

Notice of variation and consolidation with introductory note

The Environmental Permitting (England & Wales) Regulations 2016

Cuadrilla Bowland Limited

Preston New Road Exploration Site

Preston New Road

Plumpton

Fylde

Lancashire

PR4 3PJ

Variation application number

EPR/AB3101MW/V006

Permit number

EPR/AB3101MW

Preston New Road Exploration Site

Permit number EPR/AB3101MW

Introductory note

This introductory note does not form a part of the notice

Under the Environmental Permitting (England & Wales) Regulations 2016 (schedule 5, part 1, paragraph 19) a variation may comprise a consolidated permit reflecting the variations and a notice specifying the variations included in that consolidated permit.

Schedule 1 of the notice specifies the conditions that have been varied and schedule 2 comprises a consolidated permit which reflects the variations being made. Only the variations specified in schedule 1 are subject to a right of appeal.

This permit is for activities that relate to the exploration for hydrocarbon resources, namely:

1. A mining waste operation for the management of extractive waste not involving a Mining Waste Facility.
2. In respect of hydraulically fractured wells, a non-hazardous Mining Waste Facility for the accumulation of injected hydraulic fracturing fluid which will remain in the underground target formation and has become waste.
3. An above ground hazardous Mining Waste Facility for the temporary deposit and accumulation of hazardous waste in storage containers as the wells are successively drilled. The hazardous waste will include drill cuttings coated with residual Low Toxicity Oil Based Muds ("LTOBM").
4. A groundwater activity for the discharge, namely of fracturing fluid into the target formation, that might lead to an indirect input of a pollutant to groundwater.
5. The incineration by flaring of hazardous waste, namely natural gas above 10 tonnes per day, as an activity listed in schedule 1 of the Environmental Permitting (England and Wales) Regulations 2016.
6. The discharge of collected surface water onsite via Outlet 1

The Operator has applied to update the approved Waste Management Plan to add the use of nitrogen lifting as an artificial lifting technique.

The waste management plan has been updated to include the use of nitrogen lifting as an artificial well lifting technique, if required, as part of the well completion phase following hydraulic fracturing.

The purpose of a nitrogen lift is to bring liquids (injected hydraulic fracturing fluid and formation fluids) from the borehole to the surface. The liquid prevents natural gas flowing to the surface so needs to be removed before a well test can start.

The use of nitrogen, which is an inert gas, may result in the release of uncombusted formation natural gas (which is principally methane). The Operator has proposed the use of propane as a support fuel to minimise the amount of uncombusted formation gas. Propane will be used to increase the proportion of combustible gas (natural gas from the formation and propane support fuel) and bring forward the point where the gas mixture will ignite in the flare rather than being vented.

We have amended condition 3.5.7 to specify analysing for benzene and changed the reporting period from 28 days to 10 days unless otherwise agreed in writing with the Environment Agency.

We have amended table S3.6 to add a requirement for a continuous video feed of the flares when in operation and a requirement for a register of days where venting has been carried out.

We have amended table S4.1 to add requirements to report venting days register.

At the Preston New Road Exploration Site, Plumpton, Fylde, Lancashire, PR4 3PJ

The permit conditions have been amended to reflect the inclusion of this new activity

The status log of a permit sets out the permitting history, including any changes to the permit reference number.

Status log of the permit		
Description	Date	Comments
Application EPR/AB3101MW/A001	Duly made 06/06/2014	Application for an environmental permit.
Schedule 5 response	18/07/2014	Applicant response to Schedule 5 questions
Additional information received	14/08/2014	Updated information to support Financial Provision assessment and additional information to support groundwater and waste management determination
Additional information received	18/08/2014	Information on friction reducer
Additional information received	22/08/2014	Surface water and groundwater monitoring points
Additional information received	28/08/2014	Updated Waste Management Plan v2 and Appendix D
Additional information received	26/08/2014	Information on friction reducer
Additional information received	28/08/2014	Information on friction reducer
Additional information received	29/08/2014	Information on friction reducer
Additional information received	08/09/2014	Updated Waste Management Plan v3
Additional information received	19/09/2014	Noise Levels related to Uniflare 'UF10' Stacks
Additional information received	19/09/2014	Updated information to support Financial Provision assessment
Additional information received	22/09/2014	Updated Waste Management Plan v4
Additional information received	24/09/2014	Response to questions on flow back fluid
Additional information received	29/09/2014	Response to questions on noise
Additional information received	10/10/2014	Response to questions on Waste Management Plan
Additional information received	10/10/2014	Updated Waste Management Plan v5
Additional information received	10/10/2014	Revised Site Plan
Additional information received	10/10/2014	Well Design and Well Barrier Systems

Status log of the permit		
Description	Date	Comments
Additional information received	20/10/2014	Response to questions on flaring and venting
Additional information received	22/10/2014	Updated Waste Management Plan v6
Additional information received	05/11/2014	Updated Waste Management Plan v7
Permit determined EPR/AB3101MW	16/01/2015	Permit issued to Cuadrilla Bowland Limited
Variation Application EPR/AB3101MW/V002	Duly Made 12/02/2016	Application for Administrative Variation to change Registered Office Address
Variation Determined EPR/AB3101MW/V002	18/02/2016	Variation issued To Cuadrilla Bowland Limited
Variation Application EPR/AB3101MW/V003	Duly Made 23/06/2017	Application to vary permit
Variation Application EPR/AB3101MW/V004	Duly Made 30/11/2017	Application to vary permit to add surface water discharge
Variation EPR/AB3101MW/V003 Determined	11/12/2017	Variation issued To Cuadrilla Bowland Limited
Additional information received	14/03/2018	Gauging and telemetry methodology received
Variation EPR/AB3101MW/V004 Determined	01/05/2018	Variation issued To Cuadrilla Bowland Limited
Variation Application EPR/AB3101MW/V005	Duly Made 05/02/2019	Application to vary permit
Additional information received	10/04/2019	Updated Waste Management Plan Updated Non-Technical Summary Updated H1 Assessment Updated Flowback tank emission assessment
Additional information received	30/04/2019	Justification for use of open-topped tanks as BAT Flowback decision tree Open-topped tanks block diagram Updated H1 assessment
Additional information received	17/05/2019	Updated Waste Management Plan Clarification of purpose of open-topped tanks Justification for use of open-topped tanks against Mining Waste BREF Justification for proposed trigger limit
Additional information received	29/05/2019	Flowback fluid diversion instruction Block process flow diagram (Flowback fluid)
Additional information received	07/06/2019	Updated Block process flow diagram (Flowback fluid)
Variation EPR/AB3010MW/V005 Determined	11/07/2019	Variation issued To Cuadrilla Bowland Limited
Variation Application EPR/AB3010MW/V006	Duly Made 08/07/2019	Application to vary permit

Status log of the permit		
Description	Date	Comments
Additional information received	08/10/2019	Updated Environmental Risk Assessment V2.0 Updated BAT Assessment of Artificial Lift Techniques V1.1 BAT screening assessment for N2 removal V1.0
Additional information received	14/10/2019	Updated Instruction 12 N2 Lift Instruction V3
Additional information received	21/10/2019	Updated Waste Management Plan V11
Variation EPR/AB3010MW/V006 Determined	24/10/2019	Variation issued To Cuadrilla Bowland Limited

End of introductory note

Notice of variation and consolidation

The Environmental Permitting (England and Wales) Regulations 2016

The Environment Agency in exercise of its powers under regulation 20 of the Environmental Permitting (England and Wales) Regulations 2016 varies

Permit number

EPR/AB3101MW

Issued to

Cuadrilla Bowland Limited (“the operator”)

whose registered office is

**Cuadrilla House
Unit 6 Sceptre Court
Sceptre Way
Bamber Bridge
Preston
PR5 6AW**

company registration number 08340918

to operate an installation, to carry on a mining waste operation, carry on a groundwater activity, and operate a water discharge activity at

**Preston New Road Exploration Site
Preston New Road
Plumpton
Fylde
Lancashire
PR4 3PJ**

to the extent set out in the schedules.

The notice shall take effect from 24/10/2019

Name	Date
Principal Permitting Team Leader	24/10/2019

Authorised on behalf of the Environment Agency

Schedule 1

The permit has been amended as a result of the application by Cuadrilla Bowland Limited as follows:

Only conditions 3.5.7, tables S1.1, S1.2, S3.6 and S4.1 have been varied by the consolidated permit EPR/AB3101MW

The following conditions were varied as a result of an Environment Agency initiated variation:

Table S3.6 as referred in condition 3.5

Table S4.1 as referred in condition 4.2.2.

The following conditions were varied as a result of the application made by the operator:

Condition 3.5.7

Table S1.1 as referred to in condition 2.1

Table S1.2 as referred in condition 2.3.

No other parts of the permit have been amended

Schedule 2 – consolidated permit

Consolidated permit issued as a separate document.

Permit

The Environmental Permitting (England and Wales) Regulations 2016

Permit number

EPR/AB3101MW

This is the consolidated permit referred to in the variation and consolidation notice for application EPR/AB3101MW/V006 authorising,

Cuadrilla Bowland Limited (“the operator”),

whose registered office is

**Cuadrilla House
Unit 6 Sceptre Court
Sceptre Way
Bamber Bridge
Preston
PR5 6AW**

company registration number 08340918

to operate an installation, to carry on a mining waste operation, carry on a groundwater activity, and operate a water discharge activity at

**Preston New Road Exploration Site
Preston New Road
Plumpton
Fylde
Lancashire
PR4 3PJ**

to the extent authorised by and subject to the conditions of this permit.

Name	Date
Principal Permitting Team Leader	24/10/2019

Authorised on behalf of the Environment Agency

Conditions

1 Management

1.1 General management

- 1.1.1 The operator shall manage and operate the activities:
- (a) in accordance with a written management system that identifies and minimises risks of pollution, including those arising from operations, maintenance, accidents, incidents, non-conformances, closure and those drawn to the attention of the operator as a result of complaints; and
 - (b) using sufficient competent persons and resources.
- 1.1.2 Records demonstrating compliance with condition 1.1.1 shall be maintained.
- 1.1.3 Any person having duties that are or may be affected by the matters set out in this permit shall have convenient access to a copy of it kept at or near the place where those duties are carried out.
- 1.1.4 The operator shall not start the closure of the mining waste facilities unless agreed in writing by the Environment Agency.
- 1.1.5 The financial provision for meeting the obligations under this permit set out in the Deed of Trust dated 16/01/2015 made between the operator and the Environment Agency shall be maintained by the operator whilst there is a waste facility involving the accumulation or deposit of hazardous waste and the operator shall produce evidence of such provision whenever required by the Environment Agency.

2 Operations

2.1 Permitted activities

- 2.1.1 The operator is only authorised to carry out the activities specified in schedule 1 table S1.1 (the “activities”).

2.2 The site

- 2.2.1 The incineration of hazardous waste (activity A1), the management of extractive waste from exploratory activities, not involving a waste facility (activity A2), and the management of extractive waste by way of a waste facility for hazardous waste (activity A3) shall not extend beyond the site, being the land shown edged in green on the site plan at schedule 7 to this permit.
- 2.2.2 The management of extractive waste by way of a waste facility for non-hazardous waste (activity A4) shall only be carried out within the Upper and Lower Bowland Shale and Hodder Mudstone Formation and shall not extend beyond the area edged in red on the site plan at schedule 7 of this permit
- 2.2.3 The groundwater activity A5 shall not extend beyond the area edged in red on the site plan at schedule 7 of this permit and shall only be carried out within the Upper and Lower Bowland Shale and Hodder Mudstone Formation. The discharges shall be made at points along the

laterals to be drilled in a westerly direction from the vertical boreholes and for a distance not exceeding 2000 metres as listed in table S3.2 (discharge points).

- 2.2.4 The water discharge activity A6 shall take place at the discharge point marked on the site plans at schedule 7 to this permit, and as listed in table S3.2.

2.3 Operating techniques

- 2.3.1 (a) The activities shall, subject to the conditions of this permit, be operated using the techniques and in the manner described in the documentation specified in schedule 1, table S1.2, unless otherwise agreed in writing by the Environment Agency.
- (b) If notified by the Environment Agency that the activities are giving rise to pollution, the operator shall submit to the Environment Agency for approval within the period specified, a revision of any plan or other documentation ("plan") specified in schedule 1, table S1.2 or otherwise required under this permit which identifies and minimises the risks of pollution relevant to that plan, and shall implement the approved revised plan in place of the original from the date of approval, unless otherwise agreed in writing by the Environment Agency.
- 2.3.2 The operator shall review the waste management plan every five years from the date of initial approval and submit this to the Environment Agency for approval.
- 2.3.3 The injection borehole system shall be constructed to comply with the following:
- (a) the injection boreholes shall comply with the details submitted and agreed in the notice given by the operator to the Environment Agency under section 199 of the Water Resources Act 1991;
- (b) the outlets from the injection boreholes, shall be within the target strata specified in Table S1.1 at all times;
- (c) no part of the injection borehole at the well sites shall be situated within 10 metres of any watercourse (including any ditch that runs dry for part of the year), or any other surface water; or within 200 metres of a European site or Site of Special Scientific Interest (excluding one designated for geological purposes only) or within 200 metres of any other sensitive receptor.
- (d) no part of the injection boreholes at the well sites shall be situated within a SPZ1 or 50 metres of a well or borehole used for drinking water or other human consumption, other than where abstraction from that well or borehole is for the sole purpose of supplying water to the activity specified in table S1.1

2.4 Pre-operational conditions

- 2.4.1 The activities shall not be brought into operation until the measures specified in PO1 and PO4 in schedule 1 table S1.3 have been completed.
- 2.4.2 There shall be no incineration of hazardous extractive waste until the measures specified in PO2, PO9 and PO10 of schedule 1 table S1.3 have been completed.
- 2.4.3 The injection boreholes shall not be drilled until the measures specified in PO8 of schedule 1 table S1.3 have been completed.
- 2.4.4 The groundwater activity A5 shall not be carried on until the measures specified in PO3, PO5, PO6 and PO7 of schedule 1 table S1.3 have been completed.

- 2.4.5 The water discharge activity A6 shall not be carried on until the measures specified in PO11 of schedule 1 table S 1.3 have been completed.

3 Emissions and monitoring

3.1 Emissions to water, air or land

- 3.1.1 There shall be no point source emissions to water, air or land except from the sources and emission points listed in schedule 3 tables S3.1 S3.2 and S3.3.
- 3.1.2 The limits given in schedule 3 shall not be exceeded.
- 3.1.3 Subject to any other condition of this permit, periodic monitoring shall be carried out at least once every 5 years for groundwater and 10 years for soil, unless such monitoring is based on a systematic appraisal of the risk of contamination.

3.2 Emissions of substances not controlled by emission limits

- 3.2.1 Emissions of substances not controlled by emission limits (excluding odour) shall not cause pollution. The operator shall not be taken to have breached this condition if appropriate measures, including, but not limited to, those specified in any approved emissions management plan, have been taken to prevent or where that is not practicable, to minimise, those emissions.
- 3.2.2 The operator shall:
- (a) if notified by the Environment Agency that the activities are giving rise to pollution, submit to the Environment Agency for approval within the period specified, an emissions management plan which identifies and minimises the risks of pollution from emissions of substances not controlled by emission limits;
 - (b) implement the approved emissions management plan, from the date of approval, unless otherwise agreed in writing by the Environment Agency.
- 3.2.3 All liquids in containers, whose emission to water or land could cause pollution, shall be provided with secondary containment, unless the operator has used other appropriate measures to prevent or where that is not practicable, to minimise, leakage and spillage from the primary container.
- 3.2.4 The operator shall take appropriate measures:
- (a) to prevent the input of hazardous substances to groundwater; and
 - (b) where a non-hazardous pollutant is not controlled by an emission limit, to limit the input of such non-hazardous pollutants to groundwater so as to ensure that such inputs do not cause pollution of groundwater.

3.3 Odour

- 3.3.1 Emissions from the activities shall be free from odour at levels likely to cause pollution outside the site, as perceived by an authorised officer of the Environment Agency, unless the operator has used appropriate measures, including, but not limited to, those specified in any approved odour management plan, to prevent or where that is not practicable to minimise the odour.

3.3.2 The operator shall:

- (a) if notified by the Environment Agency that the activities are giving rise to pollution outside the site due to odour, submit to the Environment Agency for approval within the period specified, an odour management plan which identifies and minimises the risks of pollution from odour;
- (b) implement the approved odour management plan, from the date of approval, unless otherwise agreed in writing by the Environment Agency.

3.4 Noise and vibration

3.4.1 Emissions from the activities shall be free from noise and vibration at levels likely to cause pollution outside the site, as perceived by an authorised officer of the Environment Agency, unless the operator has used appropriate measures, including, but not limited to, those specified in any approved noise and vibration management plan to prevent or where that is not practicable to minimise the noise and vibration.

3.4.2 The operator shall:

- (a) if notified by the Environment Agency that the activities are giving rise to pollution outside the site due to noise and vibration, submit to the Environment Agency for approval within the period specified, a noise and vibration management plan which identifies and minimises the risks of pollution from noise and vibration;
- (b) implement the approved noise and vibration management plan, from the date of approval, unless otherwise agreed in writing by the Environment Agency.

3.5 Monitoring

3.5.1 The operator shall, unless otherwise agreed in writing by the Environment Agency, undertake the monitoring specified in the following tables in schedule 3 to this permit:

- (a) point source emissions specified in tables S3.1 and S3.2;
- (b) surface water or groundwater monitoring specified in table S3.5;
- (c) process monitoring specified in S3.6;
- (d) ambient air specified in S3.7

3.5.2 The operator shall maintain records of all monitoring required by this permit including records of the taking and analysis of samples, instrument measurements (periodic and continual), calibrations, examinations, tests and surveys and any assessment or evaluation made on the basis of such data.

3.5.3 The operator shall carry out:

- (a) regular calibration, at an appropriate frequency, of systems and equipment provided for carrying out any monitoring and measurements necessary to determine compliance with this permit; and
- (b) regular checking, at an appropriate frequency, that such systems and equipment are serviceable and correctly used

3.5.4 Monitoring equipment, techniques, personnel and organisations employed for the emissions monitoring programme and the environmental or other monitoring specified in condition 3.5.1 shall have either MCERTS certification or MCERTS accreditation (as appropriate), where available, unless otherwise agreed in writing by the Environment Agency.

- 3.5.5 If required by the Environment Agency, the operator shall
- (a) take such samples and conduct such measurements, tests, surveys, analyses and calculations, including environmental measurements and assessments, at such times and using such methods and equipment as the Environment Agency may reasonably specify and
 - (b) keep samples, provide samples, or dispatch samples for tests at a laboratory, as the Environment Agency reasonably specifies, and ensure that the samples or residues thereof are collected from the laboratory within three months of receiving written confirmation that testing and repackaging in accordance with the relevant legislation are complete.
- 3.5.6 Permanent means of access shall be provided to enable sampling/monitoring to be carried out in relation to the emission points specified in schedule 3 tables S3.1, S3.2, S3.4, S3.5, S3.6 and S3.7, unless otherwise agreed in writing by the Environment Agency.
- 3.5.7 The operator shall, prior to, or on commencement of flaring, and monthly thereafter; analyse the flare feed gas. The analysis shall include speciation and concentration of organic substances, benzene, carbon monoxide, sulphur containing compounds, halogen containing compounds and moisture or otherwise agreed in writing with the Environment Agency. A report of this analysis shall be submitted to the Environment Agency within 10 days of sampling unless otherwise agreed in writing with the Environment Agency.
- 3.5.8 The groundwater monitoring plan and Environmental Management and Monitoring Plan specified in Table S1.2, Schedule 1 shall be implemented unless otherwise agreed in writing.
- The plans shall be reviewed within 6 months of start of operations and a written report submitted to the Environment Agency for approval detailing the review and containing any proposals for amending the plans.
- Any revised groundwater monitoring plan or revised environmental management and monitoring plan should be implemented in place of the original in accordance with the Environment Agency's written approval unless otherwise agreed in writing

4 Information

4.1 Records

- 4.1.1 All records required to be made by this permit shall:
- (a) be legible;
 - (b) be made as soon as reasonably practicable;
 - (c) if amended, be amended in such a way that the original and any subsequent amendments remain legible, or are capable of retrieval; and
 - (d) be retained, unless otherwise agreed in writing by the Environment Agency, for at least 6 years from the date when the records were made, or in the case of the following records until permit surrender:
 - (i) off-site environmental effects; and
 - (ii) matters which affect the condition of the land and groundwater.
- 4.1.2 The operator shall keep on site all records, plans and the management system required to be maintained by this permit, unless otherwise agreed in writing by the Environment Agency.

4.2 Reporting

- 4.2.1 The operator shall send all reports and notifications required by the permit to the Environment Agency using the contact details supplied in writing by the Environment Agency.
- 4.2.2 Within 28 days of the end of the reporting period the operator shall, unless otherwise agreed in writing by the Environment Agency, submit reports of the monitoring and assessment carried out in accordance with the conditions of this permit, as follows:
- (a) in respect of the parameters and emission points specified in schedule 4 table S4.1;
 - (b) for the reporting periods specified in schedule 4 table S4.1 and using the forms specified in schedule 4 table S4.2; and
 - (c) giving the information from such results and assessments as may be required by the forms specified in those tables.
- 4.2.3 For activities A3 and A4, a report describing the behaviour of the mining waste facility over the previous year shall be submitted to the Environment Agency by 31 January (or other date agreed in writing by the Environment Agency) each year. The report shall include a review of the results of the monitoring and assessment carried out in accordance with the conditions of this permit including an interpretive review of that data.

4.3 Notifications

- 4.3.1 (a) In the event that the operation of the activities gives rise to an incident or accident which significantly affects or may significantly affect the environment, the operator must immediately—
- (i) inform the Environment Agency,
 - (ii) take the measures necessary to limit the environmental consequences of such an incident or accident, and
 - (iii) take the measures necessary to prevent further possible incidents or accidents;
- (b) in the event of a breach of any permit condition the operator must immediately—
- (i) inform the Environment Agency, and
 - (ii) take the measures necessary to ensure that compliance is restored within the shortest possible time;
- (c) in the event of a breach of permit condition which poses an immediate danger to human health or threatens to cause an immediate significant adverse effect on the environment, the operator must immediately suspend the operation of the activities or the relevant part of it until compliance with the permit conditions has been restored.
- 4.3.2 Any information provided under condition 4.3.1 (a)(i), or 4.3.1 (b)(i) where the information relates to the breach of a limit specified in the permit, shall be confirmed by sending the information listed in schedule 5 to this permit within the time period specified in that schedule.
- 4.3.3 Where the Environment Agency has requested in writing that it shall be notified when the operator is to undertake monitoring and/or spot sampling, the operator shall inform the Environment Agency when the relevant monitoring and/or spot sampling is to take place. The operator shall provide this information to the Environment Agency at least 14 days before the date the monitoring is to be undertaken.

- 4.3.4 The Environment Agency shall be notified within 14 days of the occurrence of the following matters, except where such disclosure is prohibited by Stock Exchange rules:

Where the operator is a registered company:

- (a) any change in the operator's trading name, registered name or registered office address; and
- (b) any steps taken with a view to the operator going into administration, entering into a company voluntary arrangement or being wound up.

Where the operator is a corporate body other than a registered company:

- (a) any change in the operator's name or address; and
- (b) any steps taken with a view to the dissolution of the operator.

In any other case:

- (a) the death of any of the named operators (where the operator consists of more than one named individual);
- (b) any change in the operator's name(s) or address (es); and
- (c) any steps taken with a view to the operator, or any one of them, going into bankruptcy, entering into a composition or arrangement with creditors, or, in the case of them being in a partnership, dissolving the partnership.

- 4.3.5 Where the operator proposes to make a change in the nature or functioning, or an extension of the activities, which may have consequences for the environment and the change is not otherwise the subject of an application for approval under the Regulations or this permit:

- (a) the Environment Agency shall be notified at least 14 days before making the change; and
- (b) the notification shall contain a description of the proposed change in operation.

- 4.3.6 The Environment Agency shall be given at least 14 days notice before implementation of any part of the site closure plan.

4.4 Interpretation

- 4.4.1 In this permit the expressions listed in schedule 6 shall have the meaning given in that schedule.

- 4.4.2 In this permit references to reports and notifications mean written reports and notifications, except where reference is made to notification being made "immediately", in which case it may be provided by telephone.

Schedule 1 - Operations

Table S1.1 activities			
Activity reference	Activity listed in Schedule 1 to the EP Regulations	Description of specified activity	Limits of specified activity
A1	S5.1 A(1)(a)	The incineration of hazardous waste in a waste incineration plant or waste co-incineration plant with a capacity exceeding 10 tonnes per day	<p>Limited to flaring of waste gas, from onshore oil and gas exploration activities, produced from well testing activities using two enclosed ground flares.</p> <p>Flaring of gas (including during commissioning of the flares) shall take place on no more than 360 days.</p> <p>Thereafter gas can only be flared where it is necessary to do so either as a safety measure or due to maintenance of surface equipment, unless otherwise approved in writing by the Environment Agency.</p> <p>Flaring of gas shall be limited to a maximum of 130,000 m³ per day</p> <p>There shall be no venting except where necessary for safety reasons or as part of nitrogen lifting in accordance with the approved Waste Management Plan and Operating Techniques listed in table S1.2</p> <p>Nitrogen lifting shall be limited to a maximum of 30 days over a 365 days period.</p>
	Description of activities for waste operations		Limits of activities
A2	The management of extractive waste from exploratory activities, not involving a waste facility. The management of extractive waste generated by well abandonment.		<p>Permitted waste types shall conform to the description in the approved waste management plan.</p> <p>Drilling additives shall be approved in writing by the Environment Agency prior to use.</p> <p>No more than 3,000 cubic metres of flowback fluid shall be stored on site at any one time.</p> <p>Open-topped tanks shall only be used in accordance with the approved Waste Management Plan and Operating Techniques listed in table S1.2</p>

Table S1.1 activities			
Activity reference	Activity listed in Schedule 1 to the EP Regulations	Description of specified activity	Limits of specified activity
A3	The management of extractive waste by way of a waste facility for hazardous waste.		<p>Permitted waste types shall conform to the description in the approved waste management plan.</p> <p>Drilling additives shall be approved in writing by the Environment Agency prior to use.</p> <p>All hazardous extractive waste must be stored in steel solid containers which are subject to annual non-destructive testing inspection and weekly visual inspection.</p> <p>Before the end of operation of the hazardous waste facility, all of the hazardous waste contents shall be taken off site to a permitted waste facility.</p> <p>No more than 275 tonnes of hazardous extractive waste shall be stored on site at any one time.</p>
A4	The management of extractive waste by way of a waste facility for non-hazardous waste.		<p>Permitted waste types shall conform to the description in the approved waste management plan.</p> <p>Hydraulic fracturing additives shall be approved in writing by the Environment Agency prior to use.</p>
A5	The injection of hydraulic fracturing fluid for exploration of hydrocarbons to ground via injection boreholes.		<p>Discharge of hydraulic fracturing fluid for operations for the exploration of hydrocarbons to ground via four injection boreholes.</p> <p>The concentration of polyacrylamide shall be limited to 0.05% unless otherwise agreed in writing by the Environment Agency</p> <p>There shall be no injection of hydraulic fracturing fluid (which may include reused flow back fluid) for disposal.</p> <p>Hydraulic fracturing fluid shall not contain substances other than those additives approved in writing by the Environment Agency and flowback water that is suitable for reuse, produced from previous hydraulic fracturing events at this location.</p> <p>In the event of suspension of activities as required by the agreed hydraulic fracturing plan the well integrity of each injection boreholes shall be confirmed prior to resumption of activity A5 in accordance with the requirements in the WMP as referenced in table S1.2.</p>

Table S1.1 activities			
Activity reference	Activity listed in Schedule 1 to the EP Regulations	Description of specified activity	Limits of specified activity
	Description of water discharge activity		Limits of activities
A6	The discharge of collected surface water onsite via Outlet 1		<p>The operator shall throughout the subsistence of this permit subscribe to the Environment Agency's flood alert service for the Lower River Wyre flood alert area and the Coast at Lytham St Annes flood alert area.</p> <p>The discharge shall cease when a flood alert and / or flood warning has been issued for the Lower River Wyre flood alert area and / or the Coast at Lytham St Annes flood alert area, and shall only resume when the flood alert(s) and / or flood warning(s) ends.</p>

Table S1.2 Operating techniques			
Activity reference	Description	Parts	Date Received
All	Application EPR/AB3101MW/A001	Form B3 Section 3 Operating Techniques; Table 3a Technical Standards	06/06/2014
All	Waste Management Plan Preston New Road Reference HSE-Permit- INS-PNR-006 Version 11	All of document	Date of issue of variation
A5	Schedule 5 response – groundwater and surface water determinands	All of document	14/08/2014
All	Site Shut Down Procedure as approved under PO1	All of document	approved
A1	Environmental Management and Monitoring Plan as approved under PO2	All of document	Date of approval of PO2
A5	Hydraulic Fracturing Plan for well 1z as approved under PO3	All of document	Date of approval of PO3 HFP 1z.
A5	Hydraulic Fracturing Plan for well 2 as approved under PO3	All of document	Date of approval of PO 3 HFP 2.
All	Groundwater Monitoring Plan as approved under PO4	All of document	approved
A1	Flare Operational and control procedure as approved under PO10	All of document	Date of approval of PO10
A6	Surface Water Management Plan	All of document	28/11/2017
A2	Block Process Flow Diagram Permit 015 version 3.0	All of document	07/06/2019
A2	Instruction 009 Flowback Fluid Diversion Instruction version 3.0	All of document	29/05/2019
A1	Instruction 12 N2 Lift Instruction version 3	All of document	14/10/2019

Table S1.3 Pre-operational measures	
Reference	Pre-operational measures
PO1	The Operator shall submit to the Environment Agency for approval a written Site Shut Down procedure to prevent unauthorised access to safety critical equipment and operational controls in case of a security breach and obtain the Environment Agency's written approval to it.
PO2	At least 4 weeks prior to commencement of the gas flaring activity the operator shall submit to the Environment Agency for approval a written Environmental Management and Monitoring Plan (EMMP) which will include, but is not limited to: details of the baseline air quality study undertaken prior to activities commencing; details of the ambient air monitoring programme proposed for during and after the period of gas flaring; and shall obtain the Environment Agency's written approval to the EMMP.
PO3	The Operator shall submit to the Environment Agency for approval a written Hydraulic Fracturing Plan (HFP) for each well (as referred to in Waste Management Plan (WMP) section 2.3) and obtain the Environment Agency's written approval of the HFP relating to each well.
PO4	The operator shall submit for approval a written groundwater monitoring plan to include: Details of the proposed location; depth; construction and construction method of the monitoring boreholes with provision for the number of boreholes provided to increase as activities progress. The plan shall also address the requisite surveillance requirements to monitor groundwater both pre-operation and over the lifetime of the activities authorised by this permit. The operator shall obtain the Environment Agency's written approval to the groundwater monitoring plan.
PO5	The injection boreholes shall be installed in accordance with condition 2.3.3 and following installation the Operator shall conduct a well integrity test on each borehole in accordance with section 2.2.4 of the Waste Management Plan.
PO6	The Operator shall submit a written report to the Environment Agency for approval including the results of the integrity test carried out in accordance with PO5 and the as built construction and design details of the injection boreholes including the distance (in metres) below ground level of the laterals and the national grid references for each borehole and the end of each lateral for each borehole, and obtain the Environment Agency's written approval to the report.
PO7	The operator shall provide a written report that provides the following information for each groundwater monitoring borehole installed: (a) casings/linings (length, diameter, material, type of grout or filter media and whether slotted or plain); (b) depths and diameters of unlined sections; (c) records of groundwater ingress during construction and standing groundwater levels on completion; (d) details of strata encountered during drilling; (e) reference levels in metres above ordnance datum; (f) a location plan at a suitable scale showing the boreholes in relation to the point of discharge; (g) national grid references of the borehole(s) in the form AB 12345 67890; (h) any other information obtained from the borehole(s) relevant to the interpretation of water sample analysis.

Table S1.3 Pre-operational measures

Reference	Pre-operational measures																																																
PO8	<p>The Operator shall undertake at least 3 samples of groundwater from each monitoring borehole and 3 samples of surface water. Sampling, as a minimum, must include the parameters listed below and shall be carried out monthly over a minimum period of 3 months prior to the commencement of the drilling of the injection wells. The results of the groundwater and surface water monitoring shall be submitted to the Environment Agency.</p> <table border="1"> <thead> <tr> <th>Parameter</th> <th>Parameter</th> </tr> </thead> <tbody> <tr> <td>Acrylamide</td> <td>Dissolved Ethane</td> </tr> <tr> <td>Alkalinity (Total) as CaCO3</td> <td>Dissolved Methane</td> </tr> <tr> <td>Ammoniacal Nitrogen as N</td> <td>Fluoride</td> </tr> <tr> <td>Arsenic</td> <td>Iron (Total)</td> </tr> <tr> <td>Aluminium</td> <td>Lead</td> </tr> <tr> <td>Antimony</td> <td>Lithium</td> </tr> <tr> <td>Barium</td> <td>Magnesium</td> </tr> <tr> <td>Beryllium</td> <td>Mercury</td> </tr> <tr> <td>BOD (settled)</td> <td>Nickel</td> </tr> <tr> <td>Boron</td> <td>Nitrate as NO3</td> </tr> <tr> <td>Bromide</td> <td>Nitrite as NO2</td> </tr> <tr> <td>$\delta^{13}\text{C-CH}_4$</td> <td>pH</td> </tr> <tr> <td>$\delta^{13}\text{C-CO}_2$</td> <td>Potassium</td> </tr> <tr> <td>Cadmium</td> <td>Salinity</td> </tr> <tr> <td>Calcium</td> <td>Selenium</td> </tr> <tr> <td>Carbon Dioxide</td> <td>Silver</td> </tr> <tr> <td>Chloride</td> <td>Sodium</td> </tr> <tr> <td>Chromium (Total)</td> <td>Strontium</td> </tr> <tr> <td>Cobalt</td> <td>TPH including Benzene, DRO (nC10 to nC24, GRO (nC5 to nC10), m/p Xylenes, o Xylene, MTBE, Toluene, Xylene, Ethyl Benzene.</td> </tr> <tr> <td>COD (settled)</td> <td>Total dissolved solids</td> </tr> <tr> <td>Copper</td> <td>Total suspended solids</td> </tr> <tr> <td>Dissolved Butane</td> <td>Vanadium</td> </tr> <tr> <td>Dissolved Propane</td> <td>Zinc</td> </tr> </tbody> </table>	Parameter	Parameter	Acrylamide	Dissolved Ethane	Alkalinity (Total) as CaCO3	Dissolved Methane	Ammoniacal Nitrogen as N	Fluoride	Arsenic	Iron (Total)	Aluminium	Lead	Antimony	Lithium	Barium	Magnesium	Beryllium	Mercury	BOD (settled)	Nickel	Boron	Nitrate as NO3	Bromide	Nitrite as NO2	$\delta^{13}\text{C-CH}_4$	pH	$\delta^{13}\text{C-CO}_2$	Potassium	Cadmium	Salinity	Calcium	Selenium	Carbon Dioxide	Silver	Chloride	Sodium	Chromium (Total)	Strontium	Cobalt	TPH including Benzene, DRO (nC10 to nC24, GRO (nC5 to nC10), m/p Xylenes, o Xylene, MTBE, Toluene, Xylene, Ethyl Benzene.	COD (settled)	Total dissolved solids	Copper	Total suspended solids	Dissolved Butane	Vanadium	Dissolved Propane	Zinc
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PO9	The Operator shall provide an updated site plan showing the location and designation of each of the two flares prior to the flaring activity commencing.																																																

Table S1.3 Pre-operational measures	
Reference	Pre-operational measures
PO10	<p>The operator shall submit a written operational and control procedure for the management of Activity A1 (flaring) and shall obtain the Environment Agency's written approval to the procedure.</p> <p>The procedure shall contain:</p> <ul style="list-style-type: none"> - Details of staff training and competence management. - Details of flare installation, commissioning and testing. - Flare start up and shut down procedures. - Routine system operations procedures. - Flare monitoring and data recording procedures. - Non-routine operations and emergency shut-down procedures. - Details of how the flares interact with, and can be affected by wider wellsite operations (for example, well events which may affect the flare(s) or flare(s) events which may affect the well test operations).
PO11	<p>The operator shall conduct a walkover study and topographical survey of the Ribble Main Drain from 100 metres upstream of the confluence with the Carr Bridge Brook to 100 metres downstream of the A583 road bridge.</p> <p>The walkover study and topographical survey shall identify structures that may control flow, and measure bank levels, at 10 metre intervals to ascertain the capacity of the river and its maximum water level before the onset of flooding.</p> <p>Results of the walkover study and topographical survey shall be submitted by the operator to the Environment Agency for assessment and written approval, along with details of the proposed river level gauge and monitoring location.</p> <p>On approval of the walkover study, topographical survey, and the proposed river level gauge and location, monitoring of river levels shall be conducted by the operator for a minimum of three consecutive months.</p> <p>This monitoring shall be used by the operator to determine the freeboard threshold limit for out of bank flow and provide a baseline assessment of river levels to allow discharge from site.</p> <p>Providing the results of the baseline assessment demonstrate sufficient capacity under controlled conditions to allow discharges from site, an operational procedure shall be submitted by the operator to the Environment Agency for assessment and written approval, and shall include as a minimum:</p> <ul style="list-style-type: none"> (a) Threshold level(s) in the Ribble Main Drain to commence the discharge from the site. (b) Level(s) in the Ribble Main Drain at which the discharge shall be suspended. (c) Changes to the above based on current and forecast rainfall. (d) Changes to the discharge rate based on water level in the Ribble Main Drain. (e) Method of permanent river level gauging and telemetry; and confirmation of subscription to the Environment Agency flood alert and warnings for the Lower River Wyre flood alert area and the Coast at Lytham St Annes flood alert area.

Schedule 2 - Waste types, raw materials and fuels

The disposal or recovery of non-extractive wastes are not permitted activities and there are no restrictions on raw materials or fuels under this schedule.

Schedule 3 – Emissions and monitoring

Table S3.1 point source emissions to air – emission limits and monitoring requirements				
Emission point ref. and location	Parameter	Limit (including unit)	Monitoring frequency	Monitoring standard or method
A1 gas flare as shown on drawing submitted under PO9	Oxides of nitrogen	150 mg m ⁻³	Annually	As per M2 or such subsequent guidance as may be agreed in writing with the Environment Agency
	Carbon monoxide	50 mg m ⁻³	Annually	As per M2 or such subsequent guidance as may be agreed in writing with the Environment Agency
	Total volatile organic compounds (VOCs)	10 mg m ⁻³	Annually	As per M2 or such subsequent guidance as may be agreed in writing with the Environment Agency
	Methane concentration in flare feed gas	- (%v/v)	Continuous	As approved in writing with the Environment Agency
	Flare combustion temperature	>800 °C	Continuous	As approved in writing with the Environment Agency
A2 gas flare as shown on drawing submitted under PO9	Oxides of nitrogen	150 mg m ⁻³	Annually	As per M2 or such subsequent guidance as may be agreed in writing with the Environment Agency
	Carbon monoxide	50 mg m ⁻³	Annually	As per M2 or such subsequent guidance as may be agreed in writing with the Environment Agency
	Total volatile organic compounds (VOCs)	10 mg m ⁻³	Annually	As per M2 or such subsequent guidance as may be agreed in writing with the Environment Agency
	Methane concentration in flare feed gas	- (%v/v)	Continuous	As approved in writing with the Environment Agency
	Flare combustion temperature	>800 °C	Continuous	As approved in writing with the Environment Agency
A1 and A2 gas flares as shown on drawing submitted under PO9	Flare gas feed flow rate	130,000 m ³ d ⁻¹	Continuous	As approved in writing with the Environment Agency
	Hydrogen sulphide (inlet concentration)	5.7 mg m ⁻³	Monthly	As per M2 or such subsequent guidance as may be agreed in writing with the Environment Agency

Table S3.2 Point Source emissions to water (other than sewer) and land – emission limits and monitoring requirements

Discharge source and discharge point ref. & location	Parameter	Limit (incl. unit)	Reference Period	Limit of effective range	Monitoring frequency	Compliance statistic
The injection of hydraulic fracturing fluid for the operations for exploration of hydrocarbons to ground via injection boreholes	Maximum discharge volume	765 m ³ / hydraulic fracturing stage	Total stage volume	N/A	Continuous	Maximum
	Maximum rate of discharge	106.25 litres per second	Instantaneous (spot sample)	N/A	N/A	Maximum
	15-minute instantaneous or averaged flow	No limit set. Record as l/s	15 minute	N/A	Continuous	N/A
	Acrylamide	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
	Alkalinity (Total) as CaCO ₃	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
	Ammoniacal Nitrogen as N	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
	Arsenic	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
	Aluminium	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
	Antimony	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
	Barium	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
	Beryllium	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
	BOD (settled)	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
	Boron	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
	Bromide	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
	Cadmium	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
	Calcium	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
Carbon Dioxide	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A	

Table S3.2 Point Source emissions to water (other than sewer) and land – emission limits and monitoring requirements

Discharge source and discharge point ref. & location	Parameter	Limit (incl. unit)	Reference Period	Limit of effective range	Monitoring frequency	Compliance statistic
	Chloride	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
	Chromium (Total)	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
	Cobalt	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
	COD (settled)	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
	Copper	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
	Dissolved Butane	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
	Dissolved Propane	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
	Dissolved Ethane	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
	Dissolved Methane	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
	Fluoride	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
	Iron (Total)	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
	Lead	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
	Lithium	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
	Magnesium	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
	Mercury	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
	Nickel	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
	Nitrate as NO ₃	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
	Nitrite as NO ₂	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
	pH	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
	Potassium	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A

Table S3.2 Point Source emissions to water (other than sewer) and land – emission limits and monitoring requirements

Discharge source and discharge point ref. & location	Parameter	Limit (incl. unit)	Reference Period	Limit of effective range	Monitoring frequency	Compliance statistic
	Salinity	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
	Selenium	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
	Silver	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
	Sodium	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
	Strontium	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
	TPH including Benzene, DRO (nC10 to nC24, GRO (nC5 to nC10), m/p Xylenes, o Xylene, MTBE, Toluene, Xylene, Ethyl Benzene	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
	Total dissolved solids	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
	Total suspended solids	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
	Vanadium	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A
	Zinc	N/A	Instantaneous (spot sample)	N/A	Weekly	N/A

Table S3.2 Point Source emissions to water (other than sewer) and land – emission limits and monitoring requirements

Discharge source and discharge point ref. & location	Parameter	Limit (incl. unit)	Reference Period	Limit of effective range	Monitoring frequency	Compliance statistic
A6 Discharge of collected surface water via Outlet 1	Maximum daily discharge volume Maximum rate of discharge	480 m ³ /day	Total daily volume (spot sample)	N/A	Continuous	Maximum
	15-minute instantaneous or averaged flow	No limit set. Record as l/s	15 minute	N/A	Continuous	N/A
	Suspended solids (measured after drying at 105°C)	40 mg/l	Instantaneous (spot sample)	N/A	Sample each discharge	Maximum
	Visible oil or grease	No significant trace present so far as is reasonably practicable	Instantaneous (visual examination)	N/A	Before each discharge	No significant trace
	Maximum rate of discharge	24.8 litres per second	Instantaneous (spot sample)	N/A	Continuous	Maximum
	Total Chromium	N/A	Instantaneous (spot sample)	N/A	Sample each discharge	Maximum
	Nickel	N/A	Instantaneous (spot sample)	N/A	Sample each discharge	N/A
	Copper	N/A	Instantaneous (spot sample)	N/A	Sample each discharge	N/A
	Lead	N/A	Instantaneous (spot sample)	N/A	Sample each discharge	N/A
	Zinc	N/A	Instantaneous (spot sample)	N/A	Sample each discharge	N/A
	Barium	N/A	Instantaneous (spot sample)	N/A	Sample each discharge	N/A
	pH	N/A	Instantaneous (spot sample)	N/A	Sample each discharge	N/A
	Mercury	N/A	Instantaneous (spot sample)	N/A	Sample each discharge	N/A

Table S3.2 Point Source emissions to water (other than sewer) and land – emission limits and monitoring requirements

Discharge source and discharge point ref. & location	Parameter	Limit (incl. unit)	Reference Period	Limit of effective range	Monitoring frequency	Compliance statistic
	Cadmium	0.21µg/l	Instantaneous (spot sample)	N/A	Sample each discharge	N/A

Table S3.3 Discharge points

Effluent Name	Discharge Point	Discharge point NGR	Receiving water/Environment
Hydraulic Fracturing fluid for exploration of hydrocarbons	Lateral 1 (along lateral borehole extending up to 2000m in a westerly direction from injection boreholes)	To be provided, see PO 6 in Table S1.3	Groundwater via lateral borehole constructed in Upper and Lower Bowland Shale and Hodder Mudstone Formation
	Lateral 2 (along lateral borehole extending up to 2000m in a westerly direction from the from injection boreholes)	To be provided, see PO 6 in Table S1.3	
	Lateral 3 (along lateral borehole extending up to 2000m in a westerly direction from the injection boreholes)	To be provided, see PO 6 in Table S1.3	
	Lateral 4 (along lateral borehole extending up to 2000m in a westerly direction from injection boreholes)	To be provided, see PO 6 in Table S1.3	
A6 Discharge of collected surface water	Outlet 1	SD 37116 32880	Tributary of Carr Bridge Brook

Table S3.4 Monitoring points

Effluent name	Monitoring type	Monitoring point NGR	Monitoring point reference
Hydraulic fracturing fluid for exploration of hydrocarbons	Effluent sampling	SD 37408 32744	Effluent monitoring points centred on SD 37402 32755
	Flow monitoring	SD 37402 32755	Flow monitoring points centred on SD 37402 32755
A6 Discharge of collected surface water via Outlet 1	Effluent monitoring	SD 37425 32820	M1
	MCERTS flow monitoring	SD 37425 32820	M2

Table S3.5 Surface water or groundwater monitoring requirements

Location or description of monitoring points	Parameter	Monitoring frequency	Monitoring standard or method	Other specifications
Groundwater monitoring borehole A1 at SD 37372 32659	See Table S1.2 Operating Techniques Schedule 5 response – Groundwater and Surface water determinands	Monthly prior to drilling injection boreholes, weekly during active operations (drilling / fracturing) and monthly thereafter unless otherwise agreed with the Environment Agency. Monitoring to be conducted concurrently.	BS ISO 5667 and condition 3.5.4	Samples must be filtered samples. See section 9.10 of WMP referred to in Table S1.2
Groundwater monitoring borehole A2 at SD 37322 32742				
Groundwater monitoring borehole A3 at SD 37438 32830				
Groundwater monitoring borehole A4 at SD 37497 32737				
Surface water monitoring point B1 at SD 37528 32632	See Table S1.2 Operating Techniques Schedule 5 response – Groundwater and Surface water determinands	Fortnightly from date of issue of this variation or otherwise agreed with the Environment Agency.	Condition 3.5.4	See section 9.11 of WMP referred to in Table S1.2
Surface water monitoring point B2 at SD 37738 33034				
Surface water monitoring point B3 at SD 37776 33283				
Surface water monitoring point B4 at SD 36840 33023				
Surface water monitoring point B5 at SD 36762 32749				
Surface water monitoring point B6 at SD 37042 32760				

Location or description of monitoring points	Parameter	Monitoring frequency	Monitoring standard or method	Other specifications
Downhole micro seismic array in offset well	Location, orientation and extent of induced fractures.	During the hydraulic fracturing events and in accordance with the Hydraulic Fracture Plan (HFP) approved by the Environment Agency.	As set out in the approved HFP for each well.	N/A
In accordance with the WMP as referenced in table S1.2 and table S3.2	Monitoring the quality of the flow back fluid	In accordance with the WMP as referenced in table S1.2	In accordance with the WMP as referenced in table S1.2	N/A
A1 and A2 gas flares as shown on drawing submitted under PO9	Flare gas feed rate	Continuous	As approved in writing with the Environment Agency.	N/A
A1 and A2 gas flares as shown on drawing submitted under PO9	Flare combustion temperature	Continuous	N/A	N/A
A1 and A2 gas flares as shown on drawing submitted under PO9	Flaring days register	Daily	N/A	As agreed in writing with the Environment Agency
A1 and A2 gas flares as shown on drawing submitted under PO9	Video feed with screen time display of flares	Continuous while gas is flowing to the flares is in operation	N/A	N/A
A1 and A2 gas flares as shown on drawing submitted under PO9	Venting days register	Daily	N/A	As agreed in writing with the Environment Agency

Location or description of point of measurement	Parameter	Monitoring frequency	Monitoring standard or method	Other specifications
Locations specified in Agreed EMMP specified in table S1.2	Parameters specified in approved EMMP specified in table S1.2	Frequencies specified in approved EMMP specified in table S1.2	In accordance with the EMMP specified in table S1.2	N/A

Schedule 4 – Reporting

Parameters, for which reports shall be made, in accordance with conditions of this permit, are listed below.

Table S4.1 Reporting of monitoring data			
Parameter	Emission or monitoring point / reference	Reporting period	Period begins
The following emissions to air parameters as required by condition 3.5.1. - Oxides of nitrogen. - Carbon monoxide. - Total volatile Compounds.	Gas flare A1 as shown on drawing submitted as per PO9	Annually	Date of permit issue
The following emissions to air parameters as required by condition 3.5.1. - Oxides of nitrogen. - Carbon monoxide. - Total volatile Compounds.	Gas flare A2 as shown on drawing submitted as per PO9	Annually	Date of permit issue
Flare Temperature Gas feed Rate Gas feed methane concentration (%v/v)	Gas flare A1 as shown on drawing submitted as per PO9	Quarterly	Date of permit issue
Flare Temperature Gas feed Rate Gas feed methane concentration (%v/v)	Gas flare A2 as shown on drawing submitted as per PO9	Quarterly	Date of permit issue
Hydrogen Sulphide	Flares A1 and A2 as shown on drawing submitted as per PO9	Quarterly	Date of permit issue
Total daily discharge volume of hydraulic fracturing fluid in Table S3.2	Flow monitoring points	Quarterly	Date of permit issue
Effluent parameters as listed in Table S3.2 under Parameters (excluding total daily volume)	Effluent sample points	Quarterly	Date of permit issue
Groundwater and surface water monitoring parameters as listed in Table S3.5 under Parameters	Monitoring points as indicated in Table S3.2	Quarterly for SW Monthly for GW	Date of permit issue
Process monitoring parameters Location, orientation and extent of induced fractures and monitoring the quality of the flow back fluid as listed in Table S3.6	Description as indicated in Table S3.6	Quarterly	Date of issue of permit
Flaring days register	A1 and A2 gas flares as shown on drawing submitted under PO9	Quarterly	Date of commencement of Activity A1

Table S4.1 Reporting of monitoring data			
Parameter	Emission or monitoring point / reference	Reporting period	Period begins
Venting days register	A1 and A2 gas flares as shown on drawing submitted under PO9	Monthly	Date of start of nitrogen lifting procedure
Total daily volume	Surface water discharge - Use reference from monitoring points table S3.5	Annually	1 January
15-minute flow	Use reference from monitoring points table	Report to be submitted within 28 days unless otherwise specified in writing by the Environment Agency	Upon request by the Environment Agency

Table S4.2 Reporting forms		
Media/parameter	Reporting format	Date of form
Air	Form Air1 or other form as agreed in writing with the Environment Agency.	DD/MM/YY
Total fracturing stage volume	WISKI electronic format specified by the Environment Agency.	DD/MM/YY
15 minute flow	WISKI electronic format specified by the Environment Agency.	DD/MM/YY
Parameters as listed in Table S3.2 (excluding total fracturing stage volume)	Form as agreed in writing with the environment Agency.	DD/MM/YY
Groundwater and surface water monitoring parameters as listed in table S3.5	Form Groundwater1 or other form as agreed in writing with the Environment Agency.	DD/MM/YY
Process monitoring parameters as listed in Table S3.6	Form as agreed in writing with the environment Agency.	DD/MM/YY
Other performance indicators	Form Performance1 or other form as agreed in writing with the Environment Agency.	DD/MM/YY
Total daily volume	WISKI electronic format specified by the Environment Agency	DD/MM/YY

Schedule 5 - Notification

These pages outline the information that the operator must provide.

Units of measurement used in information supplied under Part A and B requirements shall be appropriate to the circumstances of the emission. Where appropriate, a comparison should be made of actual emissions and authorised emission limits.

If any information is considered commercially confidential, it should be separated from non-confidential information, supplied on a separate sheet and accompanied by an application for commercial confidentiality under the provisions of the EP Regulations.

Part A

Permit Number	
Name of operator	
Location of Facility	
Time and date of the detection	

(a) Notification requirements for any activity that gives rise to an incident or accident which significantly affects or may significantly affect the environment

To be notified Immediately

Date and time of the event	
Reference or description of the location of the event	
Description of where any release into the environment took place	
Substances(s) potentially released	
Best estimate of the quantity or rate of release of substances	
Measures taken, or intended to be taken, to stop any emission	
Description of the failure or accident.	

(b) Notification requirements for the breach of a permit condition

To be notified immediately

Emission point reference/ source	
Parameter(s)	

Limit	
Measured value and uncertainty	
Date and time of monitoring	
Measures taken, or intended to be taken, to stop the emission	

Time periods for notification following detection of a breach of a limit	
Parameter	Notification period
In the event of a breach of permit condition which poses an immediate danger to human health or threatens to cause an immediate significant adverse effect on the environment:	
Description of where the effect on the environment was detected	
Substances(s) detected	
Concentrations of substances detected	
Date of monitoring/sampling	

Part B - to be submitted as soon as practicable

Any more accurate information on the matters for notification under Part A.	
Measures taken, or intended to be taken, to prevent a recurrence of the incident	
Measures taken, or intended to be taken, to rectify, limit or prevent any pollution of the environment which has been or may be caused by the emission	
The dates of any unauthorised emissions from the facility in the preceding 24 months.	

Name*	
Post	
Signature	
Date	

* authorised to sign on behalf of the operator

Schedule 6 - Interpretation

“accident” means an accident that may result in pollution.

“application” means the application for this permit, together with any additional information supplied by the operator as part of the application and any response to a notice served under Schedule 5 to the EP Regulations.

“Annex I” means Annex I to Directive 2008/98/EC of the European Parliament and of the Council on waste. *“Annex II”* means Annex II to Directive 2008/98/EC of the European Parliament and of the Council on waste. *“annually”* means once every year.

“approved waste management plan” means a plan of the type described in Article 5(1) of Directive 2006/21/EC of the European Parliament and of the Council of 15 March 2006 on the management of waste from extractive industries and amending Directive 2004/35/EC, approved as part of the grant or variation of an environmental permit and as revised from time to time.

“aquifer” means a subsurface layer or layers of rock or other geological strata of sufficient permeability to allow either a significant flow of groundwater or the abstraction of significant quantities of groundwater (WFD Art 2.11).

“authorised officer” means any person authorised by the Environment Agency under section 108(1) of The Environment Act 1995 to exercise, in accordance with the terms of any such authorisation, any power specified in section 108(4) of that Act.

“emissions to land” includes emissions to groundwater.

“emissions of substances not controlled by emission limits” means emissions of substances to air, water or land from the activities, either from the emission points specified in schedule 3 or from other localised or diffuse sources, which are not controlled by an emission or background concentration limit.

“EP Regulations” means The Environmental Permitting (England and Wales) Regulations SI 2016 No.1154 and words and expressions used in this permit which are also used in the Regulations have the same meanings as in those Regulations.

“exploration” means activities carried out to provide information about geological structures and the presence or absence of gas reserves together with assessments to determine whether the reservoir development is economically feasible.

“extractive waste” means waste resulting from the prospecting, extraction, treatment and storage of mineral resources and the working of quarries, excluding waste which does not directly result from these operations.

“freeboard threshold limit” is a value which determines the maximum river level whilst preventing water overtopping at the lowest point of the river bank

“groundwater” means all water, which is below the surface of the ground in the saturation zone and in direct contact with the ground or subsoil.

“injection borehole” the borehole used to carry out the hydraulic fracturing by injecting fluid into the target formation.

“Industrial Emissions Directive” means DIRECTIVE 2010/75/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 24 November 2010 on industrial emissions

“MCERTS” means the Environment Agency’s Monitoring Certification Scheme.

“mining waste facility” means a waste facility as defined in Article 3(15) of Directive 2006/21/EC of the European Parliament and of the Council of 15 March 2006 on the management of waste from extractive industries and amending Directive 2004/35/EC, where a mining waste operation is carried out.

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

“quarter” means a calendar year quarter commencing on 1 January, 1 April, 1 July or 1 October.

“requisite surveillance” means the monitoring of groundwater that is required, in particular its quality, to ensure groundwater is not impacted by the permitted activity. It is the monitoring necessary to confirm control measures are working and there is no pollution of groundwater occurring.

“significant pollution” means a category 1 or category 2 incident indicated by the Common Incident Classification Scheme (CICS).

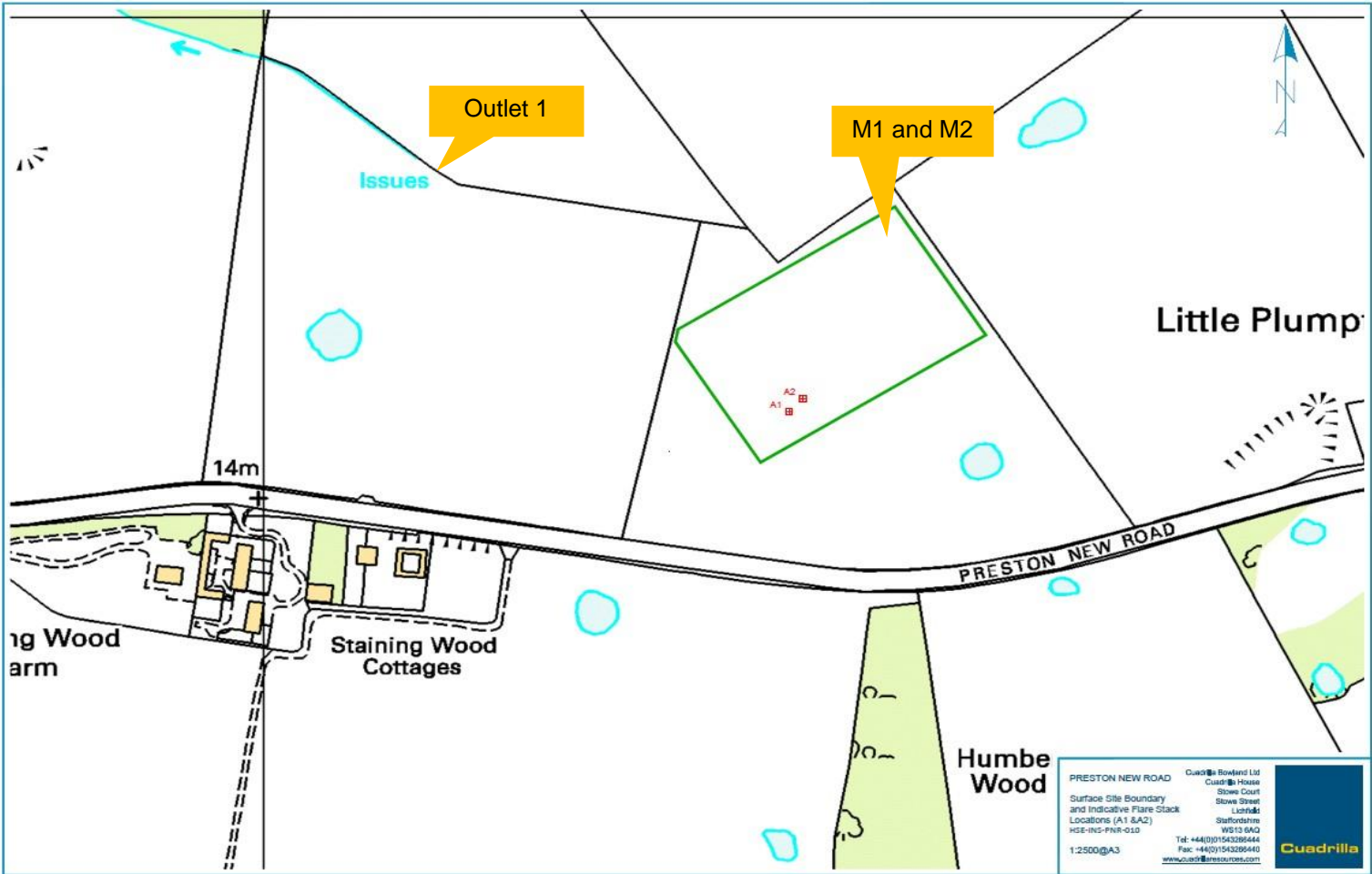
“year” means calendar year ending 31 December.

Where a minimum limit is set for any emission parameter, for example pH, reference to exceeding the limit shall mean that the parameter shall not be less than that limit.

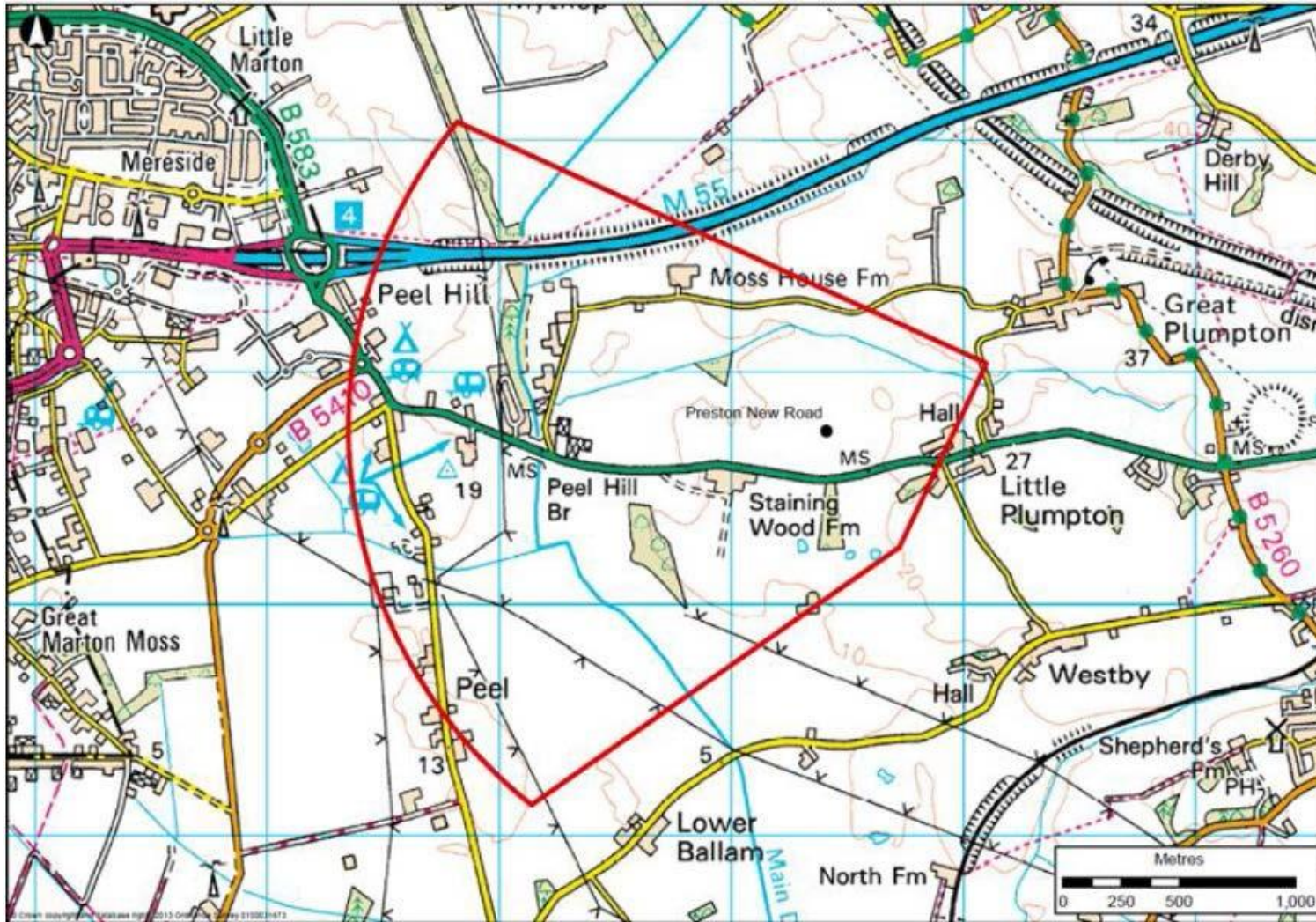
Unless otherwise stated, any references in this permit to concentrations of substances in emissions into air means:

- (a) in relation to emissions from combustion processes, the concentration in dry air at a temperature of 273K, at a pressure of 101.3 kPa and with an oxygen content of 3% dry for liquid and gaseous fuels, 6% dry for solid fuels; and/or
- (b) in relation to emissions from non-combustion sources, the concentration at a temperature of 273K and at a pressure of 101.3 kPa, with no correction for water vapour content.

Schedule 7 - Site plans



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