Dear [Name],

Our ref: IDA 263884

Thank you for your enquiry dated 19\textsuperscript{th} July, requesting information in relation to the proposed Ince Marshes research site in Cheshire. Because your request concerns environmental information we have considered it under the Environmental Information Regulations 2004 (EIRs). Please find the answers to your questions below:

**Question 1: Will the BGS pool resources with the fracking industry in its research?**

No. The proposed boreholes that comprise the Cheshire observatory have been designed for scientific research. They are not suitable for hydrocarbon extraction, and because of their design, they could not be repurposed for hydrocarbon extraction.

The UK Geoenergy Observatory boreholes are completely independent of any monitoring that the environmental regulator (i.e. the Environment Agency) would require a commercial exploration company to install. The UK Geoenergy Observatory boreholes in Cheshire could not be used by a fracking company in an attempt to avoid the need for them to carry out their own environmental monitoring.

**Background information regarding the site resources**

**Part 1: The resources needed to create the proposed Cheshire Energy Research field site**

The funding to create the Cheshire Energy Research Field Site has been supplied by the Department for Business, Energy and Industrial Strategy (BEIS) via the capital funding that they allocate to research councils (in our case the Natural Environment Research Council – NERC. From the 1\textsuperscript{st} April 2018 NERC has become part of UK Research & Innovation, a non-departmental public body funded by a grant-in-aid from the UK government) for the creation of new research infrastructure.

The funding for the project was initially publicly announced by the then Chancellor in 2014. There was then a rigorous process by which the costs and benefits of creating the two fields was assessed. This was the same way in which NERC scrutinises any request for capital funding to create new research facilities. There is no oil and gas industry money going in to funding the creation of the Cheshire Energy Research Field Site, nor the Glasgow Energy Research Field Site.
Part 2: Resources for research that could be carried out at the Cheshire Energy Research Field site in the future

Looking forward, if we obtain planning permission to create the Cheshire observatory, the British Geological Survey (BGS) and the NERC will need to establish a Management Committee for each of the UK Geoenergy Observatories. Part of the role of this group would be to assess the scientific merit of any research proposals for the field sites. This would be similar to the processes used for other NERC research facilities, a list of which can be found here.

The Management Committee will oversee requests from researchers to use the boreholes, instrumentation and data from ongoing sampling. So while we won’t be ‘pooling resources’ with the fracking industry to create the field site, it is true to say that researchers – including those from the oil and gas industry – may wish to submit research proposals requesting access to the facilities for scientific research. As with any other publicly-funded UK research site, all research proposals are considered on their individual scientific merit. There is more information on how NERC manages requests for access across its portfolio of research facilities here.

Question 2: What form will the research, specifically into fracking / unconventional gas extraction, take at Ince Marshes?

There would be no fracking or unconventional gas extraction as part of the research activities at the UK Geoenergy Observatory at Ince Marshes. Research would not include the technology of how resources are extracted (well engineering).

As activities at the UK Geoenergy Observatory at Ince Marshes would not involve either of these processes, research on data which shows what happens during an active fracking operation could only go forward if the owner of the Petroleum Exploration Development Licence (PEDL), IGas, proceeds with an application to frack and the relevant authorities approve and permit this activity for Ince Marshes.

Neither the BGS nor NERC are in control of whether fracking and unconventional gas extraction will take place at Ince Marshes. The BGS and NERC are not a part of this commercial, regulatory, or political decision-making process. IGas have stated that they are not proceeding with an application for shale gas extraction at Ince Marshes at this time. Follow this link to view the information.


Delivering new scientific evidence from our observatory at Ince Marshes is not dependent on any commercial operator fracking at Ince Marshes. What is described below would be implemented by BGS irrespective of whether fracking takes place at Ince Marshes as it delivers new data for science.

1: Baseline Geochemistry: A series of relatively shallow boreholes (less than 100 m deep) would be drilled at various locations around the Cheshire Energy Research Field Site to sample and monitor groundwater. The data would be used to characterise the baseline conditions and identify any changes that take place over the lifetime of the research facility.

The scientific data outputs from this geochemical baseline will be similar to those from our existing research in the Vale of Pickering.

Pump testing (where water is pumped out of the boreholes to watch the speed at which is replenishes) would be undertaken to determine permeability of the rocks. This understanding is important for future
experimental design at the site, interpretation of experimental results and would enable the development of groundwater flow and contaminant transport models.

2: Baseline seismic: BGS would install a number of new seismometers in two sets. Firstly new seismometers would be installed in boreholes between 200 - 300 metres below ground surface at locations which have been chosen to optimise understanding of the key geological structures in this area. Secondly, a seismometer which will be installed at the base of our deepest planned borehole at a depth of around 1200 metres. These form part of BGS national seismic monitoring network. More information on this network, and access to the data recorded from the seismic monitoring equipment is available here.

In combination, these new seismometers could detect earth movements (earthquakes) down to -0.9 magnitude (far smaller than anything that humans can feel). Raw data from this seismometer would be openly available in real-time from the UK Geoenergy Observatories data portal. The data generated by these seismometers could be used to better understand natural seismicity and events triggered by man-made activities, for example, hydraulic fracturing should it go ahead. The data could also be used to develop new models for improving the accuracy of event detection.

Using complex data from this seismometer array would allow the detailed evaluations of how rocks move or deform under UK conditions. Once processed and checked, we would publish this data in open-access peer-reviewed publications and datasets.

The seismometers should operate for many years providing high-resolution information about UK ground movements.

3: Laboratory measurement and testing: Core materials and groundwater samples extracted from UK Geoenergy Observatory boreholes would be described, interpreted and then analysed in BGS laboratories. This is to understand the properties of the rocks above the shale gas/oil source rocks such as the Bowland Shale Formation. The UK Geoenergy Observatory boreholes would not be sampling these rocks as the boreholes would terminate several hundred metres above this depth. The core samples, in combination with geophysical data collected from within the borehole, along with geophysical and geochemical data collected from the core themselves, will be analysed to try to understand the physical, chemical and mechanical properties of the rocks. This will provide data on their likelihood to either allow or prevent fluids and gases to move through them, and the likelihood that they will be deformed by earth movements.

Background information on the research aims of each borehole

The above sections 1-3 are only one aspect of the potential research at the UK Geoenergy Observatories. NERC has commissioned BGS to deliver this world-class research observatory that will provide important research evidence on a large range of sub-surface energy topics. The specific objectives of the individual borehole arrays are described on our website here: https://www.bgs.ac.uk/research/energy/esios/cheshire/borehole-arrays.html

The UK Geoenergy Observatories have been designed to equip the UK with the best possible evidence on all the potential uses of the subsurface as we move towards a low-carbon economy. The Observatories will provide current, independent research evidence to enable the very best decisions to be made on how we use the underground as a resource: whether for carbon storage, geothermal, compressed air storage, or shale gas extraction.
Question 3: Will the BGS receive any a) funding or b) other additional benefits from the fracking industry?

This project will not receive funding from the fracking industry. The BGS has been commissioned to deliver the UK Geoenergy Observatories project with funding from BEIS, via NERC.

BGS data and scientific expertise is available to the public, government, academia, regulators and industry. Any organisation can commission us to undertake work requiring our geological expertise.

In the interests of transparency, we wanted to share the following information. Since 2008, the BGS has carried out two projects for companies that have or have had interests in fracking:

1. Between 2014 and 2017, the BGS undertook the Onshore Carboniferous Basins Project: a study to improve knowledge of the geology of the mid-Carboniferous rocks under northern England. This consortium project was funded by Total, Centrica Energy, Engie and the then Department of Energy and Climate Change. Each partner contributed £75,000 to the study. More information is on our website at this link: http://www.bgs.ac.uk/research/energy/onshoreCarboniferousBasins.html

2. Between 2012 and 2014, Centrica commissioned the BGS to undertake an independent review of their borehole cores looking for specific organic fossil evidence to link it to shale gas deposition. The value of contract was £15,587.

Background information regarding data from industry

One way in which the research community, including BGS, benefit from the oil and gas industry is the National Hydrocarbons Data Archive. Oil and gas operators have a duty to preserve their data in perpetuity for public good and this data is an important source of geological information. There is a period of confidentiality covering this data. Once the period of commercial confidentiality has passed, BGS can make use of this data set in the same way as any other researcher and member of the public could. More information about the National Hydrocarbons Data Archive is available here.

Question 4: Would fracking research provide a potential revenue stream for the BGS?

The BGS does not currently have a research revenue stream from the fracking industry and we do not have plans to create this.

Just for background information, we have provided a summary below. As the national centre for providing impartial, objective and authoritative geoscience data, information and knowledge, the BGS has been involved in the following research relating to UK shale gas:


2) The BGS has studied the geological conditions in the north-west of England. Through the Environmental Baseline Monitoring (EBM) Survey, the BGS and its research partners are monitoring baseline conditions of groundwater, seismicity, air quality, ground motion, soil gas and radon. The purpose of the EBM is to establish if any changes that occur can be linked to hydraulic fracturing, and the EBM will continue during any industrial operational extraction and after completion. Further information can be found on our website.
3) The BGS has calculated the underground vertical separation between aquifers that carry potable water and prospective shale gas layers, in a series of maps intended for the guidance of planners, policy makers and shale gas exploration companies. The work was recently extended to a 3D groundwater vulnerability and risk screening assessment. Further information is on our website.

4) The BGS and the Environment Agency (EA) have developed a method of assessing the vulnerability of groundwater from onshore oil and gas extraction activities in England. This new tool will improve our understanding of the risk to groundwater. BGS conducted a study to develop an accessible and nationally consistent method for assessing the vulnerability of groundwater to potential contamination from any possible future activities deeper in the subsurface.

5) The BGS is involved in two research challenges in the NERC and the Economic & Social Research Council (ESRC) Unconventional Hydrocarbons in the UK Energy System: Environmental & socio-economic impacts & processes programme. Information about the programme is on the NERC website here.

6) Information about other BGS shale gas research can be explored on our website here.

**Question 5: Would the BGS inherit any previously drilled wells or boreholes as part of its research programme?**

No. The only boreholes that will form part of the BGS research programme will be those that we plan to drill ourselves. BGS will neither inherit, nor take on ownership/responsibility, for any previously drilled wells or boreholes.

However, if a borehole or well is drilled for the purposes of oil and gas exploration, then there is a requirement for the organisation drilling the borehole to lodge samples of the core (i.e. rock samples recovered from the borehole) with the National Geological Repository. There is more information about the National Geological Repository available here. There have previously been boreholes drilled for oil and gas exploration in the Ince Marshes area, and BGS have analysed the core samples from the boreholes to help inform our understanding of the geology in the area.

**Question 6: Would the research site be in jeopardy if the fracking aspect was removed?**

No. As stated in question 2, our plans for the Cheshire UK Geoenergy Observatory are not dependent upon the Petroleum Exploration and Development Licence holder (IGas) carrying out fracking.

NERC and BGS aim to develop a research field site in the Ince Marshes area to address the scientific topics that we have discussed at our engagement events in the local area, and which were highlighted in the published Science Plan in 2016.

A critical part of any research site is establishing a baseline and having the ability to monitor change over time. In the context of the Cheshire UK Geoenergy Observatory, this would entail drilling boreholes and installing instrumentation to improve our understanding of the groundwater, the geological strata, and seismic activity.

If fracking were to go ahead in the area, our monitoring equipment would allow us to gather a very high quality data set about the impact on the underground environment and this would be freely available to anyone that is interested.
Our scientific rationale for wanting to create the field research site is not dependent upon fracking going ahead. If fracking does not go ahead, we would continue to have a geological research field site that would allow world-class geological data to be collected and research to be carried out.

**Question 7: Would the research site be in jeopardy if Chester University’s Thornton Science Park Faculty of Science and Engineering’s work did not proceed?**

No. We are looking to rent research premises (i.e. office/laboratory space) at Thornton Science Park. This activity is unaffected by the recent planning case. The recent planning application for Thornton Science Park related to a change of use for some of the buildings on the site for teaching students. You can find out more about the current situation on this [University of Chester webpage](http://example.com).

Cheshire West and Chester Council’s decision on the Thornton Science Park planning application does not impact on the BGS plans for the Cheshire UK Geoenergy Observatory site because our plans do not involve teaching students.

**Question 8: Does the BGS view Unconventional Gas extraction as “Low Carbon”?**

As an organisation, BGS does not have a view on whether Unconventional Gas extraction is low carbon. The reason for this is that the topic is much broader than just questions relating to BGS’s remit as a geological survey.

However, the question of whether unconventional gas could be viewed as low carbon has been raised by many people attending our UK Geoenergy Observatories engagement events. In his capacity as a scientist working in this discipline, Professor Mike Stephenson has written a [book](http://example.com) which covers some of the issues raised in your question, and he has discussed these with people at local engagement events. This topic is discussed in more detail in Chapter 7 of [Shale Gas & Fracking: The Science Behind the Controversy](http://example.com) which addresses the topic of Shale Gas and Climate.

**Question 9: Will planning applications be required for all the 80 observation boreholes and if so will the planning applications be submitted individually or together?**

Yes, we aim to submit one planning application covering the whole of the field site. The rationale for this is that the borehole arrays are designed to work together to provide opportunities for a range of different science. Due to design changes we are now proposing 50 observation boreholes, instead of 80.

Additionally, to allow the overall environmental impact assessment of the proposed field site to be assessed, all of the environmental information needs to be assessed as a whole. We have also focused on each of the proposed borehole locations and identified the specific environmental impacts/constraints at that site. We have tried to structure the Environmental Impact Assessment so that it is easy for people to identify the impacts for the borehole location of greatest interest to them. Understanding the environmental impact of any proposed work is essential to us and we took the decision to invest in a broad ranging EIA covering our proposals for the Cheshire.
Question 10: a) What are the unique opportunities of this site at this particular time? b) Why has this site been chosen?

a) Unique opportunities at this particular time

The BGS has been looking to deliver a number of observatories across the UK for a number of years. Designing scientific research facilities that allows research covering a wide range of topics is a challenging task and it takes a long time to develop the detailed plans. Once a site had been identified and work had been done to understand the geology of that site, time is required to work with geoscience experts to design the boreholes and scientific instrumentation that would deliver new information. In addition to the scientific design work, the BGS was aware that any observatory would need to prepare a full planning application and corresponding Environmental Impact Assessment (EIA). The BGS does not have the in-house skills to prepare a planning application of this nature. Therefore, we had to procure specialist skills to prepare documentation and carry out the environmental surveys needed over the seasonal windows for the EIA. It is only now that we are getting towards the point at which our planning application and EIA can be finalised for submission to the local planning authority, Cheshire West and Chester Council. All of the documentation relating to the planning documents will be available for public review and consultation.

b) Why has this site been chosen?

NERC consulted with the academic community throughout 2015 to determine research that could/should be conducted at the UK Geoenergy Observatory sites. The research areas are captured in the Science Plan and include:

- Imaging a complex, heterogeneous and evolving rock mass
- Fluid flow through rock
- Mechanical response to artificial perturbations
- Biogeochemical response to artificial perturbations
- How the subsurface responds to changes
- Baseline studies
- Remote monitoring, telemetry and data analytics.

The Science Plan recommended that an over-arching priority common to virtually all of the research areas is to provide a facility with at least one deep (>1000 m) well that can be used for a range of experimental research purposes over a period of several years. It adds that this should be complemented by an array of relatively shallow boreholes to characterize the rock volume within and around the experimental research facility, to facilitate high-definition (downhole) monitoring and imaging, and to monitor impacts on shallow groundwater systems resulting from the deeper borehole experiments.

Site selection sought to ensure that the locations provide the geological environment and surface facilities to match the objectives and challenges of the Science Plan. The BGS worked with the Science Advisory Group and identified Ince Marshes, near Chester, and the Clyde Gateway in Glasgow as suitable locations for sites that would allow most aspects of the Science Plan to be addressed. Site selection requirements included:

- Suitability of Geological Environment
- Availability of 2D and 3D seismic data and data from exploration wells
- Local Science Infrastructure Support
The Ince Marshes area was chosen because:

- **Suitability of Geological Environment** – High quality subsurface data shows that the location has ideal geology for subsurface energy research. This consists of layers of sedimentary rocks and structures which is appropriate characteristics for energy research as defined by the Science Plan.

- **Availability of 2D and 3D seismic data and data from exploration wells** – There is a network of good quality 2D seismic, 3D seismic, UK Onshore Geophysical Library regional seismic profiles, Coal Authority 2D seismic, and data from exploration wells for coal bed methane, conventional oil and gas, and shale gas for the area. This provides high quality information on which to understand the suitability of the geology.

- **Local Science Infrastructure Support** – The site is located within the Cheshire Science Corridor, which was awarded Enterprise Zone status by the Government in 2015. The location is well served for science infrastructure support by the nearby Thornton Science Park of the University of Chester with lab facilities, storage and office space and supplementary computing.

Ince Marshes is part of a Petroleum Exploration Development Licence. If shale gas extraction is approved for the area, the Cheshire Energy Research Field Site sensing and listening equipment would pick up signals from an active subsurface operation. This data could then identify how the environmental baseline changes in response to human induced change as well as in response to natural change.

The rock layers, structures, data and activities around Ince Marshes together provide a combination that cannot be found elsewhere in the UK, having regard to the site selection requirements derived from the Science Plan.

**Question 11: How much information / specific training has been given to BGS scientists and representatives regarding the fracking industry?**

The BGS is a world leading applied geoscience research centre undertaking national and public good research to understand earth and environmental processes in the UK and globally. It has 650 staff, sponsors some 100 PhD students each year and has close links to 40 universities.

BGS staff have a wide range of specialisms and expertise covering all aspects of the work that BGS are involved in. Much of this information is on our website. Many BGS staff have previously worked in industry - including the oil and gas, and other energy, industries. In this sense, many BGS staff have developed knowledge and specific expertise relevant to the topic of fracking over the course of their careers. Additionally, BGS staff attend seminars, conferences and workshops at which fracking is discussed.

BGS staff have published scientific books and scientific journal papers on topics relating to fracking and unconventional hydrocarbons. These are a matter of public record. By way of an example, BGS Director of Science and Technology, Professor Mike Stephenson, has published books including ‘Shale Gas and Fracking: The Science Behind the Controversy’ in 2015.

I hope this fully answers your questions. If you feel we have failed to comply with your request in accordance with the requirements of the Regulations, you have the right to ask for an internal review (Regulation 11). Internal review requests should be submitted in writing within 40 working days after the date on which you believe we failed to comply with the requirements – normally the date of receipt of our response to your request. This should be addressed to
The Complaints Officer at NERC, Polaris House, North Star Avenue, Swindon, Wilts SN2 1EU. There is no charge for this review.

Please remember to quote the reference number above in any future communications.

If you are not content with the outcome of the internal review, you then have the right to apply directly to the Information Commissioner for a decision. The Information Commissioner can be contacted at the Information Commissioner’s Office, Wycliffe House, Water Lane, Wilmslow, Cheshire, SK9 5AF. Telephone: 08456 306060, or: 01625 545745. Website: https://ico.org.uk/

Yours sincerely

[Signature]

Head of Intellectual Property and Legal Services