

Legal Briefing

Acid Stimulation: Fracking by Stealth



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Cover photo: Hydrochloric acid at UKOG's Horse Hill site,
Summer 2018, Weald Oil Watch



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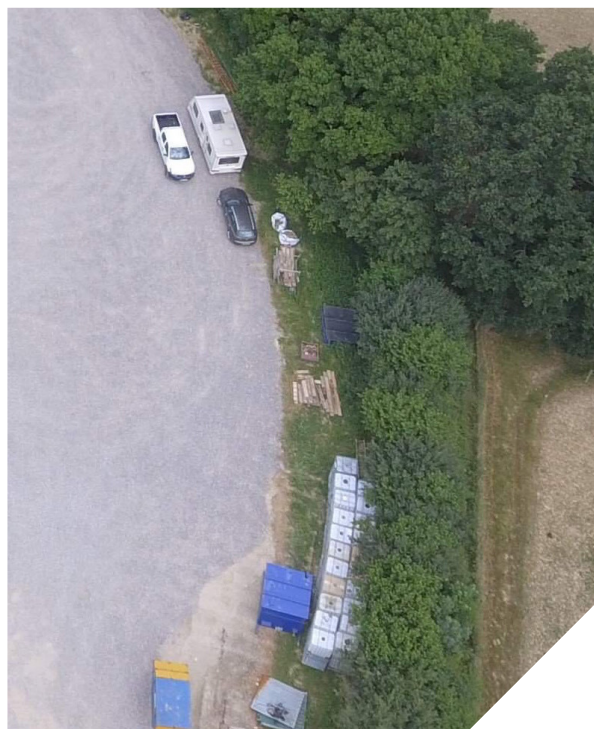
*Dilute acid at UKOG's Horse Hill site, January 2019.
Photo: Lee McCusker*



*Dilute acid at UKOG's Horse Hill site, January 2019.
Photo: Lee McCusker*



Delivery of dilute acid to Angus Energy's Brockham oil site, December 2018



Hydrochloric acid cubes at UKOG's Horse Hill site, Summer 2018, Photo: Weald Oil Watch

Foreword

Acid stimulation is a well treatment that enhances the productivity of oil and gas wells by increasing the permeability of the target rock. Unlike hydraulic fracturing, which uses high-pressure water-based fluid to enlarge existing, or create new fractures in the target rock, acid stimulation involves the use of acid to achieve the same results. The main acid stimulation techniques are matrix acidisation and acid fracturing; these should not be confused with acid wash, which is used as a routine well cleanout method and to remove formation damage from drilling.

Acid stimulation, which has been described as a fracking-like method¹ and a sister technology to hydraulic fracturing², involves similar risks to those posed by hydraulic fracturing. In California, where there is a history of using acid stimulation by the oil and gas industry, it is regulated in the same way as hydraulic fracturing under Senate Bill No. 4 (S.B. 4), 2013³. In Florida, efforts are being made to ban both hydraulic fracturing and acid stimulation⁴.

Although there has been considerable discussion around hydraulic fracturing in the UK and the controls and regulations that should apply, this debate has tended to focus only on hydraulic fracturing using large volumes of fluid pumped at high pressure. There has been far less focus on lower volume hydraulic fracturing and/or the use of acid to enhance oil and gas production.

Until the recent increased public interest in hydraulic fracturing, well stimulation was regarded as a routine aspect of well operations, not subject to specific consent, and hence not recorded systematically. The Government estimates that some 200 wells in the UK have been hydraulically fractured⁵. However, it is critical to understand that these operations, sometimes referred to as ‘conventional fracking’, were carried out on vertical wells in conventional (high permeability) formations. The first hydraulic fracturing of unconventional (low permeability) shale rock in the UK was carried out in 2011 at Preese Hall⁶.

When introducing legislation to regulate hydraulic fracturing of shale in the UK in 2015, the intention was to set the right balance between capturing high-volume hydraulic fracturing and avoiding any restrictions on ‘conventional

fracking’ which uses lower volumes of fluid⁷. Therefore the definition in the UK legal framework is restricted to hydraulic fracturing that involves large volumes of fluid. As a result, many of the legal and regulatory constraints that apply to high-volume hydraulic fracturing do not apply to acid stimulation, regardless of whether it is used in wells targeting conventional or unconventional formations (such as shale, tight sandstone or tight carbonate reservoirs). The latter developments are of particular concern, and those are currently being aggressively pursued by oil and gas firms across the UK.

Commercial exploitation of unconventional formations involves the drilling of multiple, often horizontal wells, to achieve maximum contact between the well and the target rock. This increases the scale and footprint of the development, HGV traffic on local roads to service its entire lifecycle, as well as the necessary associated infrastructure. Such oil and gas development at a large scale has come to be known as “fracking” in the public’s mind, regardless of a particular well’s depth, orientation or fluid volume used⁸.

As of July 2019, the Environment Agency has not issued any permits for acid stimulation anywhere in England⁹. The use of acid has only been permitted for acid wash treatments; however, the argument that acid wash is sufficient to make these developments commercially viable has been contradicted by industry-backed analysis¹⁰, conflicting statements by oil and gas firms^{11 12 13}, independent scientific opinion¹⁴, and it appears also by the Government’s own science. For example, the Kimmeridge Clay Formation, currently targeted by oil and gas firms in the Weald Basin, was compared in a major report¹⁵ published by the British Geological Survey to a Bakken-type shale play that has been extracted with the use of hydraulic fracturing. Moreover, the distinction between acid wash and stimulation is not clear in the UK regulatory framework and monitoring is very limited, raising concerns about stimulation taking place under the guise of acid wash.

Whether the Government continues its “all out for shale” strategy or finally succumbs to public opinion and decides to ban fracking, the acid stimulation loophole must be addressed by putting the definition right.

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Executive Summary

This briefing examines the legal and regulatory position surrounding the use of acid stimulation in England with a view to identifying the loopholes and ambiguities that exist.

In recent years, there has been a proliferation of oil and gas developments targeting unconventional rock formations, raising concerns in affected communities that commercial extraction will require the use of acid stimulation treatments. The concerns are amplified because acid stimulation is not clearly defined in law or regulation, making it challenging to establish where it might be taking place and to monitor its use.

Acid stimulation involves the use of acid to enhance the productivity of oil and gas wells by increasing the permeability of the target rock. There are a variety of acid stimulation techniques, which are described in more detail at section 2 below.

Although these stimulation techniques involve similar risks to those posed by water-based hydraulic fracturing, many of the legal and regulatory constraints that apply to hydraulic fracturing do not apply to acid stimulation. This is because the definition of hydraulic fracturing in the legal framework is restricted to fracturing that involves large volumes of fluid (high-volume hydraulic fracturing), which acid stimulation does not (section 3).

The briefing also examines the position of the key regulators involved in overseeing oil and gas exploration, in particular the Oil and Gas Authority (OGA), the Environment Agency (EA) and the Health and Safety Executive (HSE).

The OGA is dually responsible for licensing all oil and gas exploration and production, including hydraulic fracturing operations, and for managing the risks of seismic activity caused by these operations. While this regime is, for the most part, not restricted by the legal definitions outlined in section 3, broad discretion is granted to the OGA and there is a distinct lack of clarity over what activities are considered to amount to hydraulic fracturing and whether these include acid stimulation techniques (section 4).

The environmental permitting regime overseen by the EA is also lacking in clarity as to how the different acid stimulation techniques are defined and regulated, resulting once again in broad discretion for the EA to determine whether exploration and production activities involving the use of acid should be exempted from the permitting regime or require specific groundwater permits (section 5).

Section 6 examines the health and safety regime for onshore oil and gas exploration and production, which applies to all hydraulic fracturing operations, including acid stimulation activities. There are two health and safety controls specific to hydraulic fracturing. The first is a meeting and inspection regime that stems from a joint initiative between the EA and the HSE. However, which hydraulic fracturing activities this applies to is not clear from the EA/HSE agreement. The second distinction imposes mandatory site inspection but only applies to high-volume hydraulic fracturing and therefore excludes acid stimulation activities.

Finally, at section 7, this note considers how planning guidance defines hydraulic fracturing and how this definition is applied in practice by planning authorities. Although hydraulic fracturing under planning guidance is not restricted to high-volume hydraulic fracturing, the definition is open to varying interpretations. Moreover, it is not clear whether local authorities appreciate the implications of the fact that they may be required to interpret hydraulic fracturing to include activities, such as acid stimulation, that other regulators do not.

The note concludes that there is a distinct lack of clarity over what amounts to hydraulic fracturing when it falls outside the definition of high-volume fracturing set out in law and what regulatory and planning restrictions should apply in these circumstances. This is relevant for acid stimulation but also for lower volume hydraulic fracturing and other forms of well stimulation treatments. One of the key issues is the lack of clarity in regulatory and planning guidance and the broad discretion granted to regulators to determine the issue.

Recommendations

To urgently tackle climate change and given the climate change impacts of the extraction and use of oil and gas trapped in unconventional formations:

1. Ban all well stimulation, including water-based hydraulic fracturing and acid stimulation, for oil and gas exploration and production.

In the interim, to:

2. Amend the definition in the Petroleum Act 1998 to include all well stimulation treatments which may enhance the productivity of oil and gas wells by increasing the permeability of the target rock.
3. Require all regulators of the shale oil and gas exploration and production industry to apply this amended Petroleum Act 1998 definition consistently across the entire regulatory regime to ensure that all prohibitions and restrictions and monitoring and reporting requirements currently applicable to high-volume hydraulic fracturing apply to all well stimulation treatments, including:
 - a. The requirement to draw up a “well-stimulation plan” (currently a hydraulic fracture plan); and
 - b. The requirement for a traffic light monitoring system to monitor and manage induced seismicity.

4. For the purposes of environmental permitting and monitoring:

- a. introduce a volume-based definition of matrix acidising as an acid stimulation that penetrates 1 meter or more away from the wellbore (to distinguish from acid wash treatments); and
- b. require the submission of detailed injection charts to the EA for all injected fluids, including volumes of fluid pumped, injection depth, pressures, and timings.
- c. require the disclosure of information, including to the public, about all chemicals and the amounts used in each acid stimulation treatment, including chemicals subject to the ‘de minimis’ exclusion.

5. Amend the Minerals NPPG:

- a. To replace “hydraulic fracturing” with “well stimulation”, including at para.129 and amend the definition at para.129 in line with the proposed Petroleum 1998 Act definition;
- b. To clarify that para.130 is only one form of well stimulation technique; and
- c. To include at para.119 a presumption in favour of an EIA in all cases involving well stimulation.

1 Introduction

Although there has been discussion about hydraulic fracturing and the controls and regulations that should apply, this debate has tended to focus on specific forms of fracturing for shale gas, namely high-pressure hydraulic fracturing using large volumes of fluid (normally water).

There has been far less focus on the use of acid as a means of

enhancing oil and gas production, known as acid stimulation.

This is despite the fact that both water-based hydraulic fracturing and acid stimulation are forms of well stimulation. This briefing, examines the legal and regulatory position surrounding the use of acid stimulation in England with a view to identifying the loopholes and ambiguities that exist.

2 Acid Stimulation

Acid stimulation techniques

“Acid stimulation” (also known as “acidisation” or “acidising”) is the use of acid to enhance the permeability of oil and gas bearing rock to increase production from wells targeting such deposits. There are different types of acid stimulation, including:

- “acid fracturing” (also known as “fracture acidisation” or “acid fracking”);
- “matrix acidisation” (also known as “matrix acidising”), this term can also include an “acid squeeze”;

A separate procedure that is not a well stimulation technique but a cleaning process is an “acid wash”.

These terms are defined below.

Acid fracturing

Acid fracturing is the pumping of a solution of diluted acid and other chemicals at a pressure above the fracture strength of the rock to create new fractures within the rock, penetrating much further into the formation, and to increase existing fractures by dissolving the rock or components of the rock.

Acid fracturing is a form of “hydraulic fracturing”, since it involves the use of fluid to fracture rock.

Matrix acidisation

In matrix acidisation a solution of diluted acid and other chemicals is injected into the rock to dissolve the rock or components of the rock to create channels for the oil and gas to flow. This process takes place at pressures below the fracture strength of the rock.

Matrix acidisation might be classified as hydraulic fracturing depending on the circumstances. It involves the use of fluid to break down the rock but the precise pressure used determines whether this process “fractures” the rock or dissolves/acidizes it instead.

Acid wash

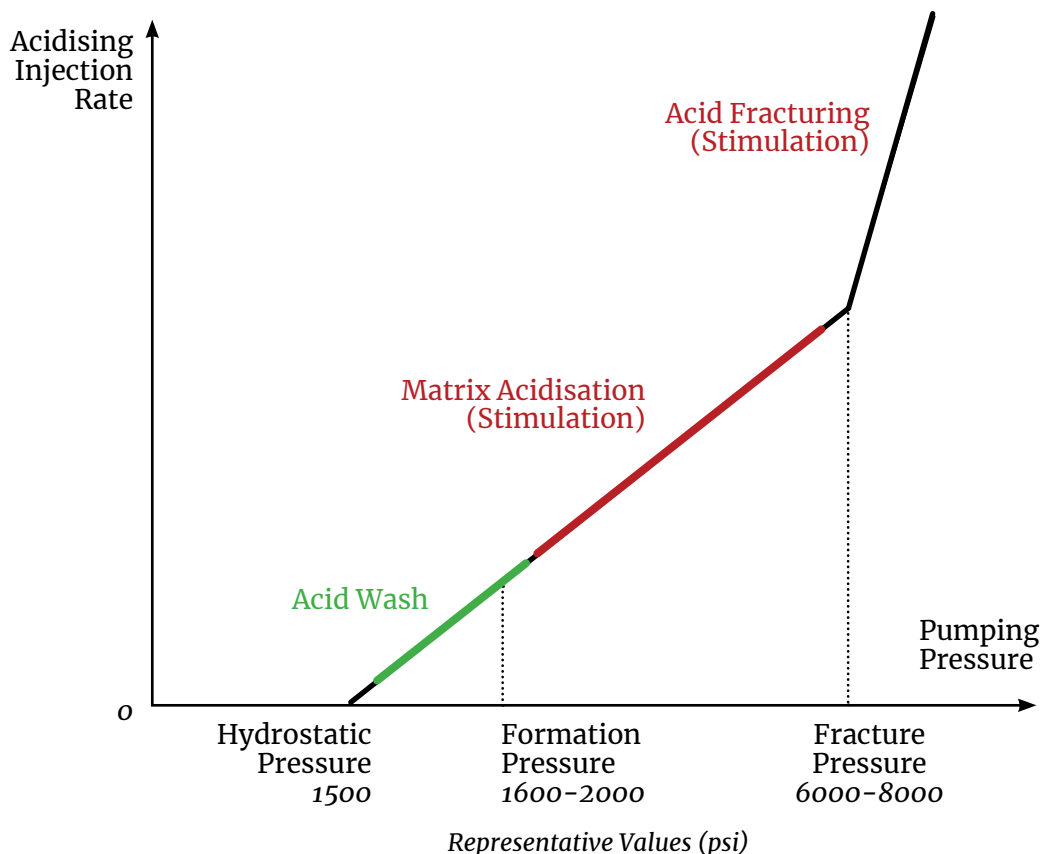
An acid wash is a well maintenance technique that uses diluted acid to remove scale and other deposits forming blockages in the well and pipes, and immediately around the wellbore. The purpose of this technique is to clean the well and equipment as opposed to targeting the surrounding rock formation.

Concerns around acid stimulation

Acid stimulation involves a variety of types of acid and other chemicals in concentrations that are far greater than that used in other forms of hydraulic fracturing. While it is clear that many of these acids and other chemicals are potentially hazardous for the environment and human health, there are few studies examining the risks and impacts of acid stimulation.

The types of chemicals used and the potential hazards involved in acid stimulation are set out in more detail in a briefing by Friends of the Earth.¹ Indeed, many of the risks and concerns surrounding other forms of hydraulic fracturing are the same as for acid stimulation, including matrix acidisation and acid fracturing.²

In addition, the climate change implications are equally as problematic for acid stimulation as for high volume hydraulic fracturing, including as a result of the release of methane during the extraction process and the release of carbon dioxide during the consumption of oil or gas extracted through acid stimulation.



Relationship between injection rate and pump pressure for different kinds of acid treatment

3 Specific Restrictions on High-Volume Hydraulic Fracturing

Under s.4A of the Petroleum Act 1998 (“the 1998 Act”),³ “Associated Hydraulic Fracturing” is subject to various restrictions, including:

- A ban at a depth of less than 1000m;
- A ban within protected groundwater source areas;⁴
- A ban within other protected areas;⁵
- Monitoring of baseline methane levels in the groundwater and ongoing methane emissions into the air;⁶
- Establishment of a scheme to provide for financial benefits to the local area; and
- The prior consent of the Secretary of State.

Neither acid stimulation, nor the different acid stimulation techniques are defined in law. Furthermore, although acid fracturing takes place at pressures above the fracture strength of the rock formation and acid stimulation techniques involves similar risks to hydraulic fracturing, neither acid fracturing nor matrix acidisation typically fall

within the definition of hydraulic fracturing contained in the 1998 Act and therefore are not subject to the same controls.

Under s.4B of the 1998 Act, “Associated Hydraulic Fracturing” is defined by reference to the volume of fluid involved. In particular, s.4B(1)(b) requires that the fracturing process “involves, or is expected to involve, the injection of—

- i. more than 1,000 cubic metres of fluid at each stage, or expected stage, of the hydraulic fracturing, or
- ii. more than 10,000 cubic metres of fluid in total.”

In 2016, the secretary of state issued regulations preventing the location of well pads used for hydraulic fracturing in “protected areas”, such as national parks.⁷ The 2016 Regulations do not refer to “Associated Hydraulic Fracturing” but instead use the term “Relevant Hydraulic Fracturing”. This definition is slightly broader and includes the injection of—

- i. more than 1,000 cubic metres of fluid at **any** stage, or expected stage, of the hydraulic fracturing, or
- ii. more than 10,000 cubic metres of fluid in total.

On 29 November 2017, the Secretary of State issued a Direction to the Oil and Gas Authority (OGA) requiring all applications for Completion Work Approval⁸ to be referred to the Secretary of State if the work involved hydraulic fracturing within the broader definition of fracturing, i.e. the Relevant Hydraulic Fracturing Definition contained in the 2016 Regulations.⁹ The purpose of this was so that the Secretary of State could consider whether the conditions set out at s.4a of the 1998 Act were met.

In effect, therefore, the 2017 Direction appears to extend the requirements of the 1998 Act to hydraulic fracturing that involves the injection of 1,000 cubic metres of fluid at any stage rather than at each stage of the fracturing process (or more than 10,000 cubic metres of fluid in total), at least once Completion Work Approval is applied for.¹⁰

However, even on the basis of this broader definition of hydraulic fracturing, the restrictions contained in the 1998 Act are unlikely to apply to acid stimulation. This is because both acid fracturing and matrix acidisation typically uses less fluid than high-volume hydraulic fracturing and these stimulation techniques therefore fall outside the definition contained in both the 1998 Act and the 2016 Regulations.¹¹

4 Oil and Gas Authority Controls

The OGA is a government company solely owned by the Secretary of State for Business, Energy and Industrial Strategy.¹² It is required to act so as to maximise the economic recovery of UK petroleum.¹³

The OGA has a twin role in relation to hydraulic fracturing activities.

First, under the Petroleum Act 1998, the OGA grants licences to ‘search and bore for and get’ petroleum.¹⁴ These licences contain “model clauses” set out in legislation.¹⁵

Second, the OGA is tasked with managing the risks of induced seismic activity.

However, there is no definition of hydraulic fracturing that applies to either its licensing role or its management of seismic activity. In particular, the definition of “Associated Hydraulic Fracturing” in the 1998 Act, does not apply to the exercise of powers by the OGA generally, including in relation to the granting of licences.¹⁶

Consequently, it is not clear what definition of hydraulic fracturing the OGA is required to use in the exercise of its functions. Indeed, the OGA guidance refers to “fracking operations”, “hydraulic fracturing” and “hydraulic stimulation” without defining what these terms mean and whether or not they include acid stimulation.

In their guidance, the OGA sets out the applicable requirements where hydraulic fracturing is proposed.

The primary means for controlling and managing these operations is through:

- i. The agreement of a Hydraulic Fracture Plan (“HF-P”);¹⁷ and
- ii. The completion of a Hydraulic Fracturing Operations Report within 30 days of completion of hydraulic fracturing.¹⁸

(For those operations that meet the “associated hydraulic fracturing” definition in the 1998 Act and the “relevant hydraulic fracturing” definition in the 2016 Regulations, the additional restrictions and Secretary of State consent listed at section 3 above are also required.)

HFP’s and preventing induced seismic activity

An HFP is important because it is one of the key ways in which the risks of fracturing operations can be assessed and monitored, including the risk of seismic activity, and any controls required to prevent or mitigate against these risks.

An HFP is approved by the OGA and the Environment Agency (EA) once the Health and Safety Executive has had an opportunity to comment.¹⁹

OGA guidance suggests that an HFP will always be required for hydraulic fracturing but that less information may be required if the activities do not meet the volume thresholds set out in the 1998 Act for “associated hydraulic fracturing”:

*If the proposed injection volumes fall below the BEIS associated hydraulic fracturing thresholds, the OGA may decide less information or monitoring is appropriate, **but an HFP will always still be required.**²⁰ [emphasis added]*

This leaves open the question as to what activities fall within this broader definition of hydraulic fracturing but the definition could potentially include acid stimulation activities.

However, in evidence to the Committee on Housing, Communities and Local Government (HCLGC), in 2018, the OGA stated:

*We use the Infrastructure Act definition as clarified by the Secretary of State last year to determine when a company needs to submit what we call a hydraulic fracture plan. If a plan does not meet the water-based tests that are set out in the legislation, **we would not always require one**. We reserve the right in guidance to require one should we think there are risks of seismic activity as a result of it. We would always require a hydraulic fracture plan when it meets the tests set out in the Infrastructure Act.²¹ [emphasis added]*

Therefore, on the one hand OGA guidance suggests an HFP will always be required where hydraulic fracturing is proposed, albeit that the information or monitoring requirements in the HFP may be less if the Infrastructure Act definition is not met, and on the other hand, the OGA's evidence to the HCLGC suggests that an HFP is mandatory where the Infrastructure Act definition is met, and in all other instances it is for the OGA to decide whether or not to request one.

In an accompanying table, the guidance demonstrates various circumstances that will not require an HFP and circumstances that will. In particular, the table demonstrates that a "completion acid wash" carried out at below fracture strength with hydrochloric acid at 15% without proppant but with flow back fluids will not require a HFP. In contrast, "hydraulic fracture stimulation" carried out above the fracture strength, involving "frac fluid", a proppant and various chemicals, with flow back fluids, will require a HFP.²²

From this table it is not clear whether acid stimulation would require a HFP or not, because matrix acidisation is carried out at below fracture strength of the rock, and acid fracturing, although carried out at above fracture strength, does not usually involve the use of a proppant.

In its evidence to the HCLGC, the OGA explained that, as regards the risk of seismicity, they are concerned with a "volume-based test". Consequently, if other substances are being injected of **equal volume** they will look carefully at this, including presumably by requiring an HFP.²³

However, in acid stimulation, the volumes of liquid involved are generally substantially less.

As a result, it appears that on the basis of the OGA's evidence to the HCLGC, the OGA would not therefore require an HFP for acid stimulation in most instances, thereby removing a key mechanism for assessing and mitigating against the risks involved, including the risk of induced seismic activity.

One of the key ways in which the OGA mitigates against the risk of induced seismic activity is through:

the monitoring in advance of background seismic activity, a real time traffic light scheme during injection, and detailed operational precautions to be incorporated in an HFP.²⁴

The OGA makes clear in its guidance that it is for the operator to propose a methodology and design as part of the HFP, which is then approved by the OGA. Consequently, if an HFP is not required, these controls on induced seismicity do not apply, including the traffic light monitoring system.

Reporting requirements – Hydraulic Fracturing Operations Report

The other means for controlling and managing hydraulic fracturing is through reporting requirements, specifically a Hydraulic Fracturing Operations Report (HFOR).

OGA guidance states that a HFOR containing data in respect of "the geology, operations or results associated with hydraulic fracturing of shale or other strata encased in shale" must be submitted to the OGA within 30 days of completion of "hydraulic fracturing". Thereafter updated reports must be provided at 3 month intervals.

Once again, there is no definition of "hydraulic fracturing" in this context. It seems likely that all companies required to submit an HFP will be required to submit a HFOR also but it is not clear if any activities that do not require an HFP must submit an HFOR. Once again, this appears to be entirely at the discretion of the OGA.

A proper approach to interpretation of the OGA guidance, taking into account the precautionary principle, would be to include acid stimulation techniques within the definition of hydraulic fracturing thereby extending the requirements regarding HFP's and HFOP's to acid stimulation activities.

5

Environmental Permitting Regime

Without specific definitions of the various types of acid stimulation and the regulation of each of these techniques set out in law, the use of acid in oil and gas exploration and production has primarily fallen to the Environment Agency (“EA”) to regulate through the environmental permitting system.

The Environmental Permitting Regulations

All onshore oil and gas activities, whether they involving hydraulic fracturing or not, are subject to an environmental permitting system, governed by the Environmental Permitting Regulations 2016 (“EPR”).

The types of permits required depend on the site in question and the activities proposed.

Hydraulic fracturing activities, like many other onshore oil and gas exploration and production activities, will at a minimum require a groundwater activity permit, a mining waste permit and a radioactive substances permit.

The use of acid in oil and gas activities is predominantly regulated by Schedule 22 of the EPR, which deals with “Groundwater activities”.

Pursuant to schedule 22, para.6 of the EPR, the EA is required to prevent the input of any hazardous substance to groundwater, and to limit the input of non-hazardous pollutants so as to prevent the pollution of groundwater. In light of this objective, the EA can decide, among other things, whether to prohibit an activity,²⁵ issue a permit,²⁶ or grant an exemption for the activity on “de minimis” grounds.²⁷

Schedule 22 does not contain specific definitions of activities and the controls required for those activities. Instead, the EA has broad discretion to determine whether the activity can take place and whether a permit is required based on the objective of preventing the pollution of groundwater.

Application and enforcement in practice

In response to increasing concerns and questions about acid stimulation, in January 2018, the EA put out a fact sheet on the use of acid in oil and gas exploration and how they regulate this activity.²⁸

Although the fact sheet sets out the different acid stimulation techniques, it provides little clarity on where the boundaries between each activity lie. For example, there are no specific limits on the concentration of acid for an acid wash as compared to matrix acidisation or acid fracturing. Similarly, there is no distinction in the pressure used for an acid wash or matrix acidisation or indeed the extent to which the different procedures are likely to penetrate the rock formation.

The lack of clear distinctions between an acid wash and acid stimulation is significant because activities deemed to be an acid wash are treated as “de minimis” and granted an exclusion from the permitting regime under paragraph 3(3)(b) of Schedule 22 of the EPR.

Para.3(3)(b) states:

The regulator may determine that a discharge, or an activity that might lead to a discharge, is not a groundwater activity if the input of the pollutant is or would be of a quantity and concentration so small as to obviate any present or future danger of deterioration in the quality of the receiving groundwater.

In practice it is clear from the EA’s own fact sheet and from responses to information requests that the EA rely heavily on the operators stated “intention” in relation to the acid use to determine whether the procedure is an acid wash or acid stimulation and therefore whether to issue a de minimis exclusion or to require a groundwater permit.

While other information may be sought by the EA – such as the type, volume, concentration and quantity of acid, details of other chemicals, waste disposal procedures and specifications of the well and the formation – it is not clear from the de minimis exclusions that have been granted where the distinctions between acid wash and acid stimulation lie and whether sufficient restrictions or monitoring are in place to adequately differentiate between the two.

This is because the EA does not differentiate between an acid wash and matrix acidisation in terms of a specific volume, concentration and frequency of acid used. For example, the recent de minimis exclusion granted for the Brockham wellsite:

- contains no definitive restriction on the frequency of the acid use;²⁹
- allows any pressure below formation fracture strength; and
- allows acid use at a concentration of up to 15%.³⁰

The EA have stated that they assess “each proposed type of acidisation activity on a site specific basis prior to deciding whether the activity is acceptable or not, and whether an environmental permit can be granted or whether an exclusion applies”.³¹ However, this merely highlights the exercise of discretion by the EA, without clarifying the basis upon which the EA demarcates between an acid wash and acid stimulation.

Once a “de minimis” exclusion has been granted the operator is exempted from obtaining a groundwater permit. Consequently, the level of information required by the EA for monitoring and enforcement purposes is significantly reduced. Based on information requests to the EA, it appears that once a de minimis has been issued, the EA:

- do not require reports on the pumping pressure used;
- do not require reports on the amounts of acid and chemicals used or frequency of use;
- do not require notifications of when an acid wash takes place; and
- do not monitor the acid treatment procedure itself.

The EA states that site inspections at an acid wash site “should identify relatively small volumes of acid on site that would be consistent with use for the acid wash and the inspector would be able to review documents to show quantities of dilute acid brought onto site, and the volumes of any waste brought back to the surface”.³² Sites using stimulation are said to “generally use higher volumes of dilute acid”, different equipment and higher volumes of returned waste fluids and have documentary evidence of such activities.³³

Despite these assurances, given the blurred lines between acid wash and matrix acidisation and the limited controls in place where a de minimis exclusion has been granted, campaigners are concerned that acid stimulation could be taking place under the guise of an acid wash.

The EA’s factsheet also distinguishes a process called ‘acid squeeze’. The EA describes acid squeeze as squeezing acid into the rock to dissolve it and enhance or create new flow paths to enable the well to be more productive, but as with

other forms of acid stimulation, it does not define it in terms of a specific volume, concentration and frequency of acid used. It is also unclear whether acid squeeze is viewed by the EA as stimulation or a wash activity but the EA has recently granted an acid squeeze a de minimis exclusion.³⁴

Monitoring

Each drill site has a specific monitoring and reporting regime, which is agreed with the Environment Agency as part of the permitting process.

For hydraulic fracturing operations that meet the definition set out in the 1998 Act, there is an automatic requirement for baseline monitoring of methane in groundwater in the period of 12 months before hydraulic fracturing begins, as well as for ongoing monitoring of emissions of methane into the air. Other monitoring is also likely to be required under the environmental permitting system (see, for example, the Preston New Road³⁵ and Kirby Misperton³⁶ sites).

For activities that do not fall within the 1998 Act definition, the monitoring and inspection regime is decided on a site specific basis and depends on the permits required. There is, however, no automatic legal requirement for baseline monitoring of methane in groundwater or ongoing methane emissions into the air. In addition, no groundwater monitoring (baseline or ongoing) is required for sites that have been granted a de minimis exclusion³⁷.

Classification and treatment of fluids returned to surface

Fluid that returns to the surface after high-volume hydraulic fracturing is termed by the EA guidance as “flowback”. Flowback that cannot be reused as injection fluid is classified as waste and must be sent to a permitted waste facility plant for treatment or disposal. It cannot be re-injected underground for disposal.³⁸

The EA’s approach to flowback fluid is limited to “high-volume hydraulic fracturing” and therefore excludes acid stimulation activities. In response to an information request, the EA stated that fluids returned to surface after an acid wash could legally be combined with produced water and injected into a permitted reinjection well.³⁹ It is not clear whether flowback fluids following acid stimulation can also be re-injected.

6 Health and Safety

The Health and Safety Executive (HSE) is responsible for ensuring that companies adequately control risks to the health and safety of people, including workers, contractors and members of the public.

In the context of hydraulic fracturing the HSE focuses on safeguarding well integrity by:

*ensuring wells are designed, constructed, operated, maintained, and ultimately abandoned to ensure that the flow of fluids in the well, whether fracking fluids or produced gas or water is controlled and stays within the well.*⁴⁰

In carrying out its work the HSE follows its general goal under the Health and Safety at Work Act 1974 as well as specific regulations that govern oil and gas extraction, including:

1. The Borehole Sites and Operations Regulations 1995 – these relate to the health and safety management of the site and require notification to the HSE in various circumstances, including prior to commencement of well construction, if there is a material change in operation and prior to abandonment (regulation 6).
2. The Offshore Installations and Wells (Design and Construction etc) Regulations 1996 – these apply to all onshore and offshore wells and are concerned with well integrity. They impose a requirement for weekly reports to be sent to the HSE (regulation 19).
3. The Reporting of Injuries Diseases and Dangerous Occurrences Regulations 1995 – these list a set of dangerous occurrences that an operator must report to the HSE to enable investigation of whether well integrity is impacted and to ensure improvements to operations.

Each of the above regulations apply to all onshore oil and gas exploration and production sites, regardless of whether the operations involve hydraulic fracturing, including acid stimulation, or not.

The HSE fulfils its role by conducting:

- assessments of well design prior to construction;
- monitoring well operations during construction, based on weekly operations reports submitted by operators; and
- meetings with operators prior to and during the operational phase, including site inspection.

Once again, this regime is not specific to hydraulic fracturing sites and would therefore apply to all onshore oil and gas exploration and production operations, including those using acid stimulation techniques.

HSE & Hydraulic Fracturing

There are two distinctions where operations involve hydraulic fracturing.

First, the HSE and EA have agreed to take additional measures in relation to hydraulic fracturing sites, as set out in a “working together agreement” between the HSE and the EA of November 2012.⁴¹ Pursuant to this agreement, the HSE and EA jointly inspect hydraulic fracturing operations. In addition, for new or first time shale gas operators, the HSE and the EA will:

- meet and advise them of their duties under the relevant legislation;
- conduct a joint inspection of the key operations, including:
 - cementing and verification of cement;
 - mini hydraulic fracture;
 - bleed back;
 - main hydraulic fracture.

These meetings and visits may include other licensing or statutory bodies. Any change to the process, such as hydraulic fracturing at shallow depth or change of fracturing media, may result in a review of the inspection schedule and may require permit modifications.⁴²

This agreement does not specify what the EA and the HSE consider amount to “hydraulic fracturing operations” and “shale gas operators” and it is therefore not clear if the HSE would consider acid stimulation activities to fall within the scope of the EA/HSE agreement.

Based on the precautionary principle, a proper approach to interpretation would be to include acid stimulation within the scope of hydraulic fracturing operations.

A more recent “working together agreement” has also been signed between the HSE, EA and the OGA.⁴³ This agreement sets out the purpose of the Shale Environmental Regulator Group (SERG), comprising these three regulators. The agreement contains no additional measures regarding hydraulic fracturing sites but rather focuses on coordination. Confusingly, it contains no reference to

hydraulic fracturing and instead focuses on “shale gas exploration and production”, “shale gas operators” and “shale gas sites”. Once again, these terms are not defined but should be interpreted so as to include acid stimulation activities and operators.

Second, under the 1998 Act, the Secretary of State cannot consent to “associated hydraulic fracturing” unless “appropriate arrangements have been made for the independent inspection of the integrity of the relevant well”.⁴⁴ This condition can be satisfied by the issuance of a certificate of the HSE confirming that it:

- a. has received a well notification under regulation 6 of the Borehole Sites and Operations Regulations 1995,
- b. has received the information required by regulation 19 of the Offshore Installations and Wells (Design and Construction, etc.) Regulations 1996, and
- c. has visited the site of the relevant well.⁴⁵

Given that these mirror the existing requirements for all onshore oil and gas, this condition does not appear to impose any additional constraints.

In oral evidence to the Committee on Housing, Communities and Local Government (HCLGC), the HSE clarified the distinction when activities fell within the “associated

hydraulic fracturing” definition inserted in the 1998 Act by the Infrastructure Act:

*The only area where it probably has some impact is that the Infrastructure Act requires us—because of the definition, I guess—to visit each shale gas site before fracking takes place and then let the Secretary of State at BEIS know that we have received notification of weekly reports from the operator. We would regulate those sites in exactly the same way whether the definition was there or not.*⁴⁶

When asked whether they would not visit a site if it did not meet the definition, the HSE clarified that they may or may not visit the site depending on their own risk assessment.

In other words, in cases involving high-volume hydraulic fracturing the HSE must carry out a site visit. For all other oil and gas exploration and production sites, including sites involving acid stimulation, the HSE has the discretion as to whether to carry out a site visit depending on its own risk assessment.

It is not known whether acid stimulation is considered sufficiently high risk by the HSE to warrant a site inspection prior to the commencement of operations.

7

The Planning Regime and Acid Stimulation

The scope of the planning regime

A further lack of clarity regarding acid stimulation is found in the definition of hydraulic fracturing in the planning regime.

Planning permission for hydraulic fracturing operations is granted by local authorities, acting as the Mineral Planning Authority (“MPA”), in accordance with the Minerals section of the National Planning Policy Guidance (“NPPG”). Annex A of the Minerals section of the NPPG states:

What is hydraulic fracturing?

Hydraulic fracturing is the process of opening and/or extending existing narrow fractures or creating new ones (fractures are typically hairline in width) in gas or oil-bearing rock, which allows gas or oil to flow into wellbores to be captured (para.129).⁴⁷

This definition is far broader than both the definition of “Associated Hydraulic Fracturing” in the 1998 Act and the definition of “Relevant Hydraulic Fracturing” contained in the 2016 Regulations. It raises the possibility of hydraulic fracturing activities falling within the NPPG definition for planning purposes but outside of the restrictions contained in the 1998 Act.

The definition at para.129 of the NPPG would include acid stimulation in all forms. However, the guidance continues:

How does the hydraulic fracturing process work?

During hydraulic fracturing, a mixture of water, sand and possibly some chemical additives is pumped under pressure down a borehole into the rock unit. The sand is used to prop the fractures open to increase gas extraction.....” (para.130).⁴⁸

If this explanation of the fracturing process is taken to form part of the NPPG definition of hydraulic fracturing it would exclude most forms of acid stimulation because acid stimulation does not typically involve the use of sand but rather relies on the acid to create or extend fractures in the rock.

On the other hand, para.130 of the NPPG could be read as describing one of the ways in which hydraulic fracturing is carried out and not part of the definition of hydraulic fracturing itself. This preferred approach to interpretation is supported by the fact that other forms of hydraulic fracturing that do not fit the precise description set out para.130, such as fracturing using liquefied gas, which does not require the use of water or sand, are still considered by industry scientists to be a form of hydraulic fracturing.⁴⁹

The lack of clarity concerning the NPPG definition raises two concerns:

- iv. Whether the NPPG definition of hydraulic fracturing includes acid stimulation or represents another loophole by which acid stimulation avoids planning restrictions that apply to other forms of hydraulic fracturing; and
- v. Whether MPA's are aware of the difference in the NPPG definition and the definition contained in the 1998 Act and 2016 Regulations and the implications of this.

It appears that some MPA's are aware of the fact that the NPPG definition of fracturing could include hydraulic fracturing that is not high-volume hydraulic fracturing, including acid stimulation. However, to the extent that this is the case, they appear to be avoiding examining the issue and instead are relying on other regulatory authorities to alert them to any potential planning implications (see Box 1). This is problematic because of the different definitions found in the regulatory regimes and in the planning regime.

Box 1: Surrey County Council and Angus Energy

In August 2018, Surrey County Council ("SCC") granted planning permission to Angus Energy for oil appraisal activities. Condition 1 of the planning permission prohibited "hydraulic fracturing".

Given concerns that Angus Energy might be engaging in acid stimulation techniques, SCC was asked how it was monitoring and enforcing planning condition 1. In response, SCC stated that hydraulic fracturing would require the OGA approval of a HFP, EA permits and BEIS consent and that SCC would be informed of any such proposals via the OGA and EA. SCC also stated that hydraulic fracturing would involve "major changes to the site infrastructure".

This response is inaccurate. Not all hydraulic fracturing requires OGA approval of a HFP (see section 4 above), consent from BEIS and major site infrastructure changes.

SCC internal emails revealed that although some planning officials thought it necessary to examine the proposed "acid washes" in more detail, the overriding view was that, having determined that this was an "acceptable use of the land", SCC "should not get involved in the processes used on site".

Further, in relation to the discrepancy between the definitions of hydraulic fracturing under the 1998 Act and the NPPG and the consequences for enforcing the ban on hydraulic fracturing, SCC stated that no discussions had taken place and it was not in their "remit to question differences in definitions of a process".

This approach raises the question whether a planning condition to prohibit hydraulic fracturing is in effect meaningless and whether it is lawful for planning authorities to rely on other regulators to alert them to breaches of planning laws when activities that fall outside the regulatory regime may fall within the planning regime.

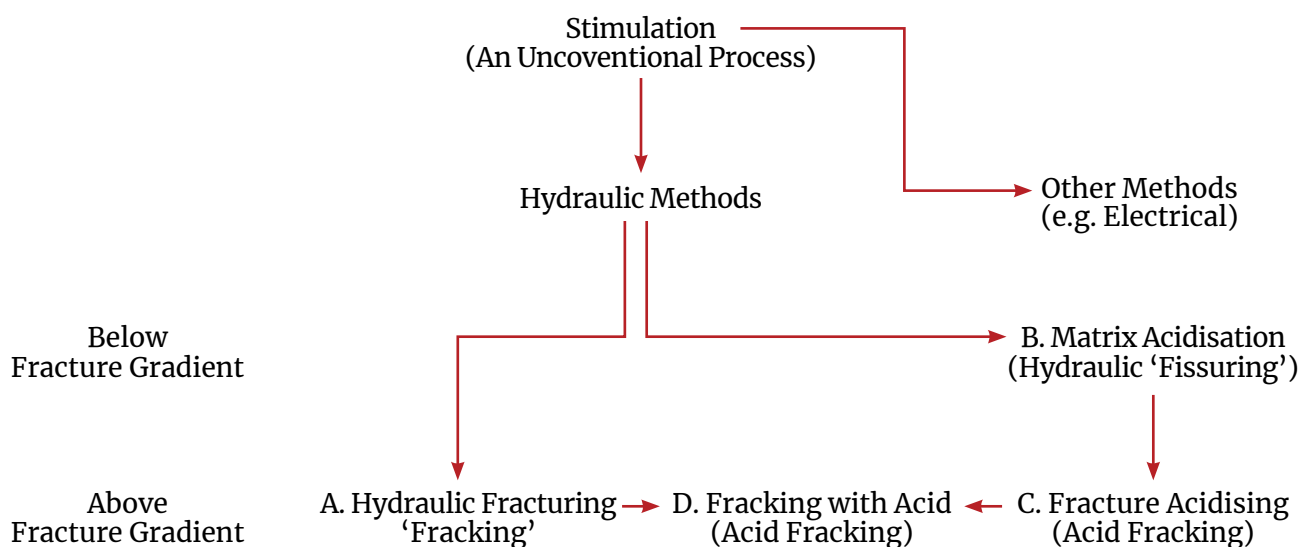
In May 2018, in a Written Ministerial Statement the Government stated that it "expected" MPA's to recognise the definition of "associated hydraulic fracturing" in the 1998 Act.⁵⁰ However, a subsequent legal challenge clarified that this was only an "expectation" and MPA's could continue to rely on the broader definition set out in the NPPG.⁵¹

The Government also informed the House of Commons Committee on Housing, Communities and Local Government (HCLGC) that it intended to amend the NPPG definition so that it mirrored the 1998 Act definition (introduced by the Infrastructure Act 2015). However, in its report, "Planning Guidance on Fracking", the HCLGC concluded that:

The Infrastructure Act 2015 definition of fracking does not reflect the technologies used on the ground nor the public understanding of fracking, leading to a lack of understanding among key stakeholders and significant concerns about loopholes in the current regulatory regime. We therefore believe that the Infrastructure Act 2015 definition is unsuitable in the planning context and recommend that it should not be liquid or volume-based. While we welcome the Government's intention to unify the definitions of fracking used in the Infrastructure Act 2015 and the National Planning Practice Guidance due to the resultant lack of clarity and uncertainty in using multiple definitions, we are highly concerned at the Government's suggestion

that the Infrastructure Act definition will replace the current definition in a revised National Planning Practice Guidance. We call on the Government to amend the Infrastructure Act definition to ensure public confidence that every development which artificially fractures rock is subject to the appropriate permitting and regulatory regime.⁵²

Amending the definition of hydraulic fracturing in the Infrastructure Act 2015 to “the artificial fracturing of rock,” as suggested by the HCLGC, could include all acid stimulation activities. Although, amending the definition to “all well stimulation treatments which may enhance the productivity of oil and gas wells by increasing the permeability of the target rock”, would avoid any ambiguity in this regard.



Relationship between different kinds of acid treatment and hydraulic fracturing

Environmental impact assessments

Prior to the grant of planning permission, the MPA must consider whether the proposal for oil or gas extraction requires an Environmental Impact Assessment (“EIA”).⁵³ The proposal will require an EIA if it is a development that:

- a. falls within Schedule 1; or
- b. falls within Schedule 2 and is likely to have significant effects on the environment by virtue of factors such as its nature, size or location.

Schedule 1 developments include those involving the “extraction of petroleum and natural gas for commercial purposes where the amount extracted exceeds 500 tonnes per day in the case of petroleum and 500,000 cubic metres per day in the case of gas.”⁵⁴

Schedule 1 does not distinguish between the methods used for extraction and could therefore apply to the extraction of oil and gas by hydraulic fracturing or acid stimulation.

Relevant schedule 2 developments include deep drillings, where the area of the works exceeds 1 hectare and “surface industrial installations for the extraction of coal, petroleum, natural gas and ores, as well as bituminous shale” where the area of the development exceeds 0.5 hectares.⁵⁵

As with schedule 1, the wording of schedule 2 does not differentiate between acid stimulation and other well stimulation techniques, such as water-based hydraulic fracturing.

However, para.119 of the NPPG examines when an EIA is required for hydrocarbon extraction. Despite stating that all applications must be assessed on a case by case basis and that

the nature, size and location of the proposed development must be taken into account, the NPPG also states that “it is unlikely that an Environmental Impact Assessment will be required for exploratory drilling operations which do not involve hydraulic fracturing”.⁵⁶

Consequently, there appears to be a presumption built into the NPPG that if the drilling operations involve hydraulic fracturing an EIA is required. On the flipside, drilling operations not involving hydraulic fracturing are presumed not to require an EIA.

If MPA’s interpret acid stimulation as falling outside the definition of hydraulic fracturing planning authorities will be less likely to require an EIA.

8

Conclusion

It is clear from the above that there is a distinct lack of clarity over what amounts to hydraulic fracturing when it falls outside the definition of high-volume fracturing, and what regulatory and planning restrictions should apply in these circumstances.

This is true for acid stimulation but also for other forms of hydraulic fracturing that don’t use large volumes of fluid. One of the key issues is that regulatory and planning guidance is also ambiguous and that regulators have broad discretion to determine when restrictions and additional requirements are imposed without reference to clear parameters.

As a result of concerns about loopholes in the current system, the HCLGC recommended an amendment to the Infrastructure Act definition of hydraulic fracturing to

include all development that artificially fractures rock. This recommendation has yet to be implemented.

In a written parliamentary question earlier this year, Dr David Drew MP asked the Secretary of State for BEIS whether the consent process for acidising is the same as for fracking. In response, Claire Perry MP stated “Acidisation refers to a number of techniques used to clean wells to improve productivity”.⁵⁷

This inaccurate statement highlights the concerns of Brockham Oil Watch and others, who fear acid stimulation and its environmental consequences are not sufficiently understood by politicians and, as a consequence, are not subject to appropriate regulation.

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- ⁴ Defined at s.2 of The Onshore Hydraulic Fracturing (Protected Areas) Regulations 2016
- ⁵ Defined at s.3 of The Onshore Hydraulic Fracturing (Protected Areas) Regulations 2016. Section 3 includes National Parks, the Broads, areas of outstanding natural beauty and World Heritage sites.
- ⁶ Monitoring is carried out by the Environment Agency under a waste management plan, issued as part of an environmental permit.
- ⁷ The Petroleum Licensing (Exploration and Production (Landward Areas) (Amendment) (England and Wales) Regulations 2016 (“the 2016 Regulations”).
- ⁸ According to the Oil and Gas Authority (“OGA”), “Completion Work” means work, by way of the installation of a casing or equipment or otherwise for the purpose of bringing the well into use as a Development Well.
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- ¹⁰ Although, if the hydraulic fracturing proposed met the “Relevant Hydraulic Fracturing” definition and not the “Associated Hydraulic Fracturing”, the requirement to meet the conditions set out at s.4a of the 1998 Act and obtain the consent of the Secretary of State, would not apply until Completion Work Approval was sought.
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- ¹³ Petroleum Act 1998, ss.9A and 9B, inserted by the Infrastructure Act 2016
- ¹⁴ As amended by the Petroleum (Transfer of Functions) Regulations 2016
- ¹⁵ The Petroleum Licensing (Exploration and Production) (Landward Areas) Regulations 2014
- ¹⁶ The only specific reference to fracturing in the model clauses refers to “hydraulic fracturing” without defining what this means and relates to the publication of data contained in a Hydraulic Fracturing Operations Report, a report made once hydraulic fracturing has taken place. See The Petroleum Licensing (Exploration and Production) (Landward Areas) Regulations 2014, sched 2 (model clauses), para.32(e)
- ¹⁷ OGA: Consolidated Onshore Guidance, June 2018, p.6, 24, 27, 30 and 31 available at https://www.ogauthority.co.uk/media/4959/29112017-consolidated-onshore-guidance-compendium_vfinal-002.pdf
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- ¹⁹ OGA: Consolidated Onshore Guidance, June 2018, Section D.7
- ²⁰ OGA: Consolidated Onshore Guidance, June 2018, p.30
- ²¹ HCLGC, Oral evidence: Planning guidance on fracking, HC 767, Q123, available at <http://data.parliament.uk/writtenevidence/committeeevidence.svc/evidencedocument/housing-communities-and-local-government-committee/planning-guidance-on-fracking/oral/82896.html>
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- ²⁵ Schedule 22, para.9
- ²⁶ Schedule 22, para.7
- ²⁷ Schedule 22, para.3(3)(b)
- ²⁸ Use of acid at oil and gas exploration and production sites, Environment Agency, January 2018. https://consult.environment-agency.gov.uk/onshore-oil-and-gas/onshore-oil-and-gas-regulation-information-page/supporting_documents/Acidisation%20FAQs%20January%202018.pdf
- ²⁹ The de minimis proforma for the Brockham wellsite, dated 18 December 2018, states that the frequency will be “typically annual, but more or less as conditions in the wells require”.
- ³⁰ This is despite the fact that the EA’s fact sheet suggests that an acid wash usually uses a concentration of acid at 7% (Use of acid at oil and gas exploration and production sites, Environment Agency, January 2018, p.2.).

- ³¹ Use of acid at oil and gas exploration and production sites, Environment Agency, January 2018, p.4.
- ³² Response from the Environment Agency of 7 November 2018 following a freedom of information request.
- ³³ Response from the Environment Agency of 7 November 2018 following a freedom of information request.
- ³⁴ EA permitting decision 6 August 2019, West Newton 'A' Well Site, available at https://consult.environment-agency.gov.uk/psc/hu11-5da-rathlin-energy-uk-limited/supporting_documents/BB3001FTV003%20Decision%20Document%20FINAL.pdf
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- ³⁶ Environment Agency's information page for Third Energy's Kirby Misperton (KM8 well) site available at <https://consult.environment-agency.gov.uk/onshore-oil-and-gas/third-energy-kirby-misperton-information-page/>
- ³⁷ EA: Onshore oil and gas sector guidance, Feb 2019, p.13.7 available at <https://www.gov.uk/guidance/onshore-oil-and-gas-sector-guidance>
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- ³⁹ Response from the Environment Agency of 20 April 2018 following a freedom of information request submitted by Brockham Oil Watch on 4 April 2018.
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- ⁴¹ Working together to regulate unconventional oil and gas developments, November 2012, available at <http://www.hse.gov.uk/aboutus/howwework/framework/aa/hse-ea-oil-gas-nov12.pdf>
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- ⁴⁴ Petroleum Act 1998, s.4A(3)(i) and condition 2 of Column 1, inserted by s.50 of the Infrastructure Act 2015.
- ⁴⁵ Petroleum Act 1998, s.4A, document 2 of Column 1.
- ⁴⁶ HCLGC, Oral evidence: Planning guidance on fracking, HC 767, Q.121-123, available at <http://data.parliament.uk/writtenevidence/committeeevidence.svc/evidencedocument/housing-communities-and-local-government-committee/planning-guidance-on-fracking/oral/82896.html>
- ⁴⁷ Annex A, Minerals, NPPG, para.129. Available at <https://www.gov.uk/guidance/minerals>
- ⁴⁸ Id., at para.130.
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