Relinquishment Report
PL480 Parts of Block 6507/8

1 INTRODUCTION

The initial period for Production Licence 480 expired March 1 2010. The partnership has unanimously decided to fully relinquish the acreage.

2 BACKGROUND AND LICENSE HISTORY

Production Licence (PL) 480 was awarded February 29 2008 to partners Statoil (40% - Operator), Dong (20%), Rocksource (20%) and RweDea (20%).

A two year initial period to decide on drill or drop was granted. Work obligations were to reprocess existing 3D data covering the License and to perform G&G studies.

Production Licence 480 is located in the central parts of Block 6507/8, and is approximately 15km E / NE of the Heidrun Field. In terms of structural setting it covers the southern parts of the Nordland Ridge and the transition to the deeper Grinda Graben to the south (Figure 1).

One prospect is mapped within PL 480; *Eiktyrne* is a downfaulted structure where the trap is dependant on structural-stratigraphic sealing and with reservoir represented by sandstones of Early to Mid Jurassic age.

3 TECHNICAL WORK AND MEETINGS

A new 3D seismic survey – ST08m07 - covering PL 480 was acquired in 2008 (Figure 2). Processing of the seismic was initiated late 2008 and continued into 2009. The data has very good quality in PL 480. Interpretation of ST08m07 started spring 2009 and were concluded late 2009.

As the Eiktyrne prospect to a large degree is driven by possible hydrocarbon indications on the seismic data, emphasis has been on geophysical special studies. Further, sealing was believed to be a critical factor, and in order to mitigate the exploration risk fault seal analysis have been performed.

Three combined Management and Exploration Committee meetings have been held:

- EC / MC NO.1: April 23 2008
- EC / MC NO. 2: November 13 2008
- EC / MC NO.3: October 29 2009

In addition three work meetings have been arranged:

- Processing at WesternGeco: January 14 2009
- Interpretation and evaluation: September 9 2009
- Prospect evaluation and Tech / Ec.: February 4 2010

4 PROSPECT EVALUATION

The Eiktyrne prospect was evaluated by the partners in APA2007. The prospect is surrounded by dry wells, but was “driven” by amplitude anomalies observed on older seismic data. The recoverable resources in APA2007 were estimated to 11, 9 MSm^3 of oil and 4, 9 GSm^3 of gas (Operators numbers).

Based on evaluation of the new seismic 3D (ST08m07), the structural definition of the prospect is in alignment with previous evaluations (Figure 3). Detailed mapping and better resolution along the delineating faults, especially to the east (northeast), illustrates that cross fault leak is a critical factor. Fault seal analysis including i) 1D triangle plots, ii) shale gauge ration (SGR) and iii) calibration towards observations on the Heidrun Field, suggests that effective sealing of Eiktyrne might be possible. However, by applying the hydrocarbon column needed in order to find commercial resources, sealing will be high risk; **probability for effective seal is 0.40**.

Presence and quality of effective reservoir is not assumed to add exploration risk to the Eiktyrne prospect. Sandstones of the Fangst- and Båt Groups are with high confidence interpreted to be present in Eiktyrne. The Garn-, Not- and Ile formations (Fangst Gp) are interpreted to be present only in small part of the prospect, but Tilje and Tofte formations (Båt Gp) are interpreted to be deposited and preserved within the total acreage of PL 480. Any variance of reservoir properties is handled in the gross rock volume considerations (GRV), and the **probability for effective reservoir is 0.90**.

Source rock and migration to Eiktyrne is the factor assumed to have the highest risk. The Spekk Formation is in PL 480 and in adjacent areas including the Grinda Graben immature in terms of hydrocarbon generation. From the current understanding of any possible source intervals in the Åre Formation, a similar immature status is expected. Filling of Eiktyrne will have to rely on intermediate to long distance migration and / or fill-spill from following possible routes (Figure 4):

- Midgard – Yttergryta – Eiktyrne
- Tyrihans – Justa / Natalia – Epsilon – Eiktyrne
- Heidrun – Heidrun Nord – Eiktyrne

A detailed analysis of these routes indicates that migration and filling of Eiktyrne can not be completely excluded, but a number of dry wells and wells with only minor gas discoveries suggest a very high exploration risk for source; **probability for source / migration is 0.20**.

Based on evaluation of the new seismic 3D (ST08m07), amplitude anomalies at the top of the prospect is now with high confidence interpreted to represent overlying Palaeocene shales with tuff. The geophysical analysis (AVO / LFP) indicates that gas should be clearly observed on the seismic data. The absence of gas-filling indications of the Eiktyrne prospect has led to **a filling model involving only oil**. Although the AVO / LFP do not support hydrocarbons in Eiktyrne, oil will probably not be imaged as well as gas. Thus, for the oil-case the results of the geophysical studies have been disregarded.

The aggregated chance of success for Eiktyrne is 0.07.

5 RESOURCES

Volume calculations were made for two different models (Figure 5): Oil filling in Fangst and Båt Groups with i) sealing of the Ror Formation or ii) non-sealing of the Ror Formation.

The recoverable resources are for model i) 6.12 MSm3 and for model ii) 3.81 MSm3. by weighting the two models 80/20 (model ii / model i), **recoverable volumes are 4.28 MSm3** (Figure 6).

From the Heidrun Field, model ii) might geologically be the most probable. However, model ii) will imply unrealistic high oil columns in order to get resources close to the being of economic interest, and this model was not considered for technical / economical assessment.

6 TECHNICAL / ECONOMICAL EVALUATIONS

A subsea development with tie-back to Heidrun Field, with 4 oil producers and 3 water injectors, has been considered. Sensitivities regarding production start and oil properties (Heidrun or Mikkel oil type) were calculated.

The Net Present Value (NPV) for Eiktyrne is very positive, but due to very high exploration risk, the risked NPV (ENPV) becomes close to zero.

7 SUMMARY AND CONCLUSIONS

The works programme for the initial period of PL 480 has been fulfilled.

The new technical evaluation has lowered the volumes and significantly increased the risk compared to the situation when the license was awarded.

The hydrocarbon potential of the acreage does not justify an exploration well and PL 480 is fully relinquished.

All communication in the partnership is found on License web, the seismic dataset ST08m07 is loaded in PetroBank.

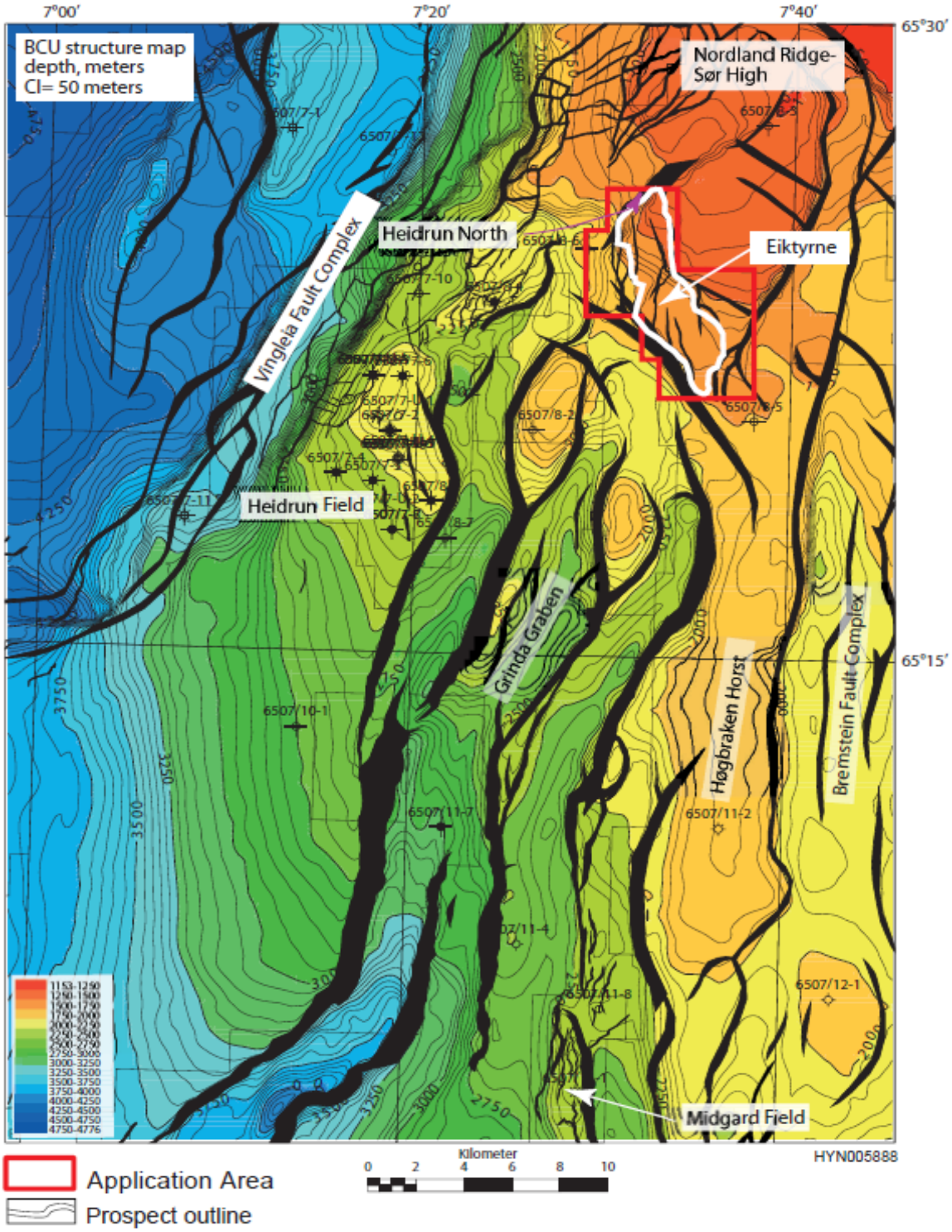

Figure 1: Location of PL 480 and structural setting. The license with the Eiktyrne prospect is situated at the southernmost part of the Nordland Ridge and the transition to the deeper Grinda Graben in the south.

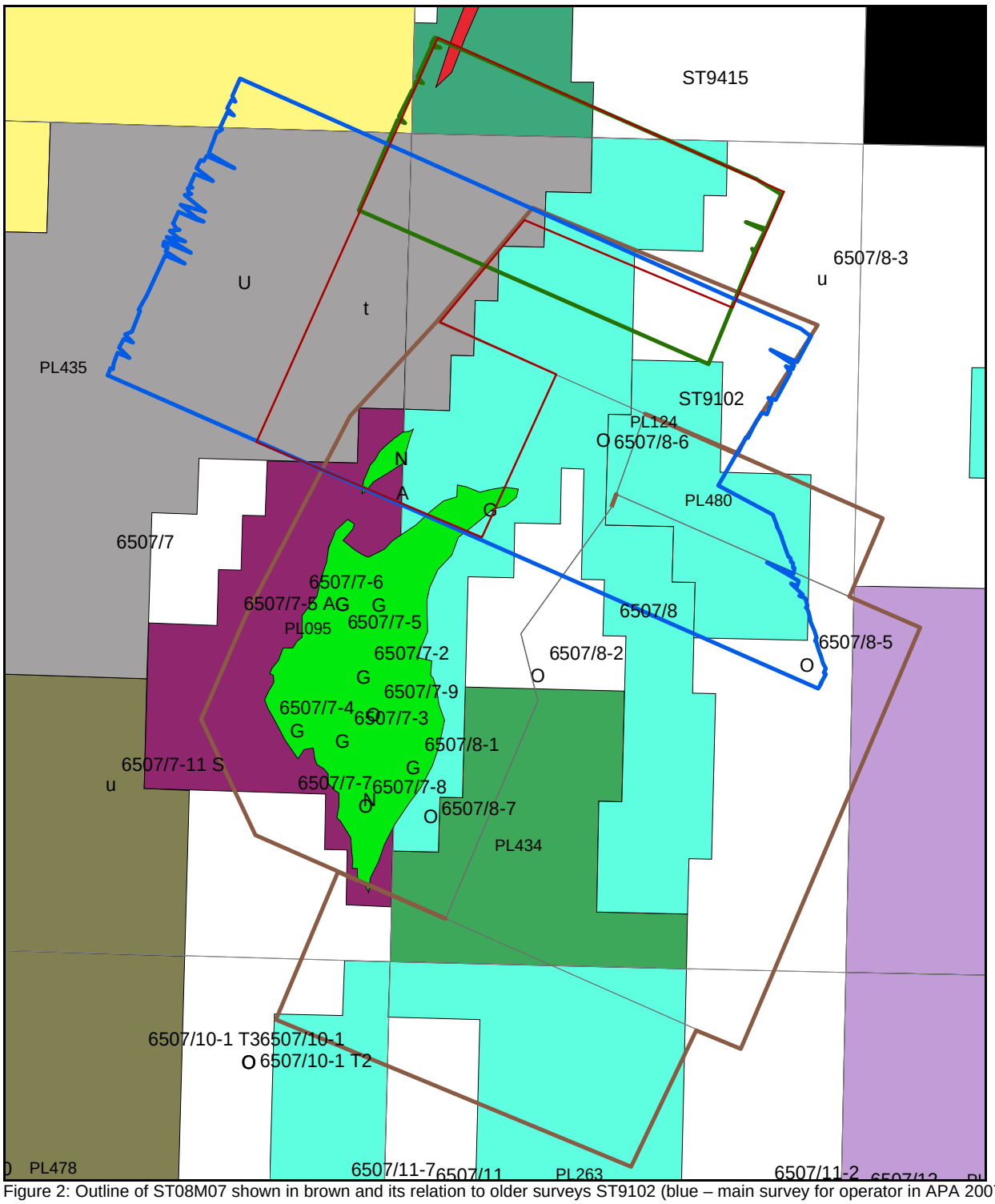

Figure 2: Outline of ST08M07 shown in brown and its relation to older surveys ST9102 (blue – main survey for operator in APA 2007) and ST9415 (red)

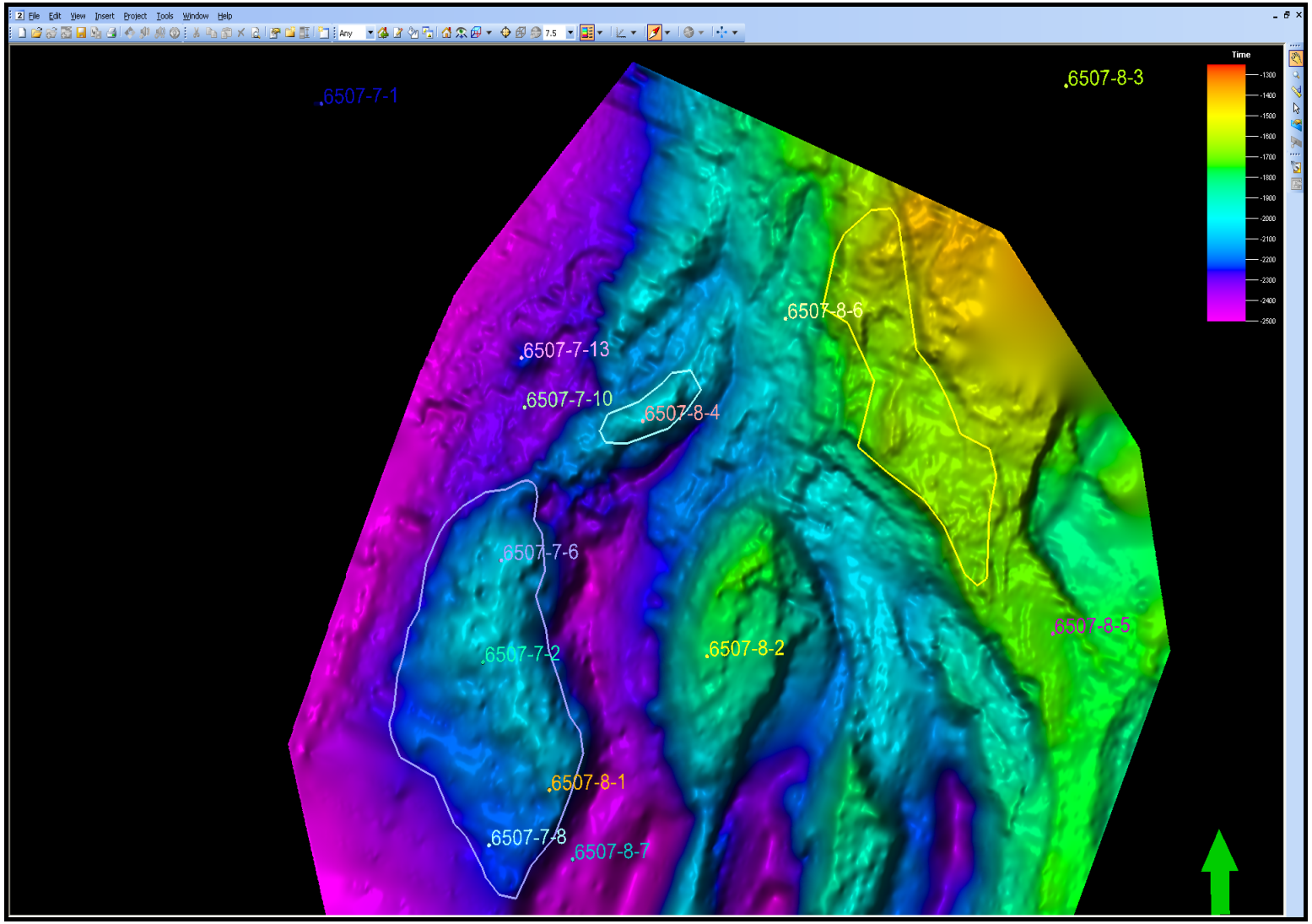

Figure 3: Base Cretaceous map showing the outline of the Eiktyrne prospect (in yellow), as interpreted from the new seismic 3D ST08m07. The Heidrun and Heidrun Nord Field are given in blue and light blue, respectively.

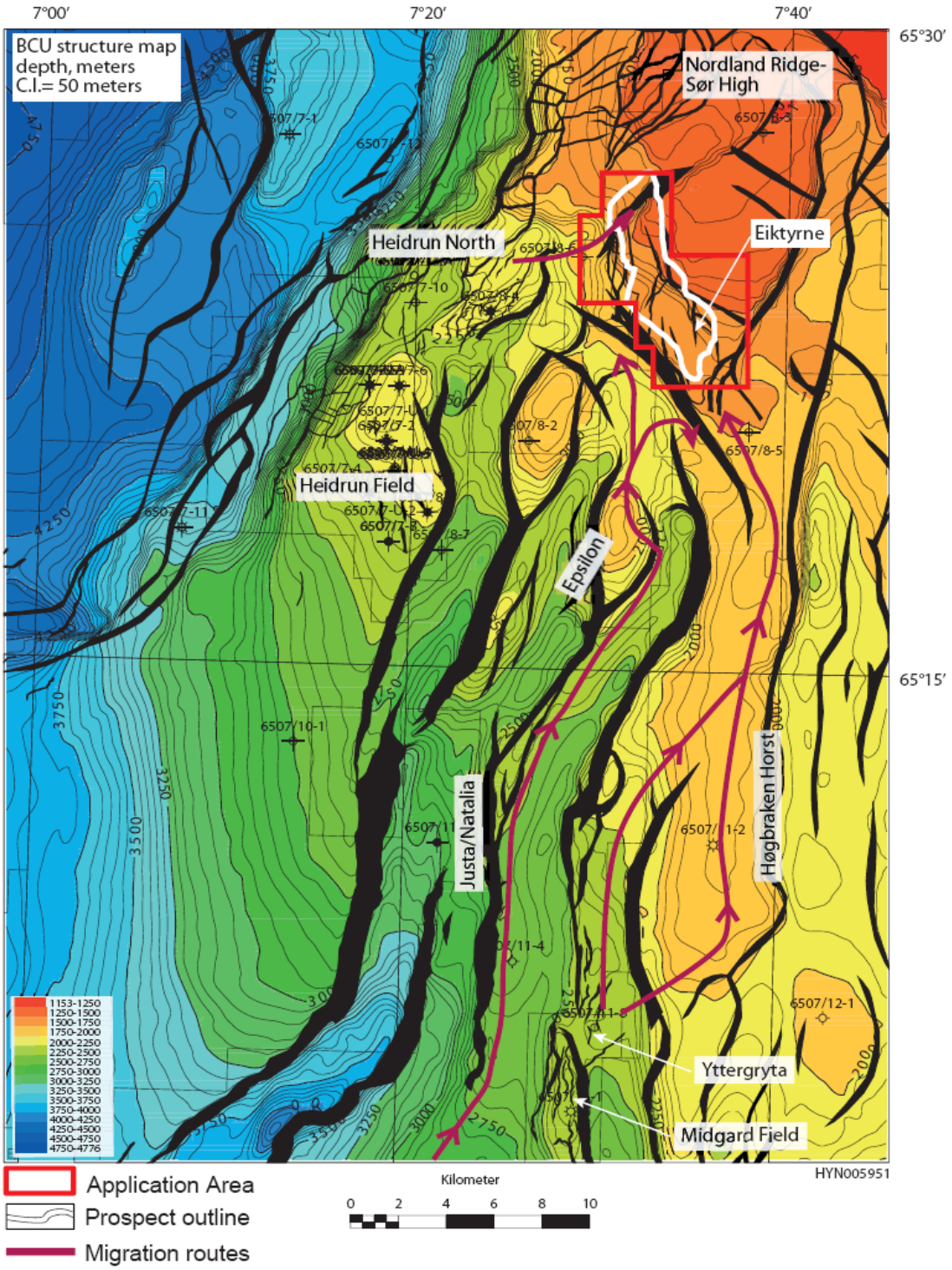

Figure 4: Migration to Eiktyrne. The Spekk Formation is immature in the kitchen area to Eiktyrne, and the any possible source rocks in the Åre Formation is not expected to supply significant quantities of oil to Eiktyrne. Filling of Eiktyrne will have to rely o on long distance migration from three alternative routes: i) Heidrun – Heidrun Nord – Eiktyrne; ii) Tyrihans – Natlia / Justa – Epsilon – Eitryrne; or iii) Midgard – Yttergryta – Eiktyrne. A number of dry wells or wells with only small gas discoveries along these routes makes oil migration to Eiktyrne very high risk.

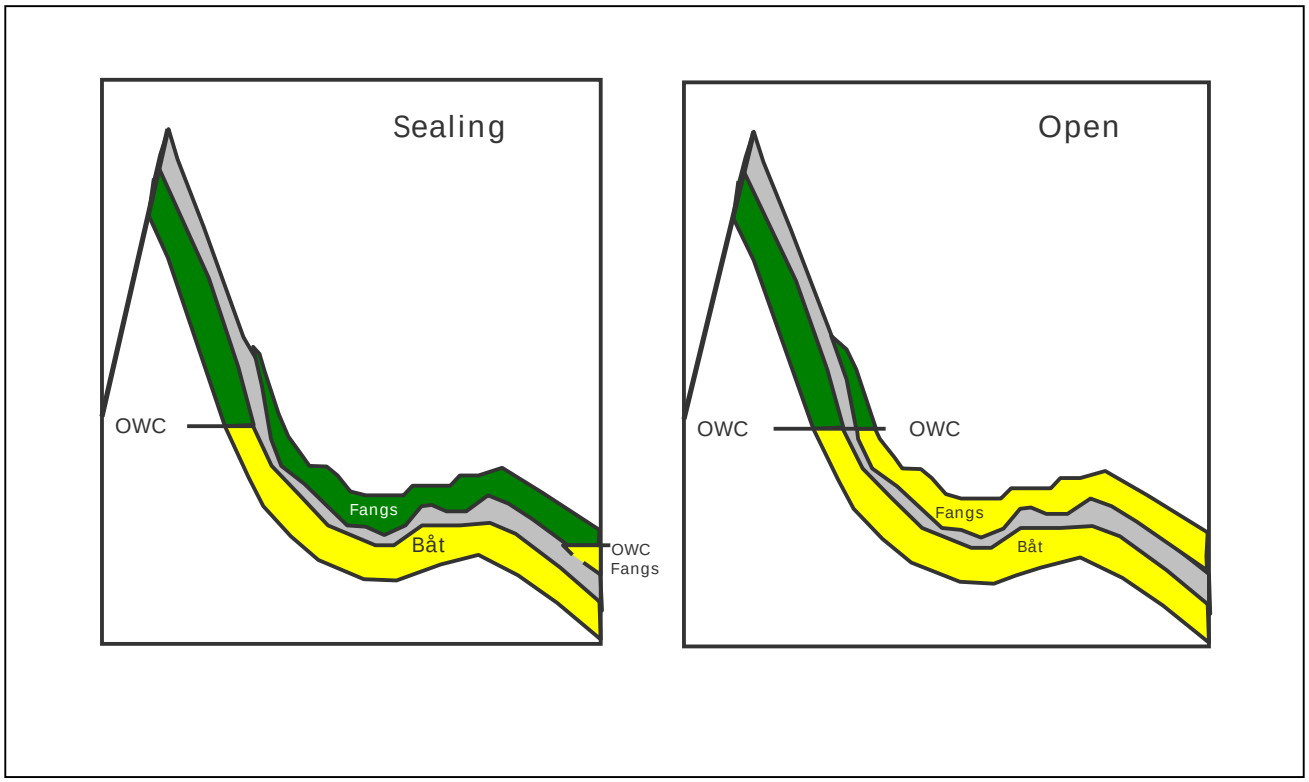

Figure 5: Schematic profile from N to SE (left to right) across Eitryne and illustrating prospect- and filling models. The two models are oil filling in Fangst and Båt Groups with i) sealing of the Ror Formation or ii) non-sealing (open) across the Ror Formation or ii) non-sealing (open) across the Ror Formation. For tech / ec evaluations model ii) has been applied.

Oil Mean MSm^3		
	Sealing Ror Fm	Non sealing Ror Fm
Fangst Gr	3,85	1,52
Båt Gr	2,83	2,83
Fangst and Båt Grs	6,12	3,81
Scenario model Weighted 80/20 Non sealing/sealing	4.28	

Table 1: Recoverable volumes for the two filling models of Eiktyrne. The volume 6.12x106Sm3 Oil refers to left model in Figure 5 above.