

**APPRAISAL AND DEVELOPMENT  
PLANNING SUBMISSION  
MARKWELLS WOOD OIL  
DISCOVERY  
UK WEALD BASIN  
Application No: SDNP/16/04679/CM**

**MARCH 30TH, 2016**

**OBJECTION SUBMITTED BY  
EMILY MOTT  
MARKWELLS WOOD WATCH  
STOUGHTON PARISH  
WEST SUSSEX**

Case Officer: Ms Natalie Chillcot  
South Downs National Park Authority

30 March 2017

Dear Natalie Chillcott,

REPRESENTATION by Emily Mott

**SDNP/16/04679/CM**

**Appraisal and production of oil incorporating the drilling of one side track well from the existing well (for appraisal), three new hydrocarbon wells and one water injection well, and to allow the production of hydrocarbons from all four wells for a 20 year period**

I strongly object to this application, which is contrary to core park policy and will have lasting significant negative impacts on the landscape and local amenity of the South Downs National Park as well as far reaching consequences for the hydrogeological catchment area of Bedhampton and Havant springs.

- 1. The development is contrary to core policies** of the South Downs National Park and would have diverse negative effects on natural and cultural resources, visitor uses and experiences, park infrastructure and management, and may be damaging to the environment and public health.
- 2. The site is unsuitable** in terms of geology, hydrogeology, the rural nature of the specific location located off narrow tracks and lanes serving hamlets, and the impact of a large scale industrialisation on this highly valued landscape, proximity to important wildlife including rare European Protected Species, Bechstein Bats.
- 3. The applicant has not demonstrated exceptional circumstances** why this major development should be allowed in the South Downs National Park.
- 4. Lack of evidence: Applicant's Environmental Impact Assessment, Groundwater Risk Assessment, Transport Assessment and Ecological Report lack key information.**
- 5. Climate change:** Promoting evidence-based decision making and awareness for preventing, mitigating, and responding to the health impacts of climate and environmental change are central to the sustainable model of development which forms an essential aspect of the park's guiding principles.
- 6. The applicant proposes acidisation** which is akin to hydraulic fracturing. Hydraulic Fracturing is not permitted in the SDNP. Both acidisation, hydraulic fracturing and horizontal drilling involve quantities of freshwater, injection of high volumes of hazardous chemicals underground and create vast quantities of toxic waste water.

**7. Significant data gaps and lack of sound science in terms of acidisation.**

There is no evidence that acidisation can be conducted without significant risk to the environment and human health. Acidisation may carry more risk than hydraulic fracturing because of the cumulative impact of chemicals and the fact that it is not adequately regulated.

**9. There are significant uncertainties about the kinds of adverse health outcomes** that may be associated with acidisation, the likelihood of the occurrence of adverse health outcomes, and the effectiveness of some of the mitigation measures in reducing or preventing environmental impacts which could adversely affect public health.

**10.** The applicant has not presented an **adequate seismic study** with precise detail of major faulting of geology for PEDL 126 or the relation to stress on infrastructure.

**11. The proposed development would significantly delay the restoration of the site to a biodiverse woodland which was planned for 30<sup>th</sup> September 2016.**

**12.** The amount of oil to be produced, and the **benefits of the project, have been overstated.**

**13.** Should this application be approved, it would set a **precedent** for future exploration and production of oil and gas within park boundaries.

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## **SUMMARY**

Precautionary Principle

Markwells Wood Watch's Hydrogeological Report, "A Review of Karstic Potential and Groundwater Vulnerability of the Chalk Principal Aquifer in and around Markwells Wood, West Sussex" by Aidan Foley and the Comments on Groundwater Risk Assessment by Envireau on behalf of UKOG (GB) is the subject of a separate representation.

## **1.NATIONAL SIGNIFICANCE OF GROUNDWATER Strategic and Vital**

*"Just as oil was to the 20th century, water is fast becoming the defining resource of the 21st century. Unfortunately however, unlike oil, there is no replacement for water." <https://data.cdp.net/>*

The core aspect of Groundwater protection as stated in EA guidelines for planners and developers is the risk-based approach. The aim is to avoid potentially polluting activities being located in the most sensitive locations for groundwater. Developers are expected to provide proper assessments and adequate information so that planners can make the appropriate decisions.

The site is designated by the Environment Agency as a "Principal Aquifer", one of only 11 such sites in the UK. It is also within an Aquifer "Source Protection Zone" classified as "Outer Zone 2". Our water supplies are extracted by Portsmouth Water (PW) through the Havant and Bedhampton Springs, 6 km to the SW of the site.

Clean groundwater is precious, finite and essential for health, the environment and our infrastructure. **Our groundwater catchment is vulnerable and it is our duty to support, conserve and protect this fragile groundwater ecosystem and to promote catchment management approaches that will ensure its purity and longevity.**

UKOG's original assessment of the groundwater showed total disregard and lack of understanding of our aquifer and ecology. The EA and PW objected to the application due to the lack of a proper Groundwater risk assessment. As Dr. Foley writes in his Technical notes, "UKOG's approach to overcoming the EA and PW

objections is by risk analysis based upon clarification of the hydrogeological conceptual model. Lack of conceptual rigour is demonstrated throughout this second report which contains gross factual errors and misinterpretations of basic sources of information.”

**The applicant has twice failed to provide a robust model and as such have failed to deliver a proper Groundwater risk assessment.**

In the EA’s objection to UKOG’s application, it is written, “If it is found that there is strong evidence to indicate karstic flows in the area of the development site we will be minded to apply the same oil and gas location position as we would for oil and gas developments proposed In SPZ1.”

Markwells Wood Watch commissioned an independent hydrogeological report with funds from 120+ members of our community as well as generous contributions from Stoughton, Compton and Rowlands Castle Parish Council and RC Residents Association.

In “A Review of Karstic Potential and Groundwater Vulnerability of the Chalk Principal Aquifer in and around Markwells Wood, West Sussex”, Dr. Foley concludes that:

**All the geological and groundwater conditions required for karsification of the Chalk Principal Aquifer are in place at Markwells Wood.**

**Karstic groundwater flow conditions, of potentially kilometres per hour, are present in the vicinity of the UKOG site at Markwells Wood.**

**The precautionary principle and other evidence presented give considerable justification for the designation of the area around the UKOG site as within SPZ1 (*that is, with travel times from beneath the water table of less than 50 days*)**

**Additional groundwater vulnerability assessment, on the basis of the methodology of Edmonds(2008), is used to determine an Aquifer Vulnerability Rating beneath the UKOG site of between Moderate to Very High vulnerability, with High vulnerability established as the most likely rating using this method.**

In the light of the evidence provided in Dr Foley’s hydrogeological report it follows that the vulnerability and status of the aquifer beneath Markwells Wood and along the transport route should be reassessed and that it should be awarded the protection afforded to Source Protection Zone 1.

We contend that the risks to our aquifer are underestimated by UKOG and that any risk, however small, should be avoided, given the significance of the aquifer under Markwells Wood, which provides drinking water for thousands of people, and the importance of woodland environments within the context of the National Park.

Dr. Foley's report has demonstrated the vulnerable nature of our aquifer which feeds into the Bedhampton and Havant Springs, the source water for over 200,000 households from Portsmouth to Chichester and beyond.

Portsmouth Water has no large raw water storage reservoirs. It relies almost entirely upon groundwater reserves in the chalk aquifers of the South Downs and abstracts its raw water from wells, boreholes and springs.

The groundwater supply from the catchment around Markwells Wood is also of regional significance due to the fact that Portsmouth Water Company's area is rated as "moderately stressed" compared to the "serious" nature of other nearby water company's supply areas. The Government has guided companies to make plans for closer cooperation at times of water stress. This is expected to happen more frequently due to climate change. Therefore any risks to water supply here must be judged in relation to this wider strategic need (and public interest tests).\*

The catchment is also a crucial source of water for the Royal Navy which is based in Portsmouth.

This is a year when the World Economic Forum has ranked global water crises – including drought, increased risk of flooding and deteriorating water quality – as the greatest threat facing the planet over the next decade in terms of impact.

The strategic importance of our aquifer and the identified vulnerability of the catchment around Markwells Wood is such that groundwater protection should be a matter of national and regional security.

There are risks during all stages of oil production during transport, drilling, stimulation and storage of chemicals, hydrocarbons, hazardous injection fluids containing very strong acids, flowback and produced liquids (flowback fluids are likely to contain additional pollutants and pose additional impacts due to the release of heavy metals, salts and possible radioactive material in the acidising context.)

## **RISKS TO GROUNDWATER**

- a. Contamination of soil, surface water by runoff from construction activities, spills and leaks of drilling muds, and/or from poorly managed wastewater or handling of chemicals
  
- b. Contamination of groundwater by pollutants (including gas) released from the well due to well integrity failure, spillage of stored wastewaters and/or chemicals, from naturally fractured geology
  
- c. Risk of production fluids migrating through natural fissures in the rock (which can be exacerbated when accompanied by seismic events) into groundwater supplies.

**We think there is sufficient evidence to show that any of these risks represent an unacceptable hazard to our water. We feel that no mitigation could provide adequate protection in this karstic setting. Any risk, however**

**small, should be avoided given the significance of the aquifer and the important of this woodland environment within the context of the South Downs National Park. The precautionary principle should be invoked and planning should be refused.**

## **2. EXCEPTIONAL CIRCUMSTANCES**

UKOG has not demonstrated exceptional circumstances why this major development should be allowed in the South Downs National Park.

There has been adequate time to explore the potential of the reserves. The company was granted consent *for three years to test for oil* in Markwells Wood in 2008 by WSCC, despite objections by Chichester District County, the South Downs Joint Committee and the Woodland Trust. UKOG began drilling in November 2010 under its former name Northern Petroleum.

In 2012, Egdon Resources [admitted](#) that Markwells Wood had performed below expectations during the extended well test. In its [annual report](#) in July 2014, Egdon described Markwells Wood as suspended. Interests in the license held by partner Magellan Petroleum were sold due on the basis that Markwells Wood was a "relatively small conventional reservoir."

The recoverable reserves at Markwells Wood are estimated by UKOG as an average of 230 barrels per day over 20 years. Based on this and the 972,715,000 barrels of crude oil consumed in the UK in 2015, this would be approximately 0.0112% of UK's annual consumption. Back of the envelope:

**This is approximately one hundredth of one percent**

<http://www.indexmundi.com/energy/?country=gb&product=oil&graph=consumption>

By comparison, the UK Production Data Release figures issued by the Oil and Gas Authority on 1st November 2016, illustrate the following quantities of oil were extracted for the month of June 2016:

-Alba Offshore Oil Field produced 18,654 barrels per day (with an annual average of 12,796 barrels per day)

-Wytch Farm Land Oil Field produced 15,632 barrels per day (with an annual average of 16,069 barrels per day)

<https://itportal.decc.gov.uk/pprs/report4.pdf>

**The applicant has not demonstrated that the national need for indigenous oil and gas supply and mix could not be met by locating elsewhere, outside the SDNP, or met in some other way.**

## **3. ALTERNATIVE SITE ASSESSMENT**

The applicant's Alternative Site Assessment is restricted to a search area within PEDL 126.

The applicant has not provided a transparent rationale for the search area identified.

The applicant argues that there is a “significant reserve” at Markwells Wood . As discussed previously, we do not find this to be the case. Just because there is an access and site in existence should not be reason for approval.

The PEDL is heavily faulted with a major fault line transecting the site making this an **inappropriate place for an oil development**. UKOG, under its former name, Northern Petroleum, is well aware of the fault line because the original MW-1 well was 56% deviated to avoid it. This means the location at which the oil reservoir was drilled into is not under the well site at Markwells Wood and may be about a kilometre away. The fault line is likely to have been the cause of major loss of drilling fluids during the flow test.

Fault lines provide pathways for contaminants.

The applicant claims that “these locations are assessed in relation to access, existing natural screening.”

Isn't it ironic that the applicant destroyed an important part of ancient woodland and soil in order to find a location that they claim is shielded?

#### **4. CONVENTIONAL/UNCONVENTIONAL WHAT IS REALLY PROPOSED FOR MARKWELLS WOOD?**

**An oil reservoir is typically classified as unconventional if well stimulation is required for economical production.** (World Petroleum Council, 2011)

Whilst acidising has been used for years to coax oil from carbonate and sandstone, technology has advanced quickly but scientific study on how it impacts our environment and human health is unknown. In the UK, acidisation has occurred **under the radar and with little regulatory oversight**.

**‘Tight oil’** doesn't flow naturally and needs stimulation to either frack or dissolve the rock to release oil. **It is difficult and costly to get out of the ground.** The most common forms of unconventional well stimulation used in tight oil reserves are **acidisation and hydraulic fracturing with horizontal wells**. The type of rock determines the method of advanced well stimulation. Matrix acidizing and acid fracking are used for limestone and sandstone reserves whilst hydraulic fracturing is used for shale. The Oolite in this area, as evidenced at the analogous Horndean site, is complex. The oil is often ‘locked’ in calcite and has **required acid fracking**.

UKOG's application has been submitted under the banner of “*conventional mineral exploration/production*” despite its close similarities to production aspects of hydraulic fracturing.

The applicant advises that “*For the avoidance of doubt, the planning application is for conventional drilling and hydrocarbon production and does not seek permission for, or require the use of, hydraulic fracturing*” (Planning Statement, paragraph 4.2).



UKOG states categorically that the method of well stimulation they plan to use is not fracking, UKOG's application at Markwells Wood calls it 'a new non-massive fracking-based reservoir stimulation technology that does not involve massive hydraulic fracturing.'

## **5. DETAILS FOR INVESTORS/ OBFUSCATION OF PUBLIC Horizontal Deception**

The applicant has discussed plans for Markwells Wood in detail to investors and the press, yet their application gives short shrift to the methods and details of drilling and producing oil. In their Competent Persons Report, UKOG is apparently investigating "**novel drilling and completion techniques**" of four phases **involving 15 wells over 40 years...** In the CPR we discover plans for four horizontal wells whereas in the application they simply describe one side-track horizontal well for MW1 and then in Phase 2 using "the same methodology as Phase 1".

The term "**horizontal**" rightly carries with it negative implications (more intensive operation, more drill time, unconventional, more chemicals, increased noise levels, emissions, transport, hazardous wastes, etc.). UKOG has significantly downplayed this aspect of the production.

## **6. ACIDISATION & FRACKING**

It is important to note that the UK government's statutory definition of "relevant hydraulic fracturing" was deliberately changed in 2015 to pertain to volume of fluid used instead of the fracturing pressure.

This means that under the new UK law almost a half of the gas wells and nearly 90% of the oil wells which were hydraulically fractured in the USA over this decade would now **not** be classified as "fracked".

Matrix acidizing and Acid Fracking are akin to hydraulic fracturing :

- Acidising uses much higher concentrations of chemicals than hydraulic fracturing (fracking). Fracking fluids for shale typically consist of water with 0.5% chemicals. Matrix acidising and acid fracking fluids could contain up to 17 or 18% chemicals.
- Given the repetitive nature of the process, acidising may use a lot of water.
- With no precise definitions, scrutiny or monitoring, the industry can get away with minimising their acidising operations, calling everything an acid wash, or just a 'stimulation technique'. At well testing stage they may propose an acid wash when in truth they want to matrix acidise, in the knowledge that at production stage they will want to acidise more vigorously, at pressure.
- Acidising brings most of the negatives of hydraulic fracturing: traffic, road tankers, air pollution, flares, potential water pollution via spills, leaking wells and faults, processing plants, large volumes of toxic liquid waste, stress on communities.

UKOG has tried to pass this application off as conventional and benign acid wash, rather than the intensive unconventional acid well stimulation that we would expect from tight carbonate geology with long lateral sidetracks.

**Throughout the applicant has attempted to present a conventional production and in so doing, have conveniently sidestepped the risks of unconventional production including the toxicity of chemicals utilized in the process and the impact of those chemicals on the natural environment, including water quality, environment and human health.**

## **7. MISLEADING INFORMATION—SCALE AND SCOPE MISREPRESENTED**

It is essential that there be transparency in the planning process about chemicals used, method of well stimulation and wastes generated. These details are crucial to understanding the magnitude and risk of the development.

If the company doesn't declare the true intention of the advanced well stimulation process then they will not need to be transparent about truck loads to and from the site or the fact that the waste might be hazardous and associated risks. These details are essential to deciding an application's fate.

Acidisation has come in under radar, technology has advanced and regulations are playing catch up.

**Although planners and the public are told to leave the technical aspects of the application to the regulatory body, these details are crucial to understanding scale and scope of developments. Acidisation and other advanced well stimulations with similar possible negative impacts must be considered in the same light as hydraulic fracturing.**

## **8. OVERSTATEMENT OF JOBS CREATED**

"Defence by exaggeration"

Inflated and misleading job numbers are nothing new to the Oil and Gas industry. A study in the US found that the industry has a strong tendency to promise nearly eight times as many jobs than what they eventually create. "Between 2005 and 2012, less than four new shale-related jobs have been created for each new well. This figure stands in sharp contrast to the claims in some industry-financed studies, which have included estimates as high as 31 for the number of jobs created per well drilled." That's a difference of nearly 700% difference in job claims per well. "Employment estimates have been overstated, and the industry and its boosters have used inappropriate employment numbers, including equating new hires with new jobs and using ancillary job figures that largely have nothing to do with drilling, even after the flaws in those numbers have been brought to their attention."

In practice much of the employment for oil developments are transient workers from outside the area in which the oil is extracted. There just aren't that many trained oil industry workers in this part of the UK.

## 9. INADEQUATE TRANSPORT ASSESSMENT

West Sussex Highways **objected to the application** for the following reasons:

The application is not supported by sufficient highways and transport information to demonstrate that the proposed development will not be prejudicial to the satisfactory functioning of the highway and highway safety. The following items appear to have been missed out of the traffic assessment:

- Vehicles carrying hazardous process water
- Cars/vans during the operational phase
- Vehicles carrying non-crude product (possibly waste) during the operational phase
- Any allowance for maintenance traffic over the operational phase.

**“Lack of precision in the transport information is not reassuring.”**

A very big concern is Broad Walk, the **narrow rural road** which is part of the transport route. In places this BW is so narrow and the camber pitched, it does not allow room for a car to pass an HGV. Last year alone, three HGVs toppled over on the side. (see photo at end of report)

The area around this road has many karstic features which demonstrates a zone vulnerable to contamination. UKOG has failed to note that over 200 **depressions/features** are present in the land to either side of the transport route. For those of us who live here—in and around Stansted Park, these features are most obvious and remarkable.

UKOG’s application makes the presumption that a waste water reinjection well will be permitted. It is highly unlikely that this would be permitted once the seismic tests are analysed.

**We would like to know the revised transport figures based on lack of permitting of waste reinjection well during Phase 2. This would greatly impact the figures and thus scale and scope of the development as well as associated hazards. The lowest estimates would quadruple the traffic movements to/from the site.**

## 10. CUMULATIVE IMPACT

The applicant has only listed one other major development in the area. There are in fact, several new developments within a 4 mile radius that will impact the roads and also the visitors to this particular area of the SDNP. Reference development plans for Warblington, Emsworth, Westbourne and Rowlands Castle with plans for up to 4,000 additional houses.

## 11. ACCIDENTS, SPILLAGE IN ONSHORE OIL AND GAS INCIDENTS

For the oil and gas companies, complying with regulations is expensive and time consuming. And accidents happen. After the 2011 earthquakes at Preese Hall 1 shale gas well near Blackpool, Cuadrilla took six months to inform the government that the well had been damaged (‘ovalised’) over several hundred feet.

Due to lack of permitting by the EA with regard to onshore oil and gas, there has been little regulatory oversight of industry. Due to data privacy, neither the UK Government nor the regulatory authorities publish a publicly available database of onshore incidents. It is, therefore, difficult to ascertain the true scale of incidents at onshore oil and gas wells.

In the offshore industry, there have been **1,768 reported spills, leaks** and unintended releases of oil, gas and chemicals between 1st January 2013 and 6th January 2016. Of those incidents where the volumes of releases were recorded, 465 were oil spills, 444 were chemical spills and 379 were spillages of both substances. **More than a fifth of incidents involved a release of half a tonne or more.** There were at least three recorded rig fires and a further 14 incidents that were assessed as having been at risk of fire and/or explosion. The Health and Safety Executive also issued 124 notices to offshore drilling companies in the same period.

**Up to 16% of hydraulically fractured oil and gas wells spill liquids every year,** according to new research from US scientists. They found that there had been 6,600 releases from these fracked wells over a ten-year period in four states. The largest spill recorded involved 100,000 litres of fluid with most related to storing and moving liquids. <http://www.bbc.co.uk/news/science-environment-39032748>

#### **BEYOND THE PERIPHERY –ACCIDENTS HAPPEN**

Between **2000 and 2013, nine pollution incidents were recorded involving the release of crude oil within 1km of an oil or gas well. Two of these were well integrity failures, which occurred at Singleton oil field, in West Sussex, when the cement casing around the well was breached.**

9 March 2013 Wytch Farm, Dorset

**Approximately 560kg (1,235lbs) of gas and 13,600 litres (2,992 gallons) of crude oil and produced water was released as a spray that covered 10,800 square metres (116,250 square feet) of drill pad and a land management area north east of the site.**<http://www.documentcloud.org/documents/1357172-130410-wytch-farm-sched-5-notif-f-site-separator.html>

This incident, coupled with 2 oil spills and 20 carbon monoxide leaks in 2013 and early 2014 at Perenco's Wytch Farm oil field in Dorset have been disclosed by the Environment Agency via Freedom of Information

**January 8th 2014 Singleton, West Sussex** An estimated 10 litres (2 gallons) of crude oil was released and dispersed as a fine film in the wind beyond the bund when the 12mm stainless steel instrument tubing failed at a compression fitting.

#### **Singleton Oil Field in the 1990s:**

Cement well failure: "The two pollution incidents at Singleton Oil Field (now operated by IGas but operated by a different company when the incidents occurred) occurred in the early 1990s, and were caused by failure of cement behind the conductor and the 9 and 5/8th - inch casing.

The leak paths were remediated by the EA **5 years after a report** of the incident.

**27 January 2014 Manchester Ship Canal, Manchester**

A BBC Inside Out programme revealed that **almost 8,401,000 litres (1,848,000 gallons) of radioactive produced water from the Preese Hall fracking well had been discharged into the Manchester Ship Canal in 2011 after the fluids had been classed as an industrial effluent rather than radioactive waste under the regulations in force at the time.**

3 March 2015 West Newton, East Yorkshire

An investigation into the site revealed 19 environmental permit breaches between July 2014 and January 2015, including 9 cases relating to operational paperwork, 3 cases of late reporting of monitoring data, 1 case of missing data in gas analysis, 1 case of failing to monitor flare temperature, 1 case of off-site odour, 3 cases of breaches of odour management plan and 1 case of activities not carried out in line with permit description.

**Acidisation incident-** a cloud of nebulised Hydrochloric acid from an Exxon Mobil gas flare near the village of Wittorf in North Germany is said to have harmed residents and vegetation, in April of last year. Inhabitants of the local village reported a cloud of what looked like steam and 'terrible smells' around the Söhlingen Z5 well. People even a few km away experienced breathing difficulties, coughing, headaches, red and streaming eyes, inflammation and bleeding pores, burning skin and general malaise. Some were treated in hospital. Exxon Mobil admitted they had flared off the gas 'for technical reasons'.

[http://www.ndr.de/nachrichten/niedersachsen/lueneburg\\_heide\\_unterelbe/index.html](http://www.ndr.de/nachrichten/niedersachsen/lueneburg_heide_unterelbe/index.html)

**UKOG has remarked that gas would be flared off in Phase 2 in emergencies.**

We would like to have details on any emergencies that may arise as well as health and safety procedures in the event of an emergency such as a blowout, spillage, or accident.

**When asked by a member of Markwells Wood Watch what would happen in the event of a leak or spill, UKOG's CEO, Stephen Sanderson, responded that UKOG's "Limited Liability company could not afford to cover the costs, you would simply have to go out of business."**

## **12. WELL FAILURE**

The drilling would go through the freshwater aquifers. This is recognised as one of the most difficult parts of the drilling process. There are concerns about the reliability and longevity of the well casings.

**The site is in a seismic zone and is heavily faulted. The applicant has not provided detailed seismic data necessary to determine safety and risks.**

'Injection wells', into which liquids or gases are pumped, are **2-3 times** more likely to leak than conventional wells.

Wells drilled horizontally as well as vertically have a failure rate **4 times** higher than for vertical wells in the same area. (FOE/Drilling without fail/well failure)

MW-1 well has been abandoned for 6 years. Is the casing intact?

**It is known that all wells fail over time.**

At a similar oil well site at Singleton there was a well integrity pollution incident which took nearly 5 years to fix and was caused by cement bond failure.

We are concerned that the original well may not be fit for the current application purpose. We are not convinced it wasn't stimulated beyond formation pressure at that time. UKOG has not provided sufficient analysis and proof of safety. We would need to see data on past well stimulations, pressures and volume of liquids used in production during the drilling, exploratory and flow test phases.

Recent FOI request for information to the HSE revealed did not conduct ONE site inspection at Markwells Wood when the borehole was first drilled and tested (2010-11)

### **13. REINJECTION WELL & SEISMIC INFORMATION**

It appears that UKOG has based its seismic profiling on seismic material of 1990s vintage which were used for UKOG's Competent Persons Report. These are inadequate for the purpose and do little to address the risks inherent in drilling multiple wells with horizontal sidetracks and a reinjection well in an earthquake zone.

- The applicant has presented an incomplete seismic study with no precise detail of major faulting of geology for PEDL 126 or the relation to stress on infrastructure
- UKOG has failed to offer an updated, high resolution GeoHazards Assessment.
- Faults are complex and unpredictable in their hydrogeological behaviour and should be regarded as conduit for fluids unless proven otherwise.
- We believe it is not possible to state categorically that no further earthquakes will be experienced.
- If horizontal stimulation is carried out, any faults intersected may act as fast-track conduits to the surface for contaminated well stimulation water and released methane.
- Horizontal drilling cannot reasonably be carried out without a proper seismic survey.

A major fault line traverses the PEDL from East to West. It appears that eight fault lines transect the geology of the site which **accounts for fluid loss during previous drilling**. This also accounts for the deviation of the current well which is apparently 56% deviated.

( see addendum notes from the original drilling)

### **REINJECTION WELL**

This planning application includes a fluid injection component and the site is in an area of seismic activity but no consideration for this had been made in the planning application.

The average oil well produces 7.6 barrels of permanently hazardous, toxic water for every barrel of crude. The water/oil ratio can rise to as much as 24:1 or even 42:1 depending on the environment. The deep Limestone such as the Oolite at Markwells Wood is known to have a high water to oil ratio.

The toxins produced in the process water could last more than 100 years.

This waste water would be contaminated with high-levels of salt which can be up to 20 times higher than sea water, and it contains traces of the hydrocarbons that it was found alongside, including chemicals harmful to human health such as benzene and may contain naturally occurring radioactive material.

The fractured carbonate geology at Markwells Wood is particularly ill suited to subsurface disposal of waste.

UKOG's diagrams, especially an important cross section of seismic in the CPR (see addendum) show that there is much pre-Gault faulting in the area, and little or none post-Gault.

**Acid injection could open these faults further by dissolving calcite cement within fault planes.**

The late Professor Bruce Sellwood, expert on the Great Oolite of the Weald, said:

"Meteoric drive down an aquifer will not necessarily reach deeper parts of the basin, but will trigger pore-fluid movement at depth." [Sellwood et al. 1987]. **The implications of this statement are major.**

If low pressure, meteoric drive can trigger pore fluid movement at depth (Selwood), what is high-pressure injected fluids likely to do in an earthquake area? The answer would seem to be simple - the new Chichester Earthquake (2018 or 2019?)

**In simple terms, high water pressure, and/or use of acid dissolving the carbonate minerals on fault planes may cause unlocking of Late Cimmerian faults."** Ian M. West

Wastewater disposal is proven to be the primary cause of the recent increase in earthquakes in the central United States.

The fact that increased pore pressure at depth resulting from fluid injection can trigger slip on preexisting, already-stressed faults is well documented (9–13), and the mechanisms by which triggered fault slip occurs are generally well known (9). Simply put, increased fluid pressure decreases the effective normal stress on a fault. [https://scits.stanford.edu/sites/default/files/walsh\\_zoback\\_science\\_2015.pdf](https://scits.stanford.edu/sites/default/files/walsh_zoback_science_2015.pdf)

“An unprecedented increase in earthquakes in the U.S. mid-continent began in 2009. Many of these earthquakes have been documented as induced by wastewater injection. We find that the entire increase in earthquake rate is associated with fluid injection wells.”

<http://science.sciencemag.org/content/348/6241/13>

## **WASTE AND SURFACE WATER**

The volumes of waste water generated and the kinds of contaminants it contains makes treating and disposing of it safely extremely challenging. Treatment of waste water is expensive and energy intensive, and still leaves substantial amounts of residual waste that then has to be disposed of. In addition the waste water from most sites would have to be transported large distances to specialised treatment plants.

**The applicant has provided insufficient information on waste disposal.** There is inadequate detail of waste, character, disposal and transport in both Phase 1 and Phase 2.

**The applicant has not properly considered storage for heavy rainfall or an elevated water table. This is not adequately represented in traffic movements to/from site.**

**How does UKOG intend to manage the waste water in Phase 2 if the reinjection well is not permitted? UKOG is proposing that Markwells Wood would essentially become a Class 2 Hazardous Waste Disposal Facility and Incineration Plant due to waste water and flaring.**

We would need to know the **revised transport figures** based on lack of permitting of waste reinjection well during Phase 2. This would greatly impact the figures and thus scale and scope of the development as well as associated hazards.

**SUBSURFACE KNOWLEDGE:** NERC is setting up a research project *The Energy Security and Innovation Observing System for the Subsurface (ESIOS) capital project* “The research aims to understand how the underground environment could respond to disturbance caused [...]by unconventional oil and gas” among other forms of energy exploitation; and, “there is ***an urgent need for an improved evidence base to inform decision making by government, industry and civil society***”. The commissioning of the ESIOS project will follow from **early 2017**. So, still no answers to all those sub-surface issues.

## **WHAT WE DO KNOW; NEARBY EARTHQUAKES REPORTED:**

The Chilgrove Earthquake, 14th Dec 2012, magnitude 3 earthquake, epicenter Chilgrove which is walking distance from Markwells Wood. This was felt as far away as Brighton

*“As you know the Markwells oilfield is bounded by a roughly east-west Intracretaceous fault, downthrowing north by roughly 200 ft. The relatively minor Chilgrove Earthquake of the 19th Dec. 2012 could, unproven, have been on an*



*eastward extension of this fault. Some questions arise. Does the Markwells fault extent to Chilgrove? It would be concealed under the Chalk, so a subsurface map extending east is needed. Replacing oil with water in the area just north of the fault changes the loading.”( I.W. to E.M)*

2011 14th July earthquake in English Channel (affected Portsmouth) 3.9 magnitude There were reports of buildings shaking . In the region there have been a: 4.5 magnitude quake in 1734, 5.0 quake in 1850 , magnitude 4.3 quake in 1750, Too small to cause major damage or casualties but the possibility of more serious incidents cannot be ignored.

**“Chichester is the onshore centre for earthquakes in the south of England. Most of them are small, but there are historic indications of a six. The Dorset coast has been affected as a distant area of the Chichester Earthquake. The New Forest has been affected. The worst that is believed to have happened in historic times was the very severe Chichester Earthquake which destroyed the tower on the top of Glastonbury. The earthquakes are roughly centred around Chichester, but not exactly at the centre of the town. One that affected Ventnor on the Isle of Wight has been regarded as a variant of a Chichester Earthquake. The probable reason for the quakes is that there is a major fault system running across the English Channel from Chichester generally southward. More specifically It is probably the Bembridge - St. Valery Line. This separate the Portland - Wight oil basin from the Weald oil basin.”**

Extract from the British Geological Survey - Hazard Webpage

"There are also important centres of activity near Chichester and Dover. The former produced a swarm-like series of small, high-intensity earthquakes in the 1830s and was active again in 1963 and 1970."

Although these earthquakes are usually relatively small, they can still cause minor structural damage and of particular concern is the possibility of damaging the well casings thus risking leakage. This did in fact happen after the earthquake at Cuadrilla's site in Lancashire, UK. The company failed to report the damage and were later rebuked by the then UK energy minister, Charles Hendry.

**What are UKOG's mitigation plans for seismic activity?**

#### **14. TECHNICAL COMMENTS ON PROPOSED WELL STIMULATION:**

There is a **lack of meaningful information** with regard to well stimulation methods. Further details are needed:

- Range of acid volumes applied per treated foot and total acid volumes used in treatments, types of acids, acid concentration are omitted
- Atmospheric emissions, including potential greenhouse gas emissions, the potential degradation of air quality. We have seen no mention of the amount of CO<sub>2</sub> emissions expected as a result of acidisation with HCl. This is likely to be significant.

- UKOG states there will be no hazardous bi-products. We are not sure which aspect of the acidisation process this covers. There may be hazardous byproducts in all stages. They do not say there will be no **hazardous products**
- Projected volume of flowback and details on hazardous waste treatment
- Where will the flowback waste be treated? There are currently no facilities to treat hazardous liquids in the south of England so this would have to be transported North. This is both costly and potentially hazardous.
- We see no mention of volumes of waste from production and how many tanker movements this would involve.
- UKOG's application states they will be injecting fluids into 2 metres of the formation. This would be considered matrix acidisation
- UKOG have not detailed volume of acids and have not disclosed any of the chemicals, pressure, or porosity. Knowing the amount of fluids they're using (water plus acid) and what pressures they are planning to operate under are critical to understanding how far they're targeting into the formation. **The application at Markwells Wood is for potentially 4 horizontal sidetrack wells of 1,000 metres which could mean 82,021 - 820,210 gallons of acids per well.**
- Does the HDPE material resist strong acids?
- Studies do find that acids are not always fully neutralized in the well. Would the acidizing would be completed (fully reacted) before the calcium chloride solutions would be transferred to Horndean? If not further leaching would occur at Horndean or in Phase 2, in the reinjection well.
- UKOG has neglected to list atmospheric emissions from the acidic reaction in the well and the potential degradation of air quality. The huge volume of carbon dioxide (with acid fumes) at Markwells Wood will be flared into the atmosphere. This is unacceptable.
- Oil and gas drilling is a messy and imprecise business. Oil drillers, for example, often hit pockets of unwanted natural gas, which they simply vent into the atmosphere. (Sometimes the gas, largely methane, is burned off, a process known as "flaring.") Fugitive methane emissions are a big problem, though. For starters, methane is an extremely powerful greenhouse gas, 86 times more powerful than carbon dioxide over 20 years. Leaks are often accompanied by other hydrocarbons, like benzene, which are carcinogenic. **The flaring of methane at Markwells Wood goes against park policy of sustainable developments.**
- In its comments regarding the application, PHE assumes that the risks will be mitigated by UKOG. However, PW and the EA have objected to the application due to the fact that the risk assessment was inadequate. UKOG's second risk assessment is also inadequate. I believe the HSE have been presented with a misleading application and as such they have not been able to adequately understand the real risks.
- Acidising horizontal wells is done in many stages. The pre-flush or acid wash cleans out corrosives in the well. After the wash there is main flush, post flush and often an over flush. In addition, each well can be re-stimulated and hence there an accumulation of chemicals that is more than in hydraulic fracturing. **There have been no studies conducted in the UK on the cumulative effect of these chemicals and how this might impact the geology, environment or human health.**

## 15. REGULATION/ ACIDISATION

Although acidisation has been used for onshore and offshore operations in the UK for a couple decades, it has occurred mostly under the radar and without proper regulatory scrutiny. Acidisation technology has advanced quickly while scientific study on how it impacts our environment and human health remains unknown.

The lack of study and information in relation to acidising techniques is even more pronounced than in relation to fracking. As noted in a recently issued study of acidising in California, “[while researchers have begun exploring the potential impacts of hydraulic fracturing more seriously, impacts from acidizing are not being examined as closely. It is important that acidizing be a bigger part of the discussion to protect the public and environment from potential harm.” Khadeeja Abdullah, Timothy Malloy, Michael K. Stenstrom & I.H. Suffet (2016)

When this application is examined in the context of what we consider to be a historically weak regulatory system, as has been the case in the UK with regard to acidisation, it presents a potentially risky scenario.

Extracting oil from tight reserves at such depths and reach is complex, difficult, costly and risky. An array of chemicals are needed for this process including: chemical corrosion inhibitors, cationic surfactants to inhibit sludge (emulsification), mutual solvents, friction reducers, acid fluid loss additives, diverting agents, iron control agents, clay stabilizer, calcium sulfate inhibitors, scale inhibitor, pH adjusting agent, clean up additives and biocides.

Despite telling a member of MWW at their informational meeting in July that a list of chemicals would be sent, and repeated claims that they were being transparent, UKOG has failed to provide us with a list of chemicals they intend to use.

**There have been no studies conducted in the UK on the cumulative effect of these chemicals and how this might impact the geology, environment or human health.**

## **CHEMICALS**

Analysing chemicals provides only part of the information needed to assess risk. Additional information on concentrations, synergistic interactions, exposures, and more are also needed to assess risks and environmental impacts from well stimulation treatments.

UKOG claims that the acids will be neutralised but not all acids are always neutralised. Return flowback (tested in the US) have been reported to have pH in the range of 0 to 3. (Please see addendum on lack of data)

During these treatments heavy metals, salts and radioactive material can be mobilized from the formation, by chemicals in the injection fluid. These flowback fluids are likely to contain additional pollutants and pose additional impacts, especially in the acidizing context.

## **16. HEALTH CONSEQUENCES**

Because of the paucity of specific environmental regulation with regard to oil and gas industry, and in particular, acidisation, the EA has not been obliged to monitor, track or regulate well stimulation activities. The exception would be industry self-reported incidences (well failure, accidents, spillages, contamination). There has been no permitting of chemicals, well stimulation methods, data collection on water abstractions and hence little disclosure of chemicals, monitoring of produced fluids or scrutiny of the most contentious aspect of the process of underground injection.

If there were to be a spillage, leak, accident or migration of well stimulation fluids during any aspect of the drilling or production of oil, or in transportation to and from the site, the aquifer may be contaminated and as such, human health could be severely impacted.

There are a number of potential human health hazards associated with well-stimulation-enabled oil and gas development with regards to air quality, water quality, and environmental exposure pathways.

If there are leakage and emission pathways then it is nearly impossible to assess the risk because of the large number of chemicals, incomplete knowledge about which chemicals are present, how long these compounds persist and what their environmental and human health impacts are.

Researchers and the public need access to sufficient levels of information on all chemicals involved in well stimulation, to begin an assessment of the toxicity, environmental profiles, and human health hazards associated with acidizing stimulation fluids.

Chemicals in recovered fluids and produced water may be toxic, persistent, or bioaccumulative. Spills and leaks of undiluted acids may present an acute toxicity and corrosivity hazard. The use of acid can also mobilize naturally occurring heavy metals and other compounds that are known to be health hazards and these compounds could therefore be present in recovered fluids used in enhanced petroleum production.

## **17. OTHER HAZARDOUS WASTE**

Additional constituents are being mobilized from the formation and their chemistry and toxicity are unknown. Quantifying the risk from discharging these fluids is not possible without this information.

**There would be a vast amount of CO<sub>2</sub> released when the acid and carbonate react underground.**

**UKOG should provide the figure for CO<sub>2</sub> equivalent gases.**

## **CRUDE OIL IS HAZARDOUS**

Crude oil is a complex material with a very variable composition; therefore the hazards of crude oil such as flammability and ecotoxicity are also variable. Crude oil is typically classified as 'Hazardous to the Aquatic Environment in category

Aquatic Chronic 2 (H411)', which makes it a dangerous substance under the COMAH regulations.

Remediation of crude oil from the aquifer is difficult, owing to sorption and entrapment of the oil in the pore spaces within sediments.

Portsmouth Water states on their website: "If groundwater becomes polluted it is extremely difficult, and sometimes impossible, to clean it up to its original quality. In the extreme it can lead to Portsmouth Water shutting down sources used for public water supply. There are also environmental risks concerning damage to the many protected areas, such as the South Downs National Park and the Chichester and Langstone Harbours".

## 18. DATA GAPS/ UNSOUND SCIENCE

There are significant data gaps and lack of scientific understanding of all aspects of acidisation. The potential direct environmental effects are unknown. A more complete **hazard assessment** must include physical, health, and environmental hazards. Other factors that must be considered to fully evaluate hazards associated with these chemicals include eco-toxicological effects, endocrine disruption, bioaccumulation, environmental transformation, and the properties of mixtures of compounds.

Through FOI requests we have learned that there have been few acidisation studies in the UK. California is a few years ahead in terms of regulation for advanced well stimulation methods and in the state legislature commissioned a comprehensive study. **The main conclusion from their two year study is that there were significant data gaps due to lack of regulation (just as in the UK) and the need for further research.**

***Investigators could not determine the groundwater quality near many hydraulic fracturing (and acidizing) operations and found that existing data was insufficient to evaluate the extent to which contamination may have occurred. California needs to develop an accurate understanding about the location, depth and quality of groundwater in oil- and gas-producing regions in order to evaluate the risk of well stimulation to groundwater.***

[http://ccst.us/projects/hydraulic\\_fracturing\\_public/BLM.php](http://ccst.us/projects/hydraulic_fracturing_public/BLM.php)

**There are no published studies on subsurface release mechanisms including acid wormhole pathways in the rock formation leading to aquifers, fault pathways leading to aquifers, deteriorated abandoned wells leaking into the subsurface, and the failure of production or disposal wells with regard to acidisation.**

Oil companies use dozens of extremely hazardous chemicals to acidize wells in California, raising water contamination and public-safety concerns, according to a new study in the [Journal of Toxicological and Environmental Chemistry](#). Researchers at UCLA's Institute of the Environment and Sustainability found that at least 28 of substances used in acidisation are F-graded hazardous

chemicals - carcinogens, mutagens, reproductive toxins, developmental toxins, endocrine disruptors or high acute toxicity chemicals.

“Acidizing is one of the most widely used processes for stimulating oil and gas wells, according to the American Petroleum Institute, but this appears to be the first scientific study ever to closely examine the toxicity of chemicals used in the process. California is the only state requiring public disclosure of acidising chemicals, and that disclosure only began recently. “

**The study notes that acidising chemicals can make up as much as 18 percent of the fluid used in these procedures. Each acidisation, researchers note, can use as much as hundreds of thousands of pounds of some chemicals.**

## **19. IS ACIDISING SAFE?**

UKOG claims that this is a tried and true, safe method.

As I've demonstrated, acidisation has occurred in the UK for decades but has not been permitted so there is currently little data held by the EA on any wells in this region (Horndean, Markwells, Singleton, etc.) There is no chemical data, no testing or monitoring of flowback, or information on water abstraction, reinjection. (see appendix)

Many chemicals used in acidisation have data gaps, chemicals are listed as trade secrets; others have no toxicological or even basic chemical property information available. As for chemicals with known hazardous endpoints, the amounts used are substantial and create high toxic loads per treatment. The high acidity creates uncertainties as to how chemicals will transform or how much heavy metal will leach out.

Unlike hydraulic fracturing fluid, where chemicals make up only 0.5% of the fluid acidizing chemicals (acids and other chemicals, not including silica in acid fracturing) can make up 18% of the fluid.

**These concentrated fluids have a greater impact than diluted hydraulic fracturing fluid.** Microbes are not as effective at breaking down organic chemicals at higher concentrations, making them more persistent in the environment (Kekacs et al. 2015). Furthermore, **new research is beginning to show that biocides that are used in unconventional oil stimulation techniques are also not effective at higher concentrations, possibly contributing to bacterial resistance to antibiotics** (Kahrilas et al. 2015; Vikram, Bomberger, and Bibby 2015)

**Through Freedom of Information, I asked the EA a series of questions which remain mostly answered. This is due to the fact that there was little permitting to date and hence no regulation, monitoring required of oil and gas industry.**

**( Q+A available at the bottom of this report.)**

**These data gaps are vital to understanding and too significant to ignore.**

## 20. ORPHAN WELLS

### **Well barrier failure and well integrity is an issue.**

Monitoring of abandoned wells does not take place in the UK and less visible pollutants such as methane leaks are unlikely to be reported. A recent report in the US showed it is possible that well integrity failure may be more widespread than the presently limited data show.

Oil, natural gas and brine seeping from the old wells can pollute groundwater, and flow to the surface to contaminate soil, rivers and lakes. Natural gas leaked from an abandoned well is a potent greenhouse gas. In 2011, a **Groundwater Protection Council study found that abandoned wells caused 41 incidents of groundwater contamination in Ohio between 1983 and 2007, and another 30 in Texas between 1993 and 2008. None of those incidents was related to fracking.**

A U.S. Geological Survey study from 1988 found that brine from abandoned wells polluted part of the groundwater supply for 50,000 people in West Point, Kentucky, and nearby Fort Knox. <http://www.gatehouseprojects.com/project/abandonedwells/> Who would pay for the monitoring? “Up to 53% of the 2,152 hydrocarbon wells which were drilled onshore in the UK between 1902 and 2013 were drilled by companies that no longer exist, or have been taken over or merged” <http://www.bbc.co.uk/news/science-environment-26692050>

**UKOG is apparently a Limited Liability company so would not expect to take care of any chronic contamination.**

## 21. BATS

A detailed bat survey has not been carried out.

Bechstein's bats are considered one of the rarest mammals in the U.K. They are listed on Annex II of the EC Habitats and Species Directive (JNCC, 2007) and are a Biodiversity Action Plan priority species. It is also listed as near threatened on the IUCN red list (IUCN, 2011). The European Habitats Directive requires the creation of Special Areas of Conservation.

We consider that these are of more than "County local value". There is evidence in Markwells Wood Watch's detailed ecological response that Bechstein bats could be roosting in the vicinity and that further surveys are needed.

## 22. CLIMATE CHANGE

The data submitted on vehicle movements has been criticised extensively by West Sussex Highways Authority. In the light of this the CO<sub>2</sub> figures relating to vehicle movements are likely to be underestimated.

**The National Park's objective 4 is, "to adapt well to and mitigate against the impacts of climate change and other pressures" (Local Plan p.26) and the NPPF has the aim, "to support the move to a low carbon future" (para.93).**

**The amount of energy used to develop this site and to produce and transport hydrocarbons as well as the possible energy used to mitigate for pollution control would far exceed the national limits.**

The figures offered by UKOG refer only to CO<sub>2</sub>. Other greenhouse gases, while they may be emitted in smaller quantities, have a much greater greenhouse effect. Methane, which will be emitted from the well, can have 25-30 times the greenhouse effect of CO<sub>2</sub>. We understand that some of the methane will be flared and burned off as CO<sub>2</sub>. What will be the level of additional methane and NO<sub>x</sub> emissions that escape into the atmosphere?

## **CONCLUSIONS**

**In the light of the evidence provided in Dr Foley's report it follows that the vulnerability and status of the aquifer beneath Markwells Wood should be reassessed and that it should be awarded the protection afforded to Source Protection Zone 1.**

No mitigation nor regulation could provide adequate protection in a karstic setting.

We are told by the authorities that the UK apparently has the most stringent regulations, in fact, "gold standard" In comparison with the US. This reason is used as an argument by planners in favour of applications for unconventional well stimulation methods of hydraulic fracturing and acidisation currently being considered.

Unfortunately, as I have demonstrated, the opposite is true. Matrix acidisation and acid fracturing has been essentially unregulated and unmonitored in the UK . Because of this lack of dedicated regulation, contentious aspects of acidisation have not been addressed.

Furthermore, data gaps and lack of scientific studies with regard to acidisation is such that there is no evidence that this form of advanced well stimulation can be conducted without significant risk to the environment and human health.

Although I am heartened that there appears to be more scrutiny as of 2017, the evidence of past oversight and the resulting lack of peer reviewed studies on the impact of the extreme well stimulation methods of acidisation should be reason for refusal of planning.

This application may be temporary yet the scale of this development would adversely effect the character of this rural landscape and the risks may have lasting effects with wider impacts on hydrology and surrounding ecosystems.

The fact that UKOG is not proposing to hydraulically frack at Markwells Wood is irrelevant when one realizes that acidisation poses the same if not more risks. Industry will effectively regulate itself, which is inappropriate for a relatively new industry involving high-risk activities which therefore requires independent regulation and inspection.



Throughout this entire application process, UKOG have consistently downplayed their operations and the risks involved. They have misled the public, SDNP planning, consultees, the press, our councilors and MPs. **We are very concerned about UKOG's integrity and question their ability to operate in an ethical and responsible manner. This is crucial in a system where industry is widely left to self-monitor.**

The SDNP seeks to promote conservation and sustainable use, to ensure that these essential natural services are protected and enhanced now and for the future. Recognizing the importance of biodiversity in terms of resilience building is at the core of the parks strategy.

The SDNP also highlights environmental corridors or stepping stones which "provide a mosaic of habitats allowing species to move between core areas". Markwells Wood is one such area, as demonstrated in Markwells Wood Watch's Ecological report and highlighted by West Sussex Wildlife Trust and The Woodland Trust, CPRE and Friends of the Earth.

It is imperative that we recognize the importance of this application with regard to safeguarding the park from future industrialization.

**Restoration of Markwells Wood should form part of the park's priority action as set out in the SDNP climate change Adaption Plan.**

**We call on the park to honour its plans through restoration and enhancement of the Markwells Wood habitat by rejecting this application.**

### **Recourse to the precautionary principle**

The precautionary principle, or precautionary approach, to risk management states that:

"If an action or policy has a suspected risk of causing harm to the public or to the environment, in the absence of scientific consensus that the action or policy is not harmful, the burden of proof that it is not harmful falls on those taking an action."

Recourse to the principle belongs in the general framework of risk analysis (which, besides risk evaluation, includes risk management and risk communication), and more particularly in the context of risk management which corresponds to the decision-making phase.

**We contend that the Precautionary Principle should be invoked in this case with the highest level of environmental protection and that this application should therefore be refused.**

My sincere thanks for your time considering these points and for your dedication to protecting the South Downs National Park.

Emily Mott, Markwells Wood Watch  
markwellswoodwatch@gmail.com

Evidence: [Environment Act 1995, Clause 61 1b](#) [English National Parks and the Broads: UK Government Vision and Circular 2010, DEFRA](#)  
[NPPF Paragraph 109, NPPF Paragraph 115 +116, 118, 123, 134,144, 147](#)  
[Planning Practice Guidance issued 6<sup>th</sup> March 2014 to accompany NPPF](#), para 223  
[South Downs National Park Partnership Management Plan Policy 1, 3,40, 55, 56](#)

[he South Downs National Park Vision –special qualities](#)

**Evidence:** SDNP Partnership Management Plan 2014 -19; Policies 23-24/ Policy SD15

Groundwater Framework, Local Plan/Water Resources; NPPF para. 120 and SDNPA emerging Local Plan policies 15 and SD59 (contaminated land) with para. 10.262. This application is contrary to NPPF, Paragraph 11,118 Conserving and enhancing the natural environment. UKOG has not adequately shown that any detrimental effect on the environment, the landscape and recreational opportunities could be avoided and therefore is contrary to Paragraph 133 of the NPPF. The *National Planning Policy Framework* paragraph 109 states that the planning system should contribute to the natural and local environment by preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels water pollution. Reference: Water Framework Directive, the Groundwater Directive and the Habitats Directive -The Waste Framework Directive 2008 Directive 2008/98/EC on waste/The Drinking Water Directive 1998/Directive 98/83/EC on the quality of water intended for human consumption/The Air Quality Framework Directive 2008 Directive 2008/50/EC on ambient air quality assessment and management-EU Management of Waste from Extractive Industries (2006/21/EC)

### **Omissions/Mistakes**

The graph provided (attached) gives incorrect measurements which would make the drilling of the sidetrack placed in the middle of the aquifer. This gives measurements in feet rather than metres so that the horizontal well is too close to the aquifer. This mistake is blindingly obvious. Another possible mistake is that the original MW-1 well is represented as 15% deviated rather than the 56% deviation. **We have read that the reason for this extreme deviation is the fact of a major fault line running through the PEDL. (see attachment).**

The well casing that is running will inevitably be perforated and fluids will be put through these perforations yet UKOG insists that this will not be done under pressure. Again, why do they only describe the acid wash phase and ignore the stimulation of the formation? **We would like to see more precise details on pressure and volumes of stimulation fluid.**

The description of the stimulation in the amended application mentions a target formation of 1,000m below the aquifer which would be the Kimmerage. This contradicts previous information given describing the Oolite strata. This should be clarified.

This is a significant omission. The target formation at Markwells Wood is the Gr. Oolite which is at approximately 1,600m. Any stimulation of the carbonate at this depth that is effective in releasing hydrocarbons may also liberate naturally occurring heavy metals, etc. (see below). This flowback would be classified as hazardous.

#### QUESTIONS ABOUT ACIDISATION/ EA FOI REQUESTS OCT 2016

Until the current regulatory regime, the EA has not been obliged to monitor, track or regulate well stimulation activities. The exception would be industry self reported incidences (well failure, accidents, spillages, contamination). There has been no permitting of chemicals, well stimulation methods, data collection on water abstractions and hence little disclosure of chemicals, monitoring of produced fluids or scrutiny of the most contentious aspect of the process of underground injection.

**Through Freedom of Information, I asked the EA the following questions which remain mostly unanswered..**

-How much water, and from what sources is used in well stimulation treatments? Please distinguish between hydraulic fracturing, acid wash, matrix acidisation, acid fracturing, etc. **(No records/monitoring)**

- Which disposal method or methods are used for wastes and wastewater generated by well stimulation treatments?**(no monitoring or records in the past . Waste permits not required. This has changed so if a company admits to their stimulation process, a waste permit and insurance would be needed)**

-Is any information available regarding the safety, efficacy, necessity and risk analyses of well stimulation treatments? If so, please list.**(no records available.)**

-Is any information available regarding potential risks to occupational or public health and safety associated with well stimulation treatments? If so, please list **(no records)**

- **There are no published studies on subsurface release mechanisms including acid wormhole pathways in the rock formation leading to aquifers, fault pathways leading to aquifers, deteriorated abandoned wells leaking into the subsurface, and the failure of production or disposal wells**

-The hazard that a material may present if released to the environment is assessed using a number of criteria, including the toxicity of the chemical to aquatic species selected to represent major trophic levels of aquatic ecosystems. What criteria is used by the EA to test for hazardous material?  
**(no studies on toxicity of acid stimulation or flowback fluids to aquatic species)**

- Experimental tests against aquatic species are an important component of an ecotoxicological assessment. Please list what kind of tests the EA conducts against aquatic species with regard to possible groundwater testing and

monitoring. Please be specific about the assessment process. **(no studies on toxicity of acid stimulation fluids or flowback )**

- Please can you list any data held on the concentrations and composition of the returned stimulation fluids in both the recovered fluids and produced water during well stimulation activities involving acids. **(no data has been collected)**

- How do you test /measure recovered fluids and monitor produced water, which is likely to contain some of the stimulation fluids and their degradation byproducts? **(no testing, monitoring, data collection)**

- How do you consider impurities in industrial-grade chemicals during an evaluation of the hazards associated with well stimulation, in particular acidisation?

- Impurities are frequently residual feedstock materials from the manufacturing process or solvents and other materials added to control product consistency or handling properties. Chemicals can be added at hundreds and sometimes thousands of mg kg of fluid. Even the impurities, which are not specifically added for a purpose directly related to well stimulation, can occur at high concentrations in well stimulation fluid. For example, magnesium chloride and magnesium nitrate are inactive ingredients (e.g., impurities) found in biocides containing 2-methyl-3(2H)-isothiazolone and 5-chloro-2-methyl-3(2H)-isothiazolone (Miller and Weiler, 1978).

Even though impurities are not added specifically for well stimulation, they must be considered during an evaluation of the hazards associated with well stimulation. How does the EA consider impurities during an evaluation of hazards? **(there has been no collection of data nor evaluation of fluids)**

- What kind of peer reviewed studies do you have regarding the dissolution and mobilization of naturally occurring heavy metals and other pollutants from the oil-bearing formation, specifically with regard to acidisation (acid wash, matrix acidisation or any form of well stimulation using acids)? **(no data, no studies)**

- How does the EA analyse the chemicals being injected and the fate and effect of well stimulation fluids in the subsurface? **(no data, studies)**

- Please list any studies conducted by the EA with regard to the composition of fluids returning to the surface as return flows and produced water with regard to well stimulation fluids using acids. **(no data, no studies)**

- Please can you list any data on the pH of returning waste/recovered fluids during well stimulation involving acids? What kind of tests are required when testing this flowback water? **(no data, no studies)**

- What kind of acids and at what volumes are typically used in well stimulation activities in the UK? Please can I see data collected from acid washes, matrix acidisation and acid fracturing? **(no data from acidisation)**

- Who is responsible for monitoring pressure of injection fluids with regard to acidisation, well stimulation using acids and do you have data on pressures applied during well stimulation activities at Horndean, Markwells Wood, Singleton (**no records available, self monitoring**)

10. Who will monitor this development? The oil and gas sector are left to self monitor their sites. I asked the HSE through FOI for records of site inspections with regard to well integrity and routine safety and received this response:

**“HSE has not conducted any risk assessments regarding well integrity at any of the wells at the Horndean, Singleton and Markwells Wood. HSE does not carry out risk assessments on behalf of operators, but may inspect assessments carried out by them.**

**HSE has no records of any site monitoring or inspections of the Markwells Wood 1 and Horndean well sites carried out by us.**

**HSE does not hold any data or details of the well stimulation methods used at Markwells Wood or Horndean with regard to well operations.”**

Environmental Information Request Reference No: 201702075 (E.Mott/HSE)

For further reading: [Acidizing Oil Wells, a Sister-Technology to Hydraulic Fracturing: Risks ...](#)Abdullah, Khadeeja

California Council on Science and Technology (CCST) independent scientific assessment of well stimulation treatments

[http://ccst.us/projects/hydraulic\\_fracturing\\_public/SB4.php](http://ccst.us/projects/hydraulic_fracturing_public/SB4.php)

<https://drillordrop.com/everything-you-always-wanted-to-know-about-acidising-detailed-study-by-kathryn-mcwhirter/>

<http://escholarship.org/uc/item/6z9238sj>

**Further easy reading**

[Conducting the acidizing procedure](#), article by PetroWiki. Do not try this at home, exciting as it sounds...

[Very readable paper on acidising carbonate formations](#), from Schlumberger, Middle East and Asia Reservoir Review

[The American Petroleum Institute on acidising](#)

[Swabbing](#) (sometimes needed after acidising to make a well flow)

**Blowouts**

[Letter from a North Sea rig worker on a gas blowout in Total's Elgin Field](#)

from People and Nature

**Geology**

[Dr Ian West of Southampton on Weald geology](#)

**Industrialisation**

<http://www.sierraclub.org/sierra/green-life/let-it-burn-congress-allows-flaring-venting-methane-gas>

[Shale: A New World Oil Order](#) UKOG Executive Chairman, Stephen Sanderson discusses the need for continual drilling of back-to-back wells [Link to video](#)

[Analysis of potential oil industry across the Weald](#) – DrillOrDrop report

**Waste water, flowback and produced water**

Engineer John Busby on the [dilemma of treatment and disposal of water](#)

Well Failure

<http://www.foe.co.uk/sites/default/files/downloads/drilling-without-fail-review-empirical-data-well-failure-oil-gas-wells-46473.pdf>

**New technology**

**SqueezeFrac**

<http://fishbones.as/>

**Volumes of well fluid**

[http://eprints.port.ac.uk/13312/1/Guide\\_to\\_Fracturing\\_r1.pdf](http://eprints.port.ac.uk/13312/1/Guide_to_Fracturing_r1.pdf)

**California**

[\*Acidizing Oil Wells, a Sister-Technology to Hydraulic Fracturing: Risks, Chemicals, and Regulations\*](#), paper by Khadeeja Abdullah

[Why Oil Companies Want to Drop Acid In California](#)

**Wressle, North Lincolnshire**

[http://www.huffingtonpost.com/2012/01/16/waste-water-barrel\\_n\\_1208587.html](http://www.huffingtonpost.com/2012/01/16/waste-water-barrel_n_1208587.html)

[Link to planning application documents](#)

[Summary of proposals](#) – DrillOrDrop report

**Markwells Wood, West Sussex**

[Link to planning application documents](#), including objections from the Environment Agency and Portsmouth Water



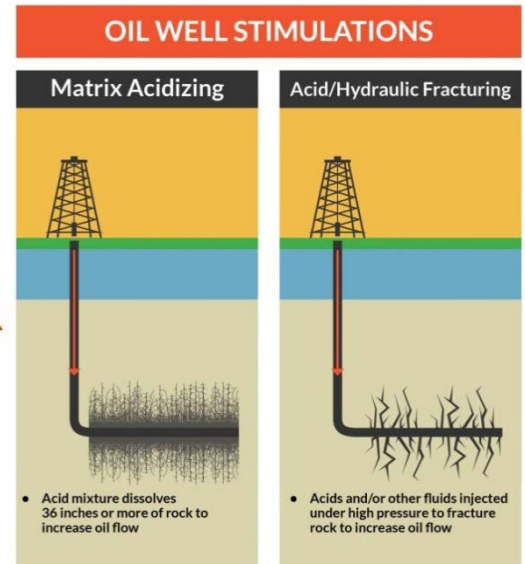
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# Matrix Acidizing: Too Risky For Florida

**Matrix acidizing is a form of well stimulation, which uses methods similar to fracking.**

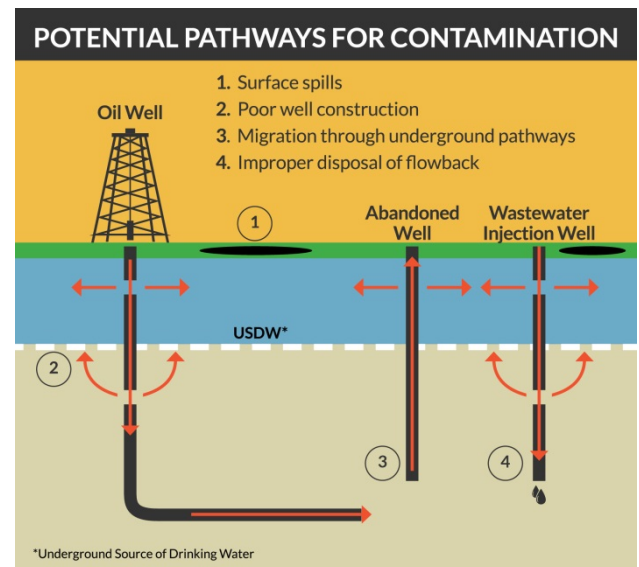
Well stimulation is an umbrella term that captures any operation at an oil well whereby fluids are injected into the rock formation in order to increase the production or recovery of an oil and gas well. Matrix acidizing involves a lower pressure than acid or hydraulic fracturing. It dissolves the rock, rather than fractures it. These well stimulation techniques all involve large quantities of freshwater, chemicals, and are untested in Florida's unique geology and hydrology.



**Fracking and fracking-like techniques are risky and need to be banned in Florida.**

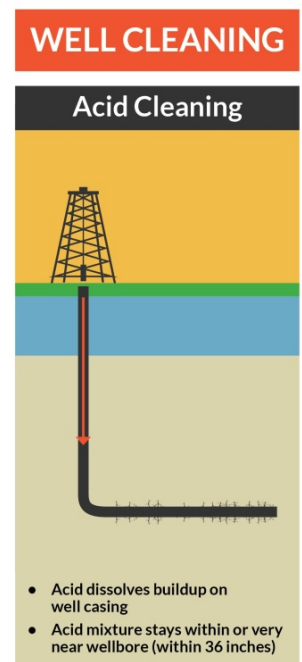
The fluids used in well stimulations contain numerous chemicals, many of which are toxic to humans. These chemicals can cause eye and skin irritation, organ damage, cancer, and other adverse health effects. Pollution of our water resources from these chemicals and from the oil itself can arise in any number of ways, from surface spill to contamination of aquifers through improperly constructed or plugged wells.

Further, these techniques utilize large amounts of potable freshwater in their operations. This water cannot be recycled into the natural system once combined with toxic chemicals and underground elements. Instead, it becomes a toxic byproduct and must be disposed of, which involves underground injection – a potential pathway to contamination itself. Florida has a naturally porous geology and use of these techniques, including matrix acidizing, pose an untested risk to Florida's water resources. Additionally, our relative flat topography, rain-driven aquifer recharge, limestone geology, and inconsistent confining layers make all forms of well stimulation risky in Florida.



**Banning matrix acidizing would not restrict routine well cleaning.**

Routine oil well cleaning can also involve the injection of acid into a well. However, the intent of such cleaning is to remove scale and other debris built up in the wellbore. Unlike matrix acidizing treatments, cleaning operations do not target deep into the rock formation. By rule, cleaning operations could be distinguished from matrix acidizing stimulation if the amount of acid used does not dissolve the rock formation more than 3 feet beyond the well bore (in either direction). Treatments that fall below this acid volume threshold can be defined as routine cleaning operations; those that are above this threshold are well stimulation treatments that should be banned.





Low-Permeability Reservoir

High-Permeability Reservoir

Medium to light oil

**Tight Oil**  
Horizontal Drilling  
Stimulation

**Conventional Oil**  
Vertical Drilling

Heavy Oil

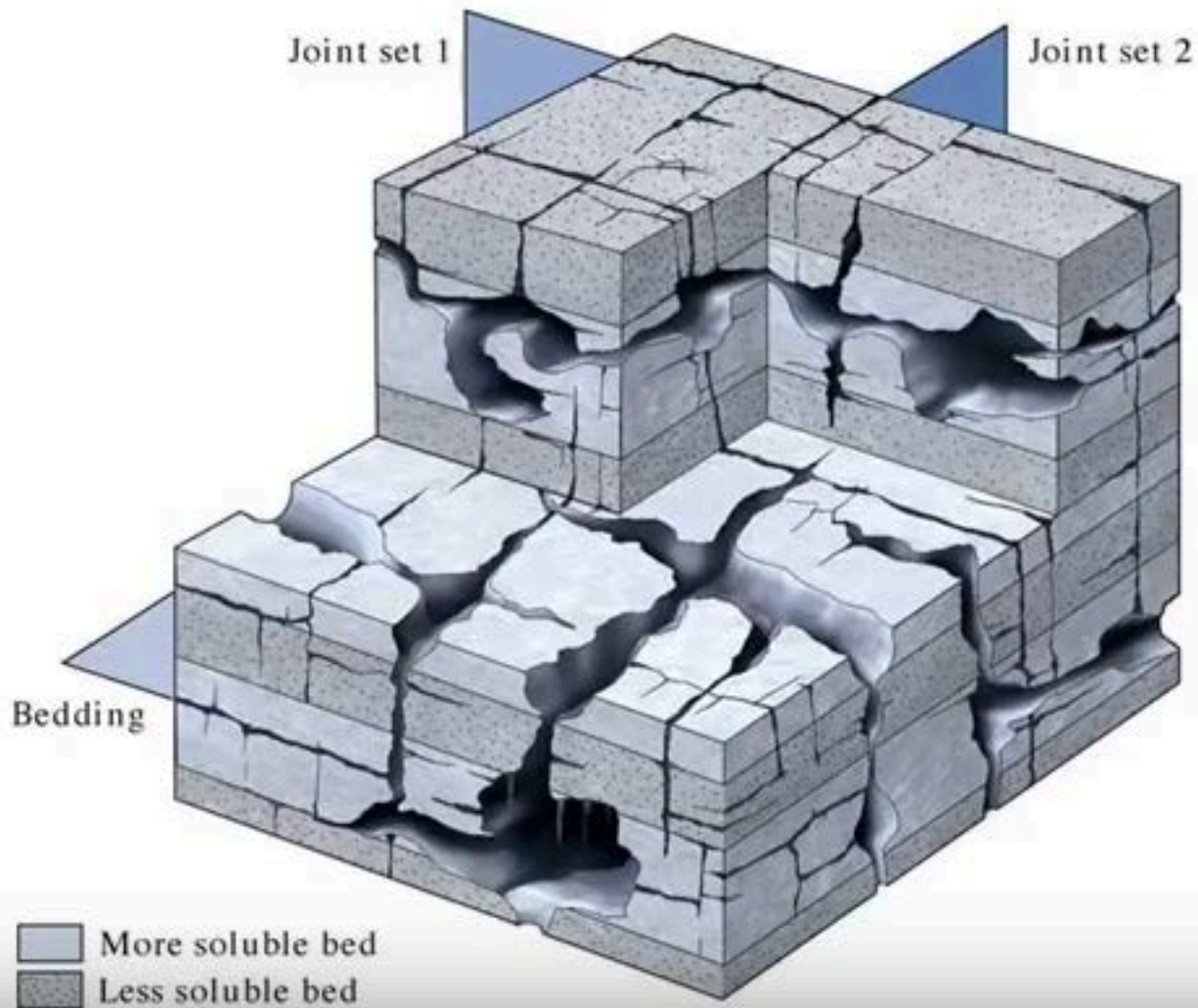
**Immature Oil**  
**"Oil Shale"**  
Mining

**Heavy Oil**  
**Bitumen - Oil Sands**  
SAGD/Mining





Fractured limestone

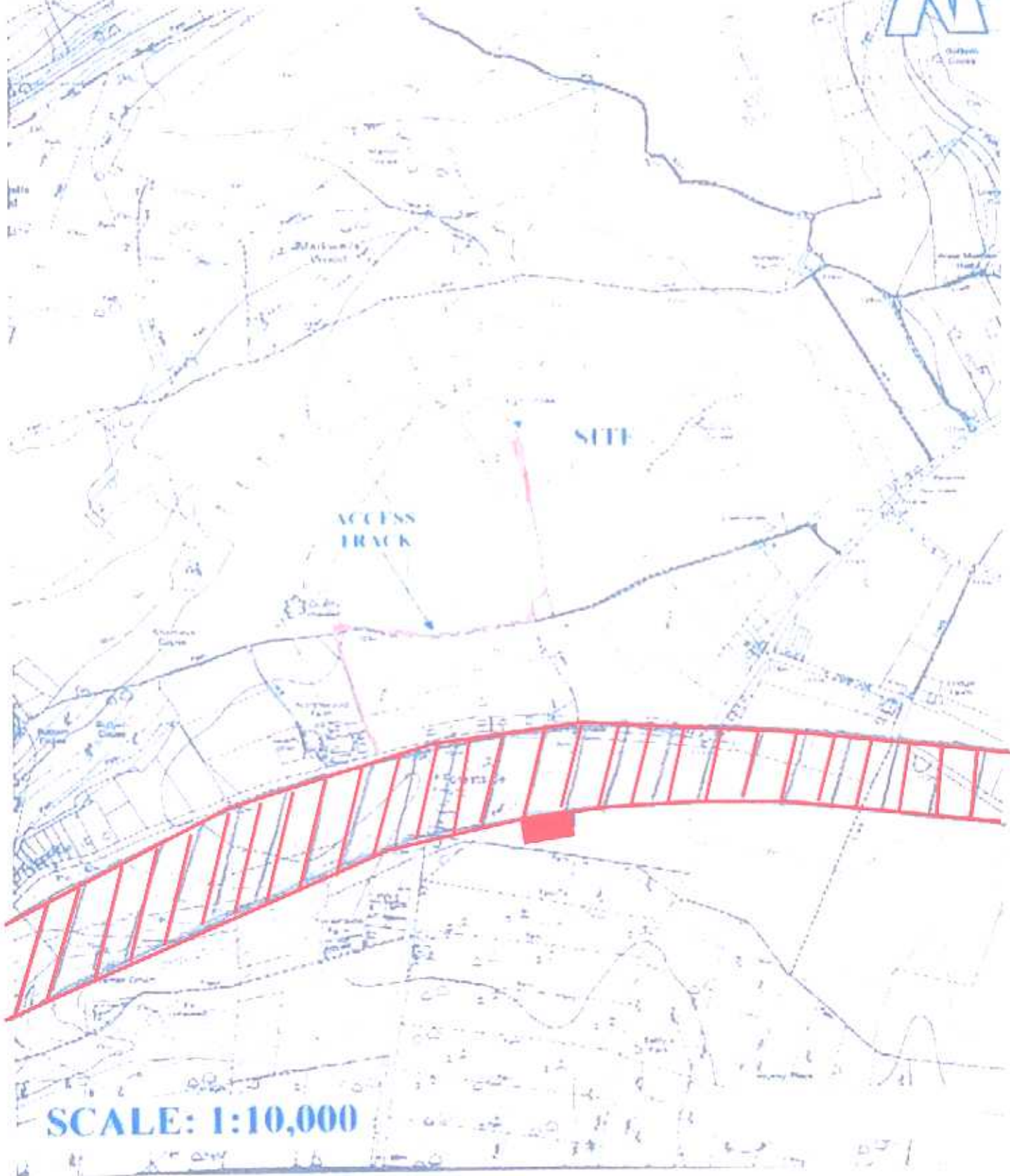








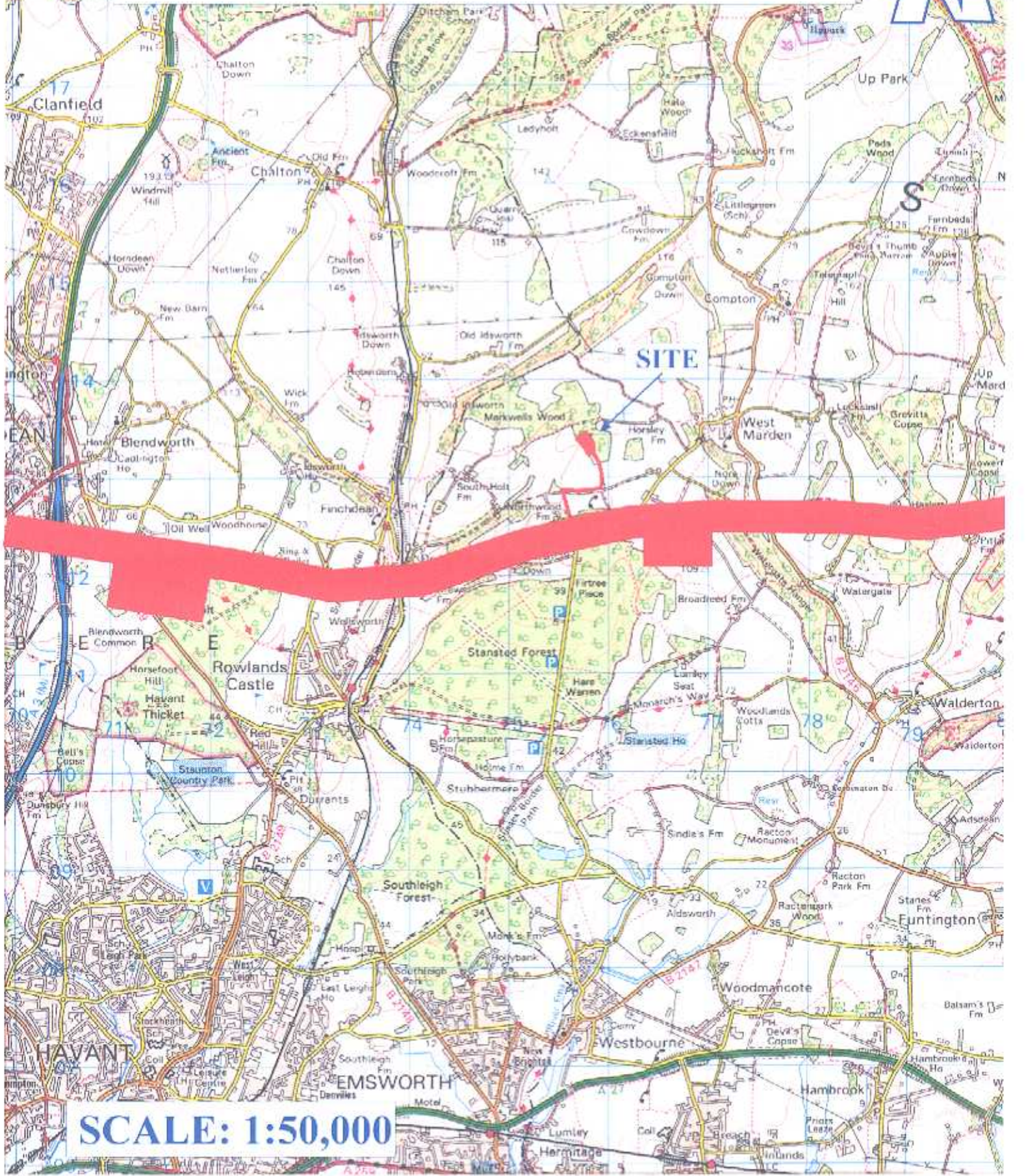
**NORTHERN PETROLEUM (GB) LIMITED  
MARKWELLS WOOD EXPLORATION SITE  
SITE LOCATION PLAN**



**SCALE: 1:10,000**



# NORTHERN PETROLEUM (GB) LIMITED MARKWELLS WOOD EXPLORATION SITE STRUCTURE FAULT



**SCALE: 1:50,000**

## Drilling Notes on the Markwells Wood Well

The Markwells Wood well is planned as a directional well to be drilled from a wellsite location in the south east corner of Markwells Wood to a bottom hole location under Forestside. The well trajectory will be in a southerly direction from the wellsite and approach the target from the north. The target structure is bounded by a major fault to the south.

It would be inadvisable to drill this structure from a wellsite to the south as this would entail drilling across the major fault which would have the following implications:

1. It is not possible to accurately estimate the throw of the fault from seismic, therefore after drilling across the fault, we could be significantly above or below the target formation. We would then have to plug back the well and drill back across the fault at a different inclination to try and intercept the target formation. (Note: there is far better depth prediction on the formations encountered when drilling through an unfaulted section, due to a good understanding of regional thicknesses)
2. There is a risk that a fault zone may be in pressure communication with formations at a higher or lower pressure which would result in either serious mud losses or gains which would necessitate running and cementing an additional string of steel casing prior to drilling into the target formation. This would result in having to drill a smaller hole into the target formation, which may compromise how the well would be completed in the event it was successful. In addition, setting casing across the fault zone would seriously restrict the ability to deviate the well in the event that the wellbore failed to intercept the target formation.

Overall there are strong technical reasons to drill the well from a surface location to the north of the target to avoid crossing the major bounding fault to the south of the target structure. This is also evidenced in the area where most wells accessing a potential reservoir bounded by a fault to the south are drilled from a northerly location.

Derek Howard-Orchard  
Drilling Manager  
Northern Petroleum Plc  
Martin House  
5 Martin Lane  
London  
EC4R 0DP

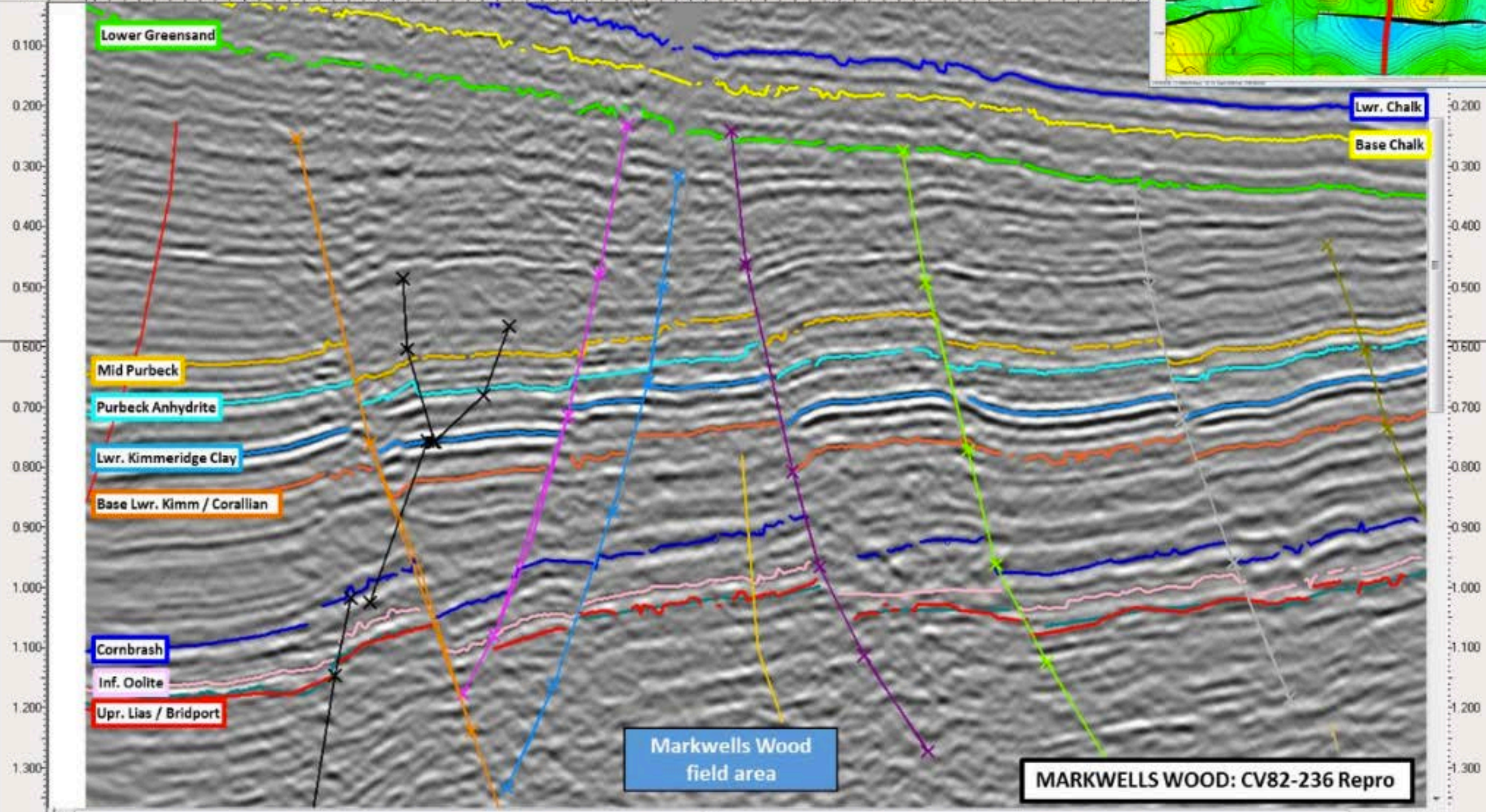
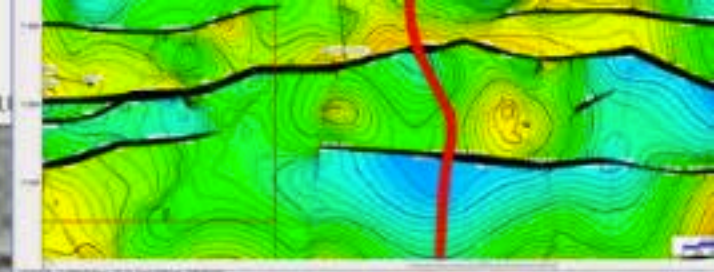
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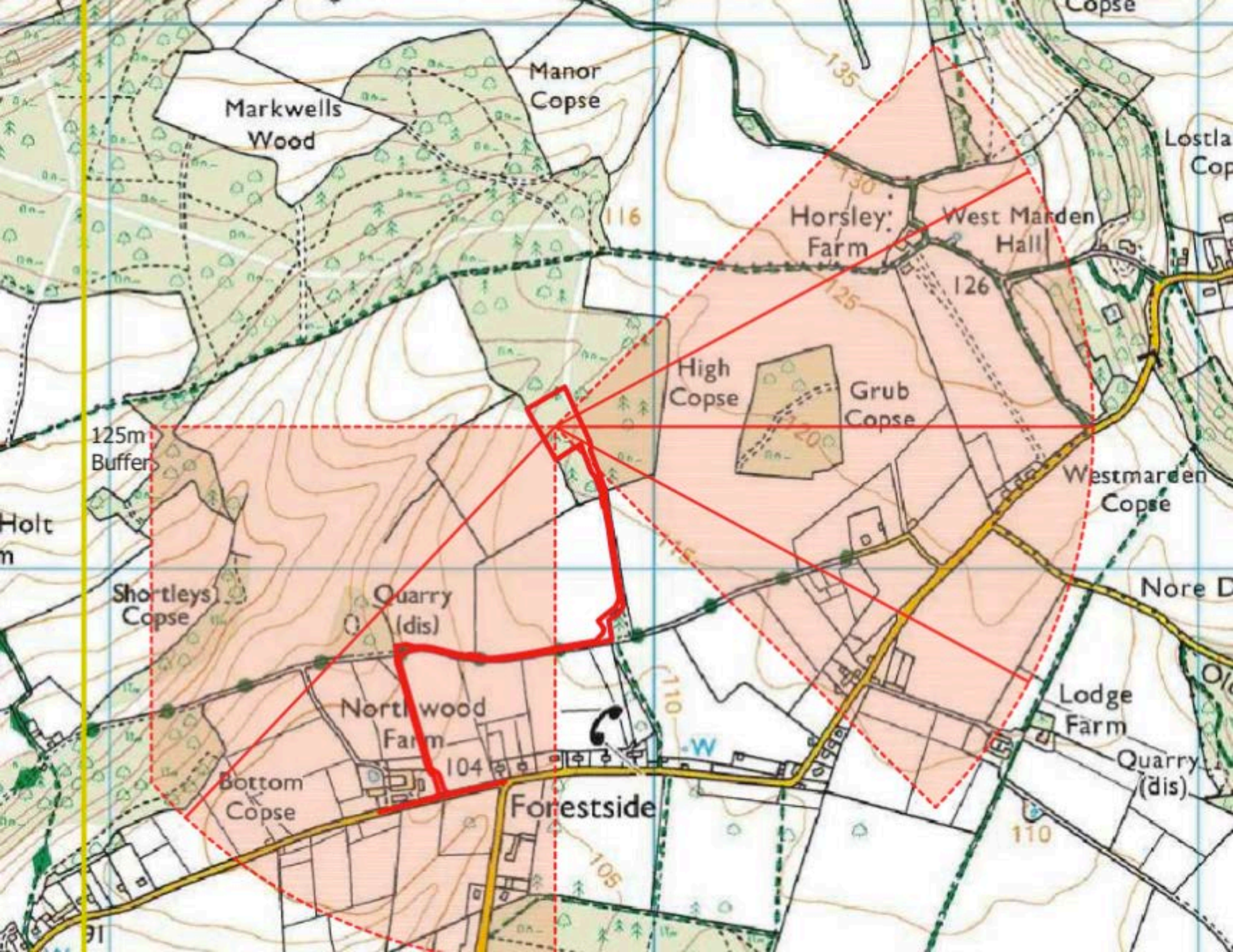
CV85-37, 246.13

CV83-297, 424.49

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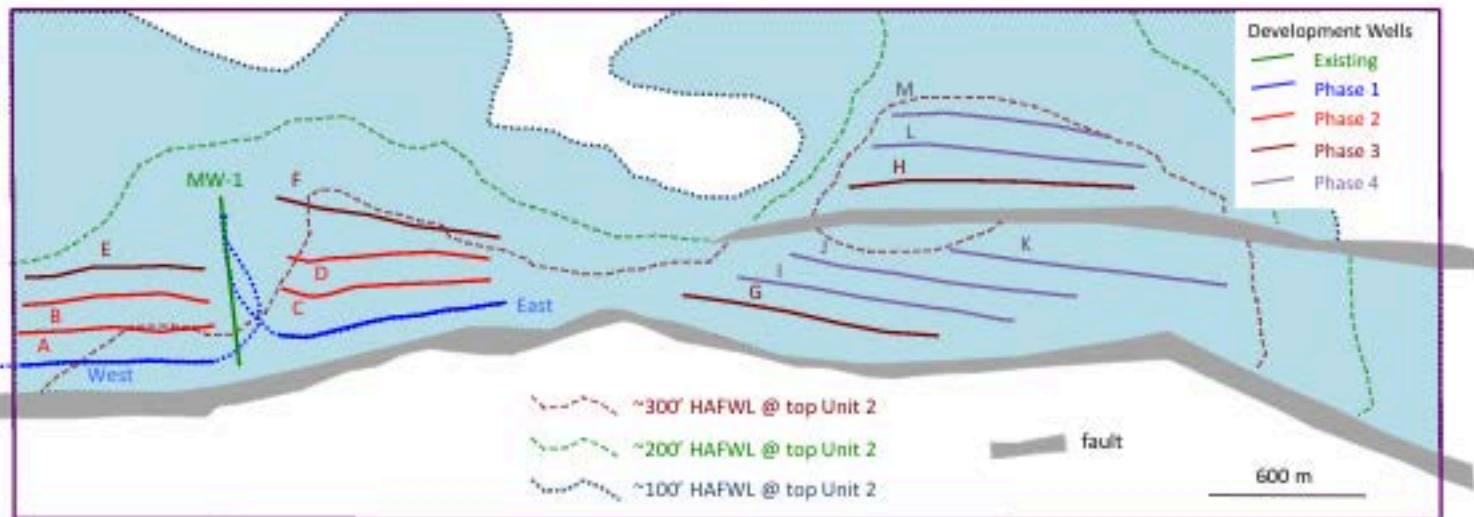
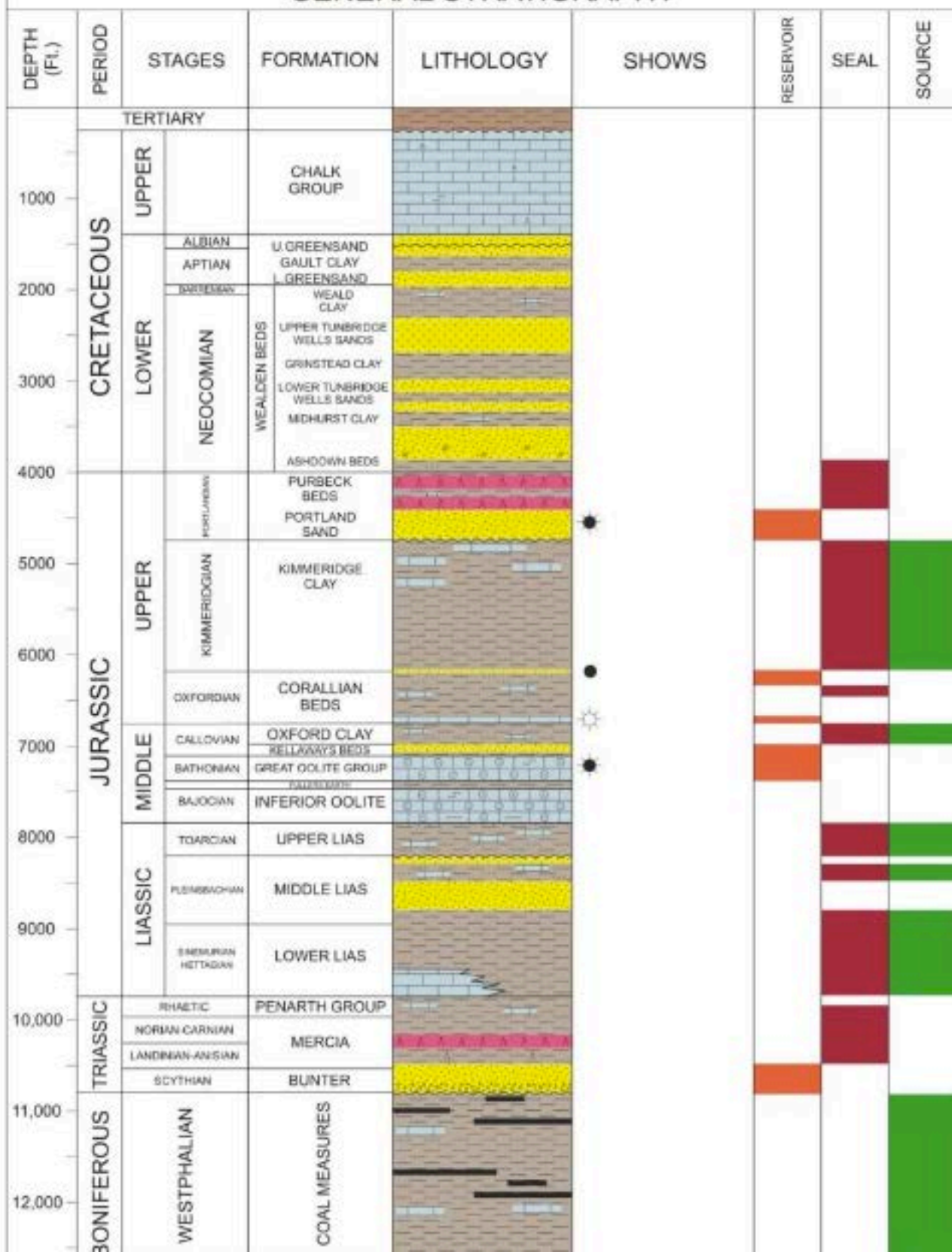


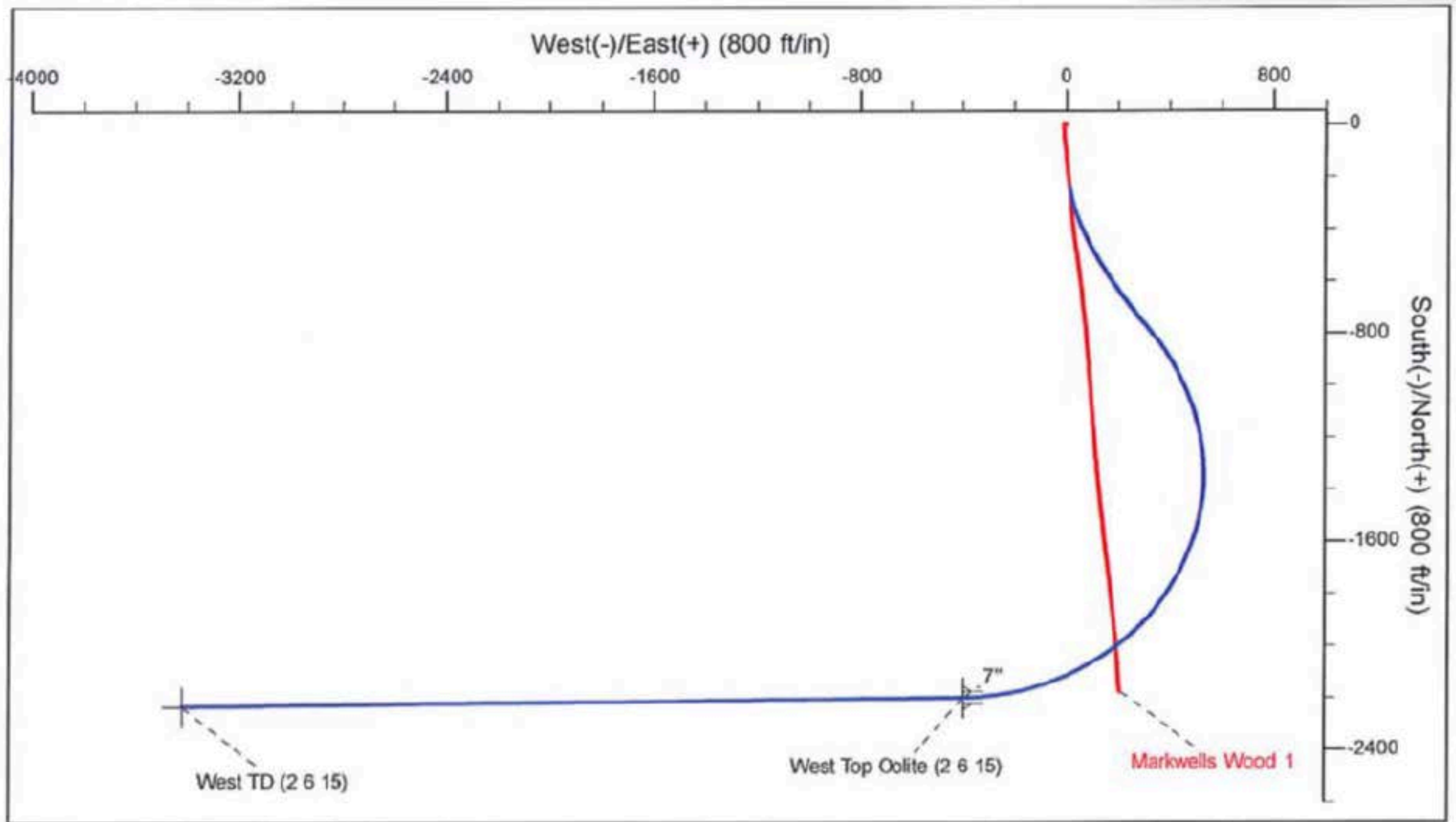
Figure 4.19 Notional phased FDP proposed by UKOG

To determine the Contingent Resource recoverable volumes Xodus assumed the following notional development scenarios (see also Figure 4.20):

- > 1C: 2 horizontal production wells (MW-1ST and MW6) – assuming reservoir quality as per MW-1ST Low Case model
- > 2C: 5 horizontal production wells (MW-1ST, MW3, MW4, MW5 and MW6) – assuming reservoir quality as per MW-1ST Best Case model
- > 3C: 5 horizontal production wells (MW-1ST, MW3, MW4, MW5 and MW6) – assuming reservoir quality as per MW-1ST High Case model and assuming no interference between wells

# ONSHORE UNITED KINGDOM - WEALD BASIN GENERAL STRATIGRAPHY





**Diagram 3.1: Diagram illustrating the proposed new MW-1 Sidetrack Well**





## HORIZONTAL NOTES—IS THIS AN APPLICATION FOR FOUR HORIZONTAL SIDETRACK WELLS?

We have always assumed this development was for four horizontal wells but this is not very clear in the application which is one of the problems flagged up by Markwells Wood, FoE , and CPRE.

The term “**horizontal**” rightly carries with it negative implications ( a more intensive operation, more drill time, unconventional, more chemicals, increased noise levels, emissions, transport, etc.). I feel that UKOG has significantly downplayed this aspect of the production. This reads as a deliberate obfuscation in order to downplay the risks, etc. which is hardly surprising.

### **Is this exploratory?**

There is some confusion about this as well and we should have more details on that if indeed they are “exploring”.

### **Name change**

One thing to realise is that UKOG was named Northern Petroleum. The company went through a name change after the last phase of exploration. They had plenty of time back in 2011 to explore the geology, take core samples, flow test and they actually produced a bit of oil. However, partner Magellan abandoned the project as there apparently wasn't much commercial prospect. There was talk about drilling and then farming it out to a third party.

UKOG under its former name has explored, flow tested Markwells Wood and knows all about the details of the target layer because they have already worked it over. They have drill logs and core samples that attest to the make up of the target strata. They acidized it two times within a couple months. This is all available to the public via the Competent Persons Report. It is in that report where it is clearly stated that they intend to drill four horizontal wells in these two phases and up to 15 in the future (that is their 40 year plan).

**Here is the illustration from CPR: This shows plans for horizontal wells in 4 phases. This current application is for phases 1 and 2**

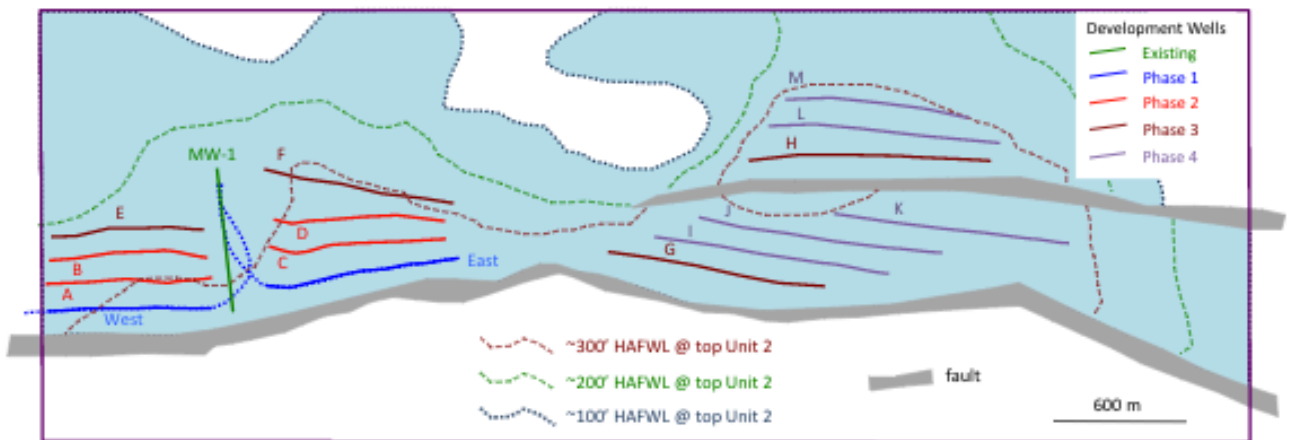


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- > 3C: 5 horizontal production wells (MW-1ST, MW3, MW4, MW5 and MW6) – assuming reservoir quality as per MW-1ST High Case model and assuming no interference between wells

## Horizontal Wells

The application is not very clear about this but from reading the Competent Persons Report, and letters to investors, it is clearly the intention to put horizontal (lateral) sidetracks to all the wells in order to get as much oil as possible. This is what every oil company is doing —putting horizontal(lateral) sidetrack wells to existing vertical wells. It just makes sense to exploit as much as possible and this is the to go to method.

I feel it is incredibly misleading to mention the three additional wells and write if all goes well with Phase 1, Phase 2 will be “same methodology as Phase 1”, with the intention of horizontal wells but not to mention the word horizontal or lateral.

"Three new production wells and a water injection well would be drilled in the event of a successful EWT on the MW-1 sidetrack well. **These activities would use the same methodology as those for drilling the MW-1 sidetrack well**, including acidising the well, and comprise: “ (3.19 Non technical Summary/Site and Proposed Development Summary)

## 4.5 Field Development Scenarios (p. 37 CPR)

To date no Markwells Wood Field Development Plan has been prepared. UKOG has proposed a notional development, which places a number of long horizontal wells in as much vertical relief from the transition zone as possible. UKOG is also investigating novel conventional drilling and completion techniques that may assist optimising the recovery from the wells and from the field overall. A field development with up to four phases is mooted with two horizontal wells in the first phase, four in each of the second and third phases and five in the fourth phase, as shown in the schematic provided by UKOG in Figure 4.19.

UKOG scenarios for estimating contingent resource are based on increasing well count with the phases as described.

- > \_1C: 2 lateral wells, east and west of MW-1 – phase 1
- > \_2C: 4 additional lateral wells (6 in total) – phase 2
- > \_3C: 9 further lateral wells (15 in total) – phases 3 and 4

<http://www.ukogplc.com/ul/XODUS%20Competent%20Person%27s%20Report%20PEDL%20126%20Markwells%20Wood%2014th%20September%202015.pdf>

**This from an invitation to some of the villagers as reported in DrillorDrop: (important to note the invitation did not go to many people in the parish—and not even our Parish Council!)**

In an invitation to the meeting, UKOG told local people it would “shortly be seeking planning permission from the South Downs National Park Authority for a petroleum development project at the existing Markwells Wood oil discovery well site”.

It said the scheme would be in two phases:

- Phase 1 would include one horizontal production well drilled as a horizontal sidetrack from the existing borehole
- Phase 2, conditional on phase 1, would have three more horizontal production wells and one vertical water injection well, all drilled from the existing well site

To investors:

<http://www.ukogplc.com/ul/UKOG%20RNS%20Interim%20Report%20FINAL%20FINAL%20CLEAN%20270616.pdf>

Markwells Wood

"Planning and Environment Agency permission applications are now being sought to develop this oil discovery. A submission to drill up to four horizontal production wells is planned to be made before the end of September 2016."

#### **Implications of Horizontal:**

Horizontal is harder to reach, more intensive and will involve a lot more chemicals, water, time, traffic, noise, emissions

Drill time: This is unclear. We need to know details on what is being proposed. This is important as drill time would be a lot of noise .

If the drill time is incorrect then it effects all things: noise levels, emissions, transport and these would have to be revised.

The most disturbing time of oil production for many esp. neighbours is the time it takes to drill. At the moment UKOG have referenced the time for the horizontal drill but have they included a sufficient amount of time to drill three new vertical wells with horizontal sidetracks?

1. It is unclear from the information provided by UKOG the direction in which the wells would be going. SDNP MW-1 is deviated at 56% and at a depth of about 1,600 m. At a depth of 1600 metres this would produce a deviation of 900 metres. We don't know the direction of the deviation but if it is in the Horndean direction the UKOG sidetrack of 1000 metres would turn into a total distance of 1900 metres from the well pad and take it outside the PEDL area.

**A map is needed to show where the direction of the wells, any angles of the deviated MW-1**

**and the additional wells and if indeed a 1,000 m horizontal sidetrack well can be completed without crossing the PEDL license.**

**PLEASE KEEP IN MIND THE ORIGINAL MW-1 IS DEVIATED BECAUSE THERE IS A MAJOR FAULT LINE THAT HAD TO BE AVOIDED**

2. Will the EA monitor sidetrack depth, direction and distance? We would like to see evidence of this kind of monitoring.
2. Will the other wells be deviated? at what angle? What is the length?
3. How long will the lateral/horizontal sidetrack wells be?
4. How much time will it take to drill the entire wells? 36 days are given for one 1,000 metre sidetrack of MW-1 and 46 days for each additional well (140 days). **This should be checked.**
5. We would like to see more detailed and updated seismic data with regard to the entire PEDL license and to see how the additional sidetrack wells will be interacting with the fault lines/seismic.

<http://www.stockopedia.com/content/northern-petroleum-and-egdon-resources-boosted-by-markwells-wood-oil-success-52086/>

The presence of live oil was observed when the 30 feet of core was extracted from the well. Initial analysis of the logs indicates the well, which was deviated at an inclination of approximately 56 degrees through the Great Oolite, penetrated a gross hydrocarbon bearing interval of 275 feet with a calculated net reservoir of 192 feet with an average porosity of 13-14%, a typical porosity value for this reservoir in the nearby fields in the same formation. The top of the Great Oolite was encountered 51 feet low to prognosis and the Great Oolite vertical thickness was 146 feet compared to a prognosis of 240 feet.

**I hope this clarifies the question over whether horizontal sidetracks are being proposed here. It just isn't very obvious and I would say indicative of the misleading**

**way UKOG has presented potentially contentious details in the application.**

## **PUBLIC ENGAGEMENT**

### **Notes on UKOG's engagement with the community in Stoughton Parish**

#### Pre-Application

UKOG have not engaged sufficiently with the public and have neglected a core principle of the National Planning Guidance as expressed in paragraph 17 of the NPPF. Paragraph 155 of the NPPF highlights the importance of early and meaningful engagement and collaboration with neighbourhoods, local organisations and businesses.

When addressing public consultation, paragraph 4.3 of the Statement (in line with section 122 of the Localism Act 2011) expects developers proposing all major types of development, to publicise and carry out a high standard of **pre-application** consultation with neighbours and people affected by the proposed development. It is noted that:

“Applicants will be encouraged to consult the community when developing their proposal in a way that is proportionate to the scale and impact of the proposal.” (Please note this is not compulsory but recommended).

1. Upon hearing that UKOG had purchased Markwells Wood site from Northern Petroleum, Markwells Wood Watch organized a public meeting in November 2015 and drew up a list of questions which were submitted to the Parish Council. Our Parish Council approached UKOG and invited them to attend a Parish Meeting to answer specific questions. There was no response for a month.

2. When UKOG finally responded, they refused to meet with the parishioners but offered to take councilors to lunch. Our councilors refused this offer based on the view that such discussions should be highly transparent and open to all community members, not just a select few.

3. As part of their public consultation, the company in question must publicise their intentions. UKOG did post an advertisement in the Petersfield Post (buried in the auto section), the Horndean Post, the Clanfield Post and the Bordon Post, which appeared on 6 July 2016

However, it appears that UKOG did not know that the Markwells Wood site was located in West Sussex and as such did not publicise in any newspapers in West Sussex. This has deprived members of the immediate community and the wider region from any knowledge that about a proposal to drill for oil.

4. There was no communication with our parish council until 7 months later, at the height of summer. UKOG arranged an “information event” from 12.00-7:30 p.m. at Forestside Hall on 14<sup>th</sup> July. They advertised only with the few houses in Forestside but not to other areas of the parish nor to neighbouring parishes which are close to the site.

## **5. UKOG did not extend the invitation to our Parish Council nor to the majority of residents of the parish.**

According to the application, the addressed leaflet was apparently distributed to properties in proximity to the application.

- 12 people received the addressed exhibition invitation
- one person saw the article in the local paper
- five people heard about the exhibition through word of mouth
- five people ticked 'other'

## **6. PUBLIC CONSULTATION**

At the limited informational meeting offered by UKOG, they explained things in a manner contradicting how they explained things to their investors. To the local community UKOG claimed that the drilling process is "conventional" Whereas to their investors, UKOG describes the intent to use "new and innovative technology."

The open exhibition was not a public meeting, where views, questions and answers could be aired publicly and lead to genuine discussion. It took place in July, when many of the local schools were already on holiday. It was publicised very locally, and not all the local villagers or parishoners were informed. Some of the members of Markwells Wood Watch who attended do not remember being asked for feedback. As our opposition to the development must have been evident, we think this probably accounts for this.

One of the most egregious concerns of the local community is that UKOG's CEO Stephen Sanderson has failed to honor a verbal commitment at this limited public consultation to disclose a full list of all the chemicals that UKOG planned to use during all of its oil exploration and extraction operations. Sanderson said he would provide the local community such a list "in a few days", but after 8 months, and repeated requests for this information, he has not been willing to transparently disclose what chemicals UKOG plans to use.

Another serious concern regarding UKOG's ability to fix any problems they accidentally create was expressed in a letter from Reed Paget, a member of Markwells Wood Watch, to UKOG's CEP Sanderson, as follows:

This is from a member of Markwells Wood Watch, Reed Paget, who attended the event and subsequently addressed in a letter to UKOG:

"You further indicated that you do not feel these chemicals are a risk to the local aquifer (or by extension the adjacent aquifers which feed Chichester and Portsmouth) because the initial borehole which has already been drilled (not the horizontal boreholes that still need to be drilled), goes all the way through the local aquifer and has been safely cased (I presume with steel and cement). Your supposition is that this casing is infallible and therefore, any potential chemicals used in drilling beneath the aquifer could never breach the casing and contaminate the water table.

When asked about the possibility of contaminating the aquifer, which supplies drinking water to hundreds of thousands of people in our catchment, you assured me that contamination is not a likely scenario. I then asked that while it might not be likely, if the impact was so severe, did UKOG have funds set aside or insurance in place to deal with such a disaster. You responded that your drilling meets all UK Environmental rules and regulation and that you do not need nor have any insurance for this eventuality. You then admitted that should there be a terrible leak as hypothesized, and your Limited Liability company could not afford to cover the costs, you would simply have to go out of business.”

## **MISLEADING APPLICATION**

UKOG’s application to drill for oil, submitted in September 2016, lacks clarity and detail on many of the most contentious issues. Over 2,000 people and statutory consultees have objected. In addition, the public has since asked a series of questions about the application, but received incredibly misleading answers.

**As we have witnessed throughout the pre application and application process, UKOG has consistently downplayed most aspects of risk with regard to ecology, environment, traffic and human health.**

## **POST APPLICATION**

Letters have been sent to UKOG and have not yet been answered

The “monthly community liaison group” has had just one meeting, last November. There were similar, misleading responses to community questions at the time.

## **Overhyping oil/National Significance**

When our MP, Andrew Tyrie wrote to UKOG asking for details, the response from Stephen Sanderson was also replete with further obfuscations.

One of the most egregious aspects of Sanderson’s letter to Mr. Tyrie (and the public) was the way he overplayed the significance of the reserves at Markwells Wood :

*The Markwells Wood-1 (MW-1) oil discovery well, drilled within the Site in 2010 and production flow tested over a 6-month period in 2011, proved the existence of between 33 to 62 million barrels of oil in the ground. It is one of the largest undeveloped conventional oil accumulations in the UK onshore.*

We consider this to be seriously misleading. Mr Sanderson uses the word “proved”. These are, in fact, still estimates. The Competent Persons Report always gives three sets of estimates, a worst case, a best case and a mean.



**Oil in the ground is not the same as oil that can be recovered.** The Competent Persons Report considers that the site could have a Recovery Factor of 5% - 7%. They applied this to their best estimate and calculated 2 – 3.5 million barrels of Oil over the lifetime of the site. This was based on five production wells. (This planning application is for four production wells)  
Competent Person's Report Markwells Wood Assignment Number: L400145

The Rigzone website report on this development reported even lower figures.

“UK Oil & Gas Investments (UKOG) announced Monday that a competent persons report (CPR) by Xodus Group has calculated Markwells Wood oil field's Jurassic great oolite limestone reservoir to contain a P50 potentially recoverable contingent resource of 1.25 million barrels.”

[http://www.rigzone.com/news/oil\\_gas/a/140590/UKOG\\_Updates\\_Reserves\\_at\\_Markwells\\_Wood\\_Field](http://www.rigzone.com/news/oil_gas/a/140590/UKOG_Updates_Reserves_at_Markwells_Wood_Field)

**We consider these statements lead, in turn, to a gross overstatement of the financial benefits locally and nationally.**

A recent request from the SDNP Planning Officer to “detail volumes of hydrocarbons to be produced over the life of the site” were in fact, fulfilled.

The projected estimated recoverable oil is to be an average of 230 barrels a day for 20 years. Back of the envelope calculations would be approximately 0.0112% of UK's annual consumption.

**This is one hundredth of one percent. Hardly of national significance**

There does seem to be a history of UKOG exaggerating their oil potential.

<http://www.telegraph.co.uk/finance/markets/11547491/Taking-Aim-risky-dream-or-wise-option-for-canny-investors.html>

<http://www.shareprophets.com/views/15721/open-letter-to-uk-oil-gas-nomad-does-it-consider-stephen-sanderson-a-fit-and-proper-person>

More misleading comments to MP Andrew Tyrie in correspondence from Stephen Sanderson include the following::

*“Since then there has been an increase in widespread scaremongering surrounding shale gas and fracking amongst the population. Effectively all forms of oil and gas extraction, essential to the maintenance of people's daily lives, has been incorrectly associated with this technique. As a responsible and ethical British company, we treat all such concerns very seriously. We endeavour to communicate our plans as openly and as transparently as possible. We have engaged with the local community via an open exhibition, attracting over 100 visitors, and have established a monthly community liaison group.”*

Contrary to Sanderson's claim of “scaremongering”, Markwells Wood Watch has been consistent in seeking to explain that the proposed oil exploration is

NOT fracking but NOR is it conventional drilling.

We believe UKOG is intentionally hiding behind their argument that they are not fracking, yet failing to fully explain what exactly they are proposing to do. The truth is that there are numerous ways of getting oil out of the ground, some with potentially more damaging environmental consequences than fracking. There would be no room for scaremongering if only UKOG were fully transparent and honestly answered the questions we have asked them.

Dismissing our concerns as “widespread scaremongering” indicates an arrogance and lack of respect for the views held by people locally.

We therefore disagree strongly that the company have been open and transparent.

**UKOG has managed to erode trust through poor public consultation, presenting a thoroughly misleading application, a lack of meaningful engagement and by using the press to further obscure their intentions and mislead the both the public and politicians.**

**We consider that UKOG’s attitude towards local people is arrogant and dismissive. They have simply jumped through the hoops that are required of them. We have no confidence that UKOG will be ethical in their activities nor truthful or transparent in their self monitoring.**

**Our National Park is too precious, our aquifer too vulnerable and our community much too important to be overlooked and treated this way.**

**We object to the application on these grounds.**

**Thank you for your consideration of these points raised.**

**Yours Sincerely,**

**Emily Mott on behalf of Markwells Wood Watch  
March 17, 2017**

**Please note: details of correspondence between UKOG and the community liason as well as a copy of the letter between Stephen Sanderson and MP Andrew Tyrie are posted on our website:  
[www.markwellswoodwatch.org](http://www.markwellswoodwatch.org)**