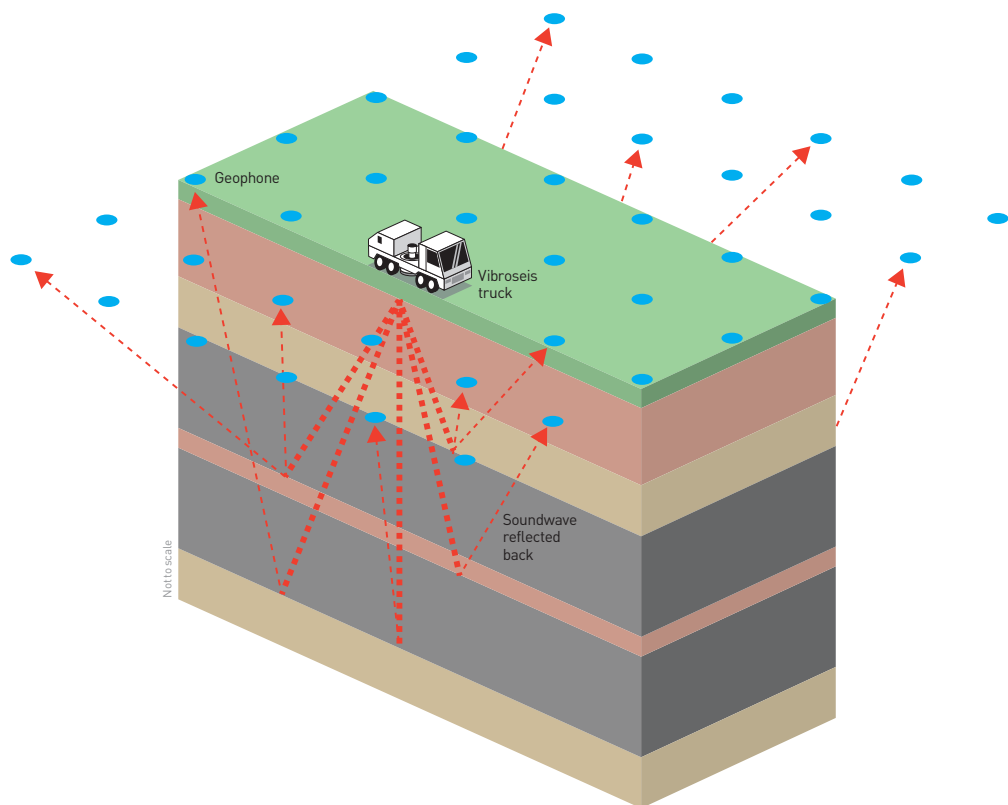


About our 3D seismic survey



Four community exhibitions

Barlborough
Creswell
Upper Langwith
Warsop

INEOS Shale is the division within INEOS Upstream Limited dedicated to exploring for gas within the shale layer of rock some 2,000 to 5,000 metres deep underground.

We have launched a three dimensional (3D) seismic survey as part of our plans to develop the nation's shale gas resources across a 250km² area of the East Midlands. The data from this extensive survey will provide a clear image of the underground rock structure and assist us in determining our future drilling activities.

The data provided by this will inform not only INEOS Shale but will become part of the national geophysical database for use by current and future generations of geoscientists.

Starting in June 2017, the data acquisition phase will take about six months for the whole 250 km² area, starting in the north west of the survey area near Harthill and finishing in the south east near Kings Clipstone.

What is seismic surveying?

Seismic surveying is a geophysical technique used commonly across the UK for more than 40 years. It uses the principles of seismology to allow deep subsurface geology to be imaged and mapped in either two or three dimensional (2D or 3D) detail.

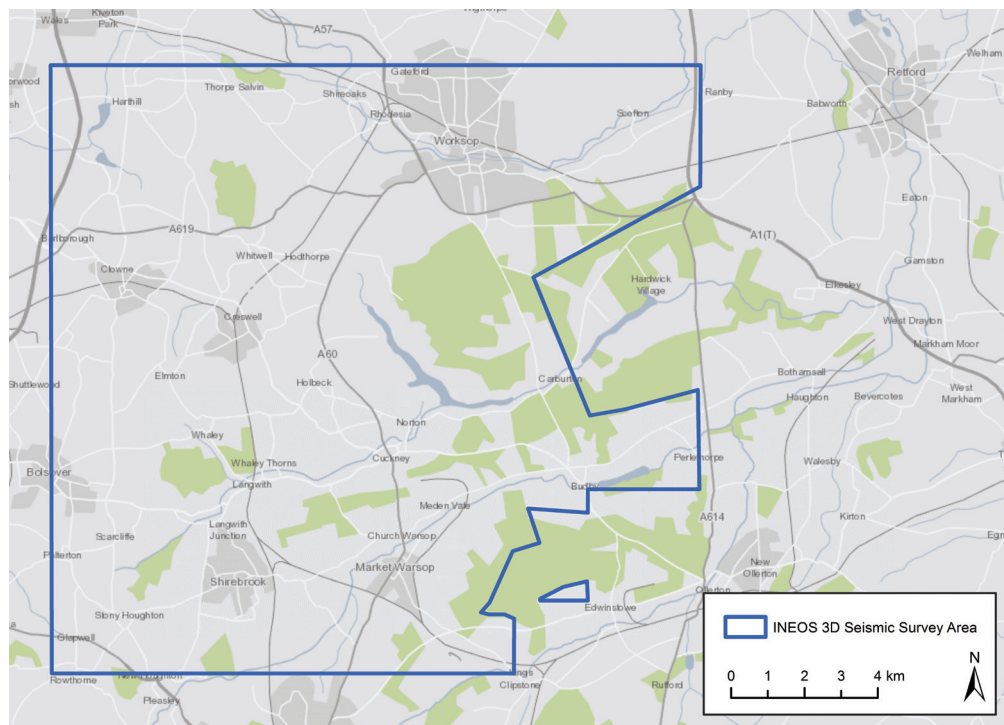
For 3D acquisition, data is acquired from a grid or 'patch' of survey lines covering a specific area of land. This provides a multi directional image beneath the surface.

A controlled seismic source, positioned on or near surface, is used to generate a reflection signal which passes through the various underground rocks. At changes in rock type and density, part of this signal is reflected back to surface where a series of microphones (geophones) receive its return. By recording this 'two way' time, the depth, extent and characteristics of rocks can be determined and imaged.

We will be holding a number of **community exhibitions** throughout the survey area for residents to come along and speak to us. These will be held on the following dates:

JULY	AUGUST	SEPTEMBER	OCTOBER
Barlborough Wednesday	Creswell Tuesday	Upper Langwith Tuesday	Warsop Monday
26/07	15/08	05/09	02/10
Barlborough Village Hall High Street Barlborough S43 4TJ	Creswell Social Centre Elmston Road Creswell S80 4BH	Langwith Bassett Community Hall Rectory Road Upper Langwith Mansfield, NG20 9RF	Warsop Ex-serviceman's Club Carr Lane Mansfield NG20 0BN
14.30-19.00	14.30-19.00	14.30-19.00	14.30-19.00

Area of survey



Starting in June 2017, the data acquisition phase will take about six months for the whole 250 km² area, starting in the north west of the survey area near Harthill and finishing in the south east near Kings Clipstone.

➤ The data provided by this will inform not only INEOS Shale but will become part of the national geophysical database for use by current and future generations of geoscientists.

Seismic survey explained

Pegging out

Ahead of the data acquisition, surveyors accompanied by an ecologist and an agricultural liaison officer walk the survey area to determine the precise placement of receivers and energy sources. Walking the land gives us an accurate record of the condition of the land to ensure it is restored appropriately once operations are finished.

It also identifies stand-off distances from buildings, buried utilities, hedges, trees, nesting birds, environmental and other restrictions, and determines whether the energy source at each location should be created by a group of up to three vibroseis machines (each about the size of a bin lorry) or in a small number of cases, by setting off a small charge buried up to ten metres below ground.

Geophone, commonly called a receiver

These passive listening devices are placed in fields and road verges. Between placement and recovery of the receiver, the only likely activity will be a technician changing the battery.

Vibroseis trucks (source)

These vehicles will usually operate in groups of three and will be the most obvious sign of a survey taking place as some surveying is done on roads. There are likely to be some short term localised traffic delays as the survey progresses through an area.

Shot hole drilling

In some circumstances, a small charge is used to generate the signal. A tractor mounted drill is used to drill a narrow hole approximately 10 cm in diameter and about 10 m in depth. The charge (source) is placed at the bottom of the hole and the hole is back filled with earth.

When the charge is detonated, a dull thud can sometimes be heard, in close proximity to the source point. The shot cord and other equipment is removed from the shot hole after detonation and the hole is backfilled and restored. The charge used will not damage the soil or groundwater and shot holes will not be drilled where drinking water supplies are present (groundwater protection zones).



Pegging out – small flags mark where the source (red flag) and receiver (blue flag) points are to be.

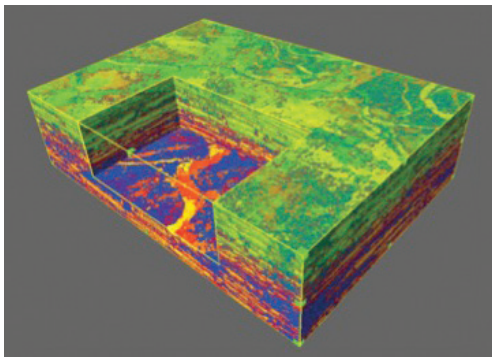


Receivers – record sound waves returning from the earth below.

- Seismic surveys have been commonplace across the UK for more than 40 years
- In total, the survey area covers 250.7 km² in Derbyshire, Nottinghamshire and Rotherham council areas
- The survey will take around six months to complete
- No sources or receivers will be placed in Sites of Special Scientific Interest (SSSIs), Scheduled Monuments, areas of standing water or watercourses, or private gardens
- No seismic survey activity will be conducted between dusk and daybreak
- Stand-off distances have been agreed with the relevant regulators and landowners to ensure safe levels of vibration at sensitive receptors such as homes, schools, hospitals, listed buildings, and to ensure vibration does not disturb environmental receptors such as trees, nesting birds and other protected species
- The majority of urban areas are excluded from the survey, though survey vehicles may pass along roads to access other areas
- In planning the survey, INEOS has consulted with a range of stakeholders including the three councils and their specialists, Natural England, Environment Agency, Historic England and RSPB
- The survey is part of a commitment made to Government as a condition of the licence
- INEOS will use the results of the survey to inform and improve their existing geological model of the region.



Vibroseis trucks – create the downward energy by vibrating a steel plate on the ground.



Final 3D image

Commonly asked questions

Will there be noise?

The vibration trucks have special silencer units installed to minimise noise. They may appear slightly noisier than a passing lorry due to the fact that they remain stationary for a period of one to two minutes.

If charges are used a muffled thud may be heard, only when close to source points.

Will I feel vibrations?

In most cases the work will go on unnoticed. Seismic energy sources are designed to direct the sound energy downwards but due to the varying near-surface geology some of this energy is directed sideways. This degrades rapidly with distance and the distance varies with different surface geology. To reduce vibration levels, the source will stand-off an appropriate distance from buildings or other sensitive receptors, and the level of vibration from the source can also be reduced if necessary.

Will there be an impact on traffic?

In certain limited areas, source and receiver locations will be located along highways and grass verges.

Where appropriate we will deploy means of traffic control during surveys (e.g. arrows or a stop/go board). This will minimise disruption to other road users and ensure safe working.

How can you be sure you don't damage wildlife habitats during the survey?

INEOS consulted Natural England, Environment Agency, Historic England and non-statutory bodies including RSPB and landowners in planning the survey to identify sensitive areas and to develop appropriate mitigation measures, stand-off distances and exclusion zones if needed. Before work commences, a team of surveyors, each accompanied by an ecologist and an agricultural liaison officer, walk the land to make sure that all sensitive areas have been identified.

Are you going to be surveying in towns and villages?

Although some very limited survey work will take place along roads and roadside grass verges in urban areas, the majority of urban areas will be excluded from the survey, and no private gardens will be used.

What happens next?

Once we have analysed the 3D data we tie that in with existing seismic and coring well data. That information collectively will enable us to decide from a geological viewpoint which areas are encouraging for exploration drilling and possible fracking, and which are not. We then identify suitable drilling locations taking into account constraints at the ground level.

For further information please contact:

Telephone: **020 3793 8066**

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twitter: [@INEOS_shale](https://twitter.com/INEOS_shale)

facebook: [INEOSShale](https://www.facebook.com/INEOSShale)

Email:

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Updates will be available on our website:

www.ineosshale.com