Communicating Geoscience

– the shale gas experience of the BGS

Clive Mitchell, Communications Team Leader, British Geological Survey

British Geological Survey
Expert | Impartial | Innovative

Working with new technology and data to understand and predict the geological processes that matter to people's lives and livelihoods.

UK Research and Innovation

NERC SCIENCE OF THE ENVIRONMENT

BGS 1835 British Geological Survey

Expert Impartial Innovative

The BBC of Geoscience

- Public Service Geoscience – impartial advice to UK government, industry, academia and public
- Not-for-profit, 50% BEIS (UK Govt), remainder commissioned/ commercial
- Centenary of the Haldane Principle which governs scientific independence
- Subject to Freedom of Information (FOI) & Environmental Information Regulations (EIR) requests for information
- The Principles of Public Life are the basis for the code of conduct for BGS staff

Principles of Public Life

- **Selflessness** act solely in the public interest
- **Integrity** independent of outside influence
- **Objectivity** makes choices based on merit
- **Accountability** subject to appropriate scrutiny
- **Openness** as open as possible about all decisions
- **Honesty** declare all private interests and avoid conflict
- **Leadership** promote principles and lead by example

https://www.ukri.org/files/termsconditions/rcukukriterms/code-of-conduct-pdf/

From: Galloway, David D.
To: Galloway, David D.
Subject: BGS SEISMIC ALERT
Date: 01 April 2011 05:02:25

SEISMIC ALERT: BLACKPOOL, LANCASHIRE 1 APRIL 2011 02:34 UTC 2.2 ML

The following preliminary information is available for this earthquake:

DATE : 1 April 2011
ORIGIN TIME : 02:34 32.3s UTC
LAT/LONG : 53.843° North / 2.990° West
GRID REF : 334.87 km/E / 439.01 km/N
DEPTH : 11.6 km
MAGNITUDE : 2.2 ML
LOCALITY : Blackpool, Lancashire
INTENSITY : 3 EMS

BGS have detected an earthquake at 02:34 UTC (03:34 BST) this morning (1 April 2011) located approximately 4 km northeast of Blackpool, Lancashire. Several residents from Blackpool, Preston and surrounding areas have reported having felt this event, describing "some neighbours houses are showing lights as if they were woken up" and "heard a bang then felt a rumble"

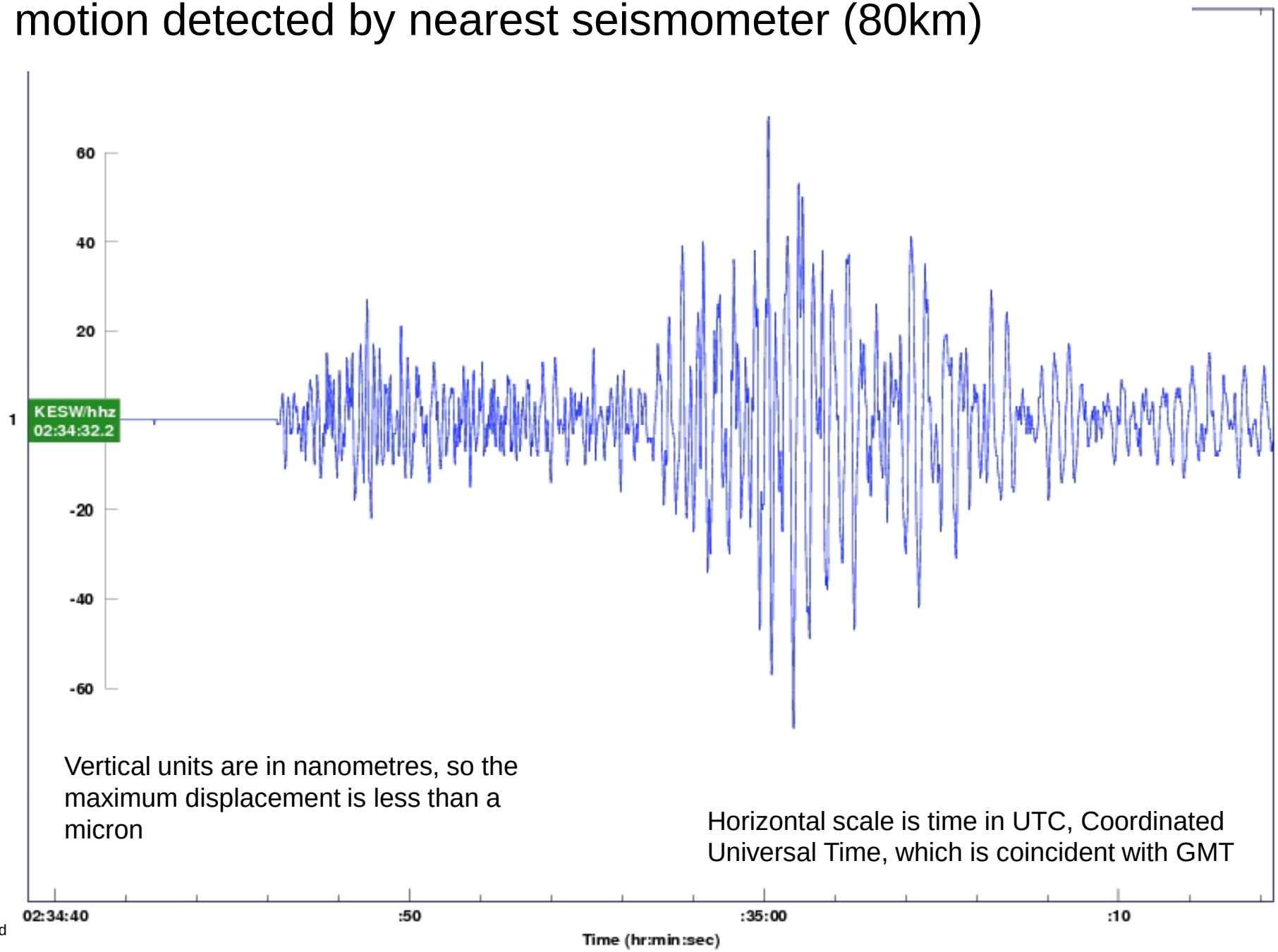
Broadband station book

Station Code	KESW
Location	Rakefoot Farm, Keswick, Cumbria, England, UK
Latitude	54.58849N
Longitude	3.10343W
Elevation	282m
Instrumentation	CMG-3T 120S SN 35331; CMG-5T acc.0.1 to 4.0 SN T5F50; CMG-DM24S6 Digitiser SN C520
GSE Response files	extract with AutoDRM

PGB1, Strathclyde

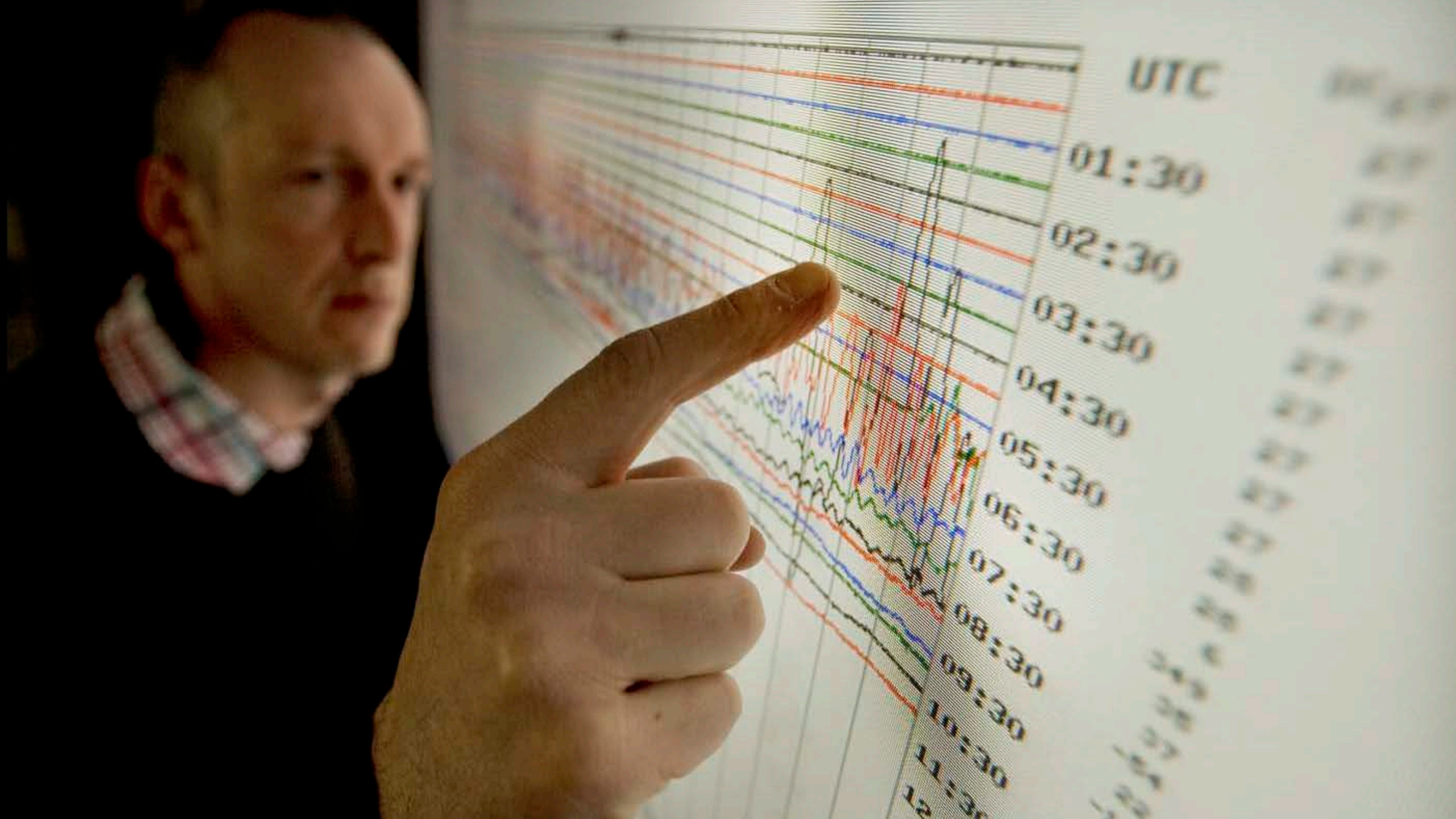
STNC, Staffordshire

Ground motion detected by nearest seismometer (80km)



Vertical units are in nanometres, so the maximum displacement is less than a micron

Horizontal scale is time in UTC, Coordinated Universal Time, which is coincident with GMT


UTC
01:30
02:30
03:30
04:30
05:30
06:30
07:30
08:30
09:30
10:30

British Geological Survey [No Title]

Small earthquake hits Blackpool

Archive

Share

BBC News; Isle of Man – 01/04/11 08:04 –

Words matched: British Geological Survey

There has been a small earthquake on the Lancashire coast, the British Geological Survey (BGS) has confirmed. A small earth

*...Blackpool There has been a small earthquake on the Lancashire coast , the **British Geological Survey** (BGS) has confirmed. A small earth tremor was...*

British Geological Survey

Blackpool rocks as 2.2 magnitude earthquake leaves (rather small) cracks in roads

Archive

Share

Mail Online – Daily Mail Reporter – 01/04/11 11:04 –

Words matched: British Geological Survey

An earthquake of a size 2.2 magnitude rocked Blackpool in the early hours

*...left some residents believing they were being broken into. The **British Geological Survey** recorded the Blackpool earthquake with a magnitude of 2.2*

- This small earthquake received 80 media hits in 48 hours
- First media enquiry regards link to fracking was 10.17am 1st April from *The Ecologist*

Drilling halted by earthquake

Published: 11:41
Saturday 02 April 2011

The Gazette

Blackpool Gazette was first media report we saw making link to fracking…

Research

- A Comparison of the Folkestone and Market Rasen Earthquakes
- Revised Seismic Hazard Maps for the UK
- Seismogenesis and State of Stress in the UK
- Monitoring Volcanic Eruptions Using Interferometry
- *Particular events*
- Are yesterday's earthquakes tomorrow's

Blackpool earthquake | Magnitude 2.3 | 1 April 2011

Date	1 April 2011
Origin time	02:34 32.3s UTC
Lat/Lon	53.834° North / 2.975° West
Grid ref	335.84 km/E / 437.99 km/N
Depth	3.6 km
Magnitude	2.3 ML
Locality	Blackpool, Lancashire
Intensity	3 EMS

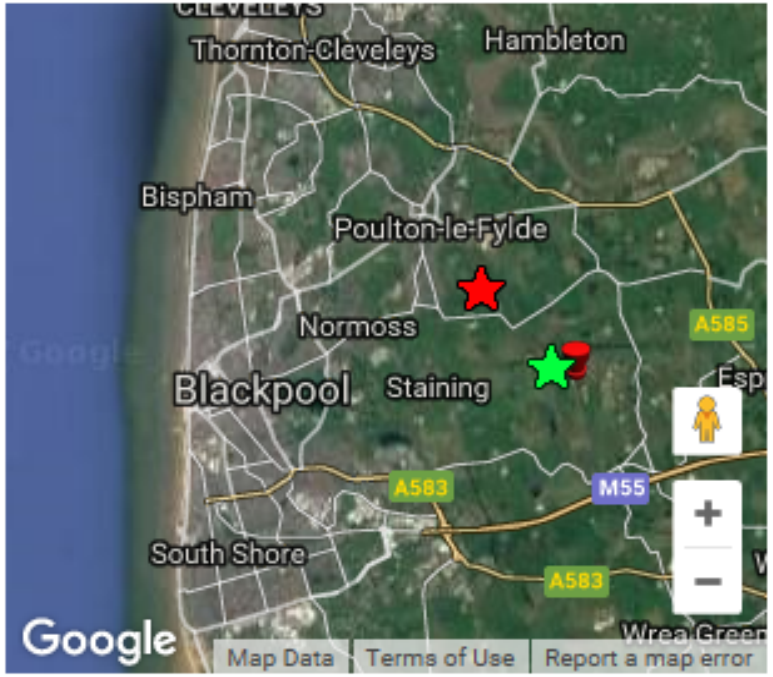


Figure 1. The location of the Preese Hall drill site is shown by the red pin. The epicentre of the 1 April earthquake is shown by the red star and the epicentre of the 27 May

See also

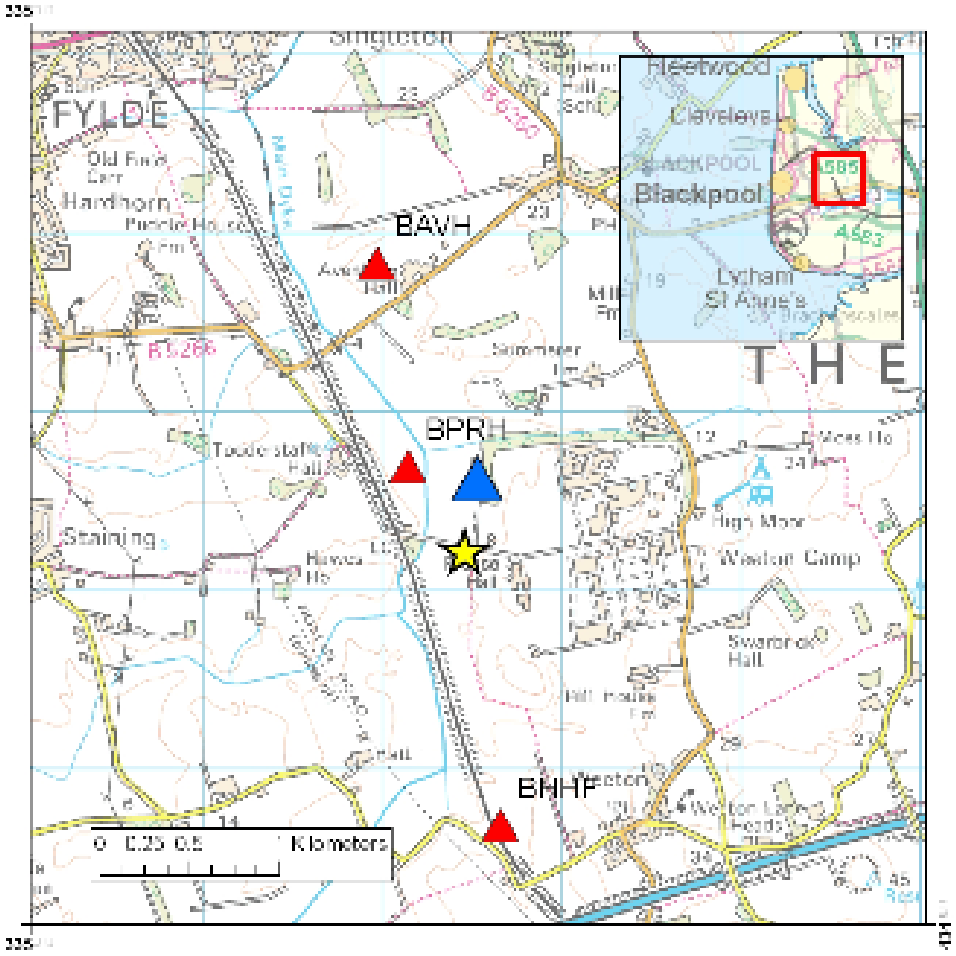
- BGS Seismograph Map
- UK School Seismology Project
- Geomagnetism
- Volcanology
- Landslides
- Flooding
- Ground shrinkage and subsidence
- Shale gas

Research highlights

Earthquakes induced by Hydraulic Fracturing Operations near Blackpool, UK

In Lancashire, UK, 58 earthquakes were linked to fluid injection during hydraulic fracturing at the Preese Hall well in 2011 (de Pater and Baisch, 2011). The largest, on 1 April 2011, had a magnitude of 2.3 and was felt locally. These hydraulic fracture treatments were carried out during exploration of a shale gas reservoir in the Bowland basin, Lancashire. A further magnitude 1.5 ML earthquake was felt on 27 May, 2011 and also linked to hydraulic fracture treatments, leading to the suspension of operations at Preese Hall.

The unusual seismicity led to a number of detailed studies of the relationship between the earthquakes and hydraulic fracturing operations (for example, de Pater and Baisch 2011; Eisner et al., 2011). In total, 58 earthquakes were detected in the time period between 31 March and 30 August 2011, nearly all of these either during or within a few hours of fracturing operations at Preese Hall. De Pater and Baisch (2011) concluded that the earthquake activity was caused by fluid injection directly into a nearby fault zone, which reduced the effective normal stress on the fault and caused it to fail repeatedly in a series of small earthquakes. A possible causative fault was later identified following a detailed 3-D seismic reflection study (Clarke et al, 2014).



Epicentres of Blackpool earthquakes (yellow star). The location of the Preese Hall drill site is shown by the blue triangle. The red triangles show in

Since 2011 BGS has…

- (as part of expert group) proposed hydraulic fracturing traffic light system with 0.5M as proposed threshold
- assessed shale gas/oil resources in the Bowland Shale, central England, as well as resources in the Weald Basin, Wales, Midland Valley of Scotland & Wessex area
- assessed the potential impact on groundwater, including aquifer-shale separation mapping
- commenced **Environmental Baseline Monitoring** in Lancashire and Vale of Pickering to enable future assessment of impact of hydraulic fracturing
- initiated the UK Geoenergy observatories project which will create world-class, subsurface energy-research test centres in Cheshire and Glasgow

Environmental baseline monitoring in Lancashire – Real-time monitoring data

Monitoring

- Air composition
- Groundwater quality
- Seismicity

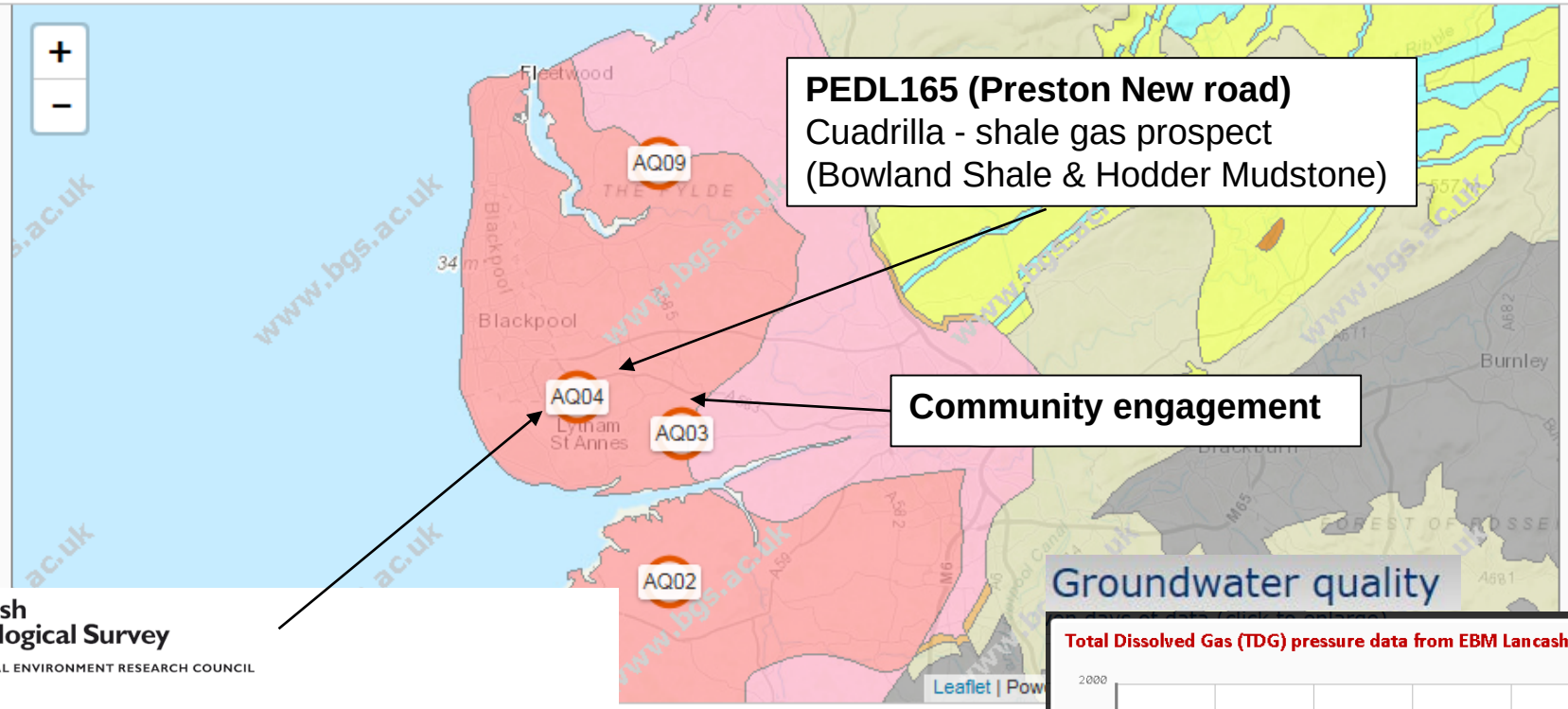
BGS data overlay

Bedrock Geology

Base map

Road map

reset zoom



PEDL165 (Preston New road)
Cuadrilla - shale gas prospect
(Bowland Shale & Hodder Mudstone)

Community engagement

Bedrock geology key

- Triassic Rocks (undifferentiated) - Mudstone, Siltstone and Sandstone
- Triassic Rocks (undifferentiated) - Sandstone and Conglomerate, Interbedded
- Permian Rocks (undifferentiated) - Mudstone, Siltstone and Sandstone
- Permian Rocks (undifferentiated) - Sandstone and Conglomerate,

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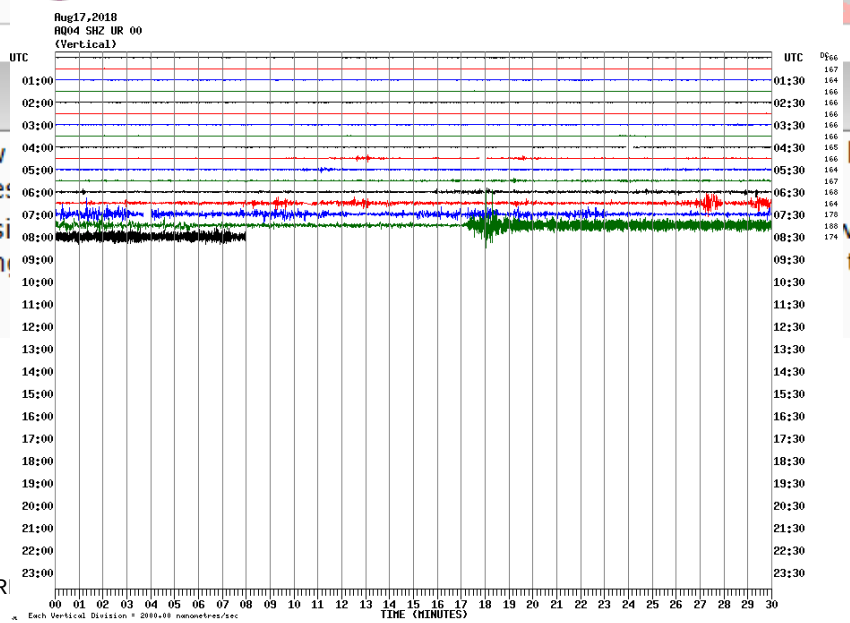
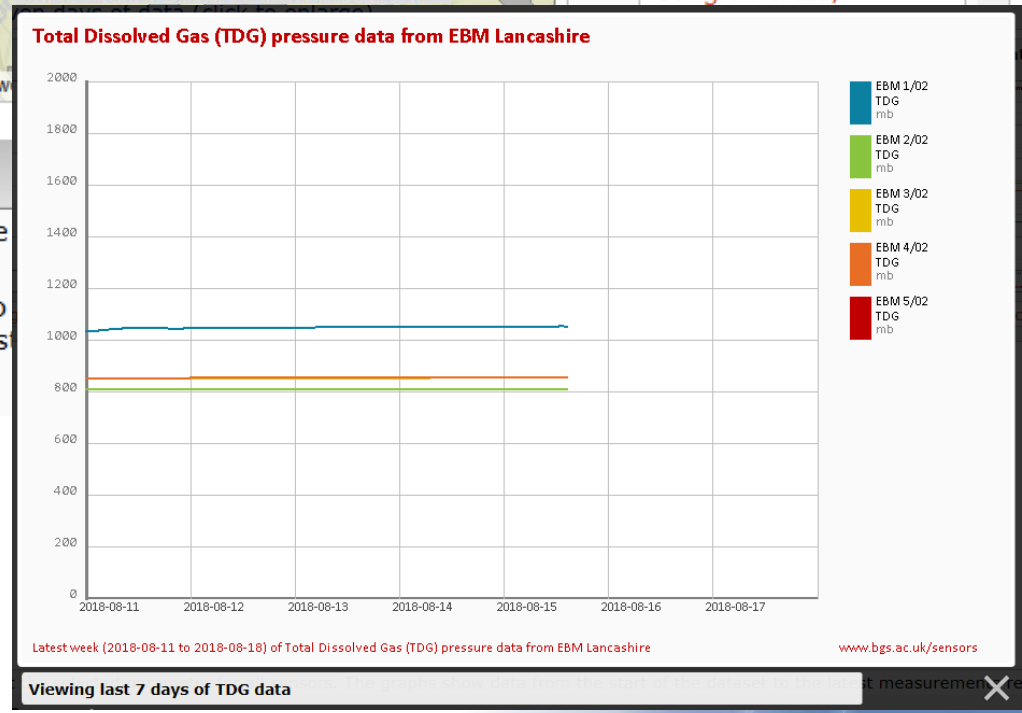
Seismicity

The images show
minute. The times
The colours are si
station - a passing



line is 30 minutes long with the
in summer.
vn when a line goes from flat to
they cause activity on several st

Groundwater quality



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Environmental Baseline Monitoring

For more information contact BGS Enquiries on (0115) 9363143
www.bgs.ac.uk


SUZUKI


British Geological Survey
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Atmospheri
compositio
We have a continuous air monit
station for the measurement
• nitrogen oxide and nitr
• methane and oth
• carbon dioxide
• particulate m
• ozone
• meteorologi
British Geological Survey
Water quality
We are testing water quality in boreholes, springs and
streams in The Fylde for
• dissolved gases (including methane)
• organic and inorganic chemicals
• stable isotopes
• naturally occurring radioactive
materials
UNIVERSITY OF BIRMINGHAM
www.bgs.
www.bgs.
hermo


Café

Cuadrilla

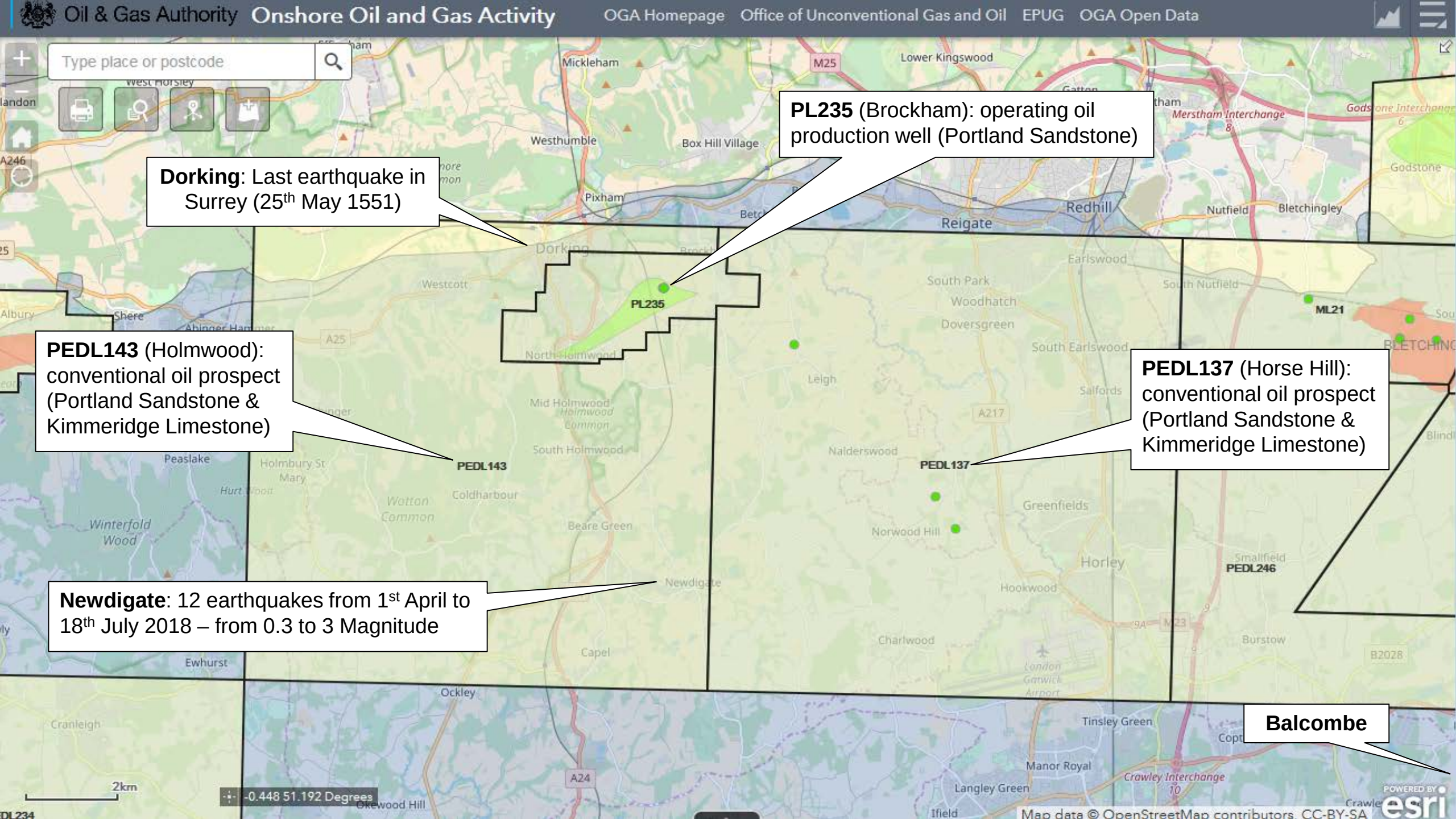
BACK TO ALL SITES

PRESTON NEW ROAD

Our current operational shale gas exploration site is Preston New Road (PNR), which is in the parish of Westby-with-Plumptons, in the Fylde, Lancashire. We were granted planning permission in October 2016 to develop PNR as a temporary exploration site with permission to drill, hydraulically fracture and test the flow of natural gas from up to four horizontal wells at the site. Site construction began in early 2017 and drilling began in mid 2017. In 2018, Cuadrilla completed drilling the UK's first two horizontal shale gas wells. To learn more about horizontal drilling

Surrey earthquake swarm

- 1st April 2018, the BGS detected the first earthquake to occur in Surrey for 467 years
- This was the first of a ‘swarm’ with a total of 12 seismic events by the 18th July
- In response BGS has installed 5 seismometers in a network close to these earthquakes to reduce uncertainty in location and depth for these events
- BGS is unable to say if there is a link between oil and gas activities, or any other man made activities, and these events
- Real-time data can be viewed for each station


Oil & Gas Authority Onshore Oil and Gas Activity
OGA Homepage
Office of Unconventional Gas and Oil
EPUG
OGA Open Data
Type place or postcode
PL235 (Brockham): operating oil production well (Portland Sandstone)
Dorking: Last earthquake in Surrey (25th May 1551)
PEDL143 (Holmwood): conventional oil prospect (Portland Sandstone & Kimmeridge Limestone)
PEDL137 (Horse Hill): conventional oil prospect (Portland Sandstone & Kimmeridge Limestone)
Newdigate: 12 earthquakes from 1st April to 18th July 2018 – from 0.3 to 3 Magnitude
Balcombe
PL235
PEDL143
PEDL137
ML21
PEDL246
Mickleham
Lower Kingswood
Westhumble
Box Hill Village
Pixham
Dorking
Reigate
Redhill
Nutfield
Bletchingley
Godstone
Merstham Interchange
Westcott
Shere
Albury
South Park
Woodhatch
Doversgreen
Earlswood
South Nutfield
South Earlswood
Leigh
Salfords
Nalderswood
Mid Holmwood
South Holmwood
Peaslake
Holmbury St Mary
Coldharbour
Wotton Common
Beare Green
Winterfold Wood
Greenfields
Norwood Hill
Horley
Hookwood
Smallfield
Newdigate
Charlwood
Capel
Ewhurst
Ockley
Cranleigh
Tinsley Green
Manor Royal
Langley Green
Crawley Interchange
Burstow
A25
A217
A24
M25
M23
B2028
2km
-0.448 51.192 Degrees
Map data © OpenStreetMap contributors, CC-BY-SA
POWERED BY esri

I have some stickers with me, ask me at the break!

My advice …

- If the media contact you, speak to your press office
- Are you an expert ? Can you talk convincingly ? Are you normally allowed out ? If yes, media work is for you
- Recorded interviews – if you can, go live every time
- Smart casual, avoid (strobing) stripes
- Be available, be brave, don’t forget to breathe!
- Stick to what you know; avoid speculation; be honest, if you don’t know, say so; don’t say “No comment”
- Take the plunge, it can be great fun!

Recommended reading

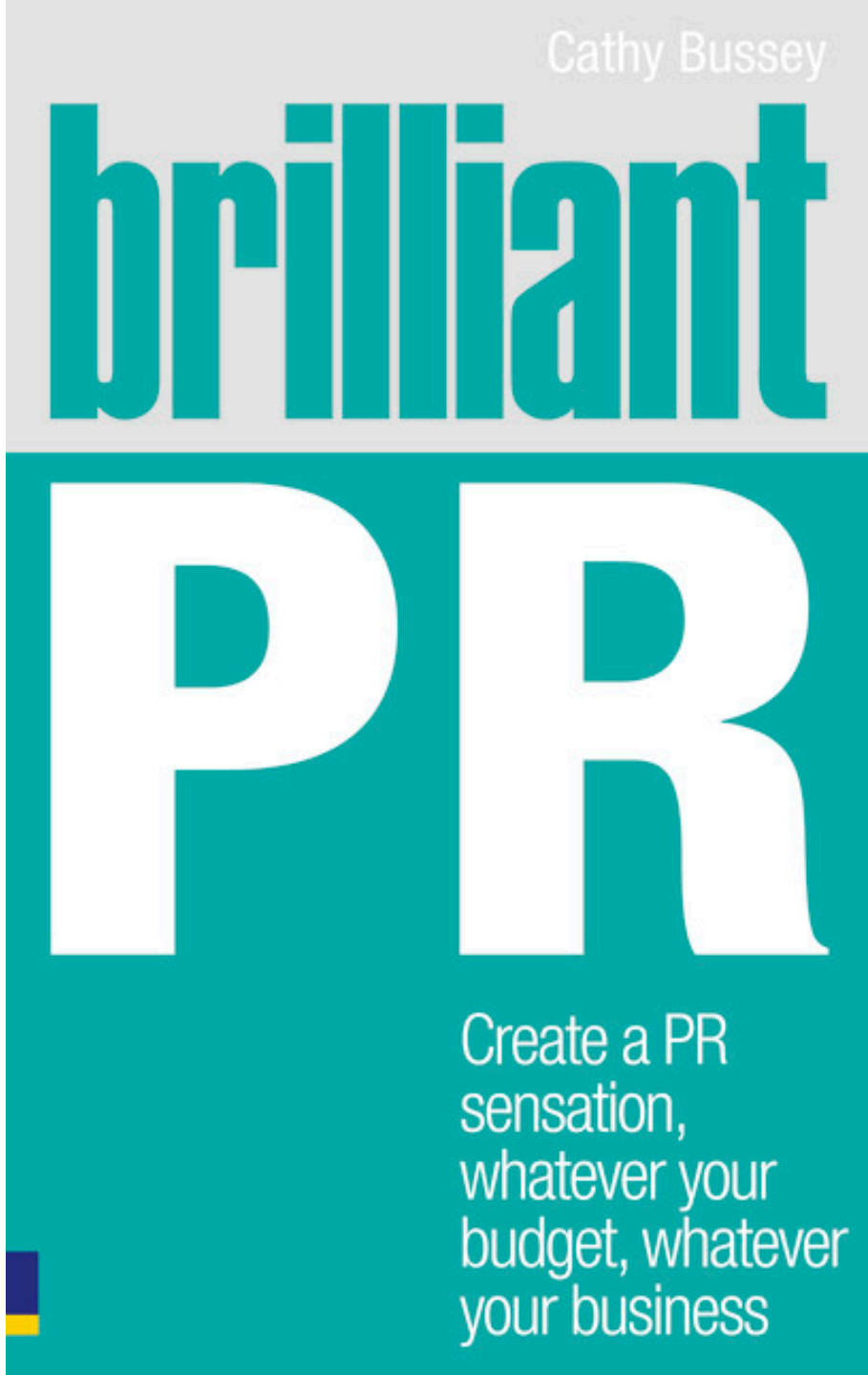
Brilliant PR

by Cathy Bussey

(deputy editor of **PRWeek** magazine)

“An easy read, not a dense academic tome, neatly sums up my approach to communications”

Clive Mitchell, Comms Team Leader, BGS



Take home messages

- BGS is an independent source of monitoring data for the UK subsurface – in real-time, free and accessible for everyone
- Community engagement is challenging, rewarding and crucial – as public sector scientists it is our duty to explain ourselves
- Geoscience communication creates awareness and value – it is essentially the business case for funding scientific research

Thank you for your attention!

Clive Mitchell
BGS Communications

British Geological Survey
Keyworth, Nottingham, NG12 5GG,
United Kingdom (UK)

+44 (0)115 936 3257

cjmi@bgs.ac.uk

www.bgs.ac.uk

Twitter:@CliveBGS