to the Ebberston Moor 'A' well site, which are Ebberston Moor Farm, South Moor Farm, and Jingleby Thorn. The operational noise levels from the Ebberston Moor 'A' well site will be of no significance in terms of their effect on local residents. The addition of operational noise from EMS Well Site will similarly be of negligible significance, as no noise from the latter will be detectable at the three dwellings.
- 9.81 Conversely, operational noise from the EDS will be completely undetectable at properties at least 2km distant (Givendale Head Farm and High Scamridge) and there will be a negligible cumulative effect.
- 9.82 During the construction phase of the EDS there will be an increase in vehicular traffic along Ebberston Common Lane, and some noise from vehicles travelling on the public highway is unavoidable. There are likely to be no more than two or three additional vehicles per hour during the normal working day as a result of EDS construction. The operation of the EDS will require the passage of just two additional HGVs daily along Ebberston Common Lane. Givendale Head Farm is already subject to sporadic lorry noise as a direct results of its own waste recycling operations, and the additional vehicle movements will be within the range of normal variation in terms of daily numbers even after the road traffic impact of the EMS-KGS Development are considered. There will accordingly be a negligible effect on road traffic noise.

### **Summary**

- 9.83 Table 9.9 contains a summary of the likely significant effects of the Development.
- 9.84 Construction noise will be of minor adverse significance at a few locations for very limited periods of time. In the worst case for pipeline construction, there will be periods of a few days at the affected locations where daytime noise levels are elevated, but this will never occur never at levels that would be regarded as significant adverse effect levels according to the WHO Guidance.

- 9.85 Drilling noise from the EMS Well Site, will be of temporary minor adverse significance at just two properties, and these circumstances will prevail for periods of no more than a few weeks at a time.
- 9.86 Operational noise from the EMS Well Site and along the pipeline route will be insignificant and will have no impact. Noise emissions from KGS will be no different from present-day permitted levels.
- 9.87 The cumulative effects on noise and vibration if the Ebberston EDS and/or the York Potash Project should proceed concurrently with the Development will be negligible.

**Table 9.9: Table of Significance – Noise and Vibration**

Potential Effect	Nature of Effect (Permanent/Temporary)	Significance (Major/Moderate/Minor) (Beneficial/Adverse/Negligible)	Mitigation / Enhancement Measures	Geographical Importance*							Residual Effects (Major/Moderate/Minor) (Beneficial/Adverse/Negligible)
				I	UK	E	R	C	B	L	
<b>Construction</b>											
EMS Well Site including drilling	Temporary	minor adverse	minimise duration of adverse effects							*	Minor adverse – Negligible
pipeline	Temporary	minor adverse	minimise duration of adverse effects							*	Minor adverse – negligible
KGS	Temporary	negligible	none							*	negligible
<b>Completed Development</b>											
EMS Well Site	Permanent	negligible	none							*	negligible
pipeline	Permanent	negligible	none							*	negligible
KGS	Permanent	negligible	none							*	negligible
<b>Cumulative Effects</b>											
<i>Construction</i>	Temporary	negligible	none							*	negligible
<i>Operation</i>	Permanent	negligible	none							*	negligible

**\* Geographical Level of Importance**

I = International; UK = United Kingdom; E = England; R = Regional; C = County; B = Borough; L = Local

<sup>i</sup> CLG (March 2012) *National Planning Policy Framework*