

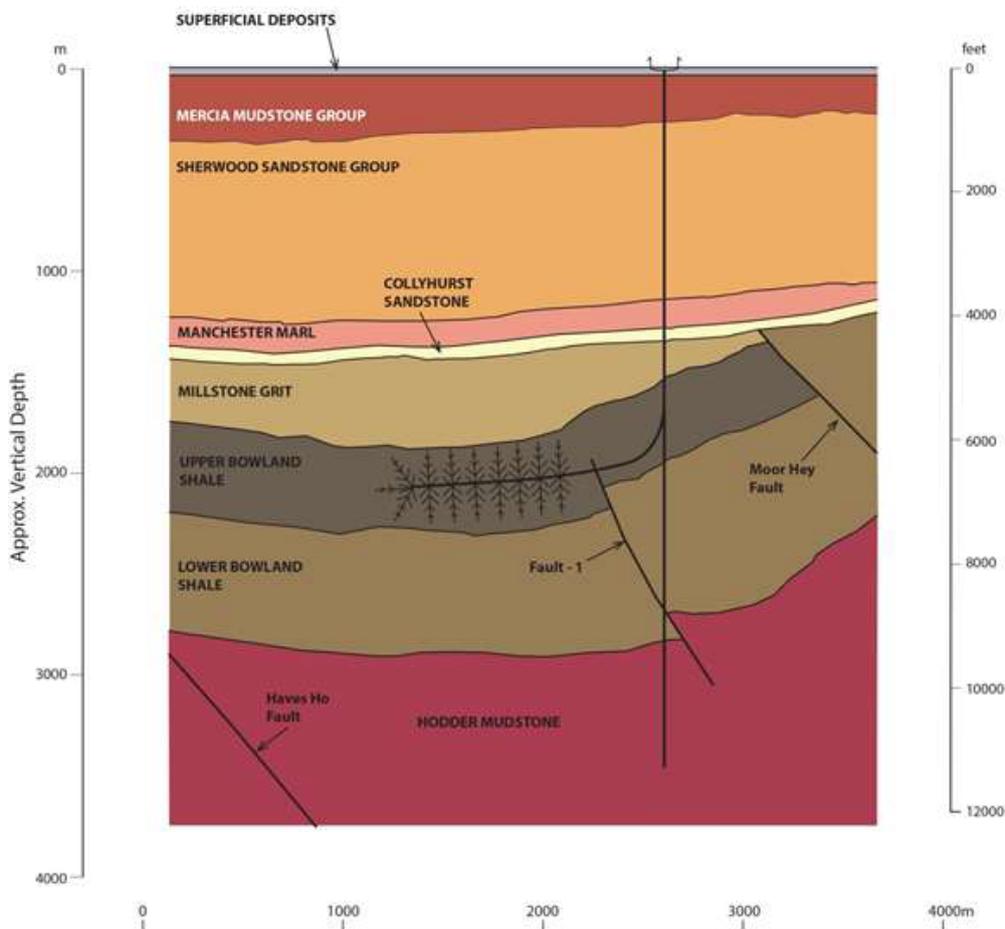
**Appendix 8**

**Hydro Geology and Ground gas**

**Proposal**

The applicant has undertaken an assessment of the potential impacts relevant to hydrogeology and ground gas. The assessment looks at the potential effects of the project as part of the well pad activities and materials in transit, the well construction and integrity and features created by the hydraulic fracturing on the quality of the water environment, both ground water and surface water and the possible creation of subsurface pathways to sensitive features that could result in pollution.

The geology beneath the site is described and the interpretation by the applicant has been assessed by the EA. The geology is such that the Manchester Marls forms a seal between the ground surface and shale rock within which is trapped the natural gas within the rock. The Manchester Marls act as an impermeable barrier and prevent the movement of water and gas up towards the surface of the ground from deeper layers of rock. The Sherwood Sandstone aquifer, a porous rock containing water lies above the Manchester Marls. The EA has confirmed the poor quality of the aquifer because of its salinity and it is therefore not used for drinking water. The following diagram is a typical cross section of the local geology.



The assessment sets out how the well pads and the wells have been designed to prevent leaks or spills from entering the wider environment (the soil, groundwater,

surface water or the atmosphere) and cause pollution. The well design is assessed by the HSE and the EA in accordance with their respective regulatory requirements and industry guidance.

The EA also assesses the proposed drilling fluid and the fracture fluid and requires it to be non-hazardous.

Prior to and during works, groundwater water and surface water would be monitored. The monitoring would be agreed with the EA. The EA will require baseline monitoring of groundwater, air quality and surface water for approval before the start of operations.

When the works are finished, the wells would be pugged and abandoned in accordance with the regulatory requirements of the HSE and the EA and industry guidance. The plugging and abandonment of the well including the monitoring of the ground water quality and gas concentrations are matters for the HSE, the EA and the DECC.

The assessment concludes that the probability of source pathway receptor linkage associated with the contaminant release during well pad construction and access is low; that the contaminant release due to defects in the pad membrane is low; that the contaminant release due to overflow discharge from the well pad drainage systems low; that liquid spray off due to high pressure equipment failure is low; that the spill of contents of vehicles in transit on the public highway is low; that the loss of well integrity due to poor well construction is very low; that the loss of well integrity caused by hydraulic fracturing is very low; that the loss of well integrity

## **Policy**

National Planning Policy Framework (NPPF) Para 122

National Planning Policy Guidance (NPPG) Water supply, wastewater, water quality

Joint Lancashire Minerals and Waste Local Plan – Site Allocation and Development Management Policies – Part One (LMWLP): Policy DM2 Development Management

Joint Lancashire Minerals and Waste Supplementary Planning Guidance: SPD Oil and gas exploration, production and distribution (draft)

Fylde Borough Local Plan: Policy EP23 Pollution of Surface Water  
Policy EP24 Pollution of Ground Water

## **Summary of consultee comments and representations**

**Department of Energy and Climate Change:** Has confirmed the details of the petroleum licence for the surface site and the maximum extent for underground drilling.

The licences give exclusive rights within their area for exploration, boring for and getting petroleum, but do not waive any other legal requirement applicable to these activities, including requirements for planning permission.

DECC requires the operator to produce Environmental Risk Assessments, taking account of guidance published to the industry by them in April 2014, which flows from the recommendations of the Royal Academy of Engineering and the Royal Society, in their report on the hazards of hydraulic fracturing for shale gas published in June 2012.

Drilling of wells requires Secretary of State consent under the terms of the licence and DECC will undertake a number of checks regarding well targeting and operator funds and insurance before giving consent. With regard to drilling practice, DECC has clarified that drilling through a fault does not entail any seismic hazard.

DECC also requires for hydraulic fracturing, the implementation of measures to mitigate seismic risk including the submission to DECC of a detailed Hydraulic Fracturing Programme (HFP) for each well to be hydraulically fractured. DECC will monitor the conduct of fracturing operations in accordance with the HFP. DECC is of the view that in principle hydraulic fracturing through a fault should be avoided. The applicant has stated that they plan to avoid all detectable faults (whether local or regional), which is the correct approach. The applicant's 3D data will be scrutinised through the review of the HFPs to ensure that the full extent of the stimulated rock volume preserves a safe distance from any detectable fault. The fracturing fluids will therefore never enter a fault and will not be transmitted along it.

DECC consider the traffic light system for shutting down operations to be adequate as the association between hydraulic fracturing and seismic activity remains a developing area of knowledge. Careful monitoring of seismic activity in real time is likely to detect precursor events, providing scope to halt operations, reduce stresses and avoid more substantial tremor. DECC would explore the implications of any red light event promptly with a view to deciding whether operations can be resumed without undue risk of disturbance to local residents and if so what operations are acceptable and whether any further precautions are appropriate.

Proposals to flare gas during the initial testing phase will require the consent from the Secretary of State under the Energy Act 1976 and any venting is subject to DECC consent. Any venting should be reduced to a minimum. DECC's standard online drilling consent allows 96 hours of testing. To test for a longer period, the applicant will need to apply to DECC for a paper-based Extended Well Consent. DECC will expect the operator to minimise flaring during the period of any Extended Well Consent.

Abandonment of any well requires the Secretary of State's consent under the terms of the licence. DECC will check for completeness of well data before giving consent.

**Environment Agency (EA):** No objection in principle and recommends the following:

- A scheme to dispose of surface water between the drill pad and Carr Bridge Brook to be submitted to ensure the proposed development does not increase the risk of pollution to Carr Bridge Brook.
- Routine monitoring of on-site surface water quality and maintenance, and inspection of surface water drains, valves and interceptors to ensure correct and efficient operation.
- Surface water run-off retained on site during operations to be tankered away for off-site disposal and to not be discharged to the watercourse.
- To consider whether the Control of Pollution (Oil Storage) (England) Regulations 2001 apply. If not any facilities, above ground, for the storage of oils, fuels or chemicals to be sited on impervious bases and surrounded by impervious bund walls.

With regard to flood risk the EA confirmed that the proposed development is located in Flood Zone 1 which is defined as having a low probability of flooding in the National Planning Practice Guidance. The Agency has reviewed the Flood Risk Assessment submitted with the application and is satisfied that the development would not be at risk of flooding or increased flood risk off-site.

With regard to radon release during the flaring of gas, the Environment Agency confirmed that radon is exempt from their permitting by the Natural Gas Exemption Order 2002 and from regulation under the Environmental Permitting Regulations 2010. This is on the basis of its low risk, widespread use and that it was not amenable to regulation. Discharges of radon in natural gas, being flared or vented at gas sites is not subject to regulation under radioactive substances regulation (RSR).

**Health and Safety Executive (HSE):** No objection; the proposed operations will be conducted in accordance with recognised regulations standards and good industry practice. From a well's operations perspective there are no issues or concerns with the proposals

HSE has provided clarification of relevant regulations applicable to onshore well; how it regulates shale gas activity; what information it requires and working with the Environment Agency. HSE's regulatory framework ensures that information is provided at key stages in the lifecycle of a well and allows HSE inspectors to assess whether risks are being adequately controlled and if not to take the appropriate regulatory action.

The Health and Safety at Work Act 1974 (HSWA) requires those who create health and safety risks to workers or the public as part of their undertaking have a duty to manage and control the risks so far as is reasonably practicable. This is supplemented with more specific regulations particular to the extraction of gas and oil through wells, which includes shale gas operations.

The Borehole Sites and Operations Regulations 1995 (BSOR) applies to all onshore oil and gas wells. These Regulations require notifications to be sent to HSE about the design, construction and operation of wells, and the development of a health and safety plan which sets out how risks are managed on site.

To comply with BSOR the well operator must submit a notification to HSE at least 21 days before work commences. The notification includes information on the design of the well, the equipment to be used to construct it, the programme of work, the location, depth and direction of the borehole, the relationship to other wells and mines, the geology of the drilling site and identified risks and their proposed management. The HSE will assess the well design before construction starts and will identify any issues which will have an impact on well integrity. Any issues will be addressed by the operator and safety features will be incorporated into the design. Further notifications are required if there are any material changes to the information previously supplied.

The Offshore Installations and Wells (Design and Construction) Regulations 1996 (DCR) includes specific requirements for all wells, whether onshore or offshore, and include well integrity provisions which apply throughout the life of shale gas or oil wells. They also require the well operator to send a weekly report to HSE during the

construction of the well so that inspectors can check that work is progressing as described in the notification. .

To comply with DCR the operator must report to HSE every week during construction and during work to abandon the well, to provide HSE with assurance that the operator is constructing and operating the well as described in the notification. The weekly report details well integrity tests, the depth and diameter of the borehole, the depth and diameter of the well casing and details of the drill fluid density. The drill fluid density allows the inspector to gauge the pressure in the well and identify any stability issues.

If the operator is not complying with the notification, the HSE can take appropriate regulatory action. HSE uses a risk based interventions on particular sites and operators and to ensure well integrity. The HSE has a team of expert well engineers who cover hydrocarbon wells onshore and offshore. In considering well integrity a lifecycle approach is used including notifications, weekly well reports, operator meetings and on-site inspections being used to manage the risks appropriately.

The operator must also appoint an independent well examiner in a quality control role who will ensure that the well is designed, constructed, operated and abandoned in accordance with industry and company standards and that regulatory requirements are met. Specialist well engineers help develop best practice standards for the onshore industry with the United Kingdom Onshore Operators Group (UKOOG). All members of UKOOG have to comply with the latest standards published in February 2013.

A well operator must also report to HSE any occurrences covered by RIDDOR – Reporting of Injuries, Diseases and Dangerous Occurrences Regulations. These could include a blowout (i.e. an uncontrolled flow of well fluids); the unplanned use of blowout prevention equipment; the unexpected detection of hydrogen sulphide (H<sub>2</sub>S) which is an explosive gas; failure to maintain minimum separation distance between wells and mechanical failure of any safety-critical element of a well. HSE can investigate any well incidents that would have an effect on well integrity and ensure the operator improves their operations.

Since 2012, the HSE and the Environment Agency have an agreement covering joint regulation of shale gas operations. HSE and EA inspectors will meet all new and first-time operators of shale gas wells to advise them of their duties under the regulations and to jointly visit all shale gas sites during the exploratory gas phase of shale gas development.

In response to comments raised by Friends of the Earth in their representation to the proposed development, HSE have clarified the following

- HSE have continued to monitor Preese Hall site during abandonment activity and that there has been no unplanned release of fluids from the well.
- HSE will continue to monitor abandonment activity on all onshore and offshore wells to ensure all work is completed to industry standards and the risk of release of fluids from wells post abandonment is as low as reasonably practicable.

- With regard to risk of leaks from gas wells and the risk of exposure to benzene, the DCR sets out the requirement that there should be no unplanned release of fluids from the well so far as is reasonably practicable. The HSE will review well notification information to ensure that the operator is managing the risks in such a way that the well is designed, constructed and abandoned safely.
- BSOR Regulation 10 requires the well operator to provide all persons engaged in borehole operations with appropriate health surveillance.
- The HSE is aware of the warning issued by NIOSH regarding exposure to silica. The HSE will look at how the well operator manages exposure to silica. It is expected that sealed units will deliver sand to site and mix it into fracturing fluid so that the exposure risk is minimised.
- HSE do not consider that the regulations are inadequate, flawed or ineffectively applied and enforced. The UK health and safety regulations are robust and the regulatory regime governing oil and gas operations is world leading.
- HSE receives well notification information 21 days before work starts. Until the notification is received HSE cannot make a full appraisal of the design of the well and the programme of work and give assurance that the well operator is managing the health and safety risks appropriately including the risk of an unplanned release of fluids.

**Public Health England (PHE):** Initially recommended that the Local Planning Authority (LPA) request and consider further information regarding sensitive receptors, atmospheric pollution, risks to surface waters and groundwater, environmental monitoring, radon, NORM, resources and waste, dust, noise, light and odour, accidents and incidents.

The applicant provided further information to address the issues raised by PHE. PHE has subsequently advised that the planning authority should confirm (in respect of hydrogeology):

- The operator is happy to provide details on the baseline monitoring protocol in response to a planning condition.
- They are satisfied with details of monitoring locations, what is being monitored for, and the schedule for monitoring frequencies.
- They are satisfied with the proposed definition of significant variation for other determinands, regarding air emissions and surface water and ground water potential contaminants.
- They are satisfied with the applicant's proposal for drill cuttings coated with low toxicity oil based muds to not be covered.

**LCC Director of Public Health:** Has undertaken a Health Impact Assessment (HIA) on the two drill sites and identified that the key risks to health and wellbeing of the population from the two proposed sites are a lack of public trust and confidence in the regulatory process and the industry, stress and anxiety from uncertainty about the industry that could lead to poor mental wellbeing; potential noise related health effects due to continuous drilling for at least five months for the initial borehole on each site and for three months for each of the subsequent three boreholes per site (14 months of continuous drilling), and potential health risks due to the presence of mining wastes generated as part of the drilling and hydraulic fracturing process being retained on site if adequate off site treatment facilities are not found.

With particular regard to hydrogeology

- To develop a framework to establish a baseline and on-going monitoring of environmental and health conditions.
- Characterisation of the extent of fracture propagation and the permeability of layers above and beyond the faults
- Characterisation of combustion gases at the flare, particularly the levels of hydrocarbons, radon, methane, volatile organic compounds and any other substances deemed hazardous to human health
- Levels of fugitive emissions at well pads, on potential pathways and at receptor households.
- Ground water monitoring of methane.
- Measuring long term well integrity.
- Information on any existing private water supplies that aren't covered by abstraction license within 2 km zone.

**Westby-with- Plumptons Parish Council:** Objects to the proposal for a number of reasons including the following summarised reasons in respect of hydrogeology:

- Impacts on the natural drainage system and potential damage to any asbestos in the underground system.
- Concerns regarding water contamination and the disposal of contaminated water.

**Medlar-with-Wesham Parish Council and Kirkham Town Council:** Object to the proposal for a number of reasons including the following summarised reasons in respect of hydrogeology:

- Potential well failure and the huge potential for land contamination, particularly to aquifers and agricultural land.
- Potential flow back water site leakages and spillage during disposal and transportation.
- No information on water treatment plans. Where will flow back water be treated and will any new treatment plan accept waste from other UK sites.

Friends of the Earth have raised a number of objections to the proposal including the following summarised reasons in respect of hydrogeology as part of their response to the application as initially submitted and in response to the further information:

- It is unclear what waste quality standards would be applied by the applicant to ensure that concentration of pollutants in the wastewater did not accumulate beyond safe levels as a result of re-use for fracking and how risks to the environment and health and safety would be mitigated as a result of well failure.
- Legacy of underground waste which will be present is denied, not a temporary development as it will create permanent contaminated wastewater
- Risks from flow back fluid and waste water
- Risks of storage of waste to protected ecological areas and the developer has not clarified what happens when the storage capacity of the site is exceeded.

- Concerned that the site has insufficient capacity to contain storm water without overflowing and presenting risk to adjoining land.

### Other representations

Representations objecting to the proposal have made reference to the unacceptable impacts on hydrogeology which are summarised as follows:

- The applicant has underplayed the impact because they have omitted important faults from their maps and that have also understated the hazard from the faults that they have considered by overlooking the possibility that fracking fluid may leak into these faults.
- Concerns have been expressed that the presence of major faults in the area means that the proposal will inevitably pollute the surrounding region as a result of flow along the faults.
- In addition concerns have also been expressed about well integrity, chemical that are used in fracking fluid, and the need for long term monitoring.
- The Earth will become a barren toxic wasteland after fracking, breaking up and filling the ground with chemicals must have environmental consequences.
- Risk of short term well failure and loss of well integrity in the long term are widely reported, resulting in a toxic legacy for current and future generations
- Issues from corrosion of well casings, cement deterioration, faulty drilling.
- Fracking fluid contains carcinogens, toxins, radioactive and hazardous materials which will contaminate land and water sources affecting food production and drinking water.
- Risk of contamination from carcinogenic chemicals.
- Risk of contamination form *Caesium-137, Americium-241, Beryllium, Hydrochloric acid, lead, arsenic, cadmium, glutaraldehyde, biocide quaternary ammonium chloride, ammonium persulfate, choline Chloride, isopropanol, petroleum distillate, polyacrylamide, guar gum, citric acid, lauryl sulphate, sodium hydroxide, copolymer of acrylamide, sodium acrylate, chloride, bromine, methane.*
- 50% of chemicals will remain in the ground.
- Don't want a chemical legacy for our children to have to deal with.
- Need full disclosure of chemicals in fracking fluids and risks from them.
- Contamination/pollution from fracking process, gases and fracking fluid to aquifers, ground water sources, local rivers, streams, springs and reservoirs in the short and long term which could endanger drinking water supply to people and grazing animals with associated health risks.
- Over a thousand documented cases in the US of groundwater pollution.
- Drinking water is more important resource than gas. Risk of contaminating water supply is too big a risk.
- Need more work to establish the safety of the process in relation to ground water contamination.
- Need baseline and continuous groundwater monitoring with work suspended if contamination / adverse effects are found.
- Monitoring wells for groundwater quality and gas concentrations should be mandatory.
- Even if tightly regulated an unforeseen accidental discharge could contaminate groundwater and the damage cannot be rectified.

- Millions of litres of polluted / toxic water will be left to drift underground, approximately 30miles around each well with long term damage.
- Faults can act as conduits and enable fracking fluids to migrate to water sources.
- The Water Framework Directive requires that a development should not go ahead unless it is proven that there is no risk to groundwater.
- Contrary to FBLP Policy EP24 as water quality will be affected by leaking wells.
- Who pays for decontamination of our water supplies? Are councils not cash strapped?
- Need a law for every contamination, company directors get 10 year jail sentence.
- Water from taps could ignite.
- UK geology – too many local faults will allow leakage. Faults still moving. In previous drilling using unproven technology an undetected fault moved and failed the borehole. Too risky.
- Link between fracking and previously geologically stable areas in Ohio, USA.
- Fracking could destabilise the entire bedrock beneath the Fylde, upon which sits several mine workings and unstable ground conditions – running sand.

### Assessment

An assessment of subsurface geology by the EA has considered the potential for retained pollutants in the shale rock to migrate upwards into contact with any groundwater bearing formations. This outcome has been assessed as very low risk and with no plausible pathway. The rock formation directly above the target formation, known as the Millstone Grit (at depths of ~1300m to ~1550m below ground level), has been assessed as a groundwater unit. A groundwater activity permit is therefore required because of the theoretical possibility that fluid could migrate from the target formation into the Millstone Grit.

The EA has assessed the possibility of fluid migration as very low risk. This is because of the absence of a pressure gradient driving the fluid once the fracturing pressure is turned off. Moreover, close monitoring of fractures (using the micro seismic array and in accordance with the Fracture Plan that must be approved by DECC and the Agency) will prevent any fractures moving into the Millstone Grit from the target formation, thus preventing the movement of fluid.

Concerns have been raised by third parties that there are groundwater / surface water pollution risks and that that *'The hydrogeology of the area immediately east of the site shows that regional faults are transmissive.'*

In considering these concerns the County Council has taken advice from the Environment Agency and from Professor Younger and Dr Westaway at the University of Glasgow. This concludes:

- (i) Where faults cut low-permeability strata such as shale there is a marked tendency for the fault plane to be lined with a fine-grained clay-rich material known as "fault gouge", which typically renders these portions of the fault planes effectively impermeable (*Younger, P.L., 2007, University of Glasgow. Groundwater in the environment: an introduction. Blackwell, Oxford*). In contrast, where the same fault cuts a permeable rock such as sandstone and

the displacement has not smeared clay-rich gouge from an over- or underlying mudstone into the fault zone, then the fault plane may well be occupied by relatively permeable breccia; minor fractures either side of the fault plane in a sandstone might also be relatively clean and open. However, because of the formation of fault gouge where the same faults pass down into mudstones, there is no a priori reason to suppose that these faults are permeable throughout their depths: where they cut mudstones they are overwhelmingly likely to be of low permeability.

- (ii) Even where a fault is not so lined with gouge as to render it impermeable, it is subject to the present crustal stress regime, which tends to favour faults being more permeable where they are aligned fairly closely to the current maximum compressive stress azimuth, but tends to make them far less permeable if they are otherwise oriented (*Ref: Ellis, J., Mannino, I., Johnston, J., Felix, M.E.J., Younger, P.L. and Vaughan, A.P.M. 2014. Shiremoor. Geothermal Heat Project: reducing uncertainty around fault geometry and permeability using Move™ for structural model building and stress analysis. European Geosciences Union General Assembly 2014, Vienna, 27th April–2nd May 2014. EGU2014-15069.* Note that this does not override the basic permeability control provided by fault gouge.
- (iii) Crucially, even where a fault is continuously permeable over a large vertical interval (which is unlikely in sequences, like those in the region under consideration, that contain thick mudstones) groundwater flow can only occur if there is a sustained driving head from one area to another. There is no evidence of any such upward-oriented hydraulic gradient in this region, and the extremely short-lived pulses of increased head close to the boreholes during fracking operations are insufficient to overcome the head in overlying strata. Where conventional oil and gas reservoirs occur, natural upward hydraulic gradients may exist, but oil and gas only accumulate where permeable pathways upwards are insufficient to allow dissipation of fluid pressure over geological time. It is inherent in the very definition of unconventional gas that such over-pressure does not occur; hence the need for reservoir stimulation and depressurisation of the target horizon in order to get gas to move into boreholes. These points were addressed in the Joint Royal Academies' report (*Ref: Shale gas extraction in the UK: a review of hydraulic fracturing. Royal Society and Royal Academy of Engineering*)

There are possible impacts associated with the well pad construction and activities. The site construction involves laying an impermeable member over the whole compound area to prevent accidental slippage and rainwater from entering the underlying soils, groundwater and nearby water courses. The platform is bounded by a ditch, for the purpose of pollution control. Surface water will drain into a water course and the Environment Agency has advised that the arrangements are acceptable subject to several conditions

There are potential impacts associated with the well design and construction and proposal to manage these impacts. It is proposed that the well would be drilled, constructed and tested in accordance with regulatory requirements and industry standards. The well design would comprise a two barrier cement sealed design.

Details of the well design would be reviewed by the Independent Well Examiner. Additionally, the Environment Agency considers the proposed well construction would form a barrier to prevent the escape of fluids. The EA is satisfied that well integrity is assured through compliance with the well examination regime and regulation by the Health and Safety Executive, and further through conformance to Oil & Gas UK and UK Onshore Operators' Group good practice guidelines for well design and construction. Hydraulic fracturing plans and a seismic monitoring programme would be submitted to DECC and the EA for approval prior to hydraulic fracturing operation commencing; operation of a traffic light system for monitoring of induced seismicity is also designed to mitigate the risk from induced seismicity, including any potential for damage to well integrity. The potential for fractures that are propagated by hydraulic fracturing to extend beyond the target formation has been assessed to be very low and the growth of fractures resulting from each fracturing stage would be assessed with the aid of the seismic monitoring array.

The EA has assessed the proposed fracture fluid as non-hazardous. It is also satisfied that the chemical similarity between the fluid and the water in the Millstone Grit is sufficiently high that any indirect discharge would be insignificant. Finally, the EA believes that if any fluid reaches the Millstone Grit it would not move far from the point of entry because of the confined nature of the rock. If needed low toxicity oil based muds would only be used below the Manchester Marl formations and with the approval of the EA.

Prior to and during works, groundwater water and surface water would be monitored (see application LCC/2014/0097). The monitoring would be agreed with the EA. The EA permit includes pre-operational requirements to provide baseline monitoring of groundwater, air quality and surface water for approval before the start of operations. The permit also includes a requirement to provide for a monitoring plan for at least 4 weeks prior to gas flaring. The EA has specified monitoring of groundwater and surface water in the permit and this would be carried out until the permit is surrendered.

When the works are finished, they would be decommissioned in accordance with the regulatory requirements of the EA and the HSE and industry guidance. The plugging and abandonment of the well including the monitoring of the ground water quality and gas concentrations are matters for the HSE, the DECC and the EA and their respective regulatory regimes. In particular, the plugging and abandonment of the borehole is regulated by the HSE under the Offshore Installations and Wells (Design and Construction etc.) Regulations 1996. These Regulations contain provisions relating to well integrity and abandonment as well as the selection of materials. The Regulations apply to all wells drilled under landward licences, the key objectives of which are to prevent the escape of fluids from the well which might result in pollution of freshwater or ground contamination. Under the Regulations, well abandonment techniques must prevent the transfer of fluids created by pressure gradients between different zones. Such transfer is achieved by means of the original borehole casing and the cementing and plugging operations that are undertaken as part of well abandonment.

Paragraph 122 of the NPPF requires that planning authorities should not seek to control processes or emissions were these are subject to approval under separate pollution control regimes and that LPA's should assume that these regimes will operate effectively. Nonetheless, paragraph 112 of PPG Minerals, notes that before granting permission the local planning authority should be satisfied that the issues dealt with

under other regimes can be adequately addressed by taking advice from the relevant regulatory body'. The County Council has consulted with the EA and HSE, neither of which has objected.

The EA has granted the applicant the necessary environmental permits needed to carry out their proposed operations. The permits set out the conditions needed to protect groundwater, surface water and air quality. Now the permits are issued, the applicant would have to comply with the proposed conditions that are designed to ensure that operations do not cause harm to people or the environment. The EA has assessed the proposed activities that could involve the discharge of pollutants into groundwater (a 'groundwater activity') and the nature of these pollutants. The EA is satisfied, subject to conditions, that there is minimal risk of direct discharge of pollutants into groundwater. The EA is also satisfied that the indirect entry of non-hazardous pollutants will be limited so as not to cause pollution.

## **Conclusion**

Hydrogeological issues and the protection of surface and ground water have been assessed by the applicant and the risks associated with such were considered to be low or very low.

Advice provided to the County Council from Professor Younger and Dr Westaway at the University of Glasgow states the scenarios of pollution of shallow groundwater and surface waters due to fracking operations, as suggested in some representations, are not credible. They also say the suggestion the proposal is unsafe because there are faults in the vicinity are unfounded.

The Environment Agency (EA) and the Health and Safety Executive (HSE) have been consulted and have advised on the regulatory regimes that would be employed to manage the risks and that they are satisfied that that such risks could be managed in a way that would not cause any unacceptable impact.

It is considered that the site can be contained and surface waters managed in a way as to prevent pollution to adjoin land or nearby watercourses.

The County Council should assume that these regimes will operate effectively and can be satisfied that the issues dealt with under other regimes can be adequately addressed.

Boreholes for ground water monitoring are the subject of planning application LCC/2014/0097. Subject to conditions controlling the management of surface water it is considered that the proposal could be acceptably controlled by other regulatory regimes and would not have any unacceptable impacts

The development is therefore considered to comply with national guidance and the policies of the development plan.