Shell U.K. Limited

Relinquishment Report

For

Licence P.088

Relinquishment of part of Block

49/20a (P1/P2) Denver Prospective Area

EP Catalog Nr: EP201404204911

Important Notice

This Relinquishment Report is presented by Shell U.K. Limited (“Shell”), and contains information which may be of use to companies considering the acquisition of this acreage in upcoming licensing rounds.

This Relinquishment Report does not purport to be all-inclusive or to contain all of the information that an interested party might desire. Shell has provided the information contained in this Relinquishment Report in good faith; nevertheless Shell and its affiliates, officers, directors, employees, agents, advisers and representatives make no representations or warranties, expressed or implied or accept any responsibility or liability, concerning any information in this Relinquishment Report or the omission of any information.

Reliance on the information provided in this Relinquishment Report shall not give rise to any cause of action against Shell, or its affiliates, officers, directors, employees, agents, advisers and representatives, including, without prejudice to the generality of the foregoing, causes of action or claims based upon their negligence or wilful misconduct.

This Relinquishment Report contains forward-looking information (statements that are not historical facts and relate to future performance). Although Shell believes the expectations reflected in these forward-looking statements are based on reasonable assumptions, no assurance can be given that these expectations will be correct. No representation, warranty or undertaking, express or implied, is made by Shell, or its affiliates, officers, directors, employees, agents, advisers and representatives, that any projections, forecasts or opinions should or will be achieved. In furnishing this Relinquishment Report, Shell undertakes no obligation to provide the recipient with access to any additional information.

1. License Summary

Licence Number: P.088
Licence Round: 2nd Round 1965
Licence type: Traditional
Block Numbers: 49/20a (P1) Caravel Field Area
49/20a (P2) Rest of Block
Present Operator: Shell U.K. Limited (P1: 71% / P2: 100%)
Partners: Esso Exploration and Production U.K. Limited (P1: 29% / P2 0%)

2. License Synopsis

The Denver Prospective Area is part of the P.088 licence which is located some 100 km east of the UK coastline, in the UK sector of the Southern North Sea (Fig. 1). The license was originally awarded during the 2nd licensing round (1965) to Total E&P UK Limited as operator for a six-company partnership. In 1971 Shell UK limited obtained a 50% interest and became operator.

At licence expiry date, in November 2011, the licence comprised the 49/20a (P1) Caravel Field area (71% Shell U.K. Limited; 29% Esso Exploration and Production UK limited) and the 49/20a (P2) Rest of Block (100% Shell U.K. Limited). At that time, a license extension was granted for the Denver prospective area to allow drilling of the 49/20a-8 exploration well. Drilling was completed in January 2013 and the well was abandoned as a dry hole. The Denver prospective area was subsequently relinquished on the 11th of July 2013.

3. Work Program Summary

Work program for the license extension comprised drilling of the 49/20a-8 exploration well targeting the Rotliegend (Leman) sandstone reservoir in the 49/20a-Denver prospect. In case of success, the well was scheduled to be completed with a 3 ½" completion and subsea tree and hooked-up to the existing Caravel/Shamrock infrastructure.

4. Database

Based on 1992 3D seismic acquisition, two 3D seismic PreSDM cubes cover the area: a regional RXXX_04 cube (2002 processing) and a dedicated R1852_08 cube (2008 processing). The regional cube has been used for interpretation of overburden horizons, definition of depth conversion parameters and tie-in of offset wells. The dedicated cube shows better imaging at the Rotliegend reservoir objective and has been the basis for mapping of the prospect geometries. The regional well database, used for the area evaluation, is tabulated below with a location map presented in Figure 2.

Well	Operator	Year	Objective(s)	Status
49/20-1	Total	1967	Rotliegend	Abandoned, Dry
49/20-2	Shell	1971	Rotliegend	Abandoned, Lucy discovery
49/15a-1	Murphy	1991	Rotliegend	Abandoned, Dry
49/20b-5	Shell	2002	Rotliegend	Abandoned, Caravel discovery
49/20a-6	Shell	2004	Rotliegend	Abandoned, Shamrock-N discovery
49/20a-7	Shell	2005	Rotliegend	Abandoned, Shamrock-S discovery

Table1: Regional offset wells

5. Prospectivity

The Denver prospect was mapped as a narrow, elongated pop-up structure, bounded by reverse faults to the north and south and a Zechstein evaporite top seal (Figs. 3 and 4). The Rotliegend (Leman) sandstone reservoir objective was predicted to be some 80m thick with excellent reservoir properties. Gas charge was postulated to originate from Carboniferous coals and shales in a kitchen area to the north, with the prospect being located on one of the two possible migration paths into the producing Caravel gas field.

The prospect carried a POS of 73% (at 0 cut-off) and MSV of 0.9 Bcm of recoverable gas (P10: 1.3; P50: 0.9; P90: 0.6 Bcm). Key risks were identified as lack of charge and lack of top seal with the main uncertainty being the depth of the GWC.

The 49/20a-8 exploration well was spudded by the SWIFT10 rig on the 7th of December 2012. TD was reached at a depth of 2694 mAH (2654 mTVSS) in the top of the Carboniferous. Top Rotliegend came-in some 30 m shallow to prognosis at 2576 mAH (2536 mTVSS). The reservoir interval was developed better than expected, but was found to be fully water-bearing (Figs. 5 and 6). The well was plugged and abandoned and the rig released on the 8th of February 2013.

The pre-Cretaceous overburden in the Denver area is complex and was poorly calibrated by offset wells. Consequently there were two pre-drill scenarios identified for the Top Zechstein pick. The 49/20a-8 well confirmed the ‘Deep Top Zechstein’ scenario comprising thin Zechstein evaporates, overlain by a thick section of Upper Triassic anhydrites and claystones (Fig. 7).

Reason of failure is, most likely, lack of gas charge and the migration path from the kitchen area through Denver, to Caravel appears not to have worked. Due to presence of the Upper Triassic anhydrite/claystone section, instead of thick Zechstein salt, failed top/lateral seal cannot be excluded. However, in the absence of residual gas in the Rotliegend reservoir, this appears to be a less likely scenario.

6. Further Technical Work Undertaken

Apart from analysis of the acquired well data in the 49/20a-8 drilling operation, no further technical studies were carried out.

7. Resource and Risk Summary

Two additional structures, Denver-South and Sasquatch, have been mapped in the Denver Prospective Area (partly straddling the block boundary). Based on the 49/20a-8 exploration well results, these are deemed not to be prospective due to lack of gas charge.

8. Conclusion

This report details the relinquishment of the Denver Prospective Area (part of license P.088), following TD of the unsuccessful 49/20a-8 exploration well and its subsequent abandonment. No further prospectivity has been identified by Shell and the area was relinquished on the 11th of July 2013.

9. Clearance

Shell U.K. Limited confirms that the Department of Energy & Climate Change is free to publish the contents of this report.

10. Maps and Figures

Figure 1 Denver Prospective Area Location Map

Figure 2 Seismic and Wells Database

Figure 3 Top Rotliegend Depth Map

Figure 4 Regional 3D Seismic Line

Figure 5 Exploration Well 49/20a-8 Reservoir Evaluation Summary

Figure 6 Exploration Well 49/20a-8 Mud log and Petrophysical Evaluation

Figure 7 Exploration Well 49/20a-8 Pre-Cretaceous Section Prognosis vs Actual

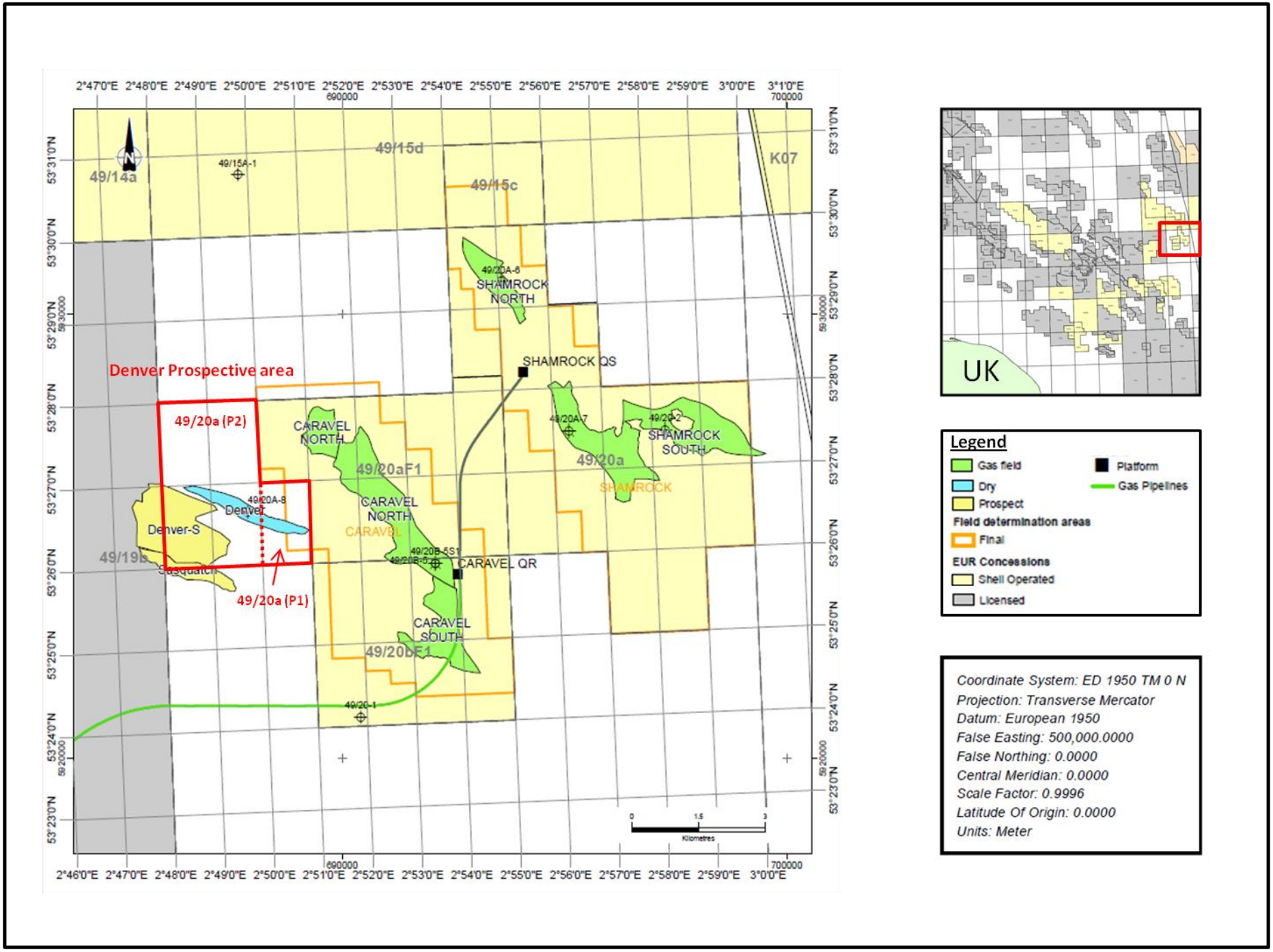

Figure 1: Denver Prospective Area Location Map

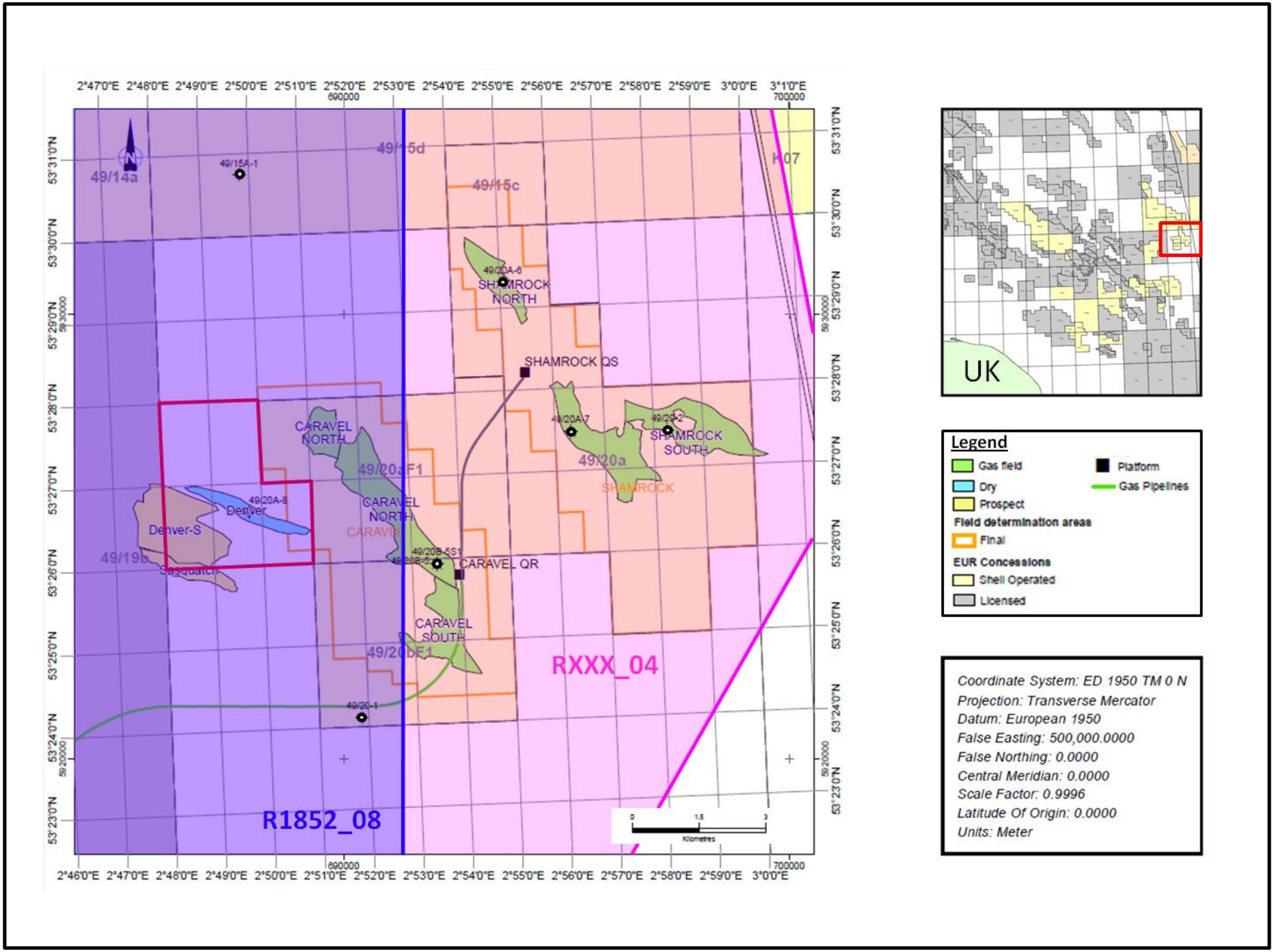

Figure 2: Seismic and Wells Database

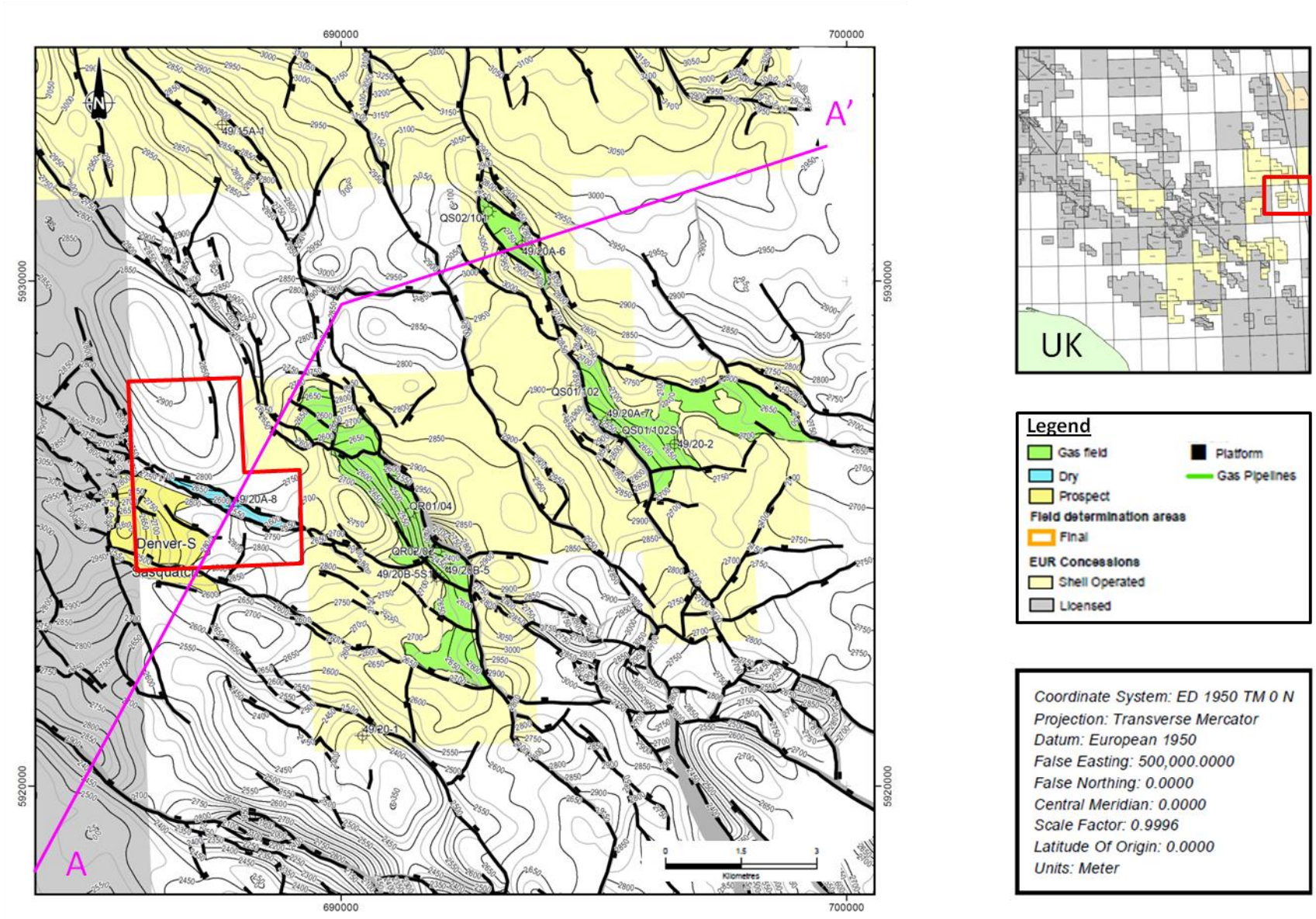

Figure 3: Top Rotliegend Depth Map

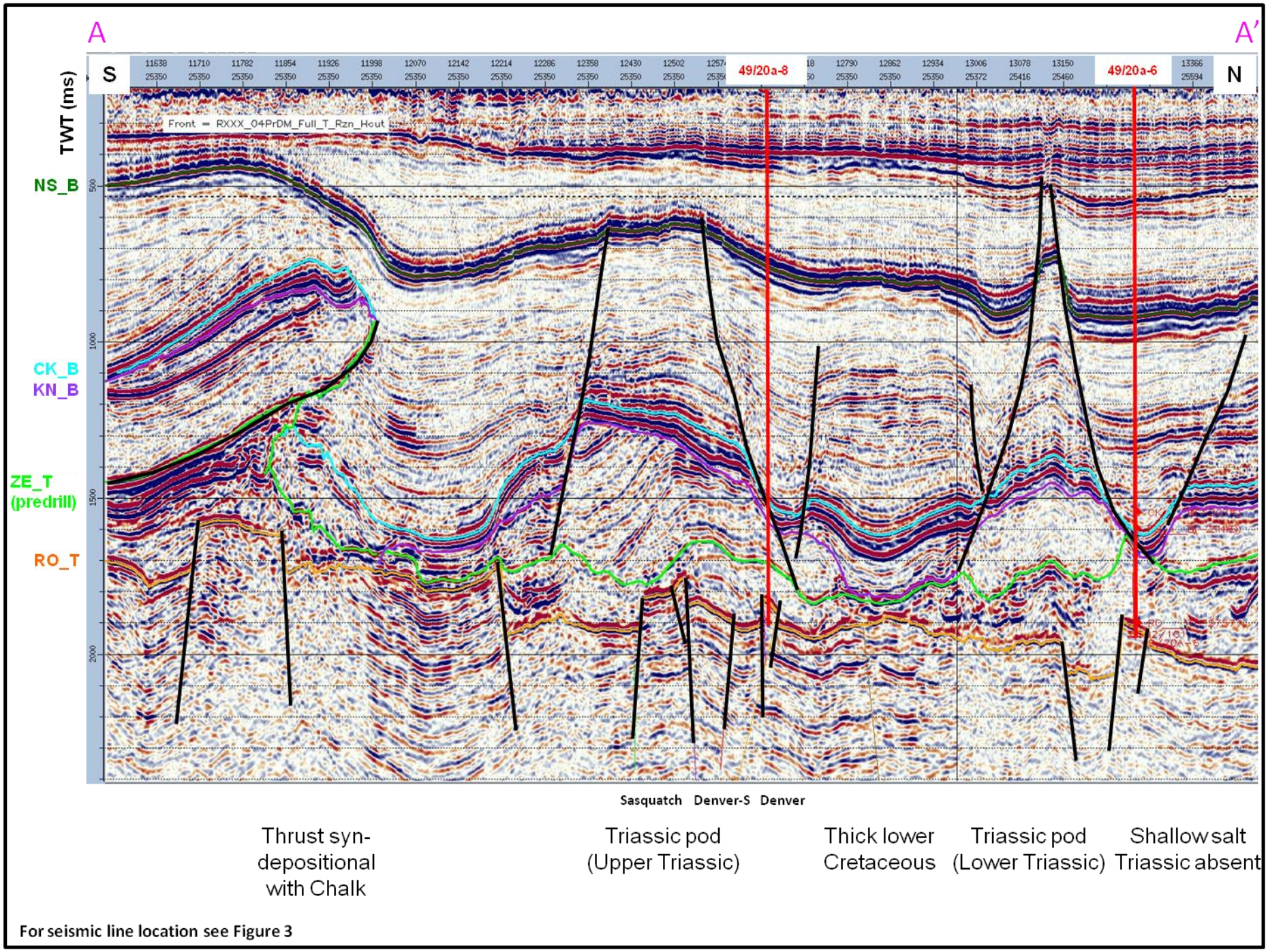

Figure 4: Regional 3D Seismic Line

Reservoir depth prediction vs actual

	top pick (mAHORT)	expected (mAHORT)	difference (mAHORT)	top pick assuming vertical well (mTVDSS)
Leman sandstone	2576	2606	-30	2536
Carboniferous	2677	2686	-9	2637

Reservoir parameters actual

Zones	Top (mAHORT)	Bottom (mAHORT)	Gross (mAHORT)	Net (mAHORT)	Net to Gross	Av_Hydrocarbon Saturation	Av_Porosity
RO	2576	2677	101	94.5	93.6%	0%	17.1%
Predicted ranges (min-max)			65-90		77-100		10-20

Note: Assumes vertical well - TVD not know due to lack of MWD data

Figure 5: Exploration Well 49/20a-8 Reservoir Evaluation Summary

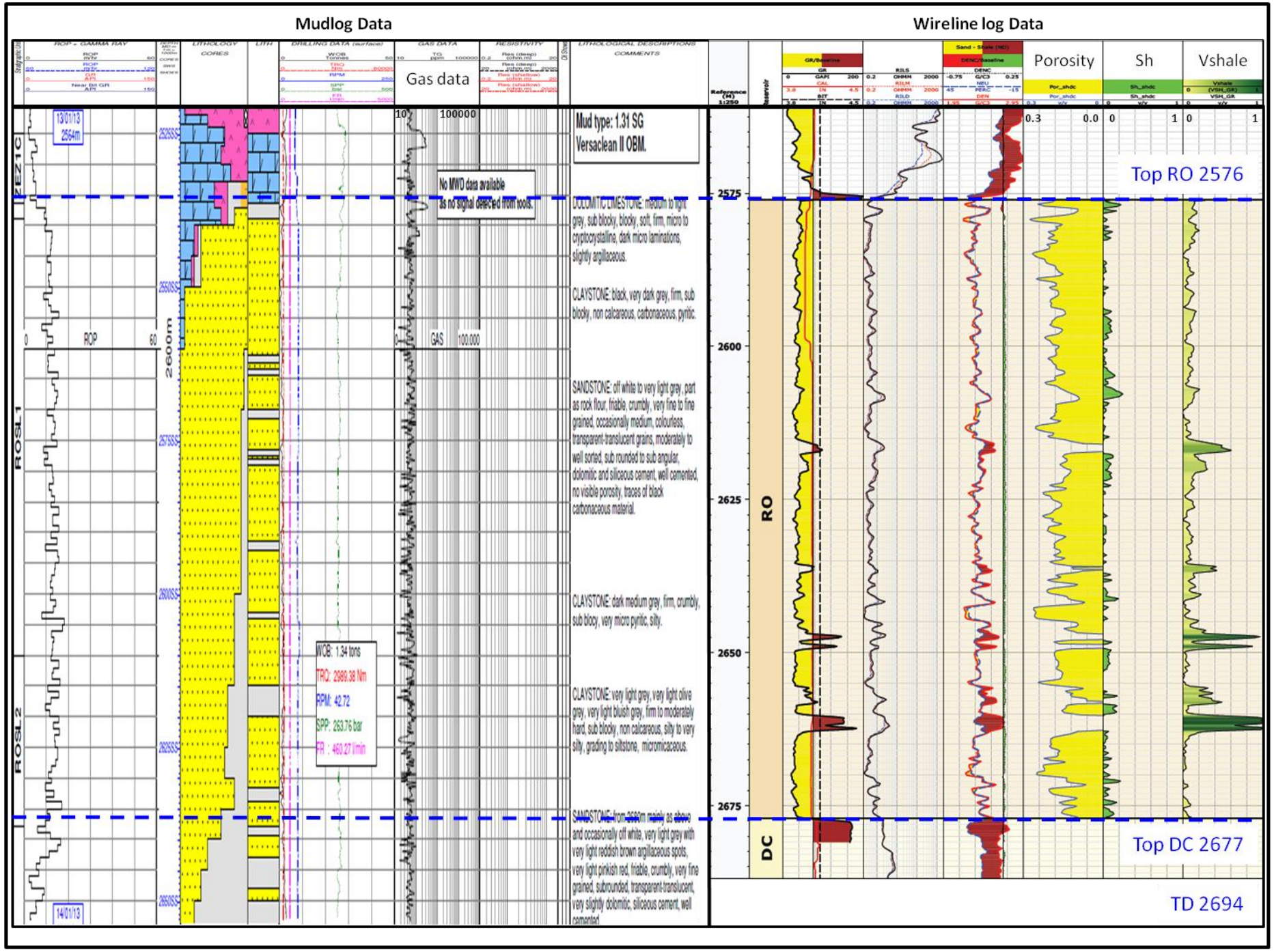

Figure 6: Exploration Well 49/20a-8 Mud log and Petrophysical Evaluation

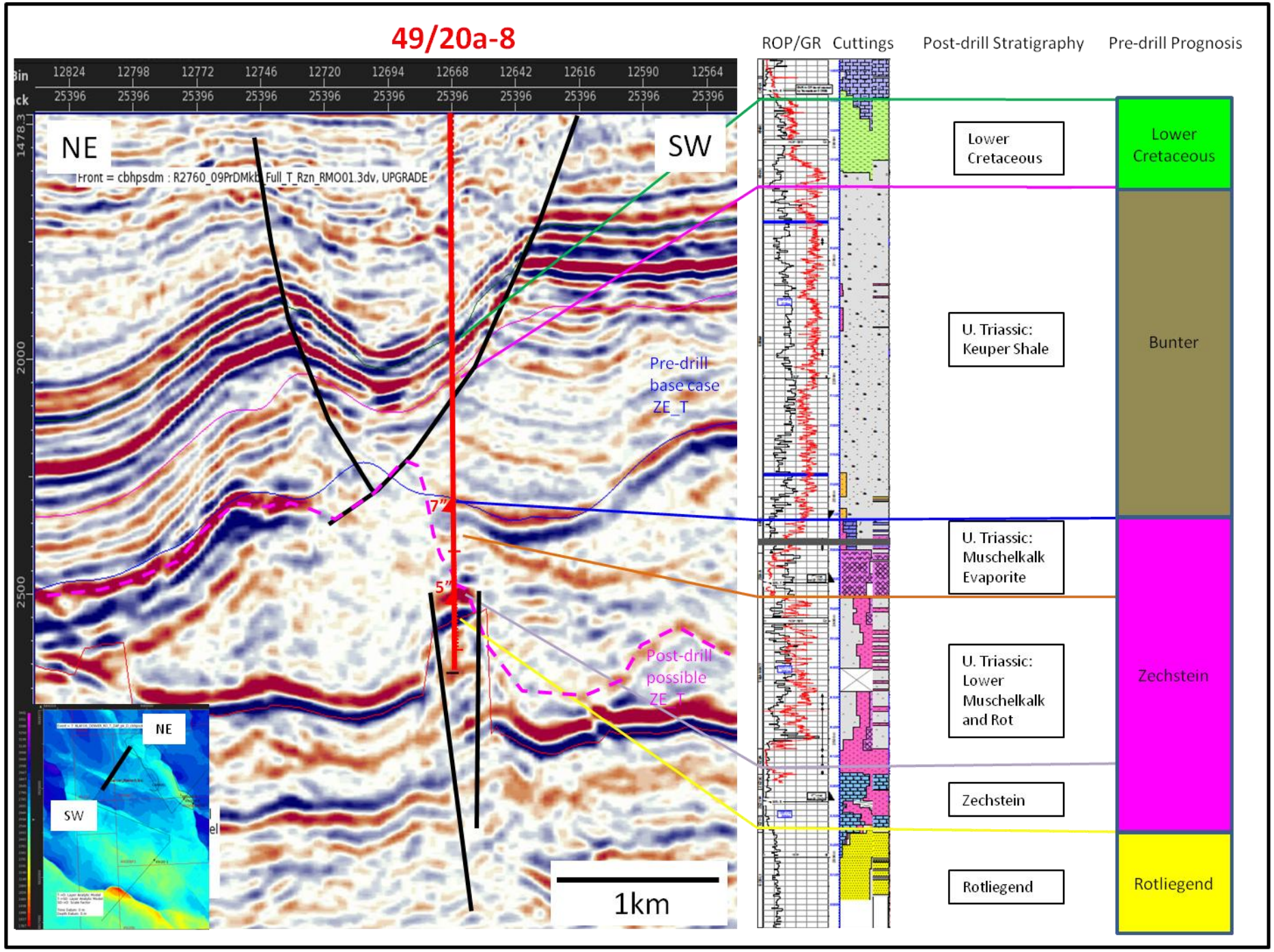

Figure 7: Exploration Well 49/20a-8 Pre-Cretaceous Section Prognosis vs Actual