Horse Hill Upper Portland Sandstone STOIIP Review

Independent Review Report

UK Oil & Gas Investments PLC

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The Directors

UK Oil & Gas Investments PLC (“UKOG”)

Suite 3B, Princes House,

38 Jermyn Street, London, SW1Y 6DN

08 May 2015

Dear Sirs,

Reference: Independent Review Report as of Friday, 08 May 2015

Horse Hill, Upper Portland Sandstone STOIIP

PEDL 137, Weald Basin, Southern England

In accordance with your instructions, Xodus Group Ltd. (“Xodus”) has reviewed the Upper Portland Sandstones of the Horse Hill discovery in PEDL137, United Kingdom.

We were requested to provide an independent evaluation of the In Place Hydrocarbons expected in accordance with the 2007 Petroleum Resources Management System prepared by the Oil and Gas Reserves Committee of the Society of Petroleum Engineers (SPE) and reviewed and jointly sponsored by the World Petroleum Council (WPC), the American Association of Petroleum Geologists (AAPG) and the Society of Petroleum Evaluation Engineers (SPEE).

Volumes are expressed as gross Stock Tank Oil In Place volumes (“STOIIP”).

In conducting this review we have utilised information and interpretations supplied by UKOG, comprising operator information, geological, geophysical, petrophysical, well logs and other data along with various technical reports. We have reviewed the information provided and modified assumptions where we considered this to be appropriate. Site visits were not considered necessary for the purposes of this report.

Standard geological and engineering techniques accepted by the petroleum industry were used in estimating the STOIIP. These techniques rely on geo-scientific interpretation and judgement; hence the resources included in this evaluation are estimates only and should not be construed to be exact quantities. It should be recognised that such estimates of STOIIP volumes may increase or decrease in future if more data becomes available and/or there are changes to the technical interpretation. It should also be noted that this is not a review of recoverable hydrocarbon volumes and that such review or estimate will require additional data and interpretation. As far as Xodus is aware there are no special factors that would affect the operation of the assets and which would require additional information for their proper appraisal.

We acknowledge that this report may be included in its entirety, or portions of this report summarised, in documents prepared by UKOG and its advisers in connection with commercial or financial activities and that such documents, together with this report, may be filed with any stock exchange and other regulatory body and may be published electronically on websites accessible by the public, including UKOG’s website.

1 EXECUTIVE SUMMARY

UK Oil & Gas Investments PLC ("UKOG") has a 20.358% interest in Licence PEDL137. There are two oil discoveries on the licence found by the Horse Hill-1 well ("HH-1"), drilled recently in 2014 and the Collendean Farm-1 well ("CF-1") drilled by Esso in 1964.

The HH-1 and CF-1 discoveries lie within an approximately 100-foot gross thick Jurassic Upper Portland sandstone reservoir within a 6km by 3km Late Cimmerian age tilted fault block structure and trap as defined by 2D seismic. The crest of the Upper Portland oil discovery lies at approximately 1760ft TVDSS and most likely extends over a mapped maximum areal closure of approximately 2000 acres. The Upper Portland reservoir is productive at the nearby Brockham Field, some 9km NNW, in which UKOG has an indirect interest of 3.6%, by virtue of UKOG's 6% shareholding in Angus Energy.

UKOG performed an updated interpretation of the seismic on the licence, incorporating the new well information together with a finalised petrophysical evaluation of HH-1 and a re-evaluation of the CF-1 log data. The main difference with the previous interpretation was in the depth conversion and petrophysical parameters. UKOG also carried out an assessment of the Stock Tank Oil Initially In Place ("STOIIP") volumes.

Xodus has independently reviewed the STOIIP volume estimates focusing on the Upper Portland Sandstone only. As such Xodus has reviewed UKOG's seismic interpretation and the underlying Kingdom project, the well data, and related petrophysics reports. Xodus independently derived the volume estimates through use of a stochastic simulation software tool, REP, similar to the approach used by UKOG.

Xodus concludes that the approach followed by UKOG to estimate the STOIIP is sound and is based on an adequate interpretation of the available data.

The gross PEDL 137 Upper Portland volume ranges estimated by Xodus are as per the table below.

STOIIP (MMbbl)	Low	Best	High	Mean
Upper Portland Gross 100%	14.3	21.0	30.4	21.8

These volumes are slightly (less than 10%) higher than the volumes estimated by UKOG. The main reasons for Xodus' slightly differing figures from UKOG's estimates are: Xodus smoothed and well corrected the top reservoir surface from a slightly cruder version presented by UKOG; Xodus also assumed a wider range in reservoir thickness and reduced the maximum Oil Water Contact ("OWC") level in the area south of the fault.

Conclusions

Xodus has reviewed the available information on the Horse Hill discovery and concludes that generally UKOG and its partners have performed a reasonable and robust interpretation of the available data. Where deemed necessary, Xodus has amended the UKOG proposed volumes. Xodus believes that the figures in this report accurately reflect the potential on the prospect, given the current status of knowledge.

UKOG is planning a well test on HH-1 later in 2015. Information gathered during that test will provide data to further improve the STOIIP estimates and to estimate the volumes that can be technically recovered.

Professional Qualifications

Xodus is an independent, international energy consultancy. Established in 2005, the company has 600+ subsurface and surface focused personnel spread across thirteen offices in Aberdeen, Anglesey, Dubai, Edinburgh, Glasgow, The Hague, Houston, Lagos, London, Orkney, Oslo, Perth and Southampton.

The wells and subsurface division specialise in petroleum reservoir engineering, geology and geophysics and petroleum economics. All of these services are supplied under an accredited ISO9001 quality assurance system.

Except for the provision of professional services on a fee basis, Xodus has no commercial arrangement with any person or company involved in the interest that is the subject of this report.

Chris de Goey is Head of Xodus Advisory in London and was responsible for supervising this evaluation. Chris has a broad commercial background in the energy industry. Starting his career in Shell he then joined Accenture where he worked on market entry, organisational, marketing, performance management and operational solutions for IOCs and European utilities. He subsequently took on management roles in venture capital and corporate finance focusing on oil and gas and renewables. For 3 years prior to joining Xodus Chris led an oil and gas evaluation group, assisting banks, private equity and operators with financing due diligence, delivering competent person reports and feasibility studies. Chris has an MSc in Applied Physics from Delft University. He is a member of the Energy Institute, the Petroleum Exploration Society of Great Britain and the Society of Petroleum Engineers.

Yours faithfully,

Chris de Goey

Director Advisory, London, Xodus Group Ltd
For and on behalf of Xodus Group Ltd.

2 INTRODUCTION

This report was prepared by Xodus Group Ltd (“Xodus”) in April and May 2015 at the request of the Directors of UK Oil & Gas Investments PLC (“UKOG”). It consists of an evaluation of the In Place Hydrocarbon Volumes of one horizon (the Upper Portland Sandstones) in the Horse Hill discovery, in PEDL137 in the Weald Basin. UKOG holds interests in this licence through its holdings in Horse Hill Developments Ltd (“HHDL”) and in Angus Energy Limited (Figure 2.1).

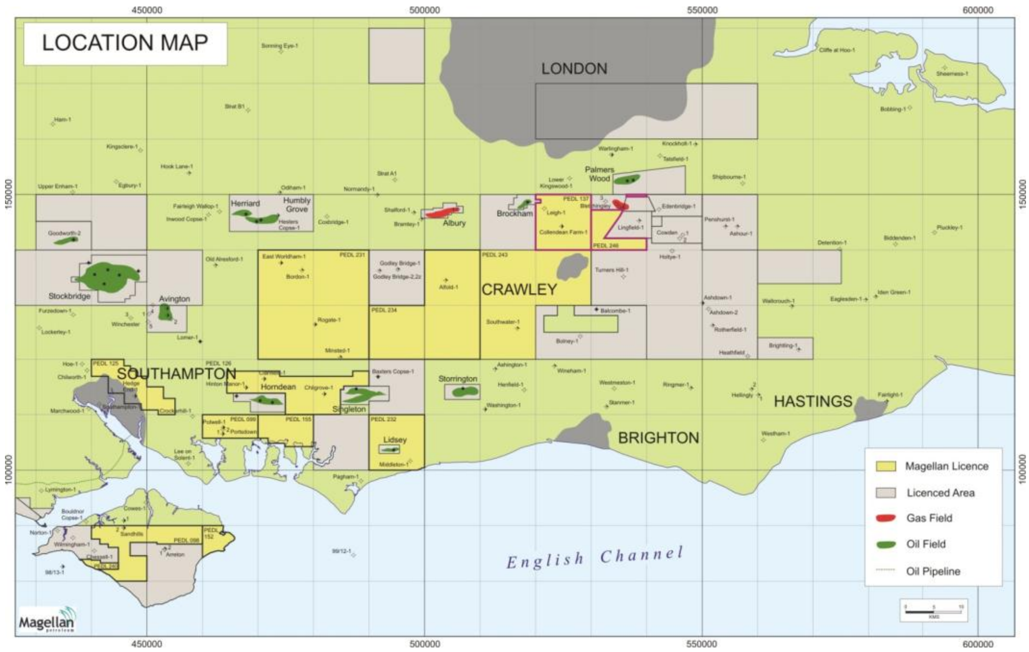

Figure 2.1 PEDL 137 location map

2.1 Licence Details

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Asset, Country	Operator	UKOG Interest	Status	License Expiry[1]	License Area (km^2)
PEDL137, UK	HHDL	20.358%	Exploration	30/09/2015	99.29

Table 2.1: Petroleum Licence Interests

2.2 Sources of Information

The content of this report and our estimates of STOIIP are based on data provided to us by UKOG. We have accepted, without independent verification, the accuracy and completeness of this data.

The data available for review varied depending on the asset and is noted in the body of the report.

[1] UKOG informed Xodus that HHDL are close to extending the Second Term of the PEDL137 licence to 30 September 2016.

2.3 Requirements

In accordance with your instructions to us we confirm that:

- we are professionally qualified and a member in good standing of a self-regulatory organisation of engineers and/or geoscientists;
- Chris de Goey is a Director of Xodus Advisory, London and was responsible for supervising this evaluation;
- we have at least five years relevant experience in the estimation, assessment and evaluation of oil and gas assets;
- we are independent of UKOG "the Company", its directors, senior management and advisers;
- we will be remunerated by way of a time-based fee and not by way of a fee that is linked to the value of the Company;
- we are not a sole practitioner;
- we have the relevant and appropriate qualifications, experience and technical knowledge to appraise professionally and independently the assets, being all assets, licences, joint ventures or other arrangements owned by the Company or proposed to be exploited or utilised by it ("Assets") and liabilities, being all liabilities, royalty payments, contractual agreements and minimum funding requirements relating to the Company's work programme and Assets ("Liabilities").

2.4 Standards Applied

In compiling this report we have used the definitions and guidelines set out in the 2007 Petroleum Resources Management System prepared by the Oil and Gas Reserves Committee of the Society of Petroleum Engineers (SPE) and reviewed and jointly sponsored by the World Petroleum Council (WPC), the American Association of Petroleum Geologists (AAPG) and the Society of Petroleum Evaluation Engineers (SPEE).

2.5 No Material Change

We confirm that to our knowledge there has been no material change of circumstances or available information since the effective date of this report (Friday, 08 May 2015) and we are not aware of any significant matters, arising from our evaluation, that are not covered within this report which might be of a material nature with respect to the Company valuation.

2.6 Liability

All interpretations and conclusions presented herein are opinions based on inferences from geological, geophysical, or other data. The report represents Xodus's best professional judgment and should not be considered a guarantee of results. Our liability is limited solely to UKOG for the correction of erroneous statements or calculations. The use of this material and report is at the user's own discretion and risk.

2.7 Consent

We hereby consent, and have not revoked such consent, to:

- the inclusion of this report, and a summary of portions of this report, in documents prepared by the Company and its advisers;
- the filing of this report with any stock exchange and other regulatory authority;
- the electronic publication of this report on websites accessible by the public, including a website of the Company; and
- the inclusion of our name in documents prepared in connection to commercial or financial activities.

The report relates specifically and solely to the subject assets and is conditional upon various assumptions that are described herein. The report must therefore, be read in its entirety. This report was provided for the sole use of UKOG on a fee basis. Except with permission from Xodus this report may not be reproduced or redistributed, in whole or in part, to any other person or published, in whole or in part, for any other purpose without the express written consent of Xodus.

3 HORSE HILL DISCOVERY: PORTLAND SANDSTONE

The Horse Hill discovery comprises several prospective intervals, however, only the Upper Portland Sandstone is included in this evaluation.

3.1 Subsurface Data

The data reviewed for this evaluation has included

- 2D seismic data and interpretation over the licence
- Well data from the CF-1 and HH-1 wells including
  - Lithological logs
  - Computer Processed Interpretations ("CPIs") and petrophysical interpretations
  - Formation tops
- Background regional geological data
- Stochastic volumetric calculation models provided by UKOG (in REP)

3.2 Structure

The HH-1 and CF-1 wells lie within an overall E-W trending Late Cimmerian age tilted fault block some 6km in length and 3km wide. The Horse Hill Top Portland Sand structure map shows a north-south trending feature formed by a 3-way dip closure in the footwall of a major east-west trending fault system, combined with an extension of this feature in the hanging wall to the north. The hanging wall section appears to show evidence of structural rejuvenation by post-Oligocene Alpine compression. The HH-1 well was drilled close to the crest of the footwall closure, while the older CF-1 well was drilled in the hanging wall. The crestal part of the feature as mapped extends to approximately 4 km east-west by 3 km north-south.

Structural mapping is controlled by 5 or 6 seismic lines of various vintages. The key area of closure is controlled by only 4 lines. Well locations and seismic coverage are shown in Figure 3.1, and a more detailed view of coverage over the crest of the structure, with the key seismic highlighted, in Figure 3.2.

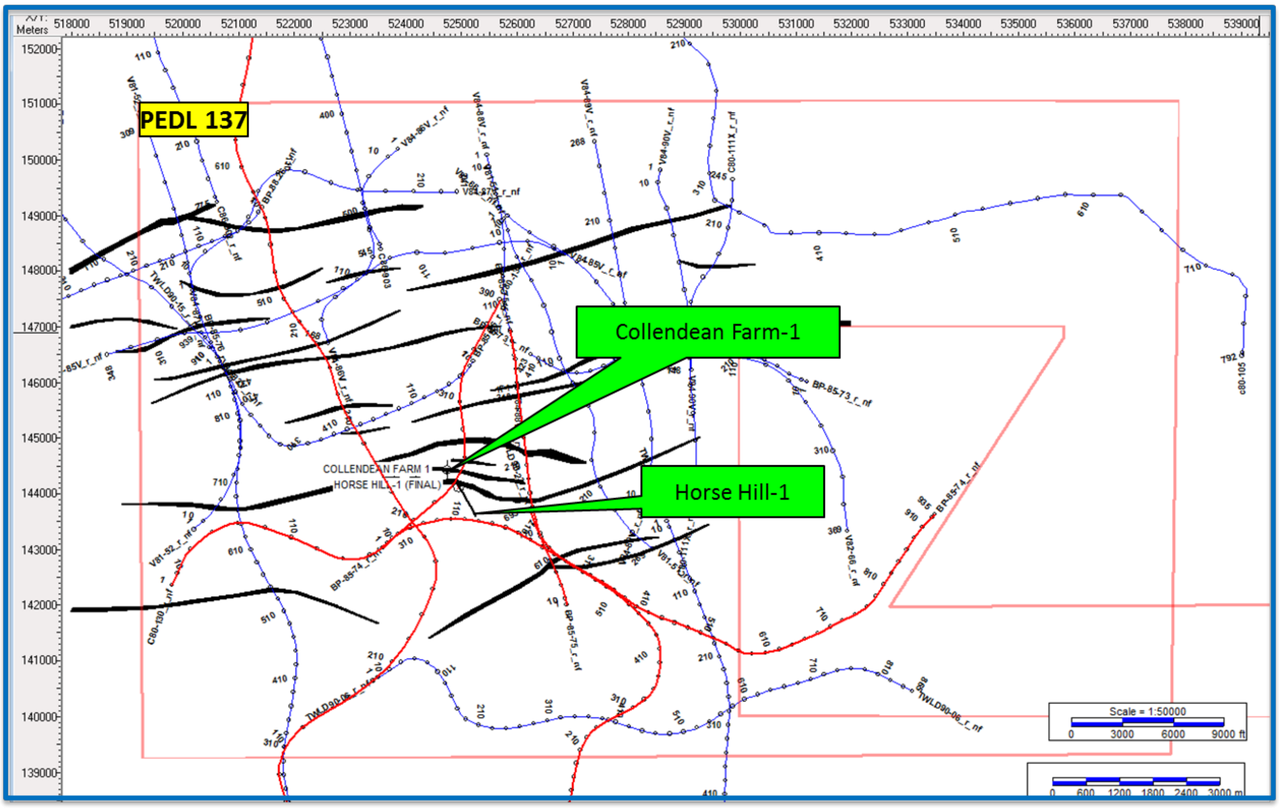


Figure 3.1 Seismic base map, with wells

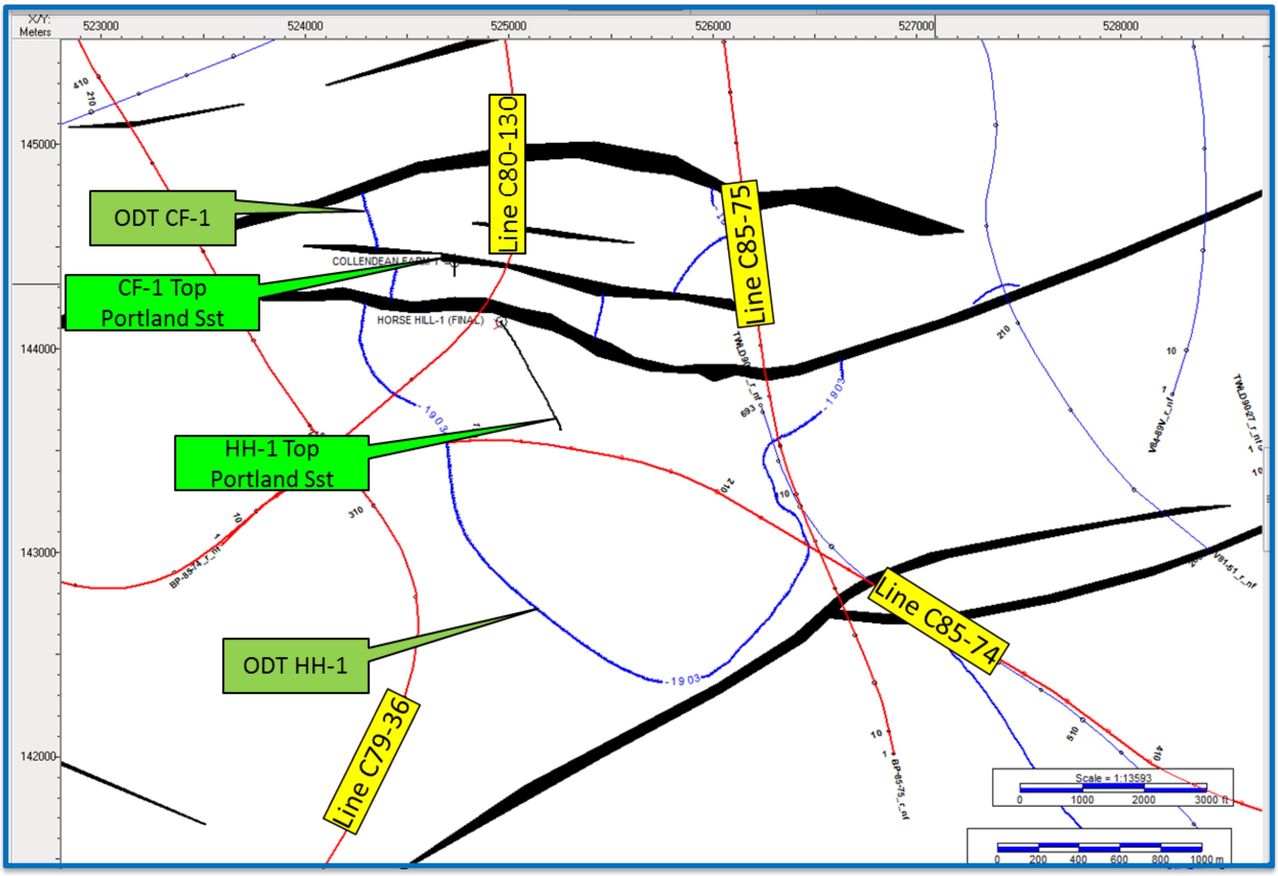


Figure 3.2 Key seismic lines across the Horse Hill discovery

3.2.1 Seismic

The most recent seismic dates from the 1980s, the oldest data were acquired in the 1960s. There is an approximate north-south / east-west grid, but line orientation is very variable, and spacing averages around 2-3km. Some lines have been reprocessed since original acquisition, with a substantial improvement in data quality. There is no seismic line in the Kingdom project, which passes directly through either well. Well CF-1 is 250m from the nearest seismic line (C80-130) and well HH-1 lies 85m from the nearest line (C85-74). Despite this, there is sufficient confidence in Vertical Seismic Profile ("VSP") and synthetic character ties to seismic to ensure that the horizon identification is sound. An example of the key seismic lines is shown in Figure 3.3.

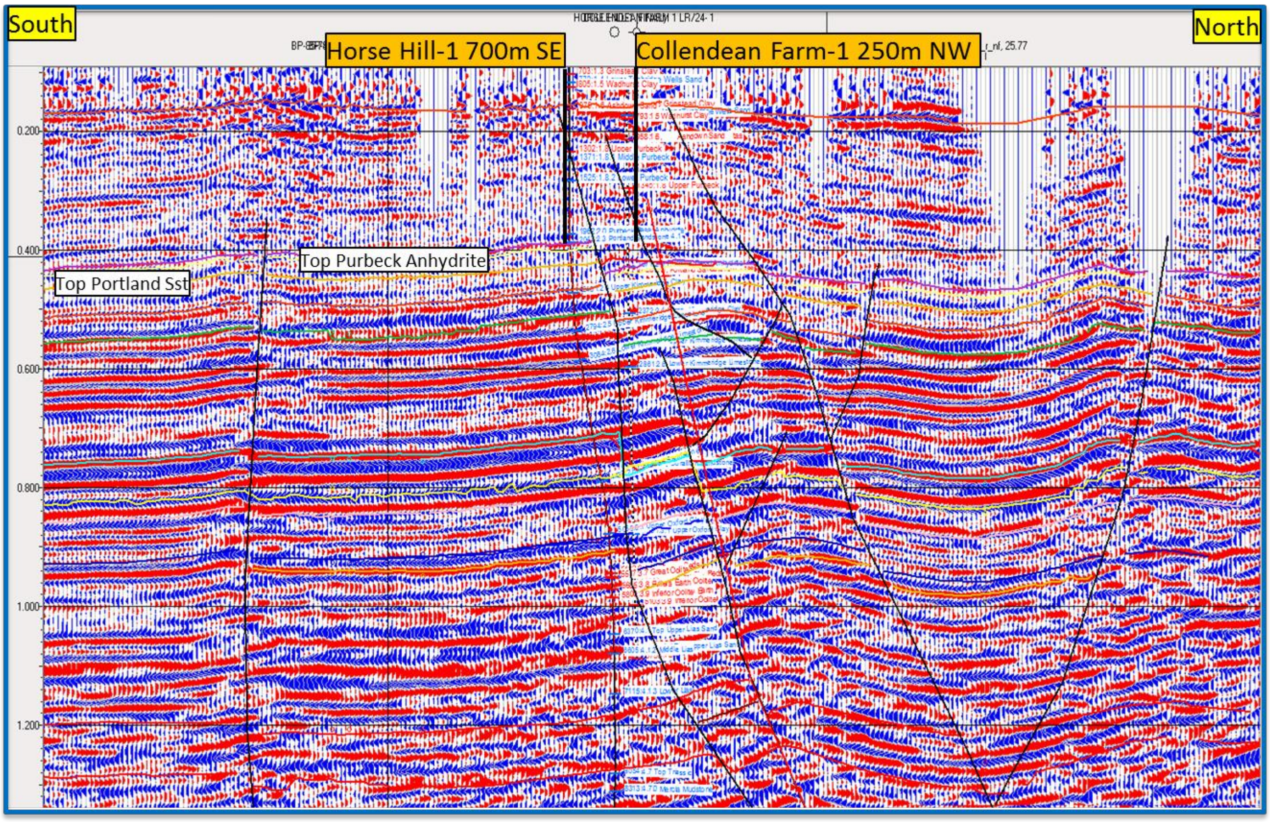


Figure 3.3 Example seismic section - Line C 80-130.

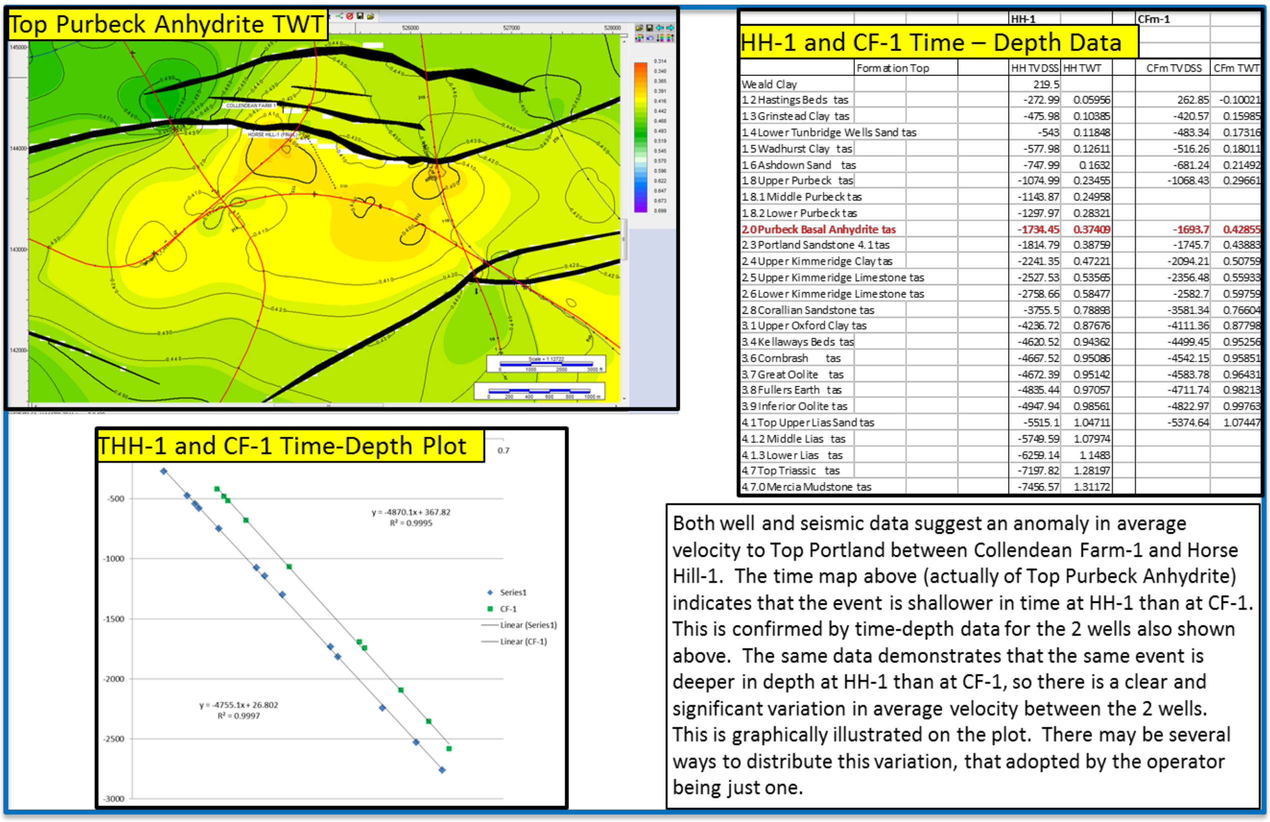
3.2.2 Interpretation and Mapping

VSP data is available from both wells, which allows an accurate correlation of the key well markers to the seismic. Log character in both wells indicates a very close match, suggesting that the Upper and Middle Jurassic sequence is consistent between the two wells. Seismic character is dominated by the very strong, conformable sequence of events lying primarily below the Kimmeridgian. Potential for correlation error exists across the main east west faulting between CF-1 and HH-1, but UKOG have shown detailed correlations to demonstrate that seismic character is very consistent from one side of the fault to the other.

Seismically, the Top Purbeck Anhydrite and the Top Upper Portland Sand form part of the same reflector cycle, and are separated by about 10 milliseconds ("msec"). As the Top Anhydrite appears the more continuous event, this has been made the key seismic pick, adjustment to the Top Portland sand depths being made at the end of the depth conversion process. Given the overall conformity of the sequence, and the dataset available, this is quite acceptable.

In general, reflection quality of the Top Purbeck Anhydrite is good, but on some critical lines (e.g. C79-36 and C80-130) continuity of the package sitting above the Kimmeridge is poor, probably due to lower impedance contrasts and reduced fold. This results in lower confidence in the key areas close to the major east-west faulting which divides the structure. Overall conformity of the sequences below helps to support the integrity of the mapping in such areas.

Time mapping and VSP data suggest that there is an average velocity anomaly between the CF-1 well and HH-1. Velocities to the shallow events in CF-1 (including the Portland sandstone) show a significant reduction compared to HH-1. This results in CF-1 Top Portland being deeper in time than HH-1 but shallower in depth. The time map of Top Purbeck Anhydrite and depth map of Top Portland Sands illustrate this. This issue is illustrated in Figure 3.4.



Formation Top	HH-1 HH TVDSS	HH TWT	CFm-1 CFm TVDSS	CFm TWT
Weald Clay	219.5			
1.2 Hastings Beds tas	-272.99	0.05956	262.85	-0.10021
1.3 Grinstead Clay tas	-475.98	0.10385	-420.57	0.15985
1.4 Lower Tunbridge Wells Sand tas	-543	0.11848	-483.34	0.17316
1.5 Wadhurst Clay tas	-577.98	0.12611	-516.26	0.18011
1.6 Ashdown Sand tas	-747.99	0.1632	-681.24	0.21492
1.8 Upper Purbeck tas	-1074.99	0.23455	-1068.43	0.29661
1.8.1 Middle Purbeck tas	-1143.87	0.24958		
1.8.2 Lower Purbeck tas	-1297.97	0.28321		
2.0 Purbeck Basal Anhydrite tas	**-1734.45**	**0.37409**	**-1693.7**	**0.42855**
2.3 Portland Sandstone 4.1 tas	-1814.79	0.38759	-1745.7	0.43883
2.4 Upper Kimmeridge Clay tas	-2241.35	0.47221	-2094.21	0.50759
2.5 Upper Kimmeridge Limestone tas	-2527.53	0.53565	-2356.48	0.55933
2.6 Lower Kimmeridge Limestone tas	-2758.66	0.58477	-2582.7	0.59759
2.8 Corallian Sandstone tas	-3755.5	0.78898	-3581.34	0.76604
3.1 Upper Oxford Clay tas	-4236.72	0.87676	-4111.36	0.87798
3.4 Kellaways Beds tas	-4620.52	0.94362	-4499.45	0.95256
3.6 Cornbrash tas	-4667.52	0.95086	-4542.15	0.95851
3.7 Great Oolite tas	-4672.39	0.95142	-4583.78	0.96431
3.8 Fullers Earth tas	-4835.44	0.97057	-4711.74	0.98213
3.9 Inferior Oolite tas	-4947.94	0.98561	-4822.97	0.99763
4.1 Top Upper Lias Sand tas	-5515.1	1.04711	-5374.64	1.07447
4.1.2 Middle Lias tas	-5749.59	1.07974		
4.1.3 Lower Lias tas	-6259.14	1.1483		
4.7 Top Triassic tas	-7197.82	1.28197		
4.7.0 Mercia Mudstone tas	-7456.57	1.31172		

Figure 3.4 Velocity anomaly HH-1 to CF-1

UKOG explains this anomaly by the difference in near surface section in the two wells. At CF-1 the Hastings beds are at the surface, while at HH-1 the younger Wealden clay is at the surface, and the Hastings Beds are at 273ft TVDSS. This provides a difference of approximately 480ft in thickness of the lower velocity Hastings sands and silts between the two wells, and can explain the difference in average velocity recorded in the shallow part of the sequence. Xodus agrees with UKOG that this is a plausible explanation, but perhaps further analysis of interval velocities in the two wells would help to confirm this.

3.2.3 Depth Conversion

As discussed above, all picking was based on the Top Purbeck Anhydrite reflector, and subsequent derivation of functions and depth conversion was also based on this reflector.

Depth conversion has been based on the VSPs in each of the wells. Because of the anomaly discussed above, it is difficult to define one velocity function which would fit both wells. In practice, separate velocity functions for each well have been derived. This was done by plotting time-depth for the shallow part of each well (down to 3000m) and deriving a straight-line function from the slope. At this depth the time-depth values closely approximate a straight line. This is illustrated in Figure 3.5, which shows the independently derived results by Xodus, confirming the UKOG results.

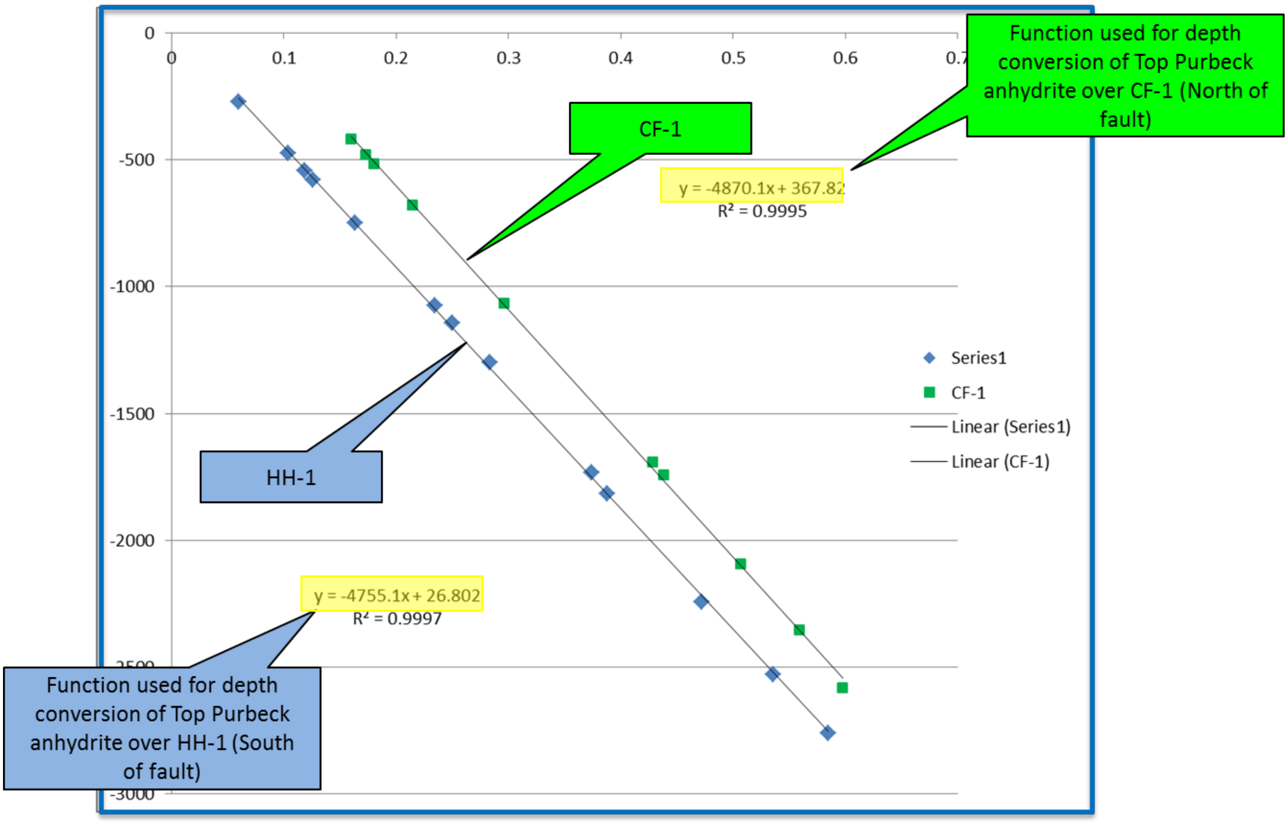


Figure 3.5 HH-1 and CF-1 time depth plot.

These two functions have been used independently to convert the hanging wall part of the structure (CF-1) and the footwall part of the structure (HH-1). The two maps were trimmed in Kingdom and physically joined along the fault. This is a solution, but it does not address the aerial distribution of velocity variation implied by the well data. If the velocity variation is related to gradually varying thickness changes within the upper part of the sequence, then the change should be spread across the area between the two wells. However, with limited well control it is difficult to know how this aspect could be refined and the UKOG interpretation is therefore acceptable.

The final Top Portland Sand map was created by taking the Top Purbeck Anhydrite map and adding an isopach to each part of the feature. An isopach of 52ft (the Top Anhydrite to Top Sand interval in CF-1) was added to the hanging wall part of the structure north of the fault, and an isopach of 80.3ft (the corresponding interval in HH-1) to the footwall part of the structure. Again the method implies that all of the thickness change takes place along the fault, rather than spread over a distance. Equally there is no clear way of improving on this with the data available.

One of the implications of this approach is that the current depth maps do not represent the true throw on the fault. The presented map shows little or no throw at the crest of the structure.

An example of the final depth maps is shown in Figure 3.6, annotated with the Oil Down To (“ODT”) levels for the two separate areas. Also shown is a conservative lowest closing contour at 1975ft TVDSS. This is a bit shallower than that proposed by UKOG, but is the deepest level supported by the maps presented. This only applies to the area of closure south of the fault. The apparent lowest closing contour to the north of the fault would be around 1920ft TVDSS. To assume oil to a lower level in the north would imply some additional form of closure – e.g. a fault seal. Such possibility has not been further included in Xodus’ volumetric review.

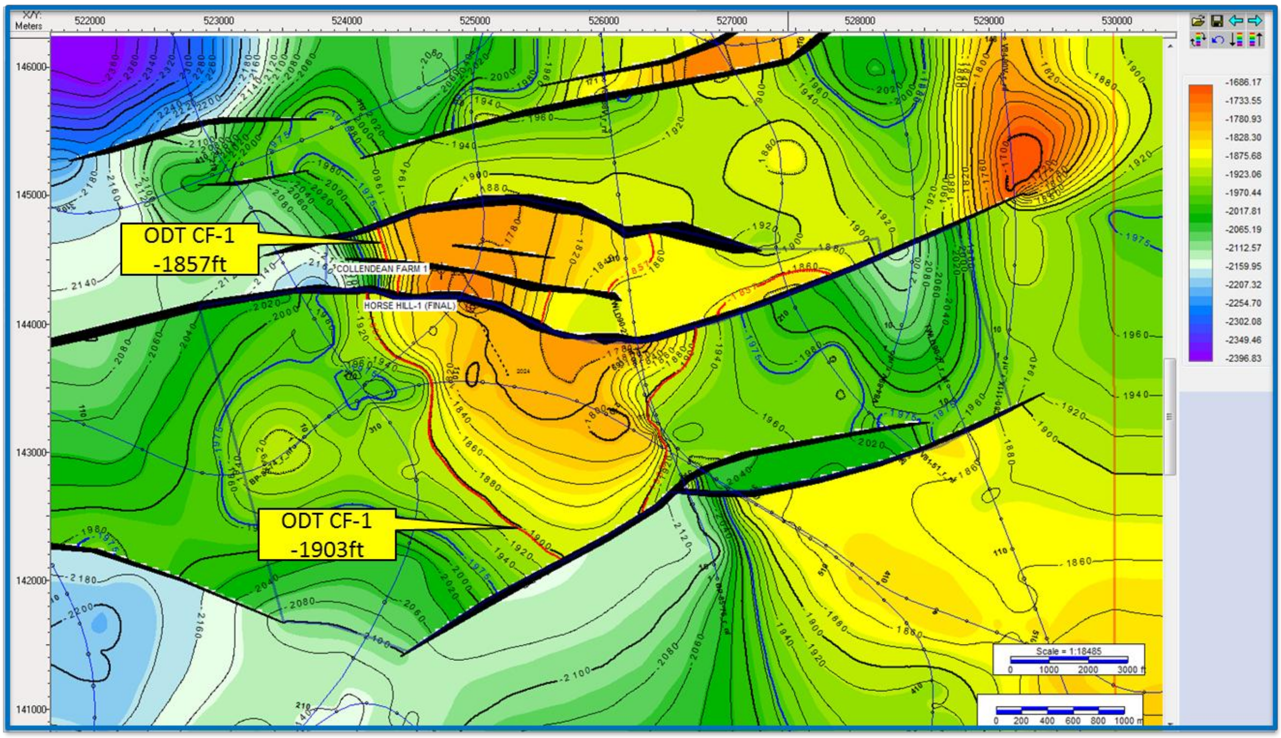


Figure 3.6 Operator map of the Top Portland Sandstone depth, smoothed and edited showing the ODTs and LCCs.

Since the CF-1 and HH-1 wells penetrate the same overall tilted fault block feature, show an oil down to base reservoir plus the footwall and hangingwall polygons show a similar maximum mapped spill point, it has been assumed for maximum volumetric purposes that the field is defined by one common spill point. It is possible that the footwall-bounding fault could seal, in which case the areal closure could be greater than the 1920ft TVDSS closure modelled. Xodus have not modelled this scenario. Further refinements to the time to depth conversion are recommended and will permit a more reliable construction of footwall to hanging wall cross fault juxtaposition.

3.3 Reservoir

The Upper Portland Sandstone, as penetrated in the two wells, comprises a number of sand units separated by shale beds, which can be correlated between the two wells (Figure 3.7). The sand units show a coarsening upwards pattern consistent with the interpretation of shallow marine depositional setting. The sands are described in the mudlog as being very fine and well sorted with an argillaceous matrix and traces of glauconite.

The top of the sand is well defined being beneath the Purbeck Anhydrite and is capped by a thin limestone layer. The gross thickness of the sand in the wells is 105ft and 110ft in CF-1 and HH-1 respectively. There are a number of thin sands (less than 4ft) beneath the main sand which are also oil bearing.

Regional data shows the sand thickening to the north into what was probably an active growth fault, the sand correspondingly thins to the south. An isopach map of the Upper Portland, provided by UKOG, shows the discovery to sit in an area of rapidly changing thickness. The thickness of the Upper Portland sandstone in the region of CF-1, as mapped, changes in thickness by 50ft over a distance of approximately 5km. The discovery covers an area of approximately 6 by 4km when considering the spill points of the structure as the limits. The variation and range of thickness observed in the wells may therefore not be truly indicative of the thickness variation in the reservoir across the area. UKOG have applied a narrow thickness range in volumetric estimate, which is justified by the wells but may not capture full range of possible reservoir thickness in this area.

New petrophysical interpretations were available for both wells, Xodus have not undertaken a detailed review of the petrophysical interpretation methodology however the parameters and results are consistent with previous interpretations and information from other wells in the basin. The interpretations of water saturation and porosity from logs also tie well to the measurements from core available in the CF-1 well.

Log porosity varies from 5.9% to 18.7% with an average of 13.3% in the CF-1 well and from 6.7% to 14.2% with an average of 10.2% in the HH-1 well. Net to gross has been determined using a 50% Vclay cut off which give a values of 40 to 53% which gives net pay of 43ft in HH-1 and 55ft in CF-1.

Log data shows that the entire gross thickness of the Upper Portland Sandstone as penetrated in the wells is oil bearing, giving an ODT in both wells. The water saturation was determined for the pay zones giving averages of 57.8% and 53.9% with an overall range of 45% to 67%. The lowest water saturation corresponds with the highest gas readings on the mud log and is recorded approximately 60ft below the top reservoir in the HH-1 well.

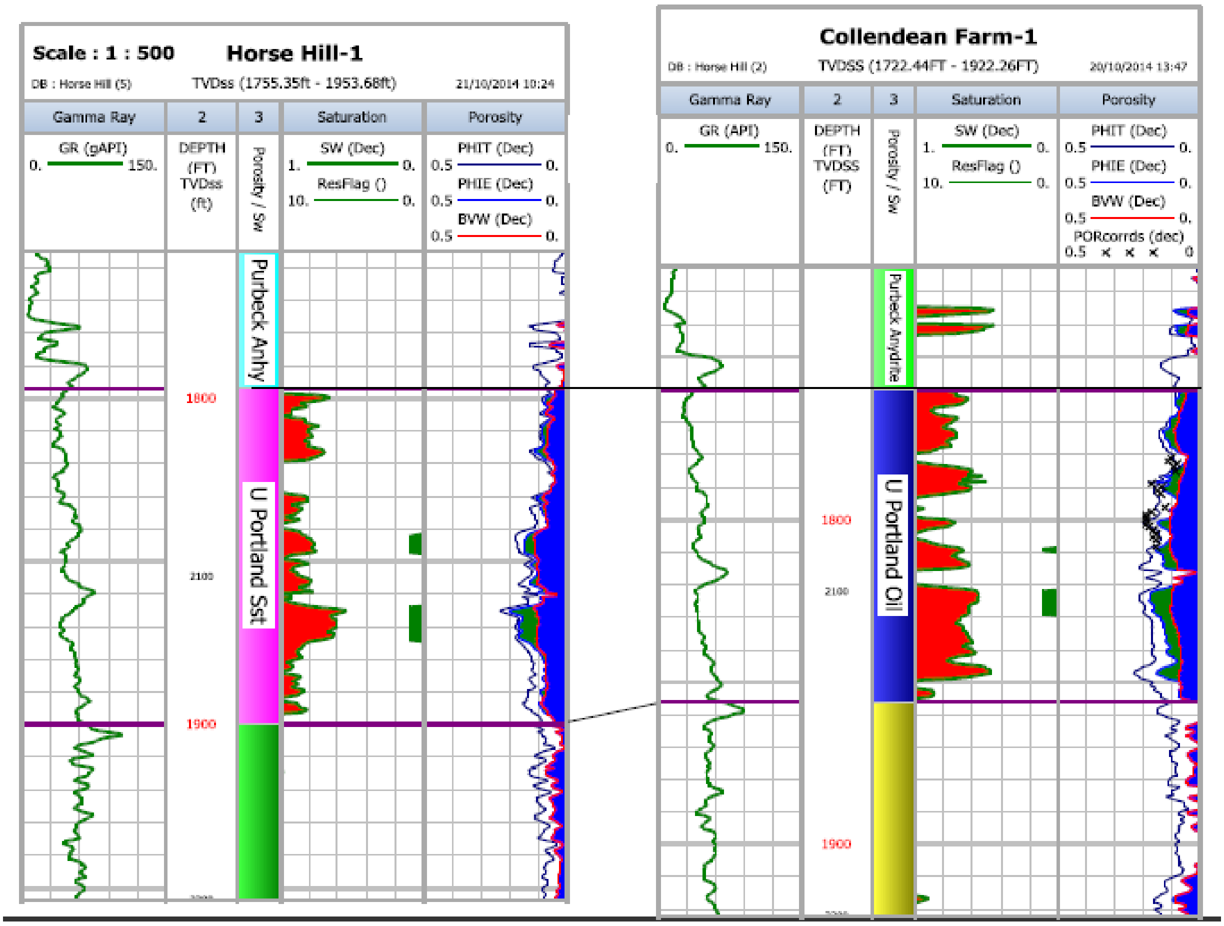


Figure 3.7 Portland section from quick look CPIs shows correlation between the wells

4 HYDROCARBON IN PLACE ESTIMATES

4.1 Approach

Xodus' STOIIP values were calculated stochastically using REP5 software from Logicom E&P.

For the purposes of GRV and STOIIP calculations, the discovery has been divided into two regions along the major east west fault resulting in two blocks defined by the well which has penetrated it (the Collendean Farm Block penetrated by the CF-1 well and the Horse Hill Block, penetrated by the HH-1 well). Figure 4.1 shows the top reservoir map with the polygons used in Petrel for determining GRVs.

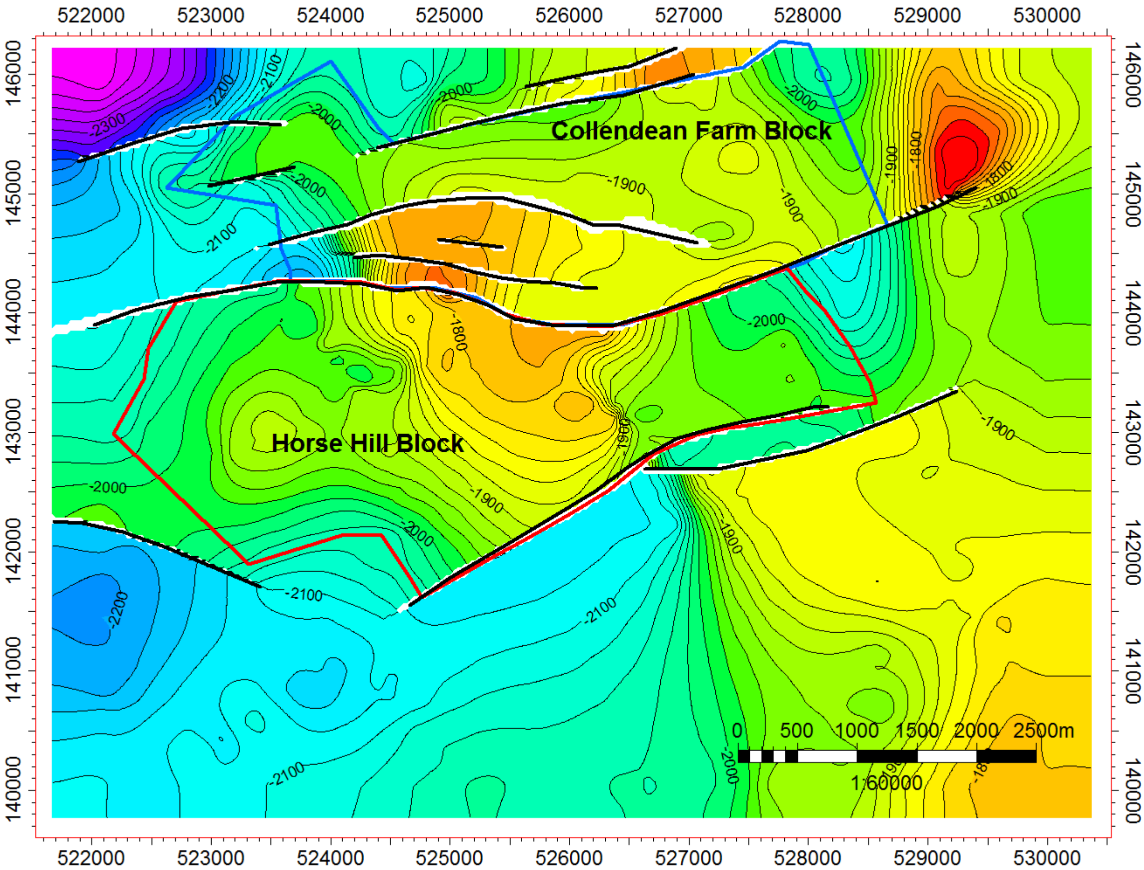


Figure 4.1 Map showing top Portland Sandstone surface and polygons used to define fault / volumetric blocks

GRV inputs were derived from the seismic interpretation for the top reservoir surface. A new surface was generated by Xodus, from the existing interpretation, which has been smoothed slightly and for which the match to well tops was improved. Area depth data was calculated using Petrel software, polygons were used to define the northern and southern blocks and to artificially close the structures around the spill point where the seismic mapping could not. This method is considered to be more accurate than that used by UKOG. UKOG loaded an image of the top reservoir map into REP and manually calibrated and traced the contours to determine the area for each. This method which is reliant on the accuracy of the map and tracing, whereas Petrel calculates the areas accurately within the software and the values were then exported and entered into REP.

No fluid contacts have been observed in the wells drilled on the discovery and the reservoir sand has been found to be full to the base. The possible range of fluid contact has been defined by the ODTs and spill points for the two fault blocks. In the northern Collendean Farm Block the ODT of 1857ft TVDSS is the minimum depth and the spill point of

2000ft TVDSS is the maximum used to define a normal beta distribution. Correspondingly in the southern Horse Hill Block, the ODT of 1900ft TVDSS and spill point of 2000ft TVDSS are applied in the same way. As described above it is not possible to close the structures at these depths, although this is potentially a result of the sparse seismic coverage and resultant depth conversion uncertainty. For the CF fault block, the ODT/Spill point Beta distribution assigned by UKOG are identical to Xodus'. For the HH fault block, UKOG use a lower P10 spill point input value of 1993ft TVDSS compared to Xodus' 1974ft TVDSS, which results in a more optimistic maximum spill point of 2040ft compared to Xodus' 2000ft TVDSS input.

Reservoir thicknesses were taken from the gross thicknesses observed in the wells, the average thickness (107.5ft) has been used as the P50. To account for some potential variation in reservoir thickness across the reservoir a P90 and P10 of 95ft and 120ft have been selected based on +/- 10ft of the minimum and maximum gross thicknesses observed in the wells.

Net to gross, porosity and water saturation ("Sw") have been taken unchanged from the UKOG REP model, which Xodus considers to be reasonable estimates, based on the well logs. The minimum and maximum averages observed in the wells have been used as the P90 and P10 estimates in normal distributions.

Formation Volume Factor ("FVF") and Gas Oil Ratio ("GOR") have been estimated by UKOG from offset well data at the Brockham Upper Portland field.

Table 4.1 and Table 4.2 show the parameters and distributions used in the determination of STOIIP

	Unit	Shape	Min	P90	P50	P10	Max	Mode	Mean
Thickness	ft	Normal	78.2	95	108	120	137	108	108
Area uncertainty	%	Normal	41.5	75	100	125	159	100	100
OWC	ft	Beta	1900	1923	1948	1974	2000	1948	1949
Net-to-gross	%	Normal	26.3	37	45	53	63.7	45	45
Porosity	%	Normal	7.95	10.1	11.7	13.3	15.4	11.7	11.7
Sw	%	Normal	51.3	54	56	58	60.7	56	56
FVF (Bo)	rb/stb	Normal	1.02	1.03	1.04	1.05	1.06	1.04	1.04
GOR	scf/bbl	Normal	13.2	40	60	80	107	60	60

Table 4.1 Parameters used in the estimation of STOIIP for the Horse Hill fault block

	Unit	Shape	Min	P90	P50	P10	Max	Mode	Mean
Thickness	ft	Normal	78.2	95	108	120	137	108	108
Area uncertainty	%	Normal	41.5	75	100	125	159	100	100
OWC	ft	Beta	1857	1877	1907	1946	2000	1900	1910
Net-to-gross	%	Normal	31.3	40	46.5	53	61.7	46.5	46.5
Porosity	%	Normal	7.95	10.1	11.7	13.3	15.4	11.7	11.7
Sw	%	Normal	51.3	54	56	58	60.7	56	56
FVF (Bo)	rb/stb	Normal	1.02	1.03	1.04	1.05	1.06	1.04	1.04
GOR	scf/bbl	Normal	13.2	40	60	80	107	60	60

Table 4.2 Parameters used in the estimation of STOIIP for the Collendean Farm fault block

Following the estimation of STOIIP in both fault blocks, a stochastic consolidation has been carried out to give a single estimated range for the Upper Portland Sandstone of Horse Hill.

4.2 In Place Volumes

Table 4.3 shows Xodus' Gross PEDL137 STOIIP estimates for Upper Portland Sandstone of the Horse Hill discovery.

STOIIP (MMbbl)	Low	Best	High	Mean
Upper Portland Gross 100%	14.3	21.0	30.4	21.8

Table 4.3: Xodus Horse Hill gross PEDL137 STOIIP estimate

4.3 UKOG Volumetric Results

The results of the volumetric assessment are very close to those provided by UKOG to Xodus for this study, see Table 4.4

STOIIP (MMbbl)	Low	Best	High	Mean
Upper Portland Gross 100%	13.4	20.0	30.1	21.0

Table 4.4 UKOG gross PEDL137 STOIIP range for Horse Hill

The slight increase in volumes compared to UKOG can primarily be attributed to the use of a top reservoir surface which has been smoothed and had an improved tie to the well tops, this results in greater volume for a given depth and therefore GRV. The increase in thickness range used is expected to have broadened the volumetric range slightly, an effect that is hidden by the effect of increased GRV. The mid case thickness has remained the same in both Xodus and UKOG cases. In the Xodus case the maximum Oil Water Contact ("OWC") in the Horse Hill Block has been reduced from 2040ft to 2000ft TVDSS, which has resulted in the high cases estimates being pulled in towards the mean and mid case.

5 CONCLUSIONS

Xodus has carried out an independent review of the work undertaken by UKOG in the determination of STOIIP for the Upper Portland Sandstone reservoir of the Horse Hill discovery. Xodus has found the work carried out by UKOG to be technically justifiable and as a result the STOIIP figures calculated by Xodus have a close match to those of UKOG.

The differences in inputs to the volumetric calculations made by Xodus and the effect on volumes in the Xodus model can be summarised as:

- Smoothed and well-corrected top reservoir surface – increased GRV and therefore STOIIP
- Wider range in reservoir thickness – broadened range but P50 kept the same as UKOG model, effect masked by other changes
- Reduced maximum OWC in Horse Hill farm block – reduced high case GRV and STOIIP estimate

The methodology used for the depth conversion does not fully explain the aerial distribution of velocity variation implied by the well data. However, with the limited control data available the method used by UKOG was deemed to be justifiable.

6 NOMENCLATURE

Term	Meaning	Units of measurement
2D	Two dimensional seismic data covering length and depth of a given geological surface	
3D	Three dimensional seismic data covering length, breadth and depth of a given geological surface	
AAPG	American Association of Petroleum Geologists	
AIM	Alternative Investment Market of the London Stock Exchange	
API	American Petroleum Institute	api
AVO	Amplitude versus offset or amplitude variation with offset is often used as a direct hydrocarbon indicator	
Best Estimate	An estimate representing the best technical assessment of projected volumes. Often associated with a central, P_{50} or mean value	
CF-1	Collendean Farm-1 well	
Contingent Resources	Contingent Resources are those quantities of petroleum estimated, as of a given date, to be potentially recoverable from known accumulations, but the applied project(s) are not yet considered mature enough for commercial development due to one or more contingencies. Contingent Resources may include, for example, projects for which there are currently no viable markets, or where commercial recovery is dependent on technology under development, or where evaluation of the accumulation is insufficient to clearly assess commerciality. Contingent Resources are further categorised in accordance with the level of certainty associated with the estimates and may be sub-classified based on project maturity and/or characterised by their economic status.	
COS	Exploration or geological chance of success. The probability, typically expressed as a percentage that a given outcome will occur.	
CPI	Computer-processed interpretation	
D	Day	

ft	Foot/feet	ft
º F / º C	Degrees Fahrenheit / Centigrade	
FDP	Field Development Programme	
FVF	Formation Volume Factor	
FWL	Free water level	
GDT	Gas Down To	ft or m
GIIP	Gas Initially In Place	
GR	Gamma ray	
GOR	Gas Oil Ratio	
GRV	Gross Rock Volume	
GWC	Gas-water contact	
H	Thickness	ft or m
High Estimate	An estimate representing the high technical assessment of projected volumes. Often associated with a high or P_{10} value	
HCIIP	Hydrocarbons Initially in Place	
HH-1	Horse Hill-1 well	
K	Permeability	mD
k_a	Air permeability	mD
Kh	Permeability-thickness	mDft
km	Kilometres	km
Kw	Water Permeability	mD
Lead	A feature identified on seismic data that has the potential to become a prospect. Usually a Lead is associated with poorer quality or limited 2D seismic data.	
LKG	Lowest Known Gas	ft or m
Low Estimate	An estimate representing the low technical assessment of projected volumes. Often associated with a low or P_{90} value.	High Estimate
M	Metres	
MD	Measured depth	ft or m
mD	Millidarcies	
MDRKB	Measured Depth Rotary Kelly Bushing	ft or m
MDBRT	Measured depth Below Rotary Table	ft or m

Mean	The arithmetic average of a set of values	
msec	Millisecond	
MM	Million	
MMbo	Millions of barrels of oil	
MMboe	Millions of barrels of oil equivalent	
MMstb	Millions of barrels of stock tank oil	
N/G	Net to Gross	
OBM	Oil based mud	
ODT	Oil down to	
OWC	Oil water contact	
P_{10}	The probability of that a stated volume will be equalled or exceeded. In this example a 10% chance that the actual volume will be greater than or equal to that stated.	
P_{50}	The probability of that a stated volume will be equalled or exceeded. In this example a 50% chance that the actual volume will be greater than or equal to that stated.	
P_{90}	The probability of that a stated volume will be equalled or exceeded. In this example a 90% chance that the actual volume will be greater than or equal to that stated.	
P_{99}	The probability of that a stated volume will be equalled or exceeded. In this example a 99% chance that the actual volume will be greater than or equal to that stated.	
P_{res}	Reservoir pressure	psi
Ppg	pounds per gallon	
Producing	Related to development projects (e.g. wells and platforms): Active facilities, currently involved in the extraction (production) of hydrocarbons from discovered reservoirs.	

Prospective Resources	Prospective Resources are those quantities of petroleum estimated, as of a given date, to be potentially recoverable from undiscovered accumulations by application of future development projects. Prospective Resources have both an associated chance of discovery and a chance of development. Prospective Resources are further subdivided in accordance with the level of certainty associated with recoverable estimates assuming their discovery and development and may be sub-classified based on project maturity.
PVT	Pressure Volume Temperature: Measurement of the variation in petroleum properties as the stated parameters are varied.
REP	Reserves Evaluation Programme - REP5 software from Logicom E&P
Reserves	Reserves are those quantities of petroleum anticipated to be commercially recoverable by application of development projects to known accumulations from a given date forward under defined conditions. Reserves must further satisfy four criteria: they must be discovered, recoverable, commercial, and remaining (as of the evaluation date) based on the development project(s) applied. Reserves are further categorised in accordance with the level of certainty associated with the estimates and may be sub-classified based on project maturity and/or characterised by development and production status.
Rw	Water resistivity
Seismic	Use of sound waves generated by controlled explosions to ascertain the nature of the subsurface geological structures. 2D records a cross section through the subsurface while 3Dprovides a three dimensional image of the subsurface.
SNS	Southern North Sea
So	Oil saturation
STOIIP	Stock tank oil initially in place
SPE	Society of Petroleum Engineers
SPEE	Society of Petroleum Evaluation Engineers

Sw	Water saturation	ratio
TD	Total depth	ft or m
TVDBRT	True vertical depth below rotary table	ft or m
TVDSS	True vertical depth sub sea	ft or m
VoK	Average velocity function for depth conversion of time based seismic data, where Vo is the initial velocity and k provides information on the increase or decrease in velocity with depth. V0+k therefore provides a method of depth conversion using a linear velocity field, increasing or decreasing with depth for each geological zone.	
VSP	Vertical Seismic Profile	
WGR	Water gas ratio	
WHP	Wellhead pressure	psi
WPC	World Petroleum Council	
WUT	Water up to	

XODUS & AUTHOR CREDENTIALS

Xodus is an independent, international energy consultancy. Established in 2005, the company has 600+ subsurface and surface focused personnel spread across thirteen offices in Aberdeen, Anglesey, Dubai, Edinburgh, Glasgow, The Hague, Houston, Lagos, London, Orkney, Oslo, Perth and Southampton.
The wells and subsurface division specialise in petroleum reservoir engineering, geology and geophysics and petroleum economics. All of these services are supplied under an accredited ISO9001 quality assurance system.
Except for the provision of professional services on a fee basis, Xodus has no commercial arrangement with any person or company involved in the interest that is the subject of this report.

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