

5.0 ALTERNATIVES AND DESIGN EVOLUTION

Introduction

5.1 Under the EIA Regulations (Ref. 5.1) an ES is required to provide:

“...an outline of the main alternatives studied by the applicant or appellant and an indication of the main reasons for his choice, taking into account the environmental effects.”

5.2 This chapter of the ES identifies the main alternatives to the Proposed Development which have been considered by the Applicant and describes the environmental considerations, constraints and opportunities which have influenced the design of the Proposed Development.

Alternatives

5.3 The alternatives to the Proposed Development, which have been considered by the Applicant, include:

1. No Development;
2. Alternative locations for the well site;
3. Alternative methods for utilising the gas; and
4. Alternative designs.

1. The 'No Development' Alternative

5.4 The 'No Development' alternative comprises leaving Eberston Moor 'A' Well Site in its restored state, namely woodland, in accordance with the restoration schemes approved when the well site was granted temporary planning permission in 2011 and 2013 (NYM/2011/0761/FL and NYM/2013/0068/FL respectively). This would result in no corresponding adverse effects arising from traffic, landscape, ecology, noise or air emissions associated with the construction and operation of the Proposed Development. The Lockton Compound would be retained in its current state as described in Chapter 3 as this is owned and managed by NGN.

5.5 There is an acknowledged need in the National Energy Policy, as set out in the 2007 Energy White Paper (Ref. 5.1), for significant private sector investment in infrastructure to bring energy to the UK. The Energy White Paper (now superseded by the Energy Act 2008) (Ref.

5.2) commits the Government to increasing gas storage by enabling the construction of gas supply infrastructure both onshore and offshore.

- 5.6 Under this planning application, the Eberston Moor 'A' Well Site is anticipated to produce up to 15mmscf/d of gas. Without this and other on-shore reserves, the risk to UK gas supply will increase as the country becomes more dependent on imported gas supplies. This will lead the UK's gas supply to become more susceptible to volatile markets outside the control of the UK particularly during cold winter periods when there is likely to be a greater risk of gas supply shortages.
- 5.7 To proceed with the 'No Development' alternative would result in the loss of the opportunity to extract and distribute conditioned gas to the local gas market in the Scarborough and Whitby area and a loss of significant investment which would have both national and regional social and economic consequences. It would also result in adverse socio-economic effects and be contrary to National Energy and Planning Guidance which supports the development of additional gas infrastructure in the UK. These adverse socio-economic impacts outweigh any potential beneficial effects that would arise from the 'No Development' alternative. Therefore, the 'No Development' option was not considered to be a suitable alternative option.

2. Alternative Locations for the Well Site

- 5.8 The precedence for using Eberston Moor 'A' Well Site has already been established with the Eberston Moor 'A' Well Site having already been operational with the drilling of Eberston Moor – 1 well in 2006 and an additional well cellar. Drilling is scheduled to recommence in 2013 in order to drill a new side track to Eberston Moor – 1 well and two gas appraisal wells in accordance with planning permission NYM/2013/0068/FL.
- 5.9 Alternative locations for the well site were considered as part of the original planning permission for the drilling of an exploratory borehole at Eberston Moor (Application Number NYM/2005/0254/FL). The assessment of alternative locations considered technical, economic and environmental criteria as described below.
- 5.10 The following technical criteria would be considered in the determination of the suitability of a site to be used for extracting gas directly from a gas field. The site is to:
- lie within a drillable distance of the target hydrocarbons;
 - be reasonably level, with no significant slope;

- be of a suitable size to accommodate the drilling rig, ancillary services and materials needed to drill the well;
- have suitable access for articulated vehicles; and
- ideally be located at least 400m from the nearest residential property to ensure noise is mitigated.

5.11 It is not unusual for boreholes to be directionally drilled to enable the target accumulations to be accessed from the well site which could not be sited above the target reservoirs. The Eberston North (EN-1) existing well, which lies to the north-east of the Eberston Moor 'A' Well Site was directionally drilled to access an accumulation of gas within Eberston Moor gas field. However, there are limits on the lateral distances that can be achieved which are largely dependent on the characteristics of the geological formations that the well is drilled through.

5.12 As the wellbore length increases, so do the technical challenges along with the associated risk and cost. Drilling in the North York Moors National Park is more difficult than in many areas due to 'faulting' and associated extensively fractured rocks characterising the geology of the area.

5.13 In addition to topographical and political boundaries, site selection is constrained by the Applicant's Production Licence Area (PL077) boundary, which runs along an east-west orientation. The vast majority of the PL077 lies within the North York Moors National Park. A very small part of the Licence Area lies just to the south of the North York Moors Park boundary, north of Sawdon Heights. However, this is not suitable for a well site because:

- it is more than 4 km from the target area;
- much of the area outside the North York Moors National Park falls within 400m of a residential property; and
- the area is devoid of any screening and the well site is likely to be highly visible from the surrounding area.

5.14 A study area with a 1 km radius from the existing Eberston Moor 'A' Well Site was considered for investigating the potential for alternative well sites, as a well site within this area would potentially target the discovered gas accumulation within Eberston Moor Gas Field with a reasonable chance of success. However there were no suitable alternative sites in evidence and any alternative site within a 1 km radius would still fall within the North York Moors National Park boundary.

5.15 Environmental considerations including visual impact, proximity to sites of archaeological importance and ecological constraints have also been taken into consideration in identifying the location of the Proposed Development. Eberston Moor 'A' Well Site and Lockton Compound are located on level ground at the top of a plateau in a remote location in the North York Moors National Park which is well screened. Mature coniferous forest surround the Assessment Site to the west, south and north; to the east screening is provided by soil bunds that were installed prior to previous drilling and testing on the well site as well as a narrow strip of vegetation.

3. Alternative Methods of Utilising the Gas

5.16 The following five viable alternative methods of treating the gas extracted from Eberston Moor gas field have been considered:

- **Pipe and burn sour gas at Knapton Electricity Station (KGS):** Separate the untreated sour gas from the condensate on the Eberston Moor 'A' Well Site and then pipe the untreated sour gas and condensate from the well site to KGS where the gas would be burned;
- **Condition the sour gas at KGS and pipe gas to NTS:** Separate the untreated sour gas from the condensate on the Eberston Moor 'A' Well Site and then pipe the untreated sour gas and condensate from Eberston Moor 'A' Well Site to KGS and condition the gas within a new gas processing facility at KGS. The processed gas would then be piped to the NTS via a new AGI;
- **Condition the sour gas within Lockton Compound and transfer to existing pipelines with offsite processing of the treatment fluid:** Condition the sour gas within the currently vacant Lockton Compound adjacent to Eberston Moor 'A' Well Site and pipe the processed gas through the existing LTZ pipeline via the existing above ground pipeline connection within the NGN AGI operated by Northern Gas Networks (NGN). The gas would then be distributed to local customers in the Scarborough and Whitby region of North Yorkshire. The treatment fluid will be transported and processed offsite;
- **Condition the sour gas within Lockton Compound and transfer to existing pipelines with onsite processing of the treatment fluid:** Condition the sour gas within the currently vacant Lockton Compound adjacent to Eberston Moor 'A' Well Site and pipe the processed gas through the existing LTZ pipeline via the existing above ground pipeline connection within the NGN AGI operated by Northern Gas Networks (NGN). The gas would then be distributed to local customers in the Scarborough and Whitby region of North Yorkshire. The treatment fluid will be transported and processed onsite; or

- Generate electricity on the Lockton Compound to be transferred to the National Grid:** Generate electricity on the Lockton Compound from the extracted gas using small-scale electricity generating facility which is likely to require no more than 1.6mmscf/d (0.045 mcm/d), and then transfer the electricity to the National Grid via overhead pylons or underground cables.

5.17 **Table 5.1** provides the advantages and disadvantages of the above options

Table 5.1: Advantages and Disadvantages of the Options for Utilising the Gas during the Early Development Phase

Option	Advantages	Disadvantages
Pipe and burn sour gas at KGS	<ul style="list-style-type: none"> Ebberston Moor 'A' Well Site is already developed although not currently in production. Existing infrastructure already existing at KGS for burning sour gas. 	<ul style="list-style-type: none"> Approximately 15 km of pipeline will need to be laid on previously undeveloped ground to connect Ebberston Moor 'A' Well Site with KGS. The longevity of the supply of gas is not yet proven. Therefore installing a pipeline may have additional adverse landscape, hydrological, ecological and archaeological effects which will require mitigation. Condensate may need to be piped to KGS.
Condition the gas at KGS and pipe gas to NTS	<ul style="list-style-type: none"> Ebberston Moor 'A' Well Site is already developed although not currently in production. Existing infrastructure already existing at KGS which means the introduction of a new gas processing facility will be in the context of the current facilities. 	<ul style="list-style-type: none"> Approximately 15 km of pipeline will need to be laid on previously undeveloped ground to connect Ebberston Moor 'A' Well Site with KGS with a further 4.5 km pipeline to connect to the AGI and NTS. The longevity of the supply of gas is not yet proven. Therefore installing a pipeline may have additional adverse landscape, hydrological, ecological and archaeological effects which will require mitigation. Condensate may need to be piped to KGS.
Condition the sour gas within Lockton Compound and transfer to existing pipelines with offsite processing of the treatment fluid	<ul style="list-style-type: none"> Ebberston Moor 'A' Well Site is already developed although not currently in production. The Lockton Compound adjacent to the Ebberston Moor 'A' Well Site is already developed although it is currently partially vacant and already fenced. Only a short length of pipeline would be required between Ebberston Moor 'A' Well Site and Lockton Compound. The proposal would be temporary, pending a viable permanent solution to treat the produced gas outside the National Park. The existing site is well screened by existing trees or bunding. 	<ul style="list-style-type: none"> The Lockton Compound will need to be extended to accommodate a gas conditioning facility and flare equipment. There is potential for landscape effects although these can be mitigated. The whole project would be located within the North York Moors National Park. Condensate and treatment fluids will be transported off the Assessment Site by tankers increasing the vehicle movements along Ebberston Common Lane. The proposal is not a permanent or long term solution.

Option	Advantages	Disadvantages
	<ul style="list-style-type: none"> • There will be early and sustainable gas production at the Ebberston Moor 'A' Well Site using existing local infrastructure already in place. • There will be no requirement for early investment in, and the environmental effect of the construction of a new pipeline for the initial phase of development. 	
<p>Condition the sour gas within Lockton Compound and transfer to existing pipelines with onsite processing of the treatment fluid</p>	<ul style="list-style-type: none"> • Ebberston Moor 'A' Well Site is already developed although not currently in production. • The Lockton Compound adjacent to the Ebberston Moor 'A' Well Site is already developed although it is currently partially vacant. • Only a short length of pipeline would be required between Ebberston Moor 'A' Well Site and Lockton Compound. • The proposal would be temporary, pending a viable permanent solution to treat the produced gas outside the National Park. • The existing site is well screened by existing trees or bunding. • There will be early and sustainable gas production at the Ebberston Moor 'A' Well Site using existing local infrastructure already in place. • There will be no requirement for early investment in, and the environmental effect of the construction of a new pipeline for the initial phase of development. • Treatment fluids will be treated onsite and will not need to be transferred off site by tankers. 	<ul style="list-style-type: none"> • The Lockton Compound will need to be extended to accommodate a gas conditioning and processing facility and flare equipment. • There is potential for landscape effects although these can be mitigated. • The whole project would be located within the North York Moors National Park. • Condensate will be transported off the Assessment Site by tankers increasing the vehicle movements along Ebberston Common Lane. • The proposal is not a permanent or long term solution. • Additional emissions to air within the North York Moors National Park from processing the treatment fluids onsite.
<p>Generate electricity on the Lockton Compound Site to be transferred to National Grid.</p>	<ul style="list-style-type: none"> • Ebberston Moor 'A' Well Site is already developed although not currently in production. • The Lockton Compound adjacent to the Ebberston Moor 'A' Well Site is already developed although it is currently vacant and already fenced. • There will be early and sustainable electricity production at the Ebberston Moor 'A' Well Site. • Only short lengths of pipeline would be required which will minimise environmental effects relating to constructing pipelines. • Condensate would be re-injected via a new borehole on the well site rather than being piped to Knapton Electricity Generating Station. 	<ul style="list-style-type: none"> • A temporary electricity generating plant would be an unsuitable and inefficient option to exploit a gas field which has the potential to supply considerably more gas than could be used by the electricity generating plant. • The infrastructure would need to be reinforced to export electricity. • Small-scale electricity generation could potentially generate noise from the turbines on site and create an increase in nitrogen oxide emissions within the North York Moors National Park • There would be a requirement for new high voltage overhead power-line within the North York Moors National Park in the form of either a pylon or a buried cable to transfer the electricity to the National Grid.

5.18 The preferred option for the initial phase of treating the gas extracted from Eberston Moor gas field, while the medium term production performance of the Eberston Moor gas reservoir is assessed, would be to condition the sour gas within the Lockton Compound and transfer the remaining sweet gas to the existing NGN LTZ pipeline system as per this ES. Once the gas production from Eberston Moor 'A' Well Site has been deemed viable for a longer term solution (Phase 2) the options would be to:

- pipe and burn sour gas at KGS as discussed in Chapter 1 of this ES; or
- pipe, condition and deliver sweet gas to the NTS

5.19 The selected Phase 2 option will be the subject of a separate planning application.

4. Alternative Designs and Design Evolution

5.20 The constraints on the Assessment Site including hedgerows, trees, drainage and topography, have influenced the design of the Proposed Development. The considerations and constraints within the Assessment Site which have influenced the design evolution of the Proposed Development are set out in detail in **Table 5.2**.

Table 5.2: Key Considerations and Constraints

Category	Sensitive Receptor/Land Use
Ecological Features	<ul style="list-style-type: none"> • Troutsdale and Rosekirk Dale Fens SSSI; • North York Moors Site of Special Scientific Interest (SSSI), Special Area of Conservation (SAC) and Special Protection Area (SPA); and • Flora and fauna within the Assessment Site and its vicinity.
Cultural Heritage	<ul style="list-style-type: none"> • Scheduled Monuments; and • Archaeology.
Landscape and Views	<ul style="list-style-type: none"> • North York Moors National Park; • Dalby Forest; • Trees and hedgerows within and surrounding the Assessment Site; • Ditches within the Assessment Site; and • Views towards the Assessment Site.
Water Resources	<ul style="list-style-type: none"> • Ditches within the Assessment Site; and • Corallian aquifer.
Transport Infrastructure	<ul style="list-style-type: none"> • Vehicles, pedestrians and cyclists using local highway infrastructure including: <ul style="list-style-type: none"> - Eberston Common Lane; - Eberston Lane; - A170; - Unmarked roads; - Tabular Hills Walk; - Dalby Forest Drive; and - Public Rights of Way.
Noise	<ul style="list-style-type: none"> • Eberston Common Farm; • South Moor Farm; and • Jingleby Thorn.

Category	Sensitive Receptor/Land Use
Air Quality	<ul style="list-style-type: none"> • High Farm; • South Moor Farm; • Bickley Gate Farm; • Troutsdale Lodge; • Eberston Common Farm; • Manor House; • Broad Head Farm; • Hern Head House; • Troutsdale And Rosekirk Dale Fens SSSI; • High Scamridge Farm; and • Jingleby Thorn.

Summary and Conclusions

- 5.21 The Applicant has investigated alternative locations for the well site; methods for treating gas; and designs. The preferred option for this phase of the Eberston Moor gas field development is to pipe the produced gas to the existing adjacent Lockton Compound, where the gas would be conditioned before being transferred through the existing LTZ pipeline via the existing above ground pipeline connection operated by Northern Gas Networks (NGN). The gas would then be distributed to local customers in the Scarborough and Whitby region of North Yorkshire.
- 5.22 The preferred option would also provide beneficial socio-economic effects resulting from the opportunity for the Applicant to exploit on-shore gas reserves in a timely manner while creating and securing existing jobs during the construction, operational and decommissioning and restoration phases in an area where there are limited job opportunities. The socio-economic benefits arising from the Proposed Development are considered to significantly outweigh the temporary adverse effects arising from the construction activities at the Eberston Moor 'A' Well Site and Lockton Compound.