

# Environment Agency Permitting Decisions

## Bespoke permit

The Permit Number is : EPR/CB3006ML

The Applicant/Operator is : Europa Oil & Gas Limited

The Site is located at : Kiln Lane Well Site, Land at Mauxhall Farm, off Stallingborough Road, Immingham, North East Lincolnshire, DN41 8BQ

Consultation commenced on : 02 September 2014

Consultation ended on : 29 September 2014

We have decided to grant a permit for the Kiln Lane well site operated by Europa Oil & Gas Limited.

We consider in reaching that decision we have taken into account all relevant considerations and legal requirements and that the permit will ensure that the appropriate level of environmental protection is provided.

## Purpose of this document

This document explains how we have considered the Applicant's Application, and why we have included the specific conditions in the permit we are issuing to the Applicant. It is our record of our decision-making process, to show how we have taken into account all relevant factors in reaching our position. Unless the document explains otherwise, we have accepted the Applicant's proposals.

This document explains our thinking to the public and other interested parties. We have made our final decision only after carefully taking into account any relevant matter raised in the responses we received. We believe we have covered all the relevant issues and reached a reasonable conclusion

We try to explain our decision as accurately, comprehensively and plainly as possible.

## Preliminary information

We gave the Application the reference number EPR/CB3006ML/A001. We refer to the Application as “the **Application**” in this document in order to be consistent.

The number we have given to the permit is EPR/CB3006ML. We refer to the permit as “the **Permit**” in this document.

The Application was duly made on 28/08/2014.

The site for the proposed mining waste operation is located at Kiln Lane well site, land at Mauxhall farm, off Stallingborough Road, Immingham, North East Lincolnshire, DN41 8BQ.

## Use of terms

The Applicant is Europa Oil & Gas Limited. We refer to Europa Oil & Gas Limited as “the **Applicant**” in this document. Where we are talking about what would happen after the Permit is granted, we call Europa Oil & Gas Limited “the **Operator**”.

### *Additive*

Chemical or chemicals manually added to clean water.

### *Conditioning spacer*

Conditioning spacer is a fluid used to separate drilling fluids and cement and is used to displace drilling muds from the borehole prior to cement being applied

### *Drilling muds*

Drilling muds are used to lubricate the wellbore while drilling.

### *Drill cuttings*

Drill cuttings are broken bits of solid material naturally occurring underground and removed from a borehole as part of the drilling process into underground formations.

### *Extractive waste*

Extractive waste is waste directly resulting from the prospecting, extraction, treatment and storage of mineral resources and the working of quarries.

### *Flaring*

Flaring is a technique used where quantities of flammable gas are burnt in a controlled manner. The gas flow is ignited under controlled conditions.

### *Prospecting*

Is defined by article 3(21) of the Mining Waste Directive as ‘the search for mineral deposits of economic value, including sampling, bulk sampling, drilling and trenching, but excluding any works required for the development of such deposits, and any activities directly associated with an existing extractive operation’.

### *Regulated facility*

This is the term used in the Environmental Permitting (England and Wales) Regulations. Those regulations provide that any regulated facility must be operated only under and in accordance with an environmental permit. The regulations define this term as to include a “mining operation”. A “mining operation” is further defined so as to include the management of extractive waste whether or not it involves a waste facility. The term “regulated facility” is therefore quite different to the term “waste facility” which is defined in the Mining Waste Directive.

### *Reservoir*

A porous and permeable rock in which oil or gas may be present.

### *Surface conductor*

The first string of casing run to prevent surface losses and or washouts below the cellar base in addition to isolating aquifers.

### *True vertical depth (TVD)*

True vertical depth is the measurement from the surface to the bottom of the borehole (or anywhere along its length) in a straight line in a perpendicular line.

### *Well bore*

The inside of the borehole which has been drilled through different geology and characteristics of the rock.

This decision document:

- explains how the application has been determined
- provides a record of the decision-making process
- shows how all relevant factors have been taken into account
- justifies the specific conditions in the permit other than those in our generic permit template.

Unless the decision document specifies otherwise we have accepted the Applicant’s proposals.

## **Structure of this document**

### **Key issues**

1. Summary of our decision
  2. How we took our decision
  3. Outline of process
  4. The legal framework
  5. Description of the operation
  6. General issues
  7. Environmental issues and their control
  8. Other legal requirements
- Annex 1 the consultation and web publicising responses

## **Key issues of the decision**

This Application is for a permit for the management of the extractive waste resulting from prospecting for hydrocarbon resources, namely oil and gas at Kiln Lane well site in North East Lincolnshire.

The Application includes the flaring of waste gas arising from such prospecting activities. As the produced water arising from the appraisal activities has the potential to contain low levels of Naturally Occurring Radioactive Material (NORM) in sufficient quantities to be classed as radioactive waste, the Applicant has applied for a separate Radioactive Substances Regulation (RSR) permit which will regulate the ways in which the Operator will manage radioactive material.

The RSR permit Application, which we have given the Application number EPR/ZB3095DP/A001, will be considered separately from this permit and will also be regulated by the Environment Agency.

If, the Applicant decides to include additional prospecting activities and/or full scale commercial production, a variation of the permit will be required.

Any such variation Application would be determined on its merits and be subject to our normal consultation process. Any Application to vary will require an amended waste management plan to be submitted and considered by us.

### **1. Summary of our decision**

We have decided to grant the Permit to the Applicant. This will allow it to operate the mining waste operation for the management of extractive waste arising from prospecting for mineral resources as set out in their Waste Management Plan (WMP). The permit will also allow flaring of waste gas arising from prospecting activities as set out in the WMP and subject to any conditions in the permit.

We consider that, in reaching that decision, we have taken into account all relevant considerations and legal requirements and that the permit will ensure that a high level of protection is provided for the environment and human health.

The Permit contains conditions taken from our standard Environmental Permit template including the relevant Annexes. We developed these conditions in consultation with industry, having regard to the legal requirements of the Environmental Permitting Regulations, Mining Waste Directive and other relevant legislation.

This document does not therefore include an explanation for these standard conditions. Where they are included in the permit, we have considered the Application and accepted the details are sufficient and satisfactory to make the standard condition appropriate.

We try to explain our decisions as accurately, comprehensively and as plainly as possible.

## 2. How we took our decision

The Application was duly made on 28/08/2014. This means we considered it was in the correct form and contained sufficient information for us to begin our determination.

We carried out consultation on the Application taking into account the Environmental Permitting Regulations and our statutory Public Participation Statement.

We advertised the Application by a notice placed on our website, which contained all the information required by the regulations, including telling people where and when they could see a copy of the Application.

We placed a paper copy of the Application and all other documents relevant to our determination on our Public Register at Waterside House, Waterside North, Lincoln, Lincolnshire LN2 5HA. Anyone wishing to see these documents could do so and arrange for copies to be made.

We sent copies of the Application to the following bodies whom we have “Working Together Agreements”:

- Health and Safety Executive
- Public Health England Director of Public Health

These are bodies whose expertise, democratic accountability and/or local knowledge make it appropriate for us to seek their views directly.

We also discussed the proposals with the Minerals Planning Authority, the North East Lincolnshire Council.

Further details along with a summary of consultation comments and our response to the representations we received can be found in Annex 1. We have taken all relevant representations into consideration in reaching our determination.

### **3. Outline of process**

Exploratory operations at Kiln Lane well site will involve management of extractive mining waste arising from prospecting activities that will include well site construction, drilling of an exploration well, production testing and well site restoration. The management of waste will include flaring of more than 10 tonnes of gas per day.

#### **3.1 Well site construction**

Site construction will commence with the excavation and removal of the topsoil to create a level base for the well site to be constructed upon. The excavated topsoil will be relocated to the southern perimeter of the site where it will form a topsoil screening bund approximately 2.5m in height. Subsoil excavated to create the well cellar and perimeter drainage ditch will also be relocated to southern boundary of the site where it will form a subsoil screening bund approximately 2.5m in height.

A concrete chamber will be sunk into the ground acting as a well cellar. The well cellar forms a containment area from which the well can be drilled, whilst also housing the wellhead. The cellar will comprise a reinforced concrete chamber sunk into the ground to a depth of approximately 2.75m below ground with the top surface level with the main site platform. Once the well cellar has been constructed, an integrity test will be carried out to confirm that it provides suitable and effective containment.

The proposed well site compound consists of a 65m by 95m environmentally sealed drilling pad with fully lined and open perimeter drainage ditches to all four sides. Connected to the perimeter ditch will be an oil interceptor which is to be installed during well site construction. The purpose of the interceptor is to enable discharge of clean surface run off water from the site during periods of operational inactivity. A shut-off valve will be located at the discharge point from the site perimeter, upstream from the interceptor. An isolation valve will also be present downstream from the interceptor to provide additional means of isolation. During periods of operational activity the oil interceptor will be isolated both upstream and downstream using the shut-off and isolation valves. A sampling chamber located between the downstream valve and the oil chamber will allow for the water to be checked prior discharging.

During periods of operational activity, any surface water captured within the perimeter ditches will be removed by a licensed waste carrier to a permitted waste water treatment works facility where it is processed, treated and discharged in accordance with the permitted controls of the water treatment facility.

The compound is to be constructed using a layer of Fibertex F-400M geotextile which overlays the exposed subsoil across the drilling compound and perimeter ditches. A layer of Bentomat (environmental membrane) overlays the Fibertex F-400M across the drilling compound and perimeter ditches, which in turn is overlaid by a layer of Fibertex F-600M. The drilling pad is then overlaid with 300mm Type 3 stone to create a hard standing capable of taking the required weight of the drilling rig and associated equipment.

### **3.2 Drilling of an exploration borehole**

The Operator will drill a hydrocarbon exploration well from a new, temporary well site on land at Mauxhall Farm, Immingham, North East Lincolnshire. The well will be constructed to target Carboniferous strata at a depth up to 2,550 metres beneath the site.

Construction of the borehole shall begin with the mobilisation of a small water well drilling rig and shall drill to a depth of approximately 75m. 13 3/8" conductor casing will then be run and cemented back to surface, isolating the shallow consolidated formations, providing structural support to site surface and subsequent casing string and allow returns whilst drilling the 12 1/4" hole section.

A 12 1/4" hole will be drilled from 75m True Vertical Depth GL (TVD) down to 640m TVD GL within the Triassic formation. Once this hole section has been drilled a surface casing of 9 5/8" will be set from 640m TVD GL and run and cemented back to surface. In doing this the casing will isolate the shallow aquifer located within the Triassic formation, and unstable shallow formation sand to provide shoe strength prior to drilling through the Sherwood sandstone and upper Permian formation. Cementing to surface will provide a high level of well integrity and a firm base to install the wellhead and the blow out preventer.

Following the setting of the surface casing an 8 1/2" hole will be drilled from 640 TVD GL to approx. 1510m TVD GL and placed within the Permian formation. Once this section has been drilled a 7" production casing will be set within the mid Permian Anhydrite formation and cemented to a minimum of the previous shoe to isolate annulus formations and provide competent shoe strength. The casing again will isolate any shallow aquifers that may be present within the strata. It will also isolate any unstable formations, potential loss zones, halite sections and provide integrity prior to drilling the 6" hole section through the reservoir.

The 6" hole will be drilled following the completion of the 7" production casing. The 6" hole will be drilled to the desired target depth of 2550, TVD GL. Once drilled a 4 1/2" production liner will be set within the Lower Carboniferous and will be cemented to isolate the Westphalian and Namurian reservoir sands. The cement shall run from the TVD GL to approx. 1360m TVD GL The zones of interest can then be perforated and tested as required.

### **3.3. Production Testing**

Well testing may involve various processes, all of which are intended to obtain a greater understanding of the formation properties and ultimately determine whether the formations are capable of producing commercial quantities of petroleum. One of the testing processes planned is a Drill Stem Test (DST). A DST is a short duration test done to provide an initial analysis of the amount of hydrocarbons and their flow characteristics within the formation. The formations in which prospecting will take place are:

- the Permian Sandstone, at a depth of approximately 1595 metres;

- the Westphalian Sandstones at depths between 1613 to 1797 metres;
- the Namurian sandstones at estimated depth of approximately 1899 metres; and
- the Dinantian Carbonates at depths between 2208 to 2376 metres.

In order to establish communication between the formation and the wellbore, perforating guns will be run into the well bore and fired, providing a direct connection between the formation and the well bore. A retrievable packer will then be lowered into the well bore across the formation to monitor formation pressure. In the event that hydrocarbons are encountered and permeability in the Lower Namurian sandstone formation is suitable, a flow test may be undertaken, as described in section 3.5. below. Based on the current available information, the flow test will be of natural gas, which may have hydrocarbon liquids, formation water and oil associated with it.

The initial information obtained during DST will be used to establish a more detailed and specific longer term testing programme, often referred to as an extended well test or pilot production test. In the event the flow test produces a mineral resource of economic value it is expected to be hydrocarbon liquids, although it may have natural gas, formation water and oil associated with it.

#### **3.4. Acid wash/squeeze and flow test in the Permian carbonate formation**

The acid wash/squeeze may be performed within all four formations being tested, with the shallowest formation being the Permian at a depth of approximately 1,445m.

To improve the flow of gas or other hydrocarbons that may be present within a carbonate formation, and hydrochloric acid (HCl) solution at 15% concentration with water, is applied to the formation through the wellbore. The operation is similar to acidisation of boreholes in the water well industry and results in high permeability channels through which material can flow.

An acid wash is applied using low pressure and will be used to clean out the natural fractures, which would have been blocked as a result of the initial drilling operation. An acid squeeze means applying the dilute hydrochloric acid solution to the formation under pressure not exceeding the fracture pressure of the formation, resulting in the acid being squeezed through the natural fractures within the geological formation and increasing the near hole permeability.

The proposed dilution of hydrochloric acid is 15%, i.e. 150 litres of HCl with 850 litres of water, which is circulated across the perforations using 1 cubic metre of HCl solution per single stage wash. The process of washing the perforations is repeated a further four times. Following the washing of the perforations, HCl solution is then selectively squeezed into the formation at 1 cubic metre of HCl solution per metre of perforation.

It is anticipated that between 6m<sup>3</sup> to 11m<sup>3</sup> of HCl will be pumped into the formation during the operation, with all spent acid being recovered to surface. If more than one interval is to be tested within each formation, the operation will be repeated.

Whilst the injection of hydrochloric acid within deep saline water bearing formations is a 'groundwater activity', the activity is considered de minimus and can be excluded under Schedule 22 3 (3) of EPR 2010. In section 7.5 below, we have outlined our justification for considering the activity as de minimus. The acid wash/squeeze does not, therefore, require a groundwater permit.

### **3.5. Extended well test and flaring of gas**

Should the results of the DST indicate that a longer term testing programme is achievable, an Extended Well Test (EWT) will be undertaken. The EWT will be of longer duration with more consistent flow rates and pressures. The WMP provided includes provision for managing waste arising from EWT

In order to establish connections between the formations and the wellbore, perforating guns will be run into the wellbore and fired, providing a direct pathway from the formations to the wellbore, through which hydrocarbons can flow. This is expected to be natural gas which may have hydrocarbon liquids, formation water and oil associated with it. This is flowed to surface together with produced fluids through the wellbore into temporary fluid separation equipment located on site.

Produced fluids are separated from the oil and gas by the separator then transported via temporary pipe work to cylindrical storage tanks located on site where they are held for subsequent offsite disposal

The oil and condensate will be transported by a licensed haulier to a permitted refinery for sale.

Formation water, which is considered a waste, will be transported by a licensed haulier to a permitted water treatment facility where it will be processed, treated and discharged in accordance with the permitted controls of the water treatment facility. Formation water has been classed as non-hazardous.

Gas is separated from produced fluids; the flow rate and pressure of the gas are measured and then the gas will be diverted via temporary pipe work to an enclosed ground flare located on site for incineration. The gas will become waste after its flow rate and pressures are measured. At this stage, it is not practical to use the gas as the activities are for an exploratory activity where no provision has been made for planned storage or use of the gas. The flare proposed for the Kiln lane exploratory operations is a high pressure Clean Enclosed Burner 4500 (CEB4500). The flare is equipped with propane fuelled always on pilot, which ensures that ignition takes place as soon as natural gas is present and reignites if there is a break in flow. No liquids will be incinerated.

### **3.6. Well decommissioning and site reinstatement.**

In the event that the well is not successful in establishing commercially producible mineral resources, the well will be decommissioned in accordance with Oil and Gas “UK Guidelines for the suspension and abandonment of wells”, the Borehole Sites and Operations Regulations 1995, and the Offshore Installations and Wells (Design and Construction regulations) 1996 and the site reinstated to its former use. The guidelines and regulations require all distinct permeable zones penetrated by the well to be isolated from each other and from surface by a minimum of one permanent barrier. If any permeable zone penetrated by the well is hydrocarbon-bearing or over-pressured and water-bearing then the requirement is for two permanent barriers from surface, the second barrier being a back-up to the first.

Once the well is decommissioned, the casing strings will be mechanically cut off at 1.5 metres below the original ground level and a steel plate welded over the top. The pre-cast concrete drilling cellar would then be removed and the site restored to its former use.

## **4. The legal framework**

The drilling and management of the extractive waste are regulated under different regimes. An Operator will need planning permission from the local Minerals Planning Authority, and a Petroleum Exploration and Development Licence (PEDL) from the Department of Energy and Climate Change (DECC).

The Permit is granted under regulation 13 of the Environmental Permitting (England and Wales) Regulations 2010, which regulates facilities whose activities involve water discharges and groundwater activities, radioactive substances, waste, mining waste or which are listed in schedule 1 to the 2010 Regulations. The Environmental Permitting regime is the regulatory framework which requires the Environment Agency to deliver the obligations required by national policy and various EC Directives.

We consider that the permit will ensure that the operation complies with all relevant legal requirements and that a high level of protection will be delivered for the environment and human health.

We explain how we have addressed specific statutory requirements more fully in the rest of this document.

## **5. Description of the operation**

The operation involves two classes of “regulated facility” as defined in the Environmental Permitting (England and Wales) Regulations 2010 (EPR), namely a mining waste operation and an installation.

As well as being a mining waste operation involving the management of extractive waste the flaring activity is an installation as it involves the incineration of hazardous waste, namely gas, in flare with capacity of more than 10 tonnes a day.

By virtue of the 2010 regulations, an environmental permit is required for the operation of a regulated facility.

### **5.1. Description of the site and related issues**

#### **5.1.1. Location**

The site is called Kiln Lane Well Site and is located 4km south-west of the Humber Estuary and is bounded by the A180 road to the north and to the south by Stallingborough Road (B1210). The site covers an area of approximately 2Ha and is located approximately 1.5km south-east of Immingham, North East Lincolnshire

The centre of the site is at National Grid Reference TA 18843 12791.

#### **5.1. 2 Topography**

The site is situated on flat land (coastal plain) that is typical of the surrounding area. The ground level at the centre of the site is approximately 6.5m Above Ordinance Datum.

#### **5.1.3 Land Use**

The site and immediate surrounding area is predominately agricultural farmland, interspersed with farms and rural properties. There are some significant industrial estates located along the Humber Estuary; the closest of which is 2km to the northeast of the site.

#### **5.1.4 Soils**

The soil type is described as ‘slowly permeable seasonally wet, slightly acid but base-rich loamy and clayey soils’.

### **5.1.5. Hydrology**

The site is located within the North Beck Drain hydrological catchment. North Beck Drain originates south-east of Keelby and flows north-easterly some 525m east of the site, to the Humber Estuary. Surface water on site currently drains north-easterly following the local topography towards the northern boundary at the A180 road embankment. Within proximity of the site, several smaller field drains run parallel to the proposed site access track and alongside the northern boundary of the site. These field drains currently route surface water away from the site and surrounding area to North Beck Drain.

Surface water features in close proximity to the site are

- a) North Beck drain, which is located about 525metres the site. It is a small to small to medium sized watercourse running north-east to the Humber Estuary
- b) Small field drains surrounding the site field boundaries and running parallel to field boundaries, surrounding the site
- c) Field Drains located about 500m to the north-west of the site and draining into other small field drains located on the outskirts of Immingham
- d) Middle drain located about 1.3km south-east of the site. This is small/medium sized watercourse that runs in a north-easterly direction.

### **5.1.6. Site of Special Scientific Interest**

There are no Sites of Special Scientific Interest within 2 kilometres of the site.

### **5.1.7. Special Protection Areas, Special Areas of conservation and Ramsar site**

The Humber Estuary Special Protection Area (SPA), Special Area of Conservation (SAC) and Ramsar site are located about 4 kilometres from the site.

### **5.1.8. National reserve**

There are no national reserves located within a 2 kilometre radius of the site.

### **5.1.9. Local wildlife sites**

Roxton Wood and Stallingborough Meadow local wildlife sites are located within 2 kilometres of the site.

## **5.2. What the regulated facility does**

The permit will authorise the operation of a regulated facility, namely a mining waste operation for the management of extractive waste not involving a waste facility. The permit will also authorise the incineration of hazardous waste, namely waste gas in a waste incineration plant with a capacity exceeding 10 tonnes a day.

If the project does progress to either further prospecting activities and/or full scale production and/or mineral exploitation (including any pre-production development), a variation of the permit will be required. This would take into account any changes in the nature and management of extractive wastes and also any changes in the manner and/or scale of operation. If a permit variation is applied for, this will need to be accompanied by an amended waste management plan which will be carefully reviewed. Any such application will be determined in accordance with our normal procedures.

### **5.3. Waste management activities**

The wastes that will or may need to be managed on site are:

- Well suspension brine (01 05 08) – Non Hazardous.
- Solidified cement which is in excess of that used (17 01 01) – Non Hazardous.
- Spent hydrochloric acid and calcium chloride (16 10 02) – Non Hazardous.
- Formation water (16 10 02) – Non Hazardous.
- Waste clays and sand (01 04 09) – Non Hazardous.
- Waste water based drilling muds (01 05 04 and 01 05 08) – Non Hazardous.
- Drill cuttings (01 04 08 and 01 05 08) – Non Hazardous.
- Excess conditioning spacer – Non Hazardous.
- Waste gas – Hazardous.
- Nitrogen – Non Hazardous.
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Storage arrangements and pollution prevention measures are discussed in Sections 6.9 and 6.10.

The following text is a brief description of how the wastes arise and what will happen to them.

#### **5.3.1. Excess solidified cement**

Cementing remediation work will be done as part of the well maintenance operations. Cement will also be used to completely seal the well bore annulus, and in the case of well abandonment a number of cement plugs will be set inside the borehole.

Measures will be taken to correctly assess the amount of cement that is required. However, it will not be possible to make completely accurate predictions and there may be an amount which is in excess of that used. Measures will be taken to minimise the amount of excess material, namely calculating the quantity of cement required as accurately as possible based on the engineering characteristics of the well.

Excess cement which will be returned to the surface will be transferred to a number of open top builders' skips for subsequent removal and disposal to a suitably permitted waste facility.

### **5.3.2. Hydrochloric acid**

Hydrochloric acid is used to wash and clean out natural fractures within carbonate formations that would have been blocked as a result of the initial drilling operations. In addition, dilute hydrochloric acid solution is squeezed into the natural fractures of the carbonate formation under pressure, increasing permeability.

The hydrochloric acid solution will be used in stages to ensure the quantity used is minimised. Hydrochloric acid reacts with calcite and dolomite to produce calcium chloride, which is non-hazardous.

The calcium chloride will be reverse circulated out of the well bore into a number of 1 m<sup>3</sup> containers stored onsite for subsequent removal via a licensed haulier to a suitably permitted facility.

### **5.3.3. Formation water**

During flow testing operations of the Carboniferous Sandstone and Permian Carbonate formations, there is a possibility of formation water being produced together with gas and oil. Formation water is separated from the gas or gas and oil on surface using temporary fluid separation equipment and transferred via temporary pipe work to storage tanks located onsite for off site removal.

The ability to prevent or minimise formation water is extremely limited. Options for reinjection of produced water have not been considered as the operations are exploratory at this stage and there is uncertainty as to whether produced water will arise from the permitted activities. We are satisfied that the waste, should it arise will be non-hazardous.

### **5.3.4. Waste gas**

During flow testing operations there is a likelihood of natural gas being produced from the Carboniferous Sandstone and Permian Carbonate formations. This will be flowed to determine the characteristics of the formation, allowing the Operator to determine whether or not the reservoir is sufficient enough to produce commercial quantities of natural gas. After the gas has been tested, it will become waste unless it can be used.

There is a requirement to prevent or minimise the generation of wastes. We are satisfied that it would not be feasible to use the gas on site during this prospecting stage.

Natural gas is separated from hydrocarbon liquids, produced water and oil fluids at surface and diverted via temporary pipe work for the flow rate to be tested. It will then enter an enclosed ground flare located onsite for incineration.

The ground flare will be fitted with a propane fuelled always on pilot, which ensures that ignition takes place as soon as natural gas is present and reignites if there is a break in flow. Natural gas is considered waste at the point of incineration. An air dispersion modelling assessment has been carried out to assess the impact of incinerating gas and we are satisfied that the contribution of emissions from the proposed flaring at locations closest to the well sites is considered to be insignificant. The operator will be required to monitor inputs into the flare so as to predict emission levels to air from the incineration activity.

### **5.3.5. Nitrogen**

Nitrogen is injected into the well to aid the initial lifting of wellbore fluids, thus reducing the hydrostatic pressure and allowing natural gas to flow to the surface. The quantities of nitrogen required are small and limited to the minimum necessary. As an inert gas nitrogen that has been previously extracted from the atmosphere will be vented back into the atmosphere without the need for any treatment.

### **5.3.6. Waste clays, sand and conditioning spacer**

The drilling of the exploratory borehole will commence with drilling and installation of a casing string known as a surface conductor. The drilling operation will be carried out using a water well drilling rig which will drill the near surface clays and sands within which the surface conductor casing will be set and cemented into position.

The clay and sand will be circulated out of the well using either an auger or water based drilling fluids and returned to the surface where it is transferred to an open square tank. The ability to prevent or minimise clay and sand arisings is limited given that the underground material within the path of the borehole needs to be removed to allow the conductor casing to be installed. The clay and sand will be transported offsite to a permitted waste facility.

### **5.3.7. Drilling muds and drill cuttings**

An exploratory vertical borehole will be drilled through several layers of rock to a depth of approximately 2,550 metres. The process of drilling the borehole will create extractive waste in the form of drill cuttings, spent drilling muds, and solidified cement.

Only water based drilling mud will be used in the drilling process.

Drilling muds are used to aid in the drilling process by lubricating the drill bit, circulating to surface the rock cuttings from the drilling process and for well control by maintaining a prescribed hydrostatic pressure within the well to prevent the uncontrolled release of natural gas or formation pressure. Drilling muds are used in a closed loop system, within which the rock cuttings are circulated to surface and

removed by vibrating screens (shakers). Finer particles of rock cuttings are then extracted from the drilling mud by a centrifuge and the drilling mud will be circulated back down the well.

Drilling mud waste will be minimised by continually reusing the mud, until it is spent, in a closed loop system and sustained by way of filtering out rock cuttings and finer particles of rock. The rock cuttings tank is a fluid separator tank (perforated false floor), which allows drilling muds coated to the rock cuttings to percolate down through the false floor where it is collected and pumped back into the closed loop mud system.

When the drilling mud weight exceeds the prescribed mud weight, having utilised all means to remove the finer particles, it will need to be diluted. Dilution requires the removal of a prescribed volume of active drilling mud which becomes waste spent drilling muds and diluting the remaining volume with new drilling mud.

Drilling muds are used in a closed loop system and become a waste when no longer required for use in the operation or become spent. In such an event the drilling mud will be transferred from the active mud system on the drilling rig to a vacuum tanker for removal offsite via licenced haulier to an authorised permitted facility.

Drilling muds used will be monitored to ensure that losses to the surrounding geological formation are prevented or where that is not possible minimised. If there are any variations in pressure and pump rates which may indicate fluid losses to the mud formation, water based fluid loss control agents will be used to minimise leaks. These loss control agents are added to drilling muds and they form a thin low-permeable layer that seal and plug small holes or fractures which stops fluid loss to the surrounding formation.

This dilute solution will be absorbed and remain locked within the micro pore space of the rock formation once the test is complete and can not return to the surface or migrate from the target formation due to the natural impermeable nature of the formation. Only the required quantity of fluid will be use in this process.

## **6. General issues**

### **6.1. Administrative issues**

We are satisfied that the Operator is the person who will have control over the operation of the regulated facility after we grant the permit in line with our Regulatory Guidance Note RGN 1: *Understanding the meaning of Operator (version 4.0)*; and that the Operator will be able to operate the regulated facility in compliance with the conditions included in the permit.

### **6.2. Management**

Having considered the information submitted in the application, we are satisfied that appropriate management systems and management structures will be in place.

### **6.3. Financial competence and relevant convictions**

We are satisfied that sufficient financial resources are available to the Operator to ensure compliance with the permit conditions.

The Operator does not have any relevant convictions.

### **6.4. External Emergency Plan**

The provisions relating to an external emergency plan do not apply.

### **6.5. Site security**

Having considered the information submitted in the application, we are satisfied that appropriate infrastructure and procedures will be in place to ensure that the site remains secure. This is part of the written management system of the permit, condition 1.1.1 a.

### **6.6. Accident management**

Having considered the information submitted in the application, we are satisfied that appropriate measures will be in place to ensure that environmental accidents that may cause pollution are prevented but that, if they should occur, their consequences are minimised. This is part of the written management system of the permit, required by condition 1.1.1 a.

### **6.7. Surrender of the permit**

When the Operator wants to surrender their permit, they have to satisfy us that the necessary measures have been taken to:

- Avoid any on-going pollution risk resulting from the operation of the facility; and
- To return the site to a satisfactory state, having regard to the state of the site before the activity was put into operation.

We will not grant any application for surrender unless and until we are satisfied that these requirements have been complied with.

### **6.8. The site and its protection**

#### **6.8.1 Site setting, layout and history**

The site is located on Kiln Lane Well Site, land at Mauxhall Farm, off Stallingborough Road, Immingham, North East Lincolnshire, DN41 8BQ.

### **6.8.2. Planning permission**

Our decision on whether to grant an Environmental Permit is separate from the planning process. An Environmental Permit allows the site to operate and to be regulated by the Environment Agency exercising its pollution control functions. The Planning Authority, in this case the North East Lincolnshire Council, decides whether or not to grant planning permission.

The Planning Authority determines whether the activity is an acceptable use of the land. It considers matters such as visual impact, traffic and access issues, which do not form part of our Environmental Permit decision making process. The Planning Authority must also consider and respond to any objections they may receive on a particular planning application.

There is no requirement for planning permission to be in force before an environmental permit is granted.

### **6.8.3. Site condition report**

The Operator submitted a site condition report detailing the condition of the site as part of their application. We use the information in a site condition report to establish a baseline for the condition of the site prior to the permitted activity starting. This baseline will be used as a comparison, to establish whether there has been any deterioration of the land as a result of the permitted activities, when the Operator applies to surrender their permit.

The Operator must keep accurate records throughout the lifetime of their permit to clearly demonstrate that their activity has not adversely affected the site. This record will be used, in conjunction with the baseline data described above, to support any surrender application.

### **6.8.4. Pollution prevention measures**

We have considered the location of the site, actual and potential emissions, the sensitivity of receptors and the nature of the activity to decide what appropriate pollution prevention measures need to be in place.

As part of our assessment of the application we have carefully considered the risk assessment and all associated documents provided by the Applicant. We consider that these cover all the potential risks and sets out appropriate measures by way of mitigation.

## **6.9. Soil and Surface water management**

The site will be constructed by removing the topsoil and storing it on the eastern and southern boundary of the site. The subsoil will then be cut to create a level plateau. The site will be constructed as a sealed site, with a perimeter ditch to provide containment of any surface water or spillages that may accidentally flow from the site. The water level in the perimeter ditch will be actively managed and water removed from the site when necessary by a licensed waste carrier. This is a

precautionary approach and will be put in place to ensure there is no discharge of water to the local environment or surface water features in proximity to the site. There is no discharge flow from the site and for this reason a greenfield runoff assessment is not required.

A 1 mm fully welded impermeable membrane was then laid across the site and perimeter containment ditches, protected above and below by a layer of non-needle punch geotextile. The high density polyethylene membrane and geotextile was then overlaid with a geo-grid which was then covered with 300mm surface layer of MOT Type 1 stone. The impermeable membrane provides containment for any spilled liquid. The proposed development is impermeable and all the drainage is self-contained within the site. Any water leaving the site is via a road tanker.

An integral part of the well design is the well cellar. A 2.75 metre deep drilling cellar will be constructed using pre-cast concrete rings, with each ring being individually sealed and cemented to ensure integrity. The cellar comprises a reinforced concrete chamber sunk and cemented into the ground with the top surface, level with the main site platform. This provides containment for any overspill of returned fluids, cement and surface water run-off from the well pad area. A similar approach will be adopted in drilling the second exploratory borehole.

## **6.10. Storage arrangements**

All storage of waste will take place on impermeable membrane. This consists of a high density polyethylene membrane placed between two geotextile layers to protect it. The membrane is self-sealing if punctured, with high climatic and chemical resistance. The geotextile membranes are then covered with a layer of compacted stone material.

Excess solidified cement, which is non-hazardous waste, will be stored in five 6 m<sup>3</sup> plastic lined open top skips.

Spent hydrochloric acid, which is non-hazardous waste, will be stored in eleven 1m<sup>3</sup> bunded intermediate bulk containers.

Formation water, which is non-hazardous waste, will be stored in four 60 m<sup>3</sup> horizontal cylindrical closed tanks. This will be stored for up to three months in order to allow for radionuclide analysis.

There will be no storage for waste gas as it will be incinerated as it is produced.

The drill cuttings will be collected in an open top skip with a capacity of 31 m<sup>3</sup>. The storage of waste on site will be for a maximum of seven days. At the end of this period, or when the skips are full, whichever event comes earlier, the waste is transferred to a licensed waste treatment facility.

## 6.11. Air quality management

During flow testing operations, there is a likelihood of natural gas being produced from the Carboniferous Sandstone and Permian Carbonate formation and flowed at different rates to determine the characteristics of the formation. These flow tests allow the Operator to determine whether or not this reservoir is capable of producing commercial quantities of natural gas.

The ability to prevent or minimise the production of natural gas is extremely limited during this operation as it is necessary to allow the operator to determine the condition or state of the reservoir. Given that the operation is exploratory, and the infrastructure required and the temporary nature of the operations, it is not practicable to capture the gas for sale and transportation for reuse as a fuel or other means of generating energy.

Natural gas is separated from produced fluids at surface and diverted via temporary pipe work for the flow rate to be tested. It will then enter a ground flare located onsite for incineration.

When in operation, the flare will be supervised 24 hours a day to ensure its effectiveness to incinerate the natural gas. In addition air emissions from the flare will be monitored. The flare activity is proposed to last for up to 14 days only.

The operator has provided an air dispersion modelling report that assesses the likely impact of flaring. The expected composition of any natural gas that may arise from the activities is approximately 90% methane with the remainder a mixture of ethane, propane and butane. We are satisfied that the combustion of this natural gas will not result in pollution or harm to human health and that it is not necessary to set emission limits as the operating controls will ensure effective combustion. Air quality management is discussed in details in section 6.11

We have reviewed the information submitted and we are satisfied that the design of the flare is appropriate.

The permit does not allow the venting of natural gas.

Fugitive emissions of methane could potentially arise from the wellbore and mud circulation system. The Operator has provided a specific risk assessment for this scenario which includes monitoring and proposes abatement and emergency control measures. We are satisfied that these measures to minimise the risk of fugitive emissions, together with condition 3.1 provide acceptable controls.

Monitoring requirements are detailed in section 7.10.

## **6.12 Odour management**

Odour is not considered to be an issue due to the nature of the proposed activities, which will be of short term duration. We are satisfied that the environmental risk assessments contain adequate measures to manage odour.

Under Condition 3.3 of the permit, the regulator can require the Operator to produce and implement an odour management plan in the unlikely event that activities at the site give rise to odour.

## **6.13 Noise management**

The Operator will undertake noise monitoring and implement a noise management plan, in line with their planning permission.

Under Condition 3.4 of the permit, the regulator can require the operator to produce and implement a noise management plan in the unlikely event that activities at the site give rise to noise. We are satisfied that adequate measures will be in place to manage noise.

# **7. Environmental Issues and their control**

This section of the document explains how we have approached the critical issue of assessing the likely impact of the permitted activities on human health and the environment. It also details the measures we require to ensure a high level of protection. The principal potential emissions are those to air, water and land.

The key issues arising in relation to human health and the environment during this determination were protection of groundwater; emissions to air; odour; noise; contamination of land; and water quality.

The sections below detail how we considered these issues.

## **7.1. Assessment of environmental impacts**

We are satisfied that the Applicant has properly assessed the risks posed by the proposed activities. The risks identified are detailed in the Applicant's risk assessment. This covers assessments of risks to surface, ground, water and air. We have reviewed the Applicant's assessments of the environmental risk from the operations. The Applicant's risk assessments are satisfactory.

## 7.2. Emissions to air

A methodology for risk assessment of point source emissions to air, which we use to assess the impacts of air emissions, is set out in our Horizontal Guidance Note H1 and has the following steps:

- Describe emissions and receptors
- Calculate process contributions
- Screen out insignificant emissions that do not warrant further investigation
- Decide if detailed air modelling is needed
- Assess emissions against relevant standards
- Summarise the effects of emissions

The H1 methodology uses a concept of “process contribution (PC)”, which is the estimated concentration of emitted substances after dispersion from the facility into the receiving environmental media at the point where the magnitude of the concentration is greatest. The guidance provides a simple method of calculating PC primarily for screening purposes and for estimating process contributions where environmental consequences are relatively low. It is based on using dispersion factors. These factors assume worst case dispersion conditions with no allowance made for thermal or momentum plume rise and so the process contributions calculated are likely to be an overestimate of the actual maximum concentrations.

The Applicant has submitted full air dispersion modelling as part of their application. Air dispersion modelling enables the process contribution to be predicted at any environmental receptor that might be impacted by the operation of the flare.

Once short-term and long-term PCs have been calculated in this way, they are compared with Environmental Quality Standards (EQS) referred to as “benchmarks” in the H1 Guidance.

Where an EU EQS exists, the relevant standard is the EU EQS. Where an EU EQS does not exist, our guidance sets out a National EQS (also referred to as Environmental Assessment Level - EAL) which has been derived to provide a similar level of protection to Human Health and the Environment as the EU EQS levels.

National EQSs do not have the same legal status as EU EQSs, and there is no explicit requirement to impose stricter conditions than BAT in order to comply with a national EQS. However, national EQSs are a standard for harm and any significant contribution to a breach is likely to be unacceptable.

PCs are considered Insignificant if:

- the long-term process contribution is less than 1% of the relevant EQS; and
- the short-term process contribution is less than 10% of the relevant EQS.

The long term 1% process contribution insignificance threshold is based on the judgements that:

- It is unlikely that an emission at this level will make a significant contribution to air quality;
- The threshold provides a substantial safety margin to protect health and the environment.

The short term 10% process contribution insignificance threshold is based on the judgements that:

- spatial and temporal conditions mean that short term process contributions are transient and limited in comparison with long term process contributions;
- the threshold provides a substantial safety margin to protect health and the environment.

Where an emission is screened out in this way, we would normally consider the Applicant's proposals for the prevention and control of the emission to be BAT. That is because if the impact of the emission is already insignificant, it follows that any further reduction in this emission will also be insignificant.

However, where an emission cannot be screened out as insignificant, it does not mean it will necessarily be significant.

For those pollutants which do not screen out as insignificant, we determine whether exceedences of the relevant EQS are likely. This is done through detailed audit and review of the Applicant's air dispersion modelling taking background concentrations and modelling uncertainties into account. Where an exceedence of an EU EQS is identified, we may require the Applicant to go beyond what would normally be considered BAT for the Installation or refuse the application. Whether or not exceedences are considered likely, the application is subject to the requirement to operate in accordance with BAT.

This is not the end of the risk assessment, because we also take into account local factors (for example, particularly sensitive receptors nearby such as a SSSIs, SACs or SPAs). These additional factors may also lead us to include more stringent conditions than BAT.

If, as a result of reviewing of the risk assessment and taking account of any additional techniques that could be applied to limit emissions, we consider that emissions would cause significant pollution, we would refuse the Application.

The Applicant has assessed the potential emissions to air from the flaring activity against the relevant air quality standards, and the potential impact upon local conservation and habitat sites and human health. These assessments predict the potential effects on local air quality from the flare using the ADMS 5.0 dispersion model, which is a commonly used computer model for regulatory dispersion modelling.

We are in agreement with this approach. The assumptions underpinning the model have been checked and are reasonably conservative.

The Applicant has modelled the concentration of key pollutants at a number of specified locations within the surrounding area.

The way in which the Applicant used dispersion models, its selection of input data, use of background data and the assumptions it made have been reviewed by the Environment Agency's modelling specialists to establish the robustness of the

Applicant's air impact assessment. The output from the model has then been used to inform further assessment of health impacts and impact on habitats and conservation sites, and the Immingham air quality management area.

Our review of the Applicant's assessment leads us to agree with the Applicant's conclusions. We have also audited the air quality and human health impact assessment and similarly agree that the conclusions drawn in the reports are acceptable.

### **Emissions modelled**

The air dispersion modelling considered the potential impacts of the main pollutants that could be emitted from the combustion of natural gas based on its expected composition:

- Oxides of nitrogen / nitrogen dioxide (NO<sub>x</sub> / NO<sub>2</sub>),
- Carbon monoxide (CO<sub>2</sub>)
- Sulphur dioxide (SO<sub>2</sub>)
- Benzene (a volatile organic compound, VOC).
- PAH emissions (with reference to Benzo-a-pyrene)
- Particulate matter (PM<sub>10</sub>)

We are satisfied with the extent of the emissions modelled by the operator.

### **Conclusions**

We are satisfied that the contribution of emissions from the proposed flaring at locations closest to the well sites is insignificant.

We are satisfied that the combustion of this natural gas will not result in pollution or harm to human health and that it is not necessary to set emission limits, as the operating controls will ensure effective and efficient combustion, maximising the conversion of the methane to carbon dioxide and water vapour and minimising other emissions.

### **7.3. Human Health**

The Applicant's report predicted no exceedences of any relevant Air Quality Environmental Quality Standards (EQS) established for human protection as a result of the proposed flare operations.

### **7.4. Ecological Receptors**

A full assessment of the application and its potential to affect the Humber Estuary SAC / SPA / Ramsar showed that the proposed activities were not likely to have a significant effect on these sites or any of their designated interest features.

The Humber Estuary SAC / SPA / Ramsar is located about 4 kilometres away. Due to the distance from the site's operations and the pollution prevention measures

in place, including an impermeable membrane that extends over the entire fenced working area and underlies the perimeter drains, we consider that the management of the solid and liquid wastes will not likely affect the interest features of the designated sites.

We are satisfied that the flare operations will not have a significant impact on ecological receptors as described below.

We assess the process contribution (PC) of each pollutant and compare it to the critical level and critical load for that pollutant; if the long-term PC is below 1% of the critical level, or the short-term PC is below 10% of the critical level then we can conclude that the emission will have no likely significant effect on the interest features of these receptors. (In accordance with our H1 guidance, Annex F).

Critical levels are defined as gaseous concentrations of pollutants in the atmosphere above which direct adverse effects on receptors, such as human beings, plants, ecosystems or materials, may occur according to present knowledge.

Critical loads relate to the quantity of pollutant **deposited** from air to the ground; defined as a quantitative estimate of exposure to one or more pollutants below which significant harmful effects on sensitive elements of the environment do not occur according to present knowledge

### Calculation of the process contribution

Tables 3 to 5 show the predicted process contributions (PC) at the closest part of the SAC / SPA / Ramsar to the Kiln Lane well site.

The PC is the modelled contribution from the flare at Kiln Lane.

The following thresholds have been applied in accordance with the Environment Agency's Operational Instruction: Assessing the impact of aerial emissions from new and varying IPPC Regulated Industry for impacts on nature conservation (in preparation) and AQTAG 21:

- a) 1 % threshold for long-term PC;
- b) 10 % threshold for short-term PC;
- c) 70 % threshold for PEC.

If either threshold a) or b) AND c) are exceeded the next level of appropriate assessment is required in consultation with Natural England.

**Table 1. Assessment results long-term**

Pollutant	Max PC (µg/m <sup>3</sup> )	Background (µg/m <sup>3</sup> )	Critical level (µg/m <sup>3</sup> )	PC as % of critical level	Likely significant effect?
NO <sub>x</sub>	0.03	6.4	30	0.1	No
SO <sub>2</sub>	0.03	1.9	10	0.3	No

**Table 2. Assessment results – short-term**

Pollutant	Max PC (µg/m <sup>3</sup> )	Background (µg/m <sup>3</sup> )	Critical level (µg/m <sup>3</sup> )	PC as % of critical level	Likely significant effect?
NO <sub>x</sub>	0.15	12.8	75	0.2	No
SO <sub>2</sub>	1	3.8	350	0.29	No

**Table 3. Assessment results – Nitrogen Deposition**

Pollutant	Max PC kgN/ha/yr	Background kgN/ha/yr	Critical load kgN/ha/yr	PC as % of lower critical load	Likely significant effect?
NO <sub>x</sub>	0.004	31.08	8-10	0.05	No

**Table 4. Assessment results – Acid Deposition**

Pollutant	Max PC (keq/ha/yr)	Back-ground (keq/ha/yr)	Critical load range (keq/ha/yr)	PC as % of min critical load	Likely significant effect?
NO <sub>x</sub>	0.00029	2.22	0.223 – 0.643	0.13	No
SO <sub>2</sub>	0.0057	0.26	4	0.14	No

From the results in the tables above it can be seen that there is no likely significant impact on the designated sites

Similar methodology has been used to assess any potential impact on the Local Wildlife Sites that lie within the screening distance of the flaring activity. The maximum process contributions of relevant pollutants are all less than 1% of the air quality standards.

## 7.5. Waste Management Plan

Under the Mining Waste Directive (Article 5) an Operator of a mining waste operation must draw up a waste management plan (WMP) for the minimisation, treatment, recovery and disposal of extractive waste. We have assessed the Applicant's WMP. The WMP references other documents which together fulfil the requirements of Article 5 of the MWD and ensure that the requirements in Article 4 of the MWD are also met.

We have approved the plan as a whole, subject to conditions in the permit. We are satisfied the permit requirements including the WMP will protect the environment and that Articles 4 and 5 of the MWD are met.

The WMP provides that the material inputs (e.g. drilling muds and dilute hydrochloric acid) have been selected to minimise risk and will be restricted to the minimum amount necessary, thereby minimising the amount of waste generated. It provides an estimate of the amount of each waste that will be managed. Wastes arising from the activities will be recovered where possible. It also characterises each waste type. We are satisfied that waste is correctly characterised taking into account the definition in Article 3 of the Waste Framework Directive.

The WMP including any associated documents are incorporated into the permit by means of condition 2.3.1 and table S1.2. The WMP needs to be reviewed every 5 years but in the unlikely event that the activities give rise to pollution, condition 2.3.1 enables us to require a revision of the plan to be submitted to us for approval and implemented thereafter. Condition 2.3.2 is a standard condition and refers to an extended time period. Although the condition is used in the permit, we do not expect the mining waste operation to extend beyond a year.

## **7.6. Setting permit conditions**

We have set conditions in the permit in accordance with our Regulatory Guidance Series, No RGN 4 – *Setting standards for environmental protection (version 3.0)*. This guidance note explains how we determine the requirements that should apply to a particular activity. Permit conditions specify certain key measures for that type of activity to protect the environment. Other measures may be required through outcome-based conditions. Outcome based conditions specify what we want the Operator to achieve, but do not tell them how to achieve it.

We have used the relevant generic conditions from our bespoke permit template along with other, activity-specific conditions to ensure that the permit provides the appropriate standards of environmental protection.

Our generic conditions allow us to deal with common regulatory issues in a consistent way and help us to be consistent across the different types of regulated facilities. We have included our generic conditions on fugitive emissions, odour and noise/ vibration to control emissions from the facility.

## 7.7 Protection of groundwater

We have reviewed the Environmental Risk Assessment and the Hydrogeological Risk Assessment provided by the applicant, against our information and conceptual understanding of the location. We are satisfied that the potential risks to groundwater have been adequately identified and addressed through mitigation measures.

We have evaluated whether a Groundwater Activity Permit is required. Based on the information presented, we have determined that a Groundwater Activity Permit is not required for the proposed activities of drilling for exploratory purposes and the limited well testing, based on the following:

We consider that the use of proposed drilling muds and well testing activities will comply with the groundwater activity exclusion under the Environmental Permitting (England and Wales) Regulations 2010, paragraph 3.3(b) of Schedule 22 in that any discharge to groundwater that may occur would be of a quantity so small as to obviate any present or future danger of deterioration in the quality of any receiving groundwater and that a permit will not be required.

The geological formations into which the tests will be carried out are isolated from near surface aquifers and groundwater formations by about 1,600 metres of overlying rock formations.

The acid wash and squeeze is being performed within all four formations as described in sections 3.3 and 3.4. above, with the shallowest being the Permian sandstones at a depth of approximately 1,445 metres. It is anticipated that between 6 cubic metres to 11 cubic metres of diluted hydrochloric acid solution will be pumped into the geological formation during the acid operation, with all spent acid being recovered to surface. The diluted hydrochloric acid solution reacts with calcite or dolomite through a dissolution process to produce carbon dioxide, water and chloride ions. The chloride ions exist in the water and pair to form calcium chloride. Calcium chloride is not a hazardous substance and can therefore be considered as a non-hazardous pollutant. All of the spent hydrochloric acid and calcium chloride solution will return to the surface.

### **Other considerations are:**

7.7.1 That the well bore is to be constructed in accordance with the requirements of the HSE and the Petroleum and Development Licence. It is also designed in accordance with industry best practice and in compliance with the Installation and Wells (Design and Construction) Regulations 1996 (DCR). DCR requires the design of the well to be such that no unplanned escape of fluids can occur. The Agency has assessed the risk of drilling a borehole through the Cretaceous Chalk aquifer and we consider that the design of the proposed well bore meets the requirement to prevent any release of liquids in to the water environment.

7.7.2 We have assessed the method of construction of the borehole and the proposed drilling additives and we are satisfied that the methods used are appropriate and will ensure that the groundwater is protected. The

Operator can only use additives that have been assessed and approved by the Environment Agency or equivalent alternatives subsequently approved. Assessment and approval is also required prior to the use of any other additive during the activities if the Operator needs to use different additives for operational reasons.

7.7.3 We have carefully considered the risk assessment provided by the Applicant and consider that it covers all the potential risks and sets out appropriate measures by way of mitigation.

7.7.4 The Operator's own monitoring will include the monitoring of any loss or gain of fluids within the mud system throughout drilling and appropriate actions to be taken;

7.7.5 As previously stated, only water based drilling muds will be used due to the nature of the formations being drilled.

## **7.8 Odour**

We carefully considered potential odour emissions from the activity during our determination. Condition 3.3.1 in the permit requires that emissions from the activities shall be free from odour at levels likely to cause pollution outside the site.

We are satisfied that adequate measures will be in place to manage odour.

We do not consider that the activity will give rise to significant levels of odour. However, we have included condition 3.3.2 in the permit. This condition enables us to require the Operator to submit a specific odour management plan, should odour become a problem. Should a plan be required in the future, once we have assessed this plan as suitable, it will form part of the permit and the Operator must carry out the activity in accordance with the approved techniques.

## **7.9 Noise and vibration**

We carefully considered emissions from noise and vibration during our determination. Condition 3.4 in the permit requires that emissions from the activities shall be free of noise and vibration at levels likely to cause pollution outside the site.

We have included condition 3.4.2 in the permit. This condition enables us to require the Operator to submit a specific noise and vibration management plan, should noise and vibration become a problem. Should a plan be required in the future, once we have assessed this plan as suitable, it will form part of the permit and the Operator must carry out the activity in accordance with the approved techniques.

There are also planning conditions in place relating to the level of noise emitted from the site during the drilling phase.

## 7.10. Monitoring

Condition 3.5 of the permit will require the operator to monitor the input to the flare and assess by calculation the emissions to air.

The permit ensures that the Operator will be required to provide an Air Quality Monitoring Plan (AQMP) for approval as part of pre-operational conditions prior to the start of any gas flaring. This AQMP will be incorporated into the permit once approved.

Direct monitoring of emissions from a flare stack is not possible because the length of the flare stack is insufficient for the stack gases to cool sufficiently so as not to damage the sampling equipment. For this reason the Operator will use surrogate parameters to calculate the emissions. The stack emissions can be calculated from the combustion chemistry using the feed gas composition, feed gas flow rate and combustion efficiency.

The permit requires the Operator to submit their proposed method for calculating the emissions for written approval by the Environment Agency prior to flaring any gas.

Monitoring of the point source emissions involves continuous measurement of the gas flow through the flare, the combustion temperature, and the gas composition. From this data the emissions from the flare can be derived, i.e. oxides of nitrogen (NO<sub>x</sub>), carbon monoxide (CO), volatile organic compounds (VOCs).

The Operator is required to continuously monitor the feed gas flow rate and analyse periodic samples of the feed gas to determine its composition. The flare efficiency is known from technical specification provided by the flare supplier. It is not possible to directly monitor combustion efficiency, but combustion temperature will be used as a surrogate indicator and also as a control parameter to ensure that the efficiency is maintained at its design value.

Using the parameters above, the operator is required to assess point source emissions which will be released into the air from incineration of gas, and will also undertake ambient air monitoring for comparison against a baseline.

The Operator will keep records of the data collected, which must be submitted to the Environment Agency on a regular basis.

The Operator will undertake a baseline study of ambient air quality around the proposed site prior to operations commencing. Once operational the Operator will continue to monitor air quality in the same locations that the baseline measurements were taken. The results of the monitoring will be made available by the Operator.

We are satisfied that assessing the emissions from the flare using the feed gas flow rate, the feed gas composition and the flare efficiency is appropriate considering that direct monitoring of the flare is not technically possible. This level of assessment will demonstrate whether the combustion is working at the correct level of efficiency to minimise harmful emissions.

Monitoring standards will be confirmed with the Applicant prior to commencement of operations and will form part of their Air quality Monitoring Plan (AQMP).

Annex II of the Industrial Emissions Directive (IED) lists a number of air pollutants that emission limits could be set for. We have considered the relevant pollutants listed in the IED Annex II that would result from this activity and are satisfied that it is not necessary to set emission limits, as the operating controls will ensure effective and efficient combustion.

We will be reviewing the assessment of point source emissions as part of our compliance work and if we have reasons to believe that emissions limits are required, we have the power to vary the permit to impose such limits. If appropriate monitoring methods/techniques are developed for monitoring point source emission from flares, we will review the activities and may vary the permit to change the monitoring requirements.

When in operation, the flare will be supervised 24 hours a day to ensure its effectiveness to incinerate the natural gas. Should a problem arise the flare can be shut off, on site or remotely.

The operator's AQMP will be approved prior to gas flaring operations commencing as required by the pre operational condition in the permit). This document is intended to set out the appropriate measures and processes for the management of the environmental aspects of the activity.

The Operator will keep records of the data collected, which must be submitted to the Environment Agency on a regular basis.

### **7.11. Site stability**

The management of waste is limited to waste generated from prospecting. Given the limited duration of the drilling activities and that the testing activities do not involve injection of fluids, it is unlikely that these well testing activities will affect the stability of the site.

## **8 Other legal requirements**

### **8.1. Mining Waste Directive 2006/21/EC**

In this section we explain how we have addressed other relevant legal requirements, to the extent that we have not addressed them elsewhere in this document.

## **8.2. Article 4 – General requirements**

Article 4 sets out requirements for the protection of the environment and human health which apply to the management of extractive waste. Under the Environmental Permitting Regulations (England and Wales) 2010 an environmental permit is required for a mining waste operation which is defined as the management of waste whether or not it involves a waste facility. It is through the permit and the conditions imposed that we are satisfied that the provisions of Article 4 will be met.

## **8.3. Article 5 - Waste management plan**

This outlines the requirement for the Operator to provide a waste management plan and the information required within this. The waste management plan, including associated documents, has been assessed in accordance with these requirements and is satisfactory. Condition 2.3.1 ensures that the operations are limited to those described in the WMP and in table S1.2. It also ensures that the Operator follows the techniques set out and that any deviation will require our written approval.

## **8.4. Article 6 – Major accident prevention**

The permit does not authorise a waste facility and therefore there is no Category A waste facility which require the Applicant to submit an Accident Prevention and Management Plan.

## **8.5. Article 7 – Application for a permit**

The permit covers the management of extractive waste that does not involve regulation as a waste facility. We are satisfied that there is no area designated for the accumulation or deposit of extractive waste beyond the time periods specified.

## **8.6. Article 8 – Public participation**

The permit covers the management of extractive waste that does not involve regulation as a waste facility. However, we have provided the public with the ability to express comments and opinions to us before a decision has been taken and we have taken the results of consultation into account in making the decision to grant this permit.

## **8.7. Article 9 – Classification system for waste facilities**

The permit covers the management of extractive waste that does not involve regulation of a waste facility.

### **8.8. Article 10 - Excavation voids**

There is a requirement under this article of the Mining Waste Directive for the Operator to take appropriate measures in order to secure the stability of the extractive waste, prevent the pollution of soil, surface water and groundwater and ensure the monitoring of the extractive waste and the excavation void when placing extractive waste into excavation voids.

We are satisfied that the Operator will comply with the relevant requirements based on the information provided and the conditions in the permit.

### **8.9. Article 11- Construction and management of facilities**

The permit covers the management of extractive waste that does not involve regulation of a waste facility.

### **8.10. Article 13 - Prevention of water status deterioration, air and soil pollution**

We are required, as the competent authority, to be satisfied that the Operator has taken the necessary measures in order to meet environmental standards, particularly to prevent deterioration of current water status.

We are satisfied that the Operator will comply with these requirements based on the information provided and the conditions in the permit.

### **8.11. Article 14 - Financial guarantee**

The permit covers the management of extractive waste that does not involve regulation of a waste facility and therefore there is no requirement for financial provision.

### **8.12. Further legislation**

#### **8.12.a) Section 4 Environment Act 1995 (pursuit of sustainable development)**

Consideration has been given as to whether the granting of an environmental permit meets our principal aim of contributing to attaining the objective of sustainable development under section 4 of the Environment Act 1995. It is felt that the proposed conditions are appropriate in providing effective protection of the environment and in turn sustainable development, in accordance with Section 4 of the Environment Act 1995 and the Department of Environment, Food and Rural Affairs statutory guidance.

That guidance is 'The Environment Agency's Objectives and Contribution to Sustainable Development: Statutory Guidance (December 2002)'. That document:

*"provides guidance to the Environment Agency on such matters as the formulation of approaches that the Environment Agency should take to its work, decisions*

*about priorities for the Environment Agency and the allocation of our resources. It is not directly applicable to individual regulatory decisions of the Environment Agency.”*

The guidance contains objectives in relation to the Environment Agency’s operational functions and corporate strategy. Some of these objectives relate to the Environment Agency’s wider role in waste management and strategy. In respect of the management of extractive waste, the guidance notes state that the Environment Agency should pursue the following objective:

*“to prevent or reduce as far as possible any adverse effects on the environment as well as any resultant risk to human health from the management of waste from the quarrying and mineral extraction industries.”*

In respect of water quality, the Environment Agency is required to: *‘protect, enhance and restore the environmental quality of inland and coastal surface water and groundwater, and in particular:*

- *To address both point source and diffuse pollution;*
- *To implement the EC Water Framework Directive; and to ensure that all relevant quality standards are met.’*

The Environment Agency has had regard to these objectives. We are satisfied that the imposition of conditions on the permit will mean it is operated in a way which protects the environment and human health.

#### **8.12.b) Section 5 Environment Act 1995 (preventing or minimising effects of pollution to the environment)**

We are satisfied that our pollution control powers have been exercised for the purpose of preventing or minimising, or remedying or mitigating the effects of pollution of the environment in accordance with section 5 of the Environment Act 1995.

#### **8.12.c) Section 6 Environment Act 1995 (conservation duties with regard to water)**

Consideration has been given to our duty to promote the conservation and enhancement of the natural beauty and amenity of inland waters and the land associated with such waters, and the conservation of flora and fauna which are dependent on an aquatic environment.

We do not consider that any additional conditions are required.

#### **8.12.d) Section 7 Environment Act 1995 (pursuit of conservation interests)**

Section 7(1)(c) of the Environment Act 1995 places a duty on us, when considering any proposal relating to our functions, to have regard amongst others to any effect which the proposals would have on the beauty and amenity of any

urban or rural area.

We do not consider that any additional conditions are required.

**8.12.e) Section 81 Environment Act 1995**

The site is not within a designated Air Quality Management Area.

We consider that we have taken our decision in compliance with the National Air Quality Strategy and that there are no additional or different conditions that should be included in this permit.

**8.12.f) Section 40 Natural Environment and Rural Communities Act 2006**

Section 40 places a duty on us to have regard, so far as it is consistent with the proper exercise of its functions, to conserving biodiversity. 'Conserving biodiversity' includes, in relation to a living organism or type of habitat, restoring or enhancing a population or habitat. We have done so and consider that no additional or different conditions are required.

**8.12.g) Section 23 of the Local Democracy, Economic Development and Construction Act 2009**

Section 23 requires us where we consider it appropriate to take such steps as we consider appropriate to secure the involvement of interested persons in the exercise of our functions by providing them with information, consulting them or involving them in any other way. Section 24 requires us to have regard to any Secretary of State guidance as to how we should do that.

The way in which the Environment Agency has consulted with the public and other interested parties is set out in this document. The way in which we have taken account of the representations we have received is set out in the Environmental Permitting (England and Wales) Regulations 2010, and our statutory Public Participation Statement, which implement the requirements of the Public Participation Directive. In addition to meeting our consultation responsibilities, we have also taken account of our guidance in Environment Agency Guidance Note RGS6 and the Environment Agency's Building Trust with Communities toolkit.

**8.12.h) Water Environment (Water Framework Directive) (England and Wales) Regulations 2003**

Consideration has been given to whether any additional requirements should be imposed in terms of the Environment Agency's duty under regulation 3 to secure compliance with the requirements of the Water Framework Directive through (inter alia) environmental permits, but it is felt that existing conditions are sufficient in this regard and no other appropriate requirements have been identified.

#### **8.12.i) Human Rights Act 1998**

We have considered potential interference with rights addressed by the European Convention on Human Rights in reaching our decision and consider that our decision is compatible with our duties under the Human Rights Act 1998. In particular, we have considered the right to life (Article 2), the right to a fair trial (Article 6), the right to respect for private and family life (Article 8) and the right to protection of property (Article 1, First Protocol). We do not believe that Convention rights are engaged in relation to this determination.

#### **8.12.j) Countryside and Rights of Way Act 2000 (CROW 2000)**

Section 85 of this Act imposes a duty on Environment Agency to have regard to the purpose of conserving and enhancing the natural beauty of the area of outstanding natural beauty (AONB). There is no AONB which could be affected by the mining waste activity or gas incineration activity.

#### **8.12.k) Wildlife and Countryside Act 1981**

Under section 28G of the Wildlife and Countryside Act 1981 the Environment Agency has a duty to take reasonable steps to further the conservation and enhancement of the flora, fauna or geological or physiographical features by reason of which a site is of special scientific interest. Under section 28I the Environment Agency has a duty to consult Natural England in relation to any permit that is likely to damage SSSIs.

The site is not within the 2 kilometre relevant distance criteria for any Site of Special Scientific Interest.

#### **8.12.l) The Conservation of Habitats and Species Regulations 2010**

We have assessed the Application in accordance with guidance agreed jointly with Natural England and concluded that there will be no likely significant effect on any European Site.

The Humber Estuary Special Area of Conservation and Special Protection Area is located about 4 kilometres from the site. The proposed activities are not likely to have any significant effect on the interest features of the SAC or SPA. See section 7.4 for our full assessment.

# Annex 1: Consultation and web publicising

## Summary of responses to consultation and web publication and the way in which we have taken these into account in the determination process.

### A) Advertising and Consultation on the Application

The Application has been advertised and consulted upon in accordance with the Environment Agency's Public Participation Statement. The way in which this has been carried out along with the results of our consultation and how we have taken consultation responses into account in reaching our decision is summarised in this Annex. Copies of all consultation responses have been placed on the Environment Agency public registers.

The Application was advertised on the Environment Agency website from 02/09/2014 to 29/09/2014. Copies of the Application were placed in the Environment Agency Public Register at Waterside House, Waterside North, Lincoln, Lincolnshire LN2 5HA.

The following statutory and non-statutory bodies were consulted:

- Mineral Planning Authority, North East Lincolnshire Council
- Health and Safety Executive
- Public Health England Director of Public Health

No objections or concerns were received from North East Lincolnshire Council Director of Public Health, Public Health England and the Local Planning Authority.

### Consultation Responses from Statutory and Non-Statutory Bodies

Health and Safety Executive. 25/09/14	
<b>Brief summary of issues raised:</b>	<b>Summary of action taken / how this has been covered</b>
Health and Safety Executive noted that the operator proposed to use hydrofluoric acid for the acid squeeze. They noted that this was not the norm for the, under current industry wide practices, and would require a justification when the Operator notifies HSE of their activities.	The Operator was asked to provide the justification for use of hydrofluoric acid. They have since revised their proposals and will now be diluted hydrochloric acid for acid wash. Hydrochloric acid is commonly used for acid wash in drilled boreholes.

## **2) Consultation Responses from Members of the Public and Community Organisations**

A total of 12 responses were received. Of these 12 responses, one was in support of the application.

We can only consider comments which pertain to the management of the extractive waste arising from the exploration for oil and gas and well testing, including flaring of gas regulated under the Industrial Emission Directive which is what the Application relates to. For consultation comments that relate to matters beyond our regulatory control see section 3 below.

Summaries of the consultation responses and how we have addressed them are as follows:

### **i) Contribution to local and UK economies**

One response to the consultation noted that the proposed exploratory activity is a very important exploratory exercise, which if successful, will contribute very positively to the local and UK economies.

### **ii) Potential impact of activity on surface water**

Concerns were raised that the proximity of the site to unnamed field drains could result in surface water pollution. Heavy rainfall and inadequate storage capacity could result in an overflow of the stored fluids. It was noted that the activities could impact on the ecosystems of the becks and waterways up to and including the Humber Estuary.

There will be no discharges of liquid waste to surface water or groundwater as the liquid waste will be taken off site for treatment by a suitably permitted facility. Storage arrangements and the associated risks and mitigation measures are addressed in section 6.10 above and we are satisfied they are adequate. Therefore there will be no pathway between the outputs of the proposed activity and local surface water or groundwater, and no potential for environmental harm.

We recognise that the integrity of the well is critical to ensuring that there is no indirect discharge to surface water. This is addressed in the key issues section above.

We are satisfied we have fully assessed the risk to surface water and that there will be no unacceptable risk of pollution.

### **iii) Potential for polluting water supply**

Concerns were raised during consultation, that public water supplies and groundwater may be contaminated.

We have reviewed the Environmental Risk Assessment and the Hydrogeological Risk Assessment provided by the applicant, against our information and conceptual understanding of the location. We are satisfied that the method of well construction, operations and drilling additive used, will not pose a risk to groundwater or surface water and therefore drinking water supplies are not at risk.

The Waste Management Plan, the Environmental Risk Assessment and the Groundwater Management Plan specify the mitigation measures that will ensure surface water and groundwater will be protected. The Waste Management Plan (WMP) sets out the nature of the fluids to be used in each process of the proposal, their expected volumes and their treatment or disposal, where applicable. These quantities are outlined in section 3 above. Relatively small volumes of fluids will be returned to surface for subsequent treatment or disposal as a result of the proposed drilling and well testing set out in the application documents.

We are satisfied that both the Waste Management Plan and Environmental Risk Assessment submitted for this application adequately define the risks to groundwater in this location from both the drilling and testing and that the appropriate mitigation measures to protect the groundwater have been imposed through the permit and the incorporated Application documents.

### **iv) Potential for polluting groundwater and breach of Groundwater Directive**

Concerns were raised that there is a real risk of a breach in the Groundwater Directive (2006/118) as the Environment Agency seems to have decided that the Applicant is not required to apply for a groundwater permit under schedule 22 to the Environmental Permitting Regulations (England and Wales) 2010.

There will be no discharges of returned waters to surface water or groundwater as the liquid waste will be taken off site for treatment by a suitably permitted facility. Storage arrangements and the associated risks and mitigation measures are addressed in section 6.10. Therefore there will be no pathway between the outputs of the proposed activity and local surface water or groundwater, and no potential for environmental harm.

We have assessed the proposed well testing activities and we have concluded that the Applicant does not require a Groundwater Activity permit. The proposed testing complies with the “de minimis” groundwater activity exclusion as stated in paragraph 3.3(b) of Schedule 22 of the Environmental Permitting Regulations (England and Wales) 2010. In assessing the impact of the activities, we are satisfied that they will remain in or within the immediate vicinity of the wellbores. We recognise that the integrity of the well is critical to ensuring that this is the case and this is addressed in the key issues sections 3, 5 and 7.5 above.

**vi) Lack of consideration of the precautionary principle**

Some comments also raised the concern that the precautionary principle has not been effectively applied as the risk assessments provided had failed to identify and demonstrate mitigation of potential risks to groundwater.

We are satisfied that both the Waste Management Plan (WMP) and Environmental Risk Assessment (ERA) submitted define the risks to groundwater and that they set out the appropriate mitigation to protect controlled waters.

**vii) Overuse of groundwater**

Concerns have been raised that the permitted activity will use large quantities of local groundwater and that is not a sustainable approach.

The operator is limited to managing waste, including by flaring gas, from these specified activities. Should the operator wish to proceed to further prospecting and/or extraction techniques, they will need to apply for a variation of the permit which will be considered in the usual way. None of the extractive waste management activities regulated by this proposed permit will require the use of local groundwater. Fresh water that will be imported to the site, stored and used in the process will be kept to a minimum to minimise the amount of waste generated. Section 3 above gives an indication of the volumes of water that will be used for the well testing processes and these quantities of water will be low.

**viii) Monitoring (surface water/groundwater/air)**

A number of comments raised concerns on how the activities will be monitored and if baseline monitoring will be carried out.

The Waste Management Plan details the monitoring that the Operator will be carrying out before, during and after the permitted activities are taking place for air emissions.

Analysis of the samples taken during this monitoring will be carried out by a UKAS accredited laboratory and the results will be made available on the Agency's public register.

As stated previously the borehole is being drilled in accordance with industry best practice and in compliance with the Installation and Wells (Design and Construction) Regulations 1996 (DCR). DCR requires the design of the well to be such that no unplanned escape of fluids is allowed. The HSE evaluate the well design and test the well integrity and would consider the risk posed by fluids in their assessment.

**ix) Human health impacts, including stress**

The Health Protection Agency have raised no objection and we are satisfied that the activities we are permitting will not give rise to significant pollution or any emissions that will cause harm to human health. In the context of Environmental Law, pollution is defined as any emission as a result of human activity which may be harmful to human health or the quality of the environment, cause offence to a human sense, result in damage to material property, or impair or interfere with amenities or other legitimate uses of the environment. This definition does not extend to fear, anxiety or stress.

**x) Adequacy of the Waste Management Plan and management of spent drilling muds**

Concerns have been raised that the options outlined in Waste Management Plan for the disposal of spent drilling muds and radioactive waste could result in contamination of land beyond the permitted site.

Exploratory drilling activities are not a NORM industrial activity. Only the activities relating to well testing would fall under NORM industrial activity. Naturally occurring radioactive substances will be managed in accordance with conditions of the Radioactive Substances Regulation permit which is separate to this permit.

We have assessed the Waste Management Plan and we are satisfied that options for disposing of waste outlined in the plan are adequate. The “Best Available Technique Statement relating to the Disposal of Waste from Kiln Lane well sites” which was provided by the Operator as part of the waste management plan identified the Best Available technique (BAT) as being the off-site transfer of waste to a suitable waste treatment facility. The permit is limited to the management of waste on this site.

The permit limits the Operator to managing waste, including flaring gas, from the specified activities. Should the operator wish to proceed to further prospecting and/or extraction techniques, he will need to apply for a variation of the permit which will be considered in the usual way.

**xi) Impact on wildlife**

Concerns were raised that the proposed activities did not give any consideration to wildlife.

We have assessed the risk from the proposed activities as part of our determination and we are satisfied that the activities will not pose a risk to any local wildlife sites or nationally or internationally designated wildlife sites (SSSIs or SPAs).

We assessed the potential likelihood of the proposed activities to impact on designated nature conservation sites, and we have outlined our conclusions of these assessments in section 7.2.

## **xii) Spillages**

Concerns were raised about potential spillages off-site during transport of the waste waters.

The risk assessment includes details of how the risks from potential spillages are going to be minimized on site. The extractive waste transfer and storage activities will take place on an impermeable surface with sealed drainage and containment.

Spillages during transport outside the permitted site boundary are outside the scope of the permit, but are subject to other regulatory controls (Duty of Care).

## **xiii) Suitability of the Risk Assessment:**

Concerns have been raised about the adequacy of the Applicant's Risk Assessment, whether it identified all the risks and categorised them correctly.

We have reviewed the assessment, and we are satisfied it complies with our relevant guidance and that it identifies and covers all appropriate risks and that measures are in place to address them.

## **xiv) Flaring of gas and emission into air**

Concerns have been raised on how fugitive methane emissions and point source emissions from the flare would be controlled. There were also concerns raised on the effect of the emissions on human health.

The purpose of the flare is to incinerate natural gas which, if encountered during the well testing phase, is flowed to surface at controlled rates. As the natural gas flows to surface, the Operator will monitor and record flow rate and pressure, giving them a greater understanding of the likely volume of natural gas in place within the formation.

The initial proposal that the Environment Agency consulted on involved the use of three point pit burner. We could not accept this proposal as submitted because it did not meet our acceptable standards for flaring techniques. The Applicant has since revised their Application and will now be used a Clean Enclosed Burner, which meets our standards for the use of a flare of an enclosed ground flare type.

Conditions 3.1 and 3.2. of the permit applies controls on fugitive emissions. With regards to the point source emissions we have included condition 3.5.1. which requires the Operator to monitor certain parameters to ensure efficient combustion takes place.

In support of the permit applications, an air dispersion modeling assessment was carried out to predict the maximum concentrations of certain pollutants generated under efficient combustion. The predicted concentrations were compared against relevant air quality standards and their contribution to the ambient concentrations at locations of human habitation closest to the well site. Modeling of emissions from the proposed ground flare achieved emission levels that were well within applicable air quality standards. We are satisfied that the contribution of emissions from the proposed flaring operation at locations of human habitation closest to the well site is considered to be insignificant.

On the subject of flaring, we recognise that the flaring of gas needs to be controlled and we have included monitoring conditions in the permit requiring the Operator to monitor the temperature, oxides of nitrogen, oxides of sulphur, carbon monoxide, methane, and total non-methane volatile organic compounds and calculate volume of gas going into the flare and to provide weekly reports of the monitoring results.

#### **xv) Particulate emissions**

Concerns have been raised over the potential for particulate emissions from the activities on site.

None of the mining waste management activities, including flaring regulated by this proposed permit, i.e. the management of the water from the spent hydrochloric acid, excess cement, drill cuttings, drilling muds and gas, are likely to emit any particulates.

#### **xvi) Light pollution**

Concerns have been raised that the flare will create light pollution which may impact both local residents and wildlife.

The flare is specified as an enclosed flare. This design type minimises light emissions and we are satisfied that the use of the flare will not result in light pollution.

The use of artificial lights on site is controlled by the planning permission.

#### **xvii) Noise pollution**

Concerns have been raised that the activities will cause noise pollution.

We are satisfied that the conditions of the permit adequately control the risk of pollution from noise.

Condition 3.4 of the permit controls noise and vibration and requires that emissions are minimised and, if the activities give rise to pollution due to noise or vibration outside the site, noise and vibration management plan is submitted to the Agency for approval and implemented.

### **xviii) Nature of chemicals used**

A comment made was that due to commercial sensitivity, the Applicant may not declare the nature of chemicals that will be added to the drilling muds and/or used in the well testing process.

The Applicant has not made any claims of confidentiality and has provided a full list of all the additives and fluids that will be used for drilling and well testing. In section 3 above we have described how these additives will be used. We have assessed the additives to be used and we do not consider that they will cause any environmental harm at the rates and levels of use proposed

### **xix) Radioactive waste**

Some of the comments raised concerns on how the radioactive substances generated from the activity will be managed. There were concerns that there were no safe limits for exposure to radionuclides generated from the proposed activity.

For clarity, sections 3.3 and 3.5 have described the well tests that the operator proposes.

The flow tests in the carboniferous sandstone and the Permian carbonate formations will produce natural gas, which may have hydrocarbon liquids, formation water and oil associated with it. There is a potential for recovering trace amounts of NORM from these formations, although this cannot be ascertained until well testing gets underway.

To plan for this, the Applicant has applied for a Radioactive Substances Regulation permit that will deal with the management of naturally occurring radioactive materials arising from the proposed activities. Issues relating to the management of radioactive materials will be considered under RSR permit.

**3) Other matters outside the scope of this permit Application that the public have commented on which may be more relevant to Applications for other permissions.**

**a) Location of the site:**

Concerns were raised on the effects that the proposed activities will have on the countryside and local populations in around living in and around the villages of Stallingborough, Healing, Keelby and Immingham.

Decisions over land use are matters for the planning system. The location of the site is a relevant consideration for Environmental Permitting, but only in so far as its potential to have an adverse environmental impact on communities or sensitive environmental receptors. The environmental impact is assessed as part of the determination process and has been in section 7 above.

**b) Vehicle access to the site and traffic movements:**

These are relevant considerations for the grant of planning permission, but do not form part of the Environmental Permit decision making process except where there are established high background concentrations contributing to poor air quality and the increased level of traffic might be significant in these limited circumstances. This is not the case for this location.

**c) Climate change and energy policy**

Policy is made by the Government; the policy states “We aim to maximise the economic recovery of oil and gas from the UK’s oil and gas reserves, taking full account of environmental, social and economic objectives”.