

Stephen Sanderson,  
UK Oil & Gas Investments PLC  
Princes House,  
38 Jermyn Street,  
London SW1Y 6DN,  
United Kingdom

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In performing its services pursuant to the Proposal, the Company is not aware that any conflict of interest has existed. As an independent consultancy, the Company is providing impartial technical advice within the energy sector. The Company's remuneration was not in any way contingent on the contents of the Report.

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The Company has not undertaken a site visit or an inspection because it was not considered relevant for the purpose of this report. As such, the Company is not in a position to comment on the operations or facilities in place, their appropriateness and condition, and whether they are in compliance with the regulations pertaining to such operations. Further, the Company is not in a position to comment on any aspect of health, safety or environment of such operation.

## **'Petrophysical Evaluation of the Horse Hill-1 Well'**

### **Executive Summary Report**

A petrophysical evaluation was performed on the tight Jurassic mudstone and limestone oil reservoirs in addition to the overlying conventional Jurassic Upper Portland sandstone oil discovery drilled by the Horse Hill-1 well "HH-1", located in UK onshore licence PEDL 137. The models used for the tight oil evaluation were based on proprietary models developed by Schlumberger.

Using this methodology an overall estimated Oil In Place (OIP), for the conventional and tight oil reservoirs specifically at the HH-1 location, is 271.4 million barrels of oil (MMBO) per square mile. This total includes a summation of the Upper Portland sandstone plus all deeper potential Jurassic tight mudstone and limestone reservoir intervals, from the Upper Jurassic Kimmeridge, starting at a measured depth ("MD") of 2482ft (2215 ft true vertical depth sub-sea or 'tvdss'), through the Kimmeridge, Oxford Clay and Lias sections down to the Rhaetic and Palaeozoic sections at the base of the well at 8815 ft MD (7942 ft tvdss).

The summary table, Table 1, captures the calculated OIP estimates for the main stratigraphic units drilled in HH-1. The Kimmeridge and Lias sections have been broken down into sub intervals for further granularity. The OIP were calculated using the true vertical depths for the top and base of each unit.

The highly organic source rock facies in the Middle Kimmeridge second interval and the Lower Kimmeridge are both calculated to have generated the most significant OIP numbers.

When attempting large scale resource assessments for the Weald basin the thermal maturity of the Jurassic section, and specifically that of the Kimmeridge, has always been a significant uncertainty, due to lack of reliable constraining information. Previous reports, including a previous assessment by Schlumberger, suggest that the Kimmeridge was primarily immature throughout the Weald. However the HH-1 logs and the well's location in the basin, together with the rock cuttings and geochemical analyses, indicate a higher level of maturity of the Kimmeridge than we have previously taken into account when building petroleum systems models for this area.

This does not necessarily mean that the Kimmeridge is mature enough to contain economically viable quantities of producible oil in the Weald Basin but it is key new information to be utilized in updating existing predictive models of the Weald.

**Table 1: OIP estimates for key stratigraphic horizons in the HH-1 well**

Formation	MD	OIP
	(ft)	MMBO/mi2
<b>Main Upper Portland Sandstone</b>	<b>2038</b>	<b>16.2</b>
U. Portland shales/silts/thin sands	2148	-
Lower Portland Sandstone	2320	-
<b>Kimmeridge (Total)</b>	<b>2482</b>	<b>176.3</b>
U. Kimmeridge	2482	21.1
Kimmeridgian Micrite1	2825	4.4
M. Kimmeridge 1	2931	26.4
Kimmeridgian Micrite2	3083	9.3
M. Kimmeridge 2	3184	53.2
Kimmeridgian Micrite3	3450	1.1
L. Kimmeridge Clay	3479	60.3
Top Corallian	4430	-
Corallian Limestone	5001	-
<b>Oxford Clay</b>	<b>5050</b>	<b>19.7</b>
Kellaways Beds	5466	-
Cornbrash	5518	-
Great Oolite	5521	-
Fullers Earth	5685	-
Inferior Oolite**	5800	-
<b>Lias (Total)</b>	<b>6370</b>	<b>59.2</b>
Upper Lias	6370	8.0
Middle Lias	6711	27.1
Lower Lias	7072	24.2
Mercia Mudstone	8288	-
Palaeozoic	8507	-
Total Depth	8815	-
<b>TOTAL</b>		<b>271.4</b>

**\*\*see note in text below**

In the Kimmeridge section three dominantly micritic limestone intervals have been identified within the section with varying OIP estimates. Of the three micrites, the middle member has the highest overall OIP value calculated. The upper two micrites could have a conventional pore system encased within the organic facies of the Kimmeridge. This would be a system akin to the Bakken Shale in North America.

In the Jurassic Lias section a separation of the OIP calculation into Upper, Middle and Lower sections has been performed with the Middle and Lower Lias exhibiting similar volumes in place. It should also be noted that a potential tight conventional oil reservoir with low oil saturations was also interpreted in the Middle Jurassic Inferior Oolite limestone section. This is not reported in Table 1 as further work and cuttings analyses are necessary and ongoing in order to help calibrate the log interpretation in this section to solidify the calculated OIP.

As a result of the HH-1 well analysis findings, it is recommended to further refine the basin's overall petroleum resource potential, future wells in the basin should now be designed to log and sample the mudstones and limestones of the Kimmeridge, Oxford and Lias sections utilizing technologies and interpretation techniques established in other productive tight oil plays in the world.

### **Next Steps:**

The logs of a number of additional wells within the Horse Hill licences and wells surrounding HH-1 have been made available by UK Oil & Gas Investments PLC ("UKOG") to proceed to the next phase of performing a localized resource assessment of licences PEDL 137 and PEDL 246. This analysis will also incorporate the Horse Hill-1 interpretation completed in this initial study.

As UKOG has other licenced acreage in the Weald, and subsequent to this localized assessment the final stage of the evaluation process will be to conduct on UKOG's behalf an overall assessment of the Weald Basin, covering approximately 5500 km<sup>2</sup>, using the well-established Rapid Resource Assessment (RRA) approach, an international emerging play exploration workflow that has been deployed around the world in places such as the Middle East, North Africa, China, Western Europe and South America. The RRA has been proven to provide key decision making criteria for the early exploration and appraisal phase for tight reservoirs and hybrid play targets. The results of the RRA will assist UKOG in assessing the conventional and tight oil potential of its licences elsewhere in the Weald and provide decision making criteria for future exploration and appraisal drilling.

## Addendum 1: Petrophysical Evaluation Methodology

Input data for this evaluation included the following logs:

- Spectral gamma ray
- Electrical induction
- Thermal neutron
- Gamma-gamma density
- Photoelectric
- Nuclear magnetic resonance (NMR).

The following cuttings analyses were also included:

- XRD
- Total organic carbon (TOC) from RockEval pyrolysis.

The evaluation software included the following steps:

1. Environmental corrections for spectral gamma ray and thermal neutron logs. Corrections necessary for hole size, mud type, mud weight, temperature, pressure, mud salinity.
2. Reprocessing of NMR log.
3. Editing of NMR, bulk density, and thermal neutron porosity for hole effects—primarily washout.
4. Estimation of TOC content from logs. A Passey model was employed using deep electrical induction and bulk density as inputs logs. The baseline value for induction is 4.5 ohm-m; the baseline for bulk density is 2.6 g/cm<sup>3</sup>. A thermal maturity of 0.65 Ro was used for the section above the Lias; a thermal maturity of 0.9 Ro was used for the Lias. This methodology can calculate TOC in zones that are not organic; hence, this log was edited to remove apparent TOC in the Portland, Sands, upper two Kimmeridge Micrites, and the Oolites.
5. Pyrite volume was estimate using an algorithm published by Schmoker and Hester (1983) based on kerogen content.
6. The petrophysical model used the following inputs:
  - a. CGR (K+Th gamma ray activity)
  - b. NPHU (environmentally corrected neutron porosity with a limestone matrix)
  - c. RHOB (bulk density)
  - d. U (volumetric photoelectric effect)
  - e. Kerogen content (estimated from TOC in step 4)
  - f. Pyrite content (step 5)
  - g. Shallow and deep electrical induction.

7. Outputs for the petrophysical model included:

- a. Illite (based on XRD, the illite was assumed to be a mixture of illite and kaolinite)
- b. Smectite
- c. Quartz
- d. Calcite
- e. Kerogen
- f. Pyrite
- g. Clay bound water (0.1 for Illite and 0.43 for smectite volumes)
- h. Effective porosity
- i. Effective water saturation

Effective water saturation was estimated using a Modified Simandoux model with a water salinity of 120 ppk and  $m = n = 2$ ,  $a = 1$ . The salinity of 120 ppk was determined by comparing  $R_t$  (true resistivity) to  $R_o$  (calculated resistivity of a water saturated formation). They should match in wet zones. This model may be inadequate for the Oolites where the presence of a complex carbonate reservoir may require tuning of a saturation model to pore characteristics.

Oil in place (OIP) was estimated by using Glaso's model to account for oil shrinkage and gas coming out of solution. The oil gravity was estimated to be 32 API, gas gravity was calculated at 0.77 based on the mud gas values, and GOR was estimated to be 200 SCF/bbl. Glaso's will estimate a GOR if one assumes the pore hydrocarbons at on the phase envelope. We input the 200 SCF/bbl as it is likely that the pore hydrocarbons are well above the envelope in the P/T conditions for this well.

Pore pressure was assumed to be hydrostatic—0.43 psi/ft. Formation temperature was calculated assuming a mean annual surface temperature of 50 degF and a bottom hole temperature of 150 degF based on logging tool measurements.