




# Relinquishment report

***PL 375, 375 B & 375 C***

*Blocks 33/6, 34/4 & 34/5*



## Table of Contents

1 License history .....	1
2 Database .....	3
3 Petroleum-Geological framework .....	5
4 Prospect update.....	9
5 Technical evaluations .....	21
6 Conclusions.....	25

# List of Figures

- 1.1 PL 375 location map ..... 2
- 2.1 Seismic and Wells Database Map ..... 3
- 3.1 Statfjord Group depth map ..... 5
- 3.2 Statfjord Stratigraphical Correlation ..... 6
- 4.1 PL375 prospects and leads ..... 10
- 4.2 Structural maps and location of prospects and leads combined ..... 11
- 4.3 Seismic line AA' through Beta Statfjord and Brent discoveries and Kappa prospect ..... 12
- 4.4 Seismic line BB' through Outsider Statfjord prospect, Gamma lead and overlaying Brent and Draupne leads. .... 13
- 5.1 Base Case IPRs for Various Producer Well Inclinations..... 22
- 5.2 Impact of Higher Permeability on Producer IPR..... 22
- 5.3 Porosity / Permeability Core Data from Well 34/4-10R..... 23
- 6.1 PL 375 location map ..... 26

**List of Tables**

2.1 New Wells Drilled in PL375 (2009 - 2015) ..... 4

3.1 Contractor studies acquired by the license group..... 7

4.1 PL 375 Exploration Potential Summary ..... 15

4.2 Prospect data "Beta Statfjord Segment 2" ..... 16

4.3 Prospect data "Beta Statfjord Segments 6 South and West" ..... 17

4.4 Prospect data "Beta Statfjord Segment 9" ..... 18

4.5 Prospect data "Kappa" ..... 19

4.6 Prospect data "Outsider" ..... 20

5.1 34/4-5 DST Data ..... 21

# 1 License history

## Summary

The PL 375 License was awarded as part of the APA 2005 License Round on January 6<sup>th</sup>, 2006 with an Initial Period of 5 years (2 + 2 + 1 years) and a Drill-or-Drop decision after the second year. The area included most of Block 34/4 and part of 34/5 totalling 285.5 km<sup>2</sup>. After finding oil in the Statfjord Group in the commitment well 34/4-11, a 151.08km<sup>2</sup> wide area PL 375 B in Block 33/6 was added in the west and north-east on 04.02.2011. A year later on 03.02.2012, the 27.97 km<sup>2</sup> wide PL 375 C area in Block 33/6 was awarded in the south, bringing the total PL 375 license areas to 464.5 km<sup>2</sup>.

## The work commitment included:

- In the first 2 Years - to acquire and reprocess at least 150 km<sup>2</sup> of 3D seismic data
- In 4 years from the award – drilling of 1 exploration well and decision on continuation (DoC / BoV).
- In one year after BoV – plan for development and operation (PDO / PUD) or relinquishment.

## License Extensions:

- On 14.12.2009, extension of BoV to 06.07.2010 – reason: ongoing drilling operation well 34/4-11.
- On 28.06.2010, extension of BoV to 31.12.2011 and of PUD to 31.12.2012
- On 07.12.2011, extension of BoV to 31.12.2012 and of PUD to 31.12.2014
- On 05.06.2013, extension of BoV to 06.01.2016 and of PUD to 06.01.2017
- On 05.01.2016, extension of BoV to 06.01.2017 and of PUD to 06.01.2018 (applicable to retained area)

## Participants:

06.01.2006 - 06.01.2008: Petro-Canada (50%, operator), Revus (20%) and Premier Oil (30%).

06.01.2008 - 03.04.2013: Petro-Canada (since 2011 Suncor), Revus (since 2009 Wintershall), Spring and Talisman

03.04.2013 - 01.10.2014: Suncor and Talisman (70 resp. 30%)

01.10.2014 - 31.10.2014: Suncor 100%

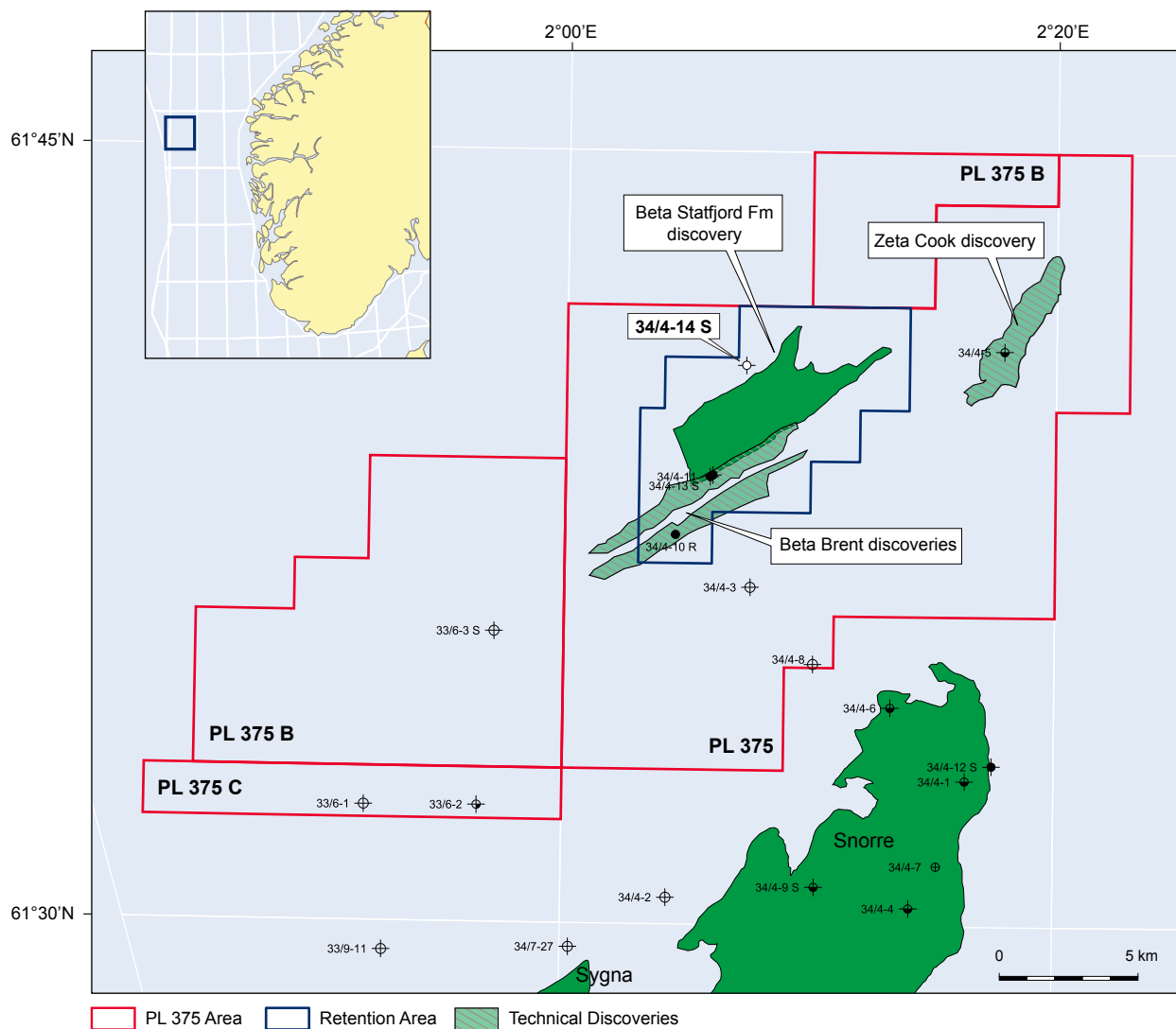
31.10.2014 - present: Suncor 80% & operator and Core Energy 20%.

## Meetings and Documentation

EC, TC and MC Meetings were held regularly in accordance with the JOA Article 2 and when judged required. Respective Presentation materials and meeting notes were documented in L2S under “PL 375 Meetings” and “PL 375 Meetings Archive”.

## Reason for partial relinquishment

By serendipity the commitment well 34/4-11 discovered oil in high quality sandstones of the Statfjord Group. The find was appraised by three wells (34/4-13 S - oil, 33/6-3S and 34/4-14S - both water-bearing). Though small, partners Suncor and Core Energy have proposed to retain the area of the Beta Statfjord discovery in order to further evaluate the technical and economical viability of development e.g. by connection to nearby infrastructure. Figure 1.1.



**Figure 1.1 PL 375 location map**

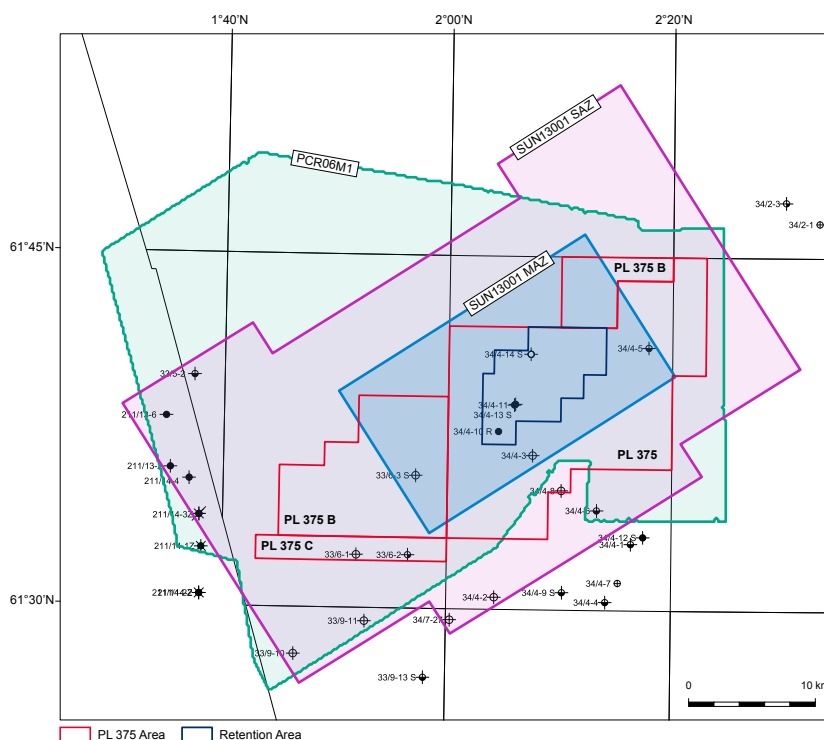
The two previous technical discoveries in the license - Beta Brent (34/4-10R) and Zeta Cook (34/4-5) - contain small volumes, are in tight and compartmented reservoirs and therefore are judged unattractive for development. Previously and newly identified exploration prospects and leads in sandstones of the Statfjord Group, the lower Jurassic Cook and the upper Jurassic Draupne Formations are characterised by their high risk due to lack of updip closure. The partner group therefore decided to relinquish the areas in licenses PL 375, PL 375 B and PL 375 C but to retain the area covering the Beta Statfjord discovery in PL 375.

## 2 Database

### Seismic database

Upon award of the license, the seismic database consisted of the 3D seismic surveys ST9406, MN9401, MN9601. These surveys were acquired in 1994 and 1996 and show moderate to good quality. The three surveys were merged and reprocessed in 2006 and 2007 into the survey PCR06M1. New broadseis seismic (partly dual azimuth) over PL 375 was acquired in 2013 (SUN13001) with the specific objectives: broad band for mapping of reservoir distribution patterns in pre-Cretaceous and AVO analysis and dual azimuth for improved structural definition.

Figure 2.1 shows the outlines of the surveys PCR06M1 and SUN13001 and the well data base. PCR06M1 is a merge of three conventional 3D surveys acquired in the 90's. SUN13001 is a broadseis survey acquired in 2013. Dual azimuth acquisition in the central part (SUN13001 MAZ) and single azimuth in the wider area (SUN13001 SAZ).



**Figure 2.1 Seismic and Wells Database Map**  
 Coloured areas represent 3D seismic surveys PCR06M1 (light green)  
 SUN13001 SAZ (light magenta) and multi-azimuth survey SUN13001 MAZ  
 (light blue)

### New wells

Four wells - as listed in Table 2.1- have been drilled during the license period. In addition, released well data from the adjacent Tampen Spur and Statfjord areas and nearby UK wells were used in order to improve stratigraphic correlation, understanding of reservoir facies, hydrocarbon charge and regional pressure trends, and complete well drilling planning and compose the geo-model of the Beta Statfjord discovery. DST data on upper Statfjord sandstones are available from the 15m gross sandstones interval at the top of the Statfjord in well 34/4-13S. DST data on sandstones in the Cook Formation and the Statfjord Group in well 34/4-5 were used to evaluate the flow potential in the Zeta Cook discovery.

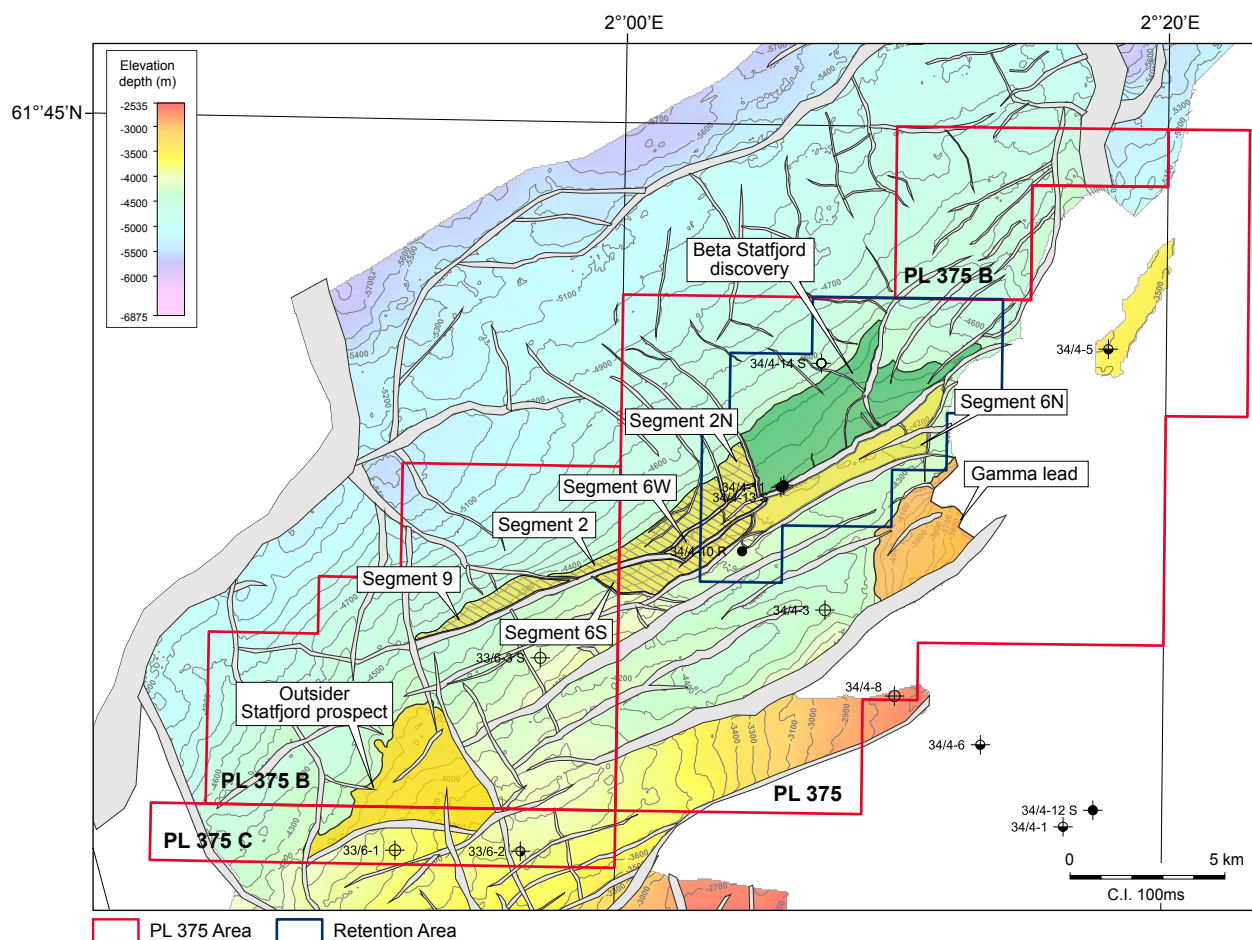
**Table 2.1 New Wells Drilled in PL375 (2009 - 2015)**

Name	Entered	Completed	TD [m MD]	Cores in interval	Result
34/4-11	13.10.2009	10.01.2010	4327	Brent Group	Oil in Brent and Statfj. ssts
34/4-13S	27.08.2010	02.01.2011	5010	Statfjord Group	Statfjord sst - oil discovery
33/6-3S	17.04.2012	24.07.2012	4444	----	Water-bearing Statfjord sst
34/4-14S	03.03.2015	19.05.2015	4822	----	Water-bearing Statfjord sst

### 3 Petroleum-Geological framework

Understanding of the structural setting and seismic stratigraphy has changed with new high quality seismic and new wells drilled in the area since license award in 2006. Particularly the new seismic (SUN13001) provided a better resolution of fault patterns, depth conversion and seismic signatures of the pre-Cretaceous series. Inversion works for reservoir prediction however delivered still inconclusive results.

The pre-Cretaceous structural setting in PL 375 is a tilted fault block terrain with predominantly SW-NE trending main faults. The Beta high on the eastern flank of the Marulk Basin is a pronounced high trend with generally fault-dependent 3-way or 2-way dip closures, often however rather small. Further to the east, along the master fault of the Tampen Spur structuration is characterised by synthetic dip without obvious structural closure towards updip. At Base Cretaceous level the PL 375 area is lacking structural closure. The Statfjord Fm depth map, reflecting the current structural mapping, is given as an example in Figure 3.1



**Figure 3.1 Statfjord Group depth map**

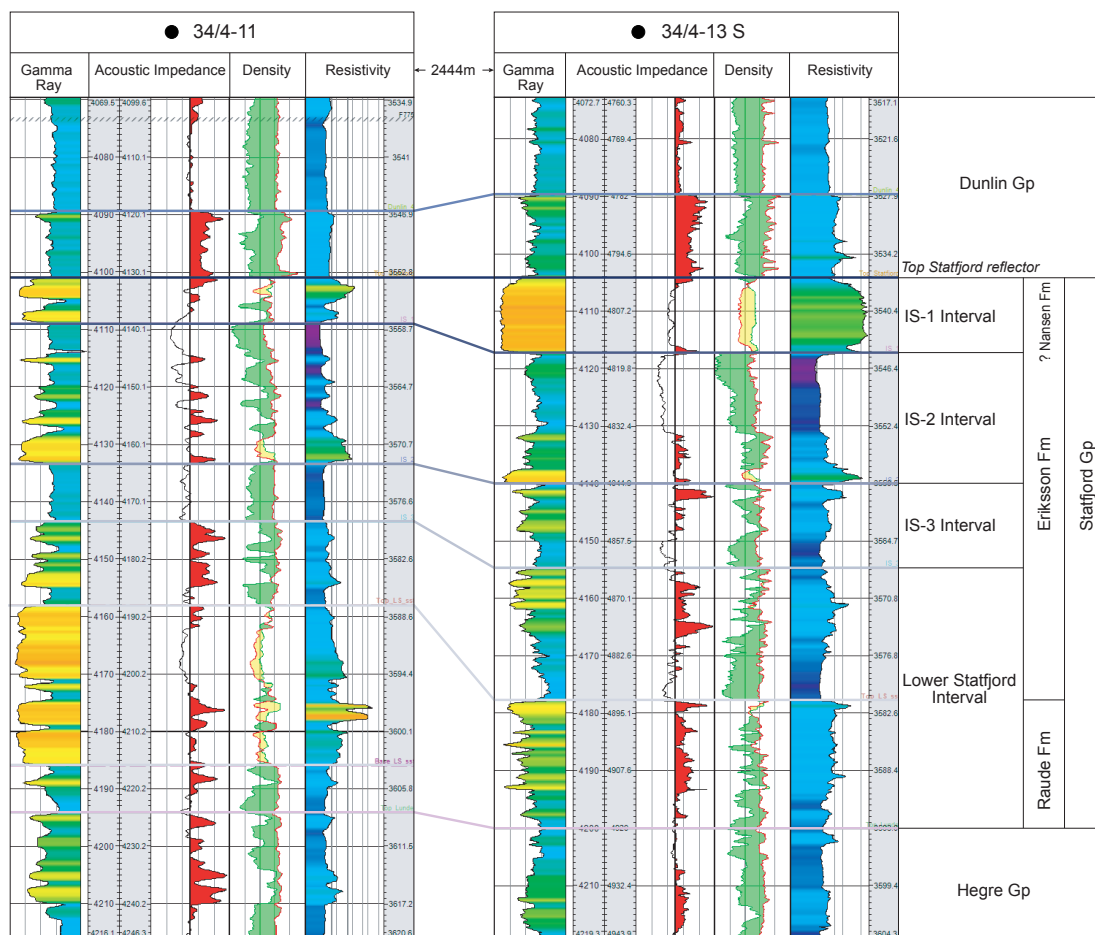
Beta Statfjord discovery (green) and the Statfjord prospect in segment 6N is in the retention area. Other Statfjord prospects are segments 2, 6W, 6S and 9, Outsider and the Gamma lead.

**Hydrocarbon sourcing:** Geochemical analyses reveal that the oils of Beta Statfjord Discovery originated from higher mature source rocks as compared to oils from the nearby fields. Charge thus is inferred to have entered the upper Statfjord sandstones on the deeper flank of the Beta high directly via fault-juxtapositions to sourcing shales of the Draupne Formation. The Snorre oilfield is inferred to probably

have received charge from the higher flank of the Marulk Basin, i.e. via channels in the upper Jurassic Draupne Formation that reach from the Tampen Spur into the basin and are mappable on seismic over the eastern flank of the Marulk Basin.

**Reservoirs:**

Sandstones of the Statfjord Group Figure 3.2 in Beta were deposited by a river system that probably originated from a distant westerly source area, probably west of the Shetland platform (Provenance study by Lundmark et al., 2011). In the PL 375 area, sandstones in the lower part of the Statfjord Group (Raude Formation) were deposited by a meandering river system locally forming fluvial point bars - good quality point bar sandstones were drilled oil-filled by well 34/4-11. This shale and siltstone-prone facies regime seems to have continued into the Eirikson Formation with deposition of some possibly not connected point bars and numerous siltstone and shale beds interfingering with (non-reservoir ?) crevasse splay sandstones. Only towards the top of the Eirikson Formation, the depositional system had changed to a high energy south to north trending braided river fairway that covered the northern part of the Beta high with channel sandstones. Though only about 10 - 15 m thick, these sandstones tested oil flow rates in excess of 1600Sm<sup>3</sup> per day (well 34/4-13S). Average porosities are 18 - 20% with reservoir permeabilities in excess of 1500mD which are due to absence of illitisation and preservation of kaolinite/dickite instead. Bjørlykke (2011) identified lack of potassium feldspars, absence of illite clay mineral admixture and a deficit of potassium ions (K<sup>+</sup>) in the pore waters as possible key factors for permeability preservation. Carbonate cementation seems to be an only locally occurring early diagenetic phenomenon.



**Figure 3.2 Statfjord Stratigraphical Correlation**  
 Stratigraphy based on biostratigraphy (ICHRON) and within the Statfjord Group on log correlation.

Sandstones of the Brent Group in Beta show severe illitisation and reduction of permeability to 1 - 10mD in best layers despite porosities between 15 and 20%. By analogy, this is inferred to also apply to sandstones of the Cook and upper Jurassic Draupne Formations in PL375. Background: K<sup>+</sup>-containing minerals and clay assemblages favor the formation of diagenetic illite in the pore space which at high temperatures of >120 -150°C, as prevailing in the pre-Cretaceous sections of the license area, tends to become penetrated by fibrous illite - detrimental for permeability but hardly affecting the porosity.

#### Sealing:

Shales above the base of Cretaceous form a regional top seal over the Tampen Spur and the Marulk Basin area. These shales confine the hydrocarbon plays to the pre-Cretaceous overpressured reservoirs. Sealing of individual reservoir within the pre-Cretaceous series of PL 375 also depends on shales. Shales of the Dunlin Group represent a regionally extensive proven top- and side seal for uppermost sandstones of the Statfjord Group. Look-alike, shales of the Brent Group provide the seal for sandstones of the Cook Formation and shales of the Heather Formation seal the sandstones of the Brent Group in the Beta Brent discovery (well 34/4-10R). However, these shales of the Heather Formation are thinning towards the SW and in combination with erosion by channels in the upper Jurassic Draupne Formation imply the risk of breached top seal for structures in the Brent Group. The top-seal capacity of upper Jurassic and lower Cretaceous shales is proven by nearby fields. However, the prospects and leads along the master fault of Tampen Spur are located in synthetically dipping hangingwall-structures and will require stratigraphic pinch-out for sealing of their reservoirs in sandstones of late Jurassic age.

#### **Studies**

Subsurface studies acquired by the license group is given in Table 3.1. The final documents have been stored at L2S.

**Table 3.1 Contractor studies acquired by the license group**

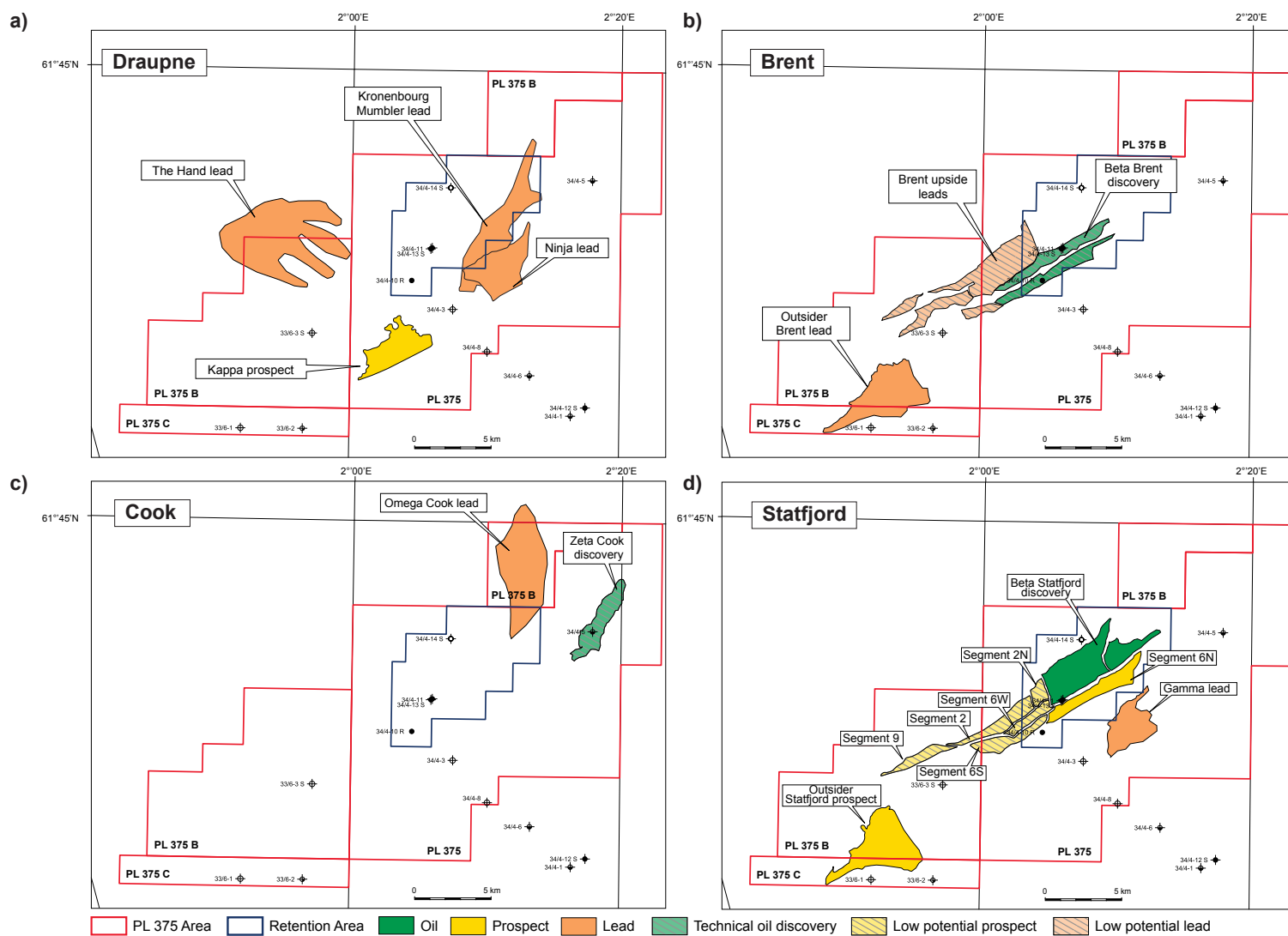
Title	Author/Company & Year
Sedimentology & Depositional Model of the Brent Grp - well 34/4-11	ICHRON 2010
Chemostratigraphy and Mineralogy of wells 34/4-11 and 34/4-13 S	Chemostrat Ltd, 2011
Diagenesis and Reservoir Quality of Statfjord sandstones in well 34/4-13S	Knut Bjørlykke, 2011
Provenance and reservoir heterogeneity in the Banks Group, northern North Sea	University of Oslo, 2011
Rock Physics Modeling Project	Rock Solid Images, 2011 and 2013
High resolution 3D seismic survey design	RPS, 2012
High density velocity analysis for over-pressure detection	RPS, 2012
Fluid Substitution and AVO Modeling	Hampson-Russell / CGG 2-13
3D AVO and Elastic Inversion study	CGG, 2014
Beta Reservoir Connectivity Analysis	Gorgee Geotechnical, 2014
Geochemical evaluation of petroleum variability and distribution in oils from the Statfjord Formation, block 34/4, offshore Norway	Robertson, 2014
Reservoir quality assessment of the Statfjord Formation in the vicinity of license areas PL375 and PL637, and IK block 211: Phase II	Robertson, 2014

Title	Author/Company & Year
Sedimentology of well 34/4-5 and comparison with wells 34/4-11 and 34/4-13S	ICHRON , 2015
Biostratigraphy and petrography of the Statfjord Group cored in well 34/4-5	ICHRON, 2015
Controls on reservoir quality in wells 34/4-5 and 34/4-13 S	CiPEG, 2015

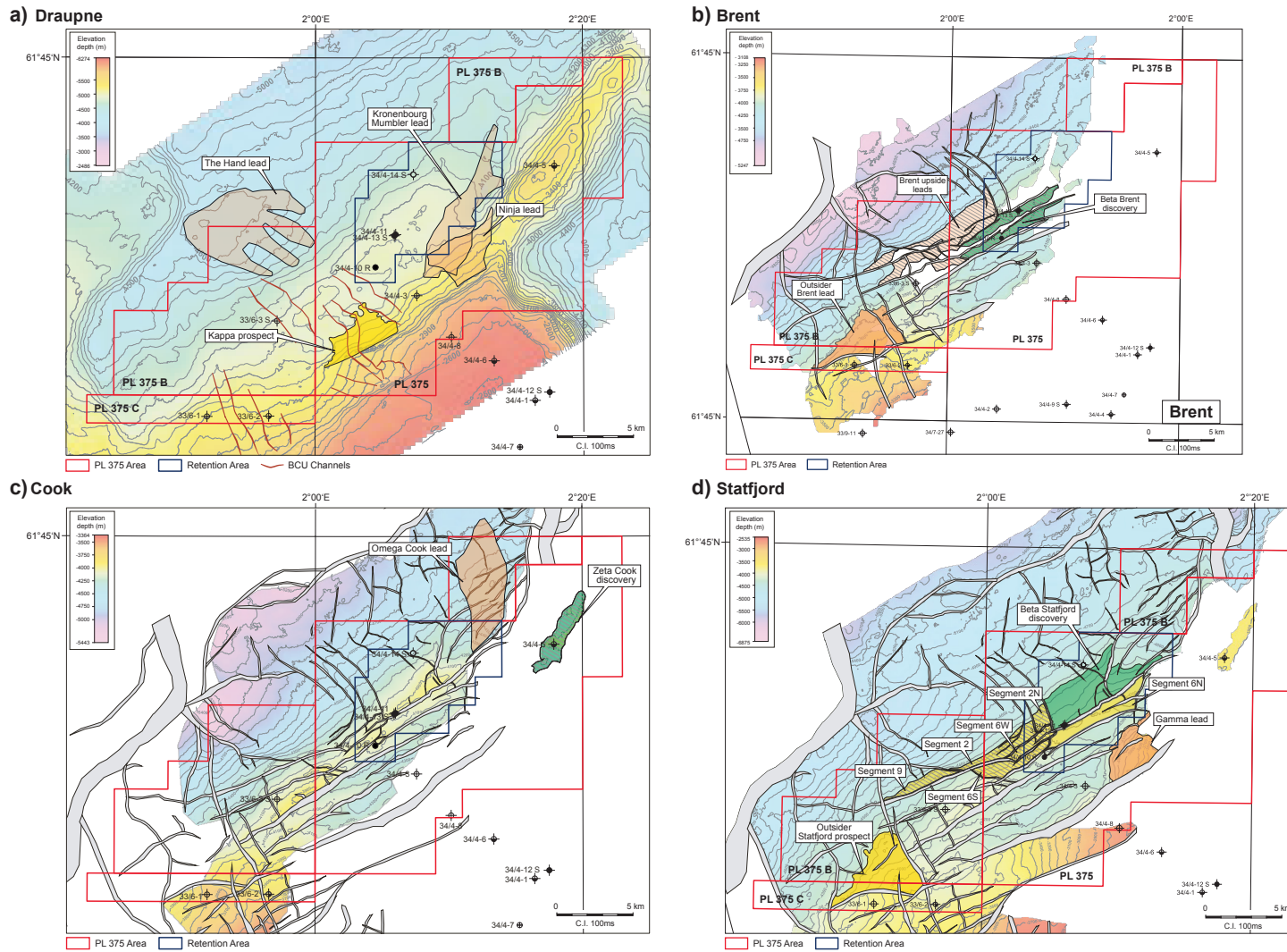
## 4 Prospect update

In the PL375 license application, the Ducati prospect (now called "Kappa") in upper Jurassic Draupne Formation and the leads Trigger and Panther in Cretaceous sandstone reservoirs were ranked as main exploration targets. In 2006, Ducati was estimated to contain recoverable resources between 12.6 and  $43.4 \times 10^6 \text{ Sm}^3$  (80 and 273 MBO) at 13% COS. Based on new seismic and better understanding of reservoir diagenesis, Ducati (now called "Kappa") likely contains less than a tenth of this with recoverable resources between  $(0.2 \text{ and } 4.6 \times 10^6 \text{ Sm}^3 \equiv 1.2 \text{ and } 29 \text{ MBO})$  at a lower COS of 8%. The Cretaceous leads Trigger and Panther have been removed from the inventory since new 3D-seismic does not corroborate the previously assumed presence of reservoir and structural closure.

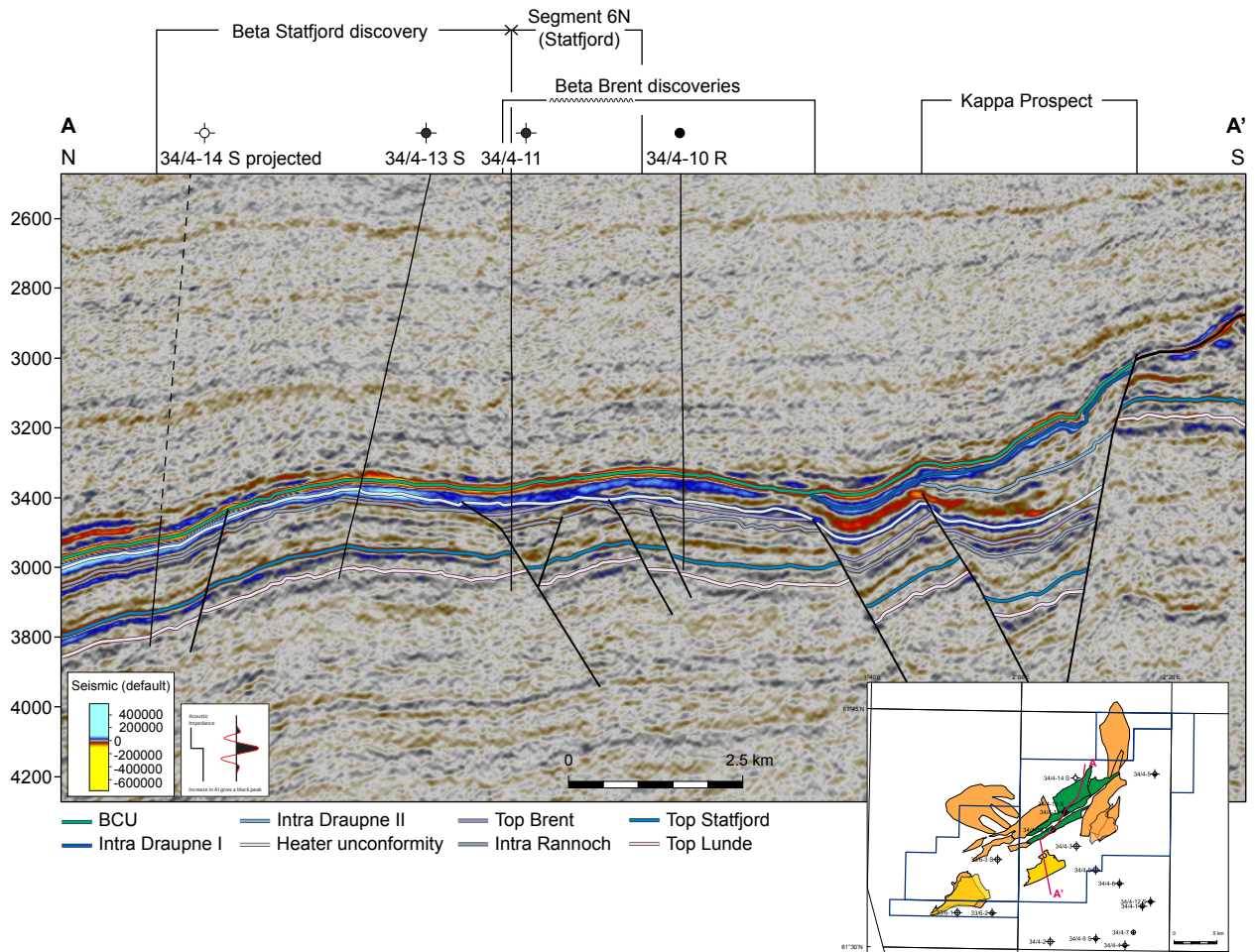
Seismic reprocessing and the newly acquired 3D-seismic have allowed identifying new exploration leads in the pre-Cretaceous too (see below). In the Statfjord Group these are the "Outsider" prospect and "Gamma" lead, the "Omega" lead in the Cook Formation and the "Ninja", "Kronenbourg Mumbler" and "The Hand" in the upper Jurassic Draupne Fm. Figure 4.1. and Figure 4.2 shows the locations of discoveries, prospects and leads at the 4 pre-Cretaceous target levels as mapped on seismic. Figure 4.3 and Figure 4.4. display seismic transects depicting the main pre-Cretaceous target reservoirs ranging from fault-dip closures in the Statfjord Gp and Brent Gp to the Upper Jurassic Draupne Fm leads in synthetic hangingwall structures along the Tampen Spur master fault. In essence, the exploration potential of all prospects and leads remains limited by their structural sizes and high risk for lack of updip seal, as caused by e.g. unfavorable juxtaposition of Statfjord Gp sandstones to non-sealing Triassic and Jurassic formations or by erosion at top Brent by the Heather unconformity. Even if prospects and leads of different ages overlap laterally, they are not considered attractive because of high risk and low volumes.



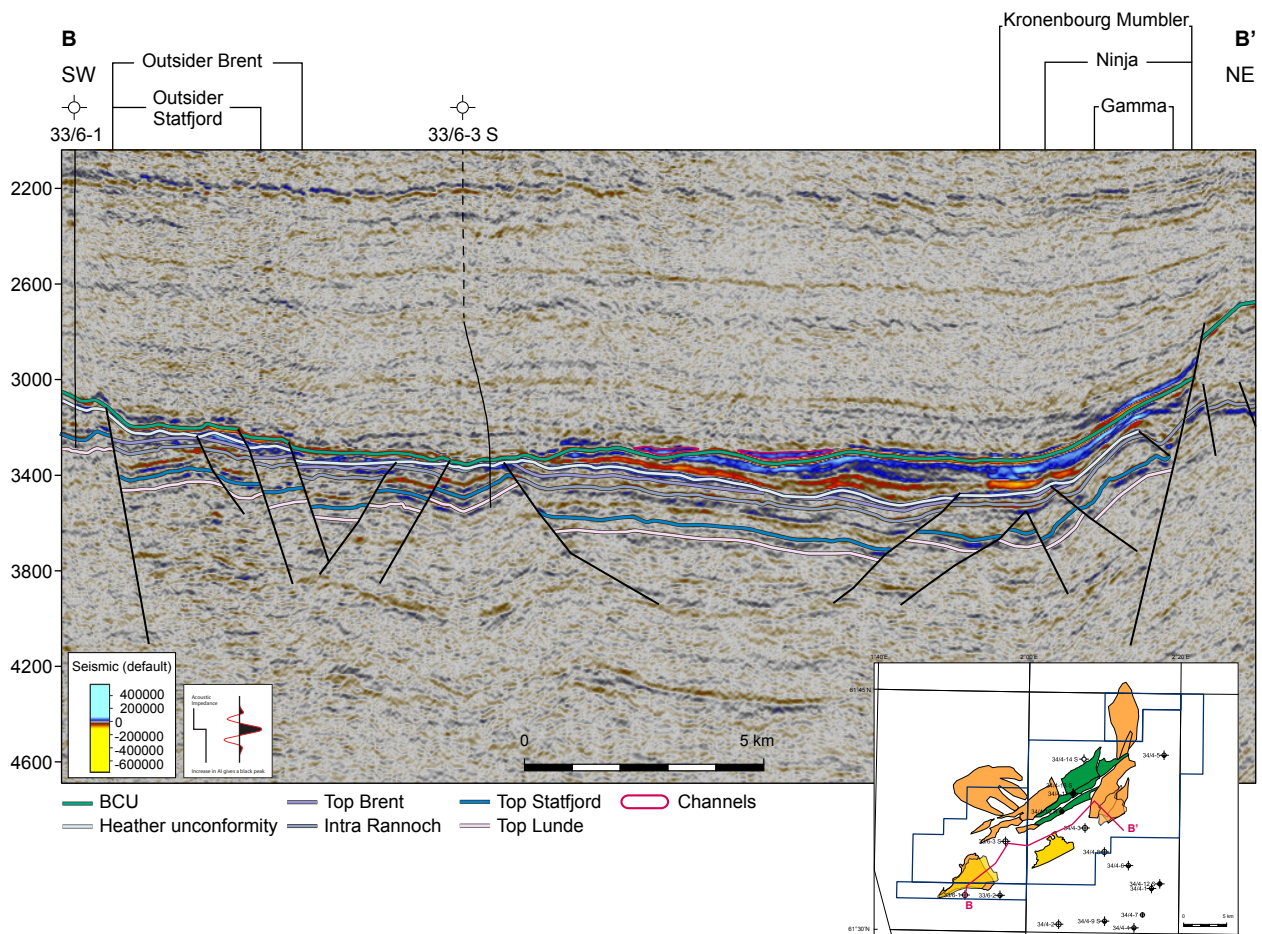
**Figure 4.1 PL375 prospects and leads**  
 Location of prospects and leads at the different stratigraphic levels. a) Draupne Fm, b) Brent Gp, c) Cook Fm, d) Statfjord Gp.



**Figure 4.2 Structural maps and location of prospects and leads combined**  
 Location of prospects and leads at different stratigraphic levels. a) Draupne Fm, b) Brent Gp, c) Cook Fm and d) Statfjord Gp. (bluish colors show deep, yellow-reddish colors structural high areas - color/depth relation not equalised between the maps)



**Figure 4.3 Seismic line AA' through Beta Statfjord and Brent discoveries and Kappa prospect**  
 Beta Statfjord discovery and most of Beta Brent lie within the retention area, while the Kappa prospect in the Draupne Fm is in the relinquishment area.



**Figure 4.4 Seismic line BB' through Outsider Statfjord prospect, Gamma lead and overlaying Brent and Draupne leads.**

*Outsider prospect, Gamma, Kronenbourg Mumbler and Ninja leads all lie in the relinquishment area.*

At the time of license application in 2006, further opportunity was seen in studying possible development options for the existing discoveries Beta Brent and Zeta Cook. The Brent wells 34/4-10R (2000) and 34/4-11 (2010) reveal that Brent producibility is severely downgraded and economically unattractive due to two main factors: 1) Low reservoir permeability (1mD and 10 mD to max. 15 mD) due to illitisation and thin net reservoir thicknesses downsize timely accessible oil-in-place per well. 2) Thin reservoir thicknesses of 5 and max. 20-30m (using 12.5% porosity cutoff) in combination with the narrow and elongate shape of fault blocks imply the risk of poor overall reservoir connectivity causing inefficient drainage and low recovery efficiency. The Brent discovery was recalculated to contain recoverable resources between 0.5 to 1.3\*10<sup>6</sup> Sm<sup>3</sup> (3 to 8 MBO). The Zeta Discovery which now has been estimated to contain recoverable resources of 0.2 to 0.8\*10<sup>6</sup> Sm<sup>3</sup> (1 to 5 MBO) and is regarded as unattractive. Again, low oil in place, thin net pay (>12.5% porosity), low reservoir permeability (<50mD), as confirmed by DST in well 34/4-5, a narrow and elongate shape and likely compartmentalisation due to severe faulting are the downgrading factors.

**New discovery Beta Statfjord:** A positive outcome from the PL375 exploration campaign has been the Beta Statfjord discovery with estimated recoverable resources in the upper Statfjord Group sandstones between 2.4 and 4.3\*10<sup>6</sup>Sm<sup>3</sup> (15 and 30 MBO) in segments 1A and 1C. Depending on the development scheme, a further 0.3 - 1.7\*10<sup>6</sup>Sm<sup>3</sup> (1.6 - 10 MBO) of oil can become producible from the Segment 1B. The Beta Statfjord discovery appears confined to the northern part of the Beta high where as mapped on seismic, a fairway with up to 11m (net) thick fluvial channel sandstones of a braided river system provides an excellent reservoir (DST flow 1335 up to 1750 Sm<sup>3</sup>/d ≅ 8,400 to >11,000 BOPD). Internally

this reservoir has been called IS-1 sandstone and according to biostratigraphic correlation forms the top of the Eirikson Formation. Appraisal potential in the SE-adjacent Segment 6-North ranges between 0.9 and  $1.7 \cdot 10^6 \text{ Sm}^3$  (5.4 - 11 MBO), though carrying substantial risk for trap integrity.

Sandstones in the lower part of the Statfjord Group - corresponding to the Raude Formation - contain oil in a fluvial point bar of unknown extent in the area underneath the southern part of the IS-1 discovery. Expected recoverable resources between 0,2 and  $0,7 \cdot 10^6 \text{ Sm}^3$  (0,6 to 4,3 MBO). Though small, this lower Statfjord discovery may become technically and economically developable provided appropriate host conditions and cost settings. The above IS-2 sandstone can contain about 2 - 3 m of net reservoir but has not been assessed further because its distribution is unknown and not resolved on seismic.

Statfjord Group prospects/leads: To the south of the Beta discovery, four Statfjord fault blocks (segments 2, 6-South and 9 - Fig 4.1.d) may cumulatively contain recoverable resources between 0.24 and  $4.3 \cdot 10^6 \text{ Sm}^3$  (1.5 to 27 MBO) at variable COS between 16 and 32%. Besides a risk for absence of effective reservoir, the main risk seems to be related to leakage at top structure - background: the dry well 33/6-3S in crestal position on the southern Beta high was void of liquid hydrocarbon shows (only minor gas shows) and encountered about 70 bars lower reservoir pressures than those observed in the Beta Statfjord discovery. The "Outsider" Statfjord prospect further south, is a synthetic hangingwall fault block with expected recoverable P50 resources of about  $3.0 \cdot 10^6 \text{ Sm}^3$  (~19 MBO) at a COS of 17%. Located to the north of the updip dry well 33/6-1, lack of sealing/lack of retention is the obvious main risk. The "Gamma" Statfjord lead is a synthetically dipping fault block in the hangingwall off the Tampen Spur with expected P50 recoverable resources of about  $1.3 \cdot 10^6 \text{ Sm}^3$  (8 MBO) at a COS of 10% due to both, a severe risk for absence of closure and a risk of competition for charge ( $\equiv$  deviation of charge into Snorre) by channels in the Draupne Formation.

Cook Formation prospectivity: The "Omega" lead (P50 URR  $3.5 \cdot 10^6 \text{ Sm}^3 \equiv 22 \text{ MMBO}$ ; COS 10%) lies about 6km west and downdip of the Zeta Cook discovery and is mapped as a stratigraphic trap in sandstones at Cook Formation level with a very small crestal 4-way dip closure. Seismic amplitude strength and AVO signature would indicate the presence of porous sandstones in the Cook Formation, e.g. a tidal or offshore bar in a near-shore area to the west of the tidal flat facies around the Zeta discovery. The seismic anomaly appears to be dis-conformable with structure.

Brent Group prospectivity: Consolidated expected recoverable resources in tilted fault block structures in the vicinity of the Beta Brent discovery appear to be less than  $1.6 \cdot 10^6 \text{ Sm}^3$  (<10 MBO), the main risk being lack of sealing due to erosion at the crest by the upper Jurassic Heather unconformity. In the "Outsider Brent" prospect net reservoir thicknesses may reach 30 - 50m, however strong reservoir diagenesis and a high risk for absence of sealing due to erosion by the Heather unconformity (dry well 33/6-1) imply a low COS of 9%. Expected recoverable resources of less than  $0.6 \cdot 10^6 \text{ Sm}^3$  (ca. 4 MBO) appear unattractive.

Upper Jurassic prospectivity: The "Kappa" prospect (in the 2006 license application called "Ducati") and the "Ninja" lead both are synthetic hangingwall structures bordering the western Tampen Spur master fault. The Kappa prospect (Ducati) is now calculated to contain recoverable resources between 0.2 and  $4.6 \cdot 10^6 \text{ Sm}^3$  (1.2 and 29 MBO) at a COS of 8%, i.e. significantly lower than the previously calculated expected recoverable resources between 12.6 and  $43.4 \cdot 10^6 \text{ Sm}^3$  (80 and 273 MBO) at 13% COS. The newly identified Ninja lead may contain between 0.25 and  $3.7 \cdot 10^6 \text{ Sm}^3$  (1.2 and 23 MBO) of expected recoverable resources with a COS of 6%. For both, lack of top seal is the main risk. Lack of effective reservoir and competition for charge by channels in the upper Jurassic Draupne add to the risk.

Channels of the Draupne Formation are mappable extending from the master fault of the Tampen Spur and into the Marulk Basin. "Kronenbourg Mumbler" is mapped on seismic as a northward trending channel system in the Draupne Formation extending from the Tampen Spur over the Ninja lead and the flank of the Marulk Basin into the area to the north-east of the Beta Statfjord discovery. Recoverable

resources may range between 0.2 and 4.1\*10<sup>6</sup> Sm<sup>3</sup> (1.2 and 26 MBO) at a COS of 6%. A second set of channels in the Draupne Formation extends over the Kappa prospect, possibly extending over the Beta High in the area south of the Beta Statfjord discovery and further into the deeper Marulk Basin where these channels possibly link-up with the fan-shaped lead called "The Hand". Of course, this setting likely can provide an ideal passway for charge from oil-mature Draupne shales on the flank of the Marulk Basin towards the Tampen Spur and into the Snorre oilfield thereby increasing the risk for lack of charge for prospects Kappa or Outsider. Lead "The Hand" might contain recoverable resources of 0.1 to 2.5\*10<sup>6</sup> Sm<sup>3</sup> (0.6 and 16 MBO) but with a COS of 4% is very unattractive.

**Table 4.1 PL 375 Exploration Potential Summary**

Expected Recoverable Resources	Prospect/Lead	P90	P50	P10	Mean	COS
<b>Statfjord Prospectivity</b>						
Beta Segments 2, 6-South, 6-West and Segment 9	Prospects	0,24	1,24	4,3	1,90	range 16 - 32%
Outsider Statfjord	Prospect	0,83	3,04	8,51	4,04	17.0 %
(Outsider Brent)	Lead	0,08	0,62	2,23	0,95	9.0 %
Gamma Statfjord	Lead	0,29	1,30	3,88	1,78	10.0 %
<b>Cook Prospectivity</b>						
Omega Cook	Lead	0,95	3,50	8,59	4,29	10.0 %
<b>Late Jurassic Prospectivity</b>						
Kappa	Prospect	0,19	1,27	4,64	1,96	8.0 %
Ninja	Lead	0,24	1,32	3,72	1,59	6.0 %
The Hand	Lead	0,11	0,62	2,51	0,73	4.0 %
Kronenbourg Mumbler	Lead	0,19	1,11	4,09	1,37	6.0 %

Prospect data can be seen in Tables 4.2 - 4.6.

Table 4.2 Prospect data "Beta Statfjord Segment 2"

Table 5: Prospect data (Enclose map)									
Block	34/4	Prospect name	Statfj. Seg 2	Discovery/Prospect/Lead	Prospect	Prospect ID (or New!)	NPD will insert value	NPD approved (Y/N)	
Play name	NPD will insert value	New Play (Y/N)		Outside play (Y/N)					
Oil, Gas or O&G case:	Oil	Reported by company	Suncor	Reference document	PL 375, PL375b and PL375C - Report on Partial Relinquishment	Assessment year	2015		
This is case no.:	1 of 1	Structural element	Beta High	Type of trap	Tilted fault block	Water depth [m MSL] (>0)	365	Seismic database (2D/3D)	3D
Resources IN PLACE and RECOVERABLE Volumes, this case		Main phase			Associated phase				
		Low (P90)	Base, Mode	Base, Mean	High (P10)	Low (P90)	Base, Mode	Base, Mean	High (P10)
In place resources	Oil [10 <sup>9</sup> Sm <sup>3</sup> ] (>0.00)	2,04		17,83	16,00				
	Gas [10 <sup>9</sup> Sm <sup>3</sup> ] (>0.00)								
Recoverable resources	Oil [10 <sup>6</sup> Sm <sup>3</sup> ] (>0.00)	0,44		2,49	5,45				
	Gas [10 <sup>9</sup> Sm <sup>3</sup> ] (>0.00)								
Reservoir Chrono (from)	Rhaetian	Reservoir litho (from)	Sandstones	Source Rock, chrono primary	Tithonian	Source Rock, litho primary	shales	Seal, Chrono	Lower Jurassic
Reservoir Chrono (to)	Lower Jurassic	Reservoir litho (to)	Sandstones	Source Rock, chrono secondary		Source Rock, litho secondary		Seal, Litho	shales
Probability [fraction]									
Total (oil + gas + oil & gas case ) (0.00-1.00)	0,22	Oil case (0.00-1.00)	1,00	Gas case (0.00-1.00)	0,00	Oil & Gas case (0.00-1.00)	0,00		
Reservoir (P1) (0.00-1.00)	0,60	Trap (P2) (0.00-1.00)	0,90	Charge (P3) (0.00-1.00)	0,80	Retention (P4) (0.00-1.00)	0,50		
<b>Parameters:</b>	Low (P90)	Base	High (P10)	Comments - Beta Statfjord Segment 2 is a prospect in Statfjord sandstones immediately SW-adjacent to the Beta Statfjord Discovery. GRV were taken from static GEOMODEL. The prospect is assumed to contain reservoirs in IS-2 (Eirikson) sandstones and in the lower Statfjord, as thick lower Statfjord (20m net) fluvial point bar was found oil bearing in nearby well 34/4-11. Charge appears probable, either via spill over from the Beta Statfjord Discovery in Segment 1 or from the deeper western flank of the Beta high. Lack of retention is regarded as the main risk. Compartmentalisation by faults to be considered near top structure.					
Depth to top of prospect [m MSL] (> 0)		4125							
Area of closure [km <sup>2</sup> ] (> 0.0)									
Reservoir thickness [m] (> 0)									
HC column in prospect [m] (> 0)									
Gross rock vol. [10 <sup>9</sup> m <sup>3</sup> ] (> 0.000)	0,050	0,163	0,323						
Net / Gross [fraction] (0.00-1.00)	0,281	0,471	0,67						
Porosity [fraction] (0.00-1.00)	0,171	0,171	0,19						
Permeability [mD] (> 0.0)									
Water Saturation [fraction] (0.00-1.00)	0,161	0,191	0,22						
Bg [Rm3/Sm3] (< 1.0000)									
1/Bo [Sm3/Rm3] (< 1.00)	0,74	0,72	0,70						
GOR, free gas [Sm <sup>3</sup> /Sm <sup>3</sup> ] (> 0)									
GOR, oil [Sm <sup>3</sup> /Sm <sup>3</sup> ] (> 0)	131	142	153						
Recov. factor, oil main phase [fraction] (0.00-1.00)	0,18	0,29	0,41						
Recov. factor, gas ass. phase [fraction] (0.00-1.00)									
Recov. factor, gas main phase [fraction] (0.00-1.00)									
Recov. factor, liquid ass. phase [fraction] (0.00-1.00)									
Temperature, top res [°C] (>0)	145			Innrapp. av geolog-init:	NPD will insert value	Registrert - init:	NPD will insert value	Kart oppdatert	NPD will insert value
Pressure, top res [bar] (>0)	775			Dato:	NPD will insert value	Registrert Dato:	NPD will insert value	Kart dato	NPD will insert value
Cut off criteria for N/G calculation	0,125 Porosity	GR 41deg API	Vsh 0,4					Kart nr	NPD will insert value

Table 4.3 Prospect data "Beta Statfjord Segments 6 South and West"

Table 5: Prospect data (Enclose map)									
Block	34/4	Prospect name	Statfj. Seg 6 South	Discovery/Prospect/Lead	Prospect	Prospect ID (or New)	NPD will insert value	NPD approved (Y/N)	
Play name	NPD will insert value	New Play (Y/N)		Outside play (Y/N)					
Oil, Gas or O&G case:	Oil	Reported by company	Suncor	Reference document	PL 375, PL375B and PL375C - Report on Partial Relinquishment			Assessment year	2015
This is case no.:	1 of 1	Structural element	Beta High	Type of trap	Tilted Fault Block	Water depth [m MSL] (>0)	365	Seismic database (2D/3D)	3D
<b>Resources IN PLACE and RECOVERABLE</b>		<b>Main phase</b>			<b>Associated phase</b>				
<b>Volumes, this case</b>		Low (P90)	Base, Mode	Base, Mean	High (P10)	Low (P90)	Base, Mode	Base, Mean	High (P10)
In place resources	Oil [10 <sup>9</sup> Sm <sup>3</sup> ] (>0.00)	1,40		2,53	3,80				
	Gas [10 <sup>9</sup> Sm <sup>3</sup> ] (>0.00)								
Recoverable resources	Oil [10 <sup>9</sup> Sm <sup>3</sup> ] (>0.00)	0,20		0,80	1,50				
	Gas [10 <sup>9</sup> Sm <sup>3</sup> ] (>0.00)								
Reservoir Chrono (from)	Rhaetian	Reservoir litho (from)	Sandstones	Source Rock, chrono primary	Tithonian	Source Rock, litho primary	shales	Seal, Chrono	Lower Jurassic
Reservoir Chrono (to)	Lower Jurassic	Reservoir litho (to)	Sandstones	Source Rock, chrono secondary		Source Rock, litho secondary		Seal, Litho	shales
<b>Probability [fraction]</b>									
Total (oil + gas + oil & gas case ) (0.00-1.00)	0,22	Oil case (0.00-1.00)	1,00	Gas case (0.00-1.00)	0,00	Oil & Gas case (0.00-1.00)	0,00		
Reservoir (P1) (0.00-1.00)	0,60	Trap (P2) (0.00-1.00)	0,90	Charge (P3) (0.00-1.00)	0,80	Retention (P4) (0.00-1.00)	0,50		
<b>Parametres:</b>	Low (P90)	Base	High (P10)	<i>Comments - Beta Statfjord Segment 6South is a prospect in Statfjord sandstones in the SW continuation of Beta Statfjord Segment 6 North. Charge by fill and spill from Seg 6 North appears likely. Segment 6 South seems to lie outside of the upper Statfjord IS_1 sandstone fairway. When applying a model of compensational stacking, IS-2 sandstones (Eirikson Fm) may be assumed the main reservoir ("reservoir risk"). Main risk is lack of retention. GRV derived from GOEMODEL.</i>					
Depth to top of prospect [m MSL] (> 0)			4085						
Area of closure [km <sup>2</sup> ] (> 0.0)									
Reservoir thickness [m] (> 0)									
HC column in prospect [m] (> 0)	90		110		115				
Gross rock vol. [10 <sup>9</sup> m <sup>3</sup> ] (> 0.000)	0,040		0,052		0,067				
Net / Gross [fraction] (0.00-1.00)	0,28		0,47		0,67				
Porosity [fraction] (0.00-1.00)	0,17		0,17		0,19				
Permeability [mD] (> 0.0)									
Water Saturation [fraction] (0.00-1.00)	0,16		0,19		0,22				
Bg [Rm3/Sm3] (< 1.0000)									
1/Bo [Sm3/Rm3] (< 1.00)	0,76		0,72		0,69				
GOR, free gas [Sm <sup>3</sup> /Sm <sup>3</sup> ] (> 0)									
GOR, oil [Sm <sup>3</sup> /Sm <sup>3</sup> ] (> 0)									
Recov. factor, oil main phase [fraction] (0.00-1.00)	0,17		0,29		0,14				
Recov. factor, gas ass. phase [fraction] (0.00-1.00)									
Recov. factor, gas main phase [fraction] (0.00-1.00)									
Recov. factor, liquid ass. phase [fraction] (0.00-1.00)									
For NPD use:									
Temperature, top res [°C] (>0)	140			Innrapp. av geolog-init:	NPD will insert value	Registrert - init:	NPD will insert value	Kart oppdatert	NPD will insert value
Pressure, top res [bar] (>0)	770			Dato:	NPD will insert value	Registrert Dato:	NPD will insert value	Kart dato	NPD will insert value
Cut off criteria for N/G calculation	0,125 Porosity	GR 41deg API	Vsh 0.4					Kart nr	NPD will insert value

Table 4.4 Prospect data "Beta Staffjord Segment 9"

Table 5: Prospect data (Enclose map)										
Block	34/4	Prospect name	Statfj. Segmt 9	Discovery/Prospect/Lead	Prospect	Prospect ID (or New!)	NPD will insert value	NPD approved (Y/N)		
Play name	NPD will insert value	New Play (Y/N)		Outside play (Y/N)						
Oil, Gas or O&G case:	Oil	Reported by company	Suncor	Reference document	PL 375, PL375b and PL375C - Report on Partial Relinquishment			Assessment year	2015	
This is case no.:	1 of 1	Structural element	Beta High	Type of trap	Tilted Fault Block	Water depth [m MSL] (>0)	365	Seismic database (2D/3D)	3D	
<b>Resources IN PLACE and RECOVERABLE</b>		<b>Main phase</b>			<b>Associated phase</b>					
<b>Volumes, this case</b>		Low (P90)	Base, Mode	Base, Mean	High (P10)	Low (P90)	Base, Mode	Base, Mean	High (P10)	
In place resources	Oil [10 <sup>6</sup> Sm <sup>3</sup> ] (>0.00)	2,26		5,22	9,00					
	Gas [10 <sup>9</sup> Sm <sup>3</sup> ] (>0.00)									
Recoverable resources	Oil [10 <sup>6</sup> Sm <sup>3</sup> ] (>0.00)	0,44		1,66	3,27					
	Gas [10 <sup>9</sup> Sm <sup>3</sup> ] (>0.00)									
Reservoir Chrono (from)	Rhaetian	Reservoir litho (from)	Sandstones	Source Rock, chrono primary	Tithonian	Source Rock, litho primary	shales	Seal, Chrono	Lower Jurassic	
Reservoir Chrono (to)	Lower Jurassic	Reservoir litho (to)	Sandstones	Source Rock, chrono secondary		Source Rock, litho secondary		Seal, Litho	shales	
<b>Probability [fraction]</b>										
Total (oil + gas + oil & gas case ) (0.00-1.00)	0,23	Oil case (0.00-1.00)	1,00	Gas case (0.00-1.00)	0,00	Oil & Gas case (0.00-1.00)	0,00			
Reservoir (P1) (0.00-1.00)	0,60	Trap (P2) (0.00-1.00)	0,90	Charge (P3) (0.00-1.00)	0,70	Retention (P4) (0.00-1.00)	0,60			
<b>Parameters:</b>		Low (P90)	Base	High (P10)	Comments - Beta Staffjord Segment 9 is a prospect in Staffjord sandstones imlocated in the west of Segment 2. GRV were taken from static GEOMODEL. The prospect is assumed to possibly contain reservoirs in IS-1 and IS-2 (Nansen and Eirikson) sandstones. Charge appears probable from the structural deep western of the Beta high. Lack of retention is regarded as the main risk.					
Depth to top of prospect [m MSL] (> 0)			4185							
Area of closure [km <sup>2</sup> ] (> 0.0)										
Reservoir thickness [m] (> 0)										
HC column in prospect [m] (> 0)										
Gross rock vol. [10 <sup>9</sup> m <sup>3</sup> ] (> 0.000)	0,060		0,109	0,170						
Net / Gross [fraction] (0.00-1.00)	0,28		0,47	0,67						
Porosity [fraction] (0.00-1.00)	0,17		0,17	0,19						
Permeability [mD] (> 0.0)										
Water Saturation [fraction] (0.00-1.00)	0,16		0,19	0,22						
Bg [Rm3/Sm3] (< 1.0000)										
1/Bo [Sm3/Rm3] (< 1.00)	0,74		0,72	0,70						
GOR, free gas [Sm <sup>3</sup> /Sm <sup>3</sup> ] (> 0)										
GOR, oil [Sm <sup>3</sup> /Sm <sup>3</sup> ] (> 0)										
Recov. factor, oil main phase [fraction] (0.00-1.00)	0,17		0,29	0,41						
Recov. factor, gas ass. phase [fraction] (0.00-1.00)										
Recov. factor, gas main phase [fraction] (0.00-1.00)										
Recov. factor, liquid ass. phase [fraction] (0.00-1.00)										
Temperature, top res [°C] (>0)	145				Innrapp. av geolog-init:	NPD will insert value	Registrert - init:	NPD will insert value	Kart oppdatert	NPD will insert value
Pressure, top res [bar] (>0)	775				Dato:	NPD will insert value	Registrert Dato:	NPD will insert value	Kart dato	NPD will insert value
Cut off criteria for N/G calculation	0,125 Porosity	GR 41deg API	Vsh 0,4					Kart nr	NPD will insert value	

Table 4.5 Prospect data "Kappa"

Block	34/4	Prospect name	Kappa Draupne	Discovery/Prosp/Lead	Prospect	Prosp ID (or New!)	NPD will insert value	NPD approved (Y/N)		
Play name	NPD will insert value	New Play (Y/N)		Outside play (Y/N)						
Oil, Gas or O&G case:	Oil	Reported by company	Suncor	Reference document	PL 375, PL375b and PL375C - Report on Partial Relinquishment	Assessment year	2015			
This is case no.:	1 of 1	Structural element	Western Fault Tam	Type of trap	Hangingwall fault b	Water depth [m MSL] (>0)	365	Seismic database (2D/3D)	3D	
<b>Resources IN PLACE and RECOVERABLE</b>		<b>Main phase</b>			<b>Associated phase</b>					
		Low (P90)	Base, Mode	Base, Mean	High (P10)	Low (P90)	Base, Mode	Base, Mean	High (P10)	
In place resources	Oil [10 <sup>6</sup> Sm <sup>3</sup> ] (>0.00)	1.75		12.67	27.70					
	Gas [10 <sup>6</sup> Sm <sup>3</sup> ] (>0.00)									
Recoverable resources	Oil [10 <sup>6</sup> Sm <sup>3</sup> ] (>0.00)	0.19		1.96	4.64					
	Gas [10 <sup>6</sup> Sm <sup>3</sup> ] (>0.00)					0.04		0.46	1.10	
Reservoir Chrono (from)	Rhaetian	Reservoir litho (from)	Sandstones	Source Rock, chrono primary	Tithonian	Source Rock, litho primary	shales	Seal, Chrono	Lower Jurassic	
Reservoir Chrono (to)	Lower Jurassic	Reservoir litho (to)	Sandstones	Source Rock, chrono secondary		Source Rock, litho secondary		Seal, Litho	shales	
<b>Probability [fraction]</b>										
Total (oil + gas + oil & gas case ) (0.00-1.00)	0.08	Oil case (0.00-1.00)	1.00	Gas case (0.00-1.00)	0.00	Oil & Gas case (0.00-1.00)	0.00			
Reservoir (P1) (0.00-1.00)	0.70	Trap (P2) (0.00-1.00)	0.40	Charge (P3) (0.00-1.00)	0.70	Retention (P4) (0.00-1.00)	0.30			
<b>Parameters:</b>		Low (P90)	Base	High (P10)	<i>Comments - Kappa Draupne is a prospect in an upper Jurassic fan-type sediment wedge deposited off the Tampen Spur. Therefore top and bottom of Draupne Fm Interval were mapped on seismic; Interval thickness varies between about 60m and 220m; Average thickness of reservoir interval as estimated from map is about 120m. While volumes are represented as P90 - Mean - P10, Reservoir parameters are given as P90 - P50 - P10 values. Permeabilities are expected to be ranging between 1 and 15 - 20mD;</i>					
Depth to top of prospect [m MSL] (> 0)			3385							
Area of closure [km <sup>2</sup> ] (> 0.0)	1.1		4.0	6.9						
Reservoir thickness [m] (> 0)			120							
HC column in prospect [m] (> 0)	156		292	432						
Gross rock vol. [10 <sup>9</sup> m <sup>3</sup> ] (> 0.000)	0.069		0.433	0.887						
Net / Gross [fraction] (0.00-1.00)	0.20		0.32	0.50						
Porosity [fraction] (0.00-1.00)	0.17		0.20	0.22						
Permeability [mD] (> 0.0)										
Water Saturation [fraction] (0.00-1.00)	0.13		0.21	0.31						
Bg [Rm3/Sm3] (< 1.0000)										
1/Bo [Sm3/Rm3] (< 1.00)	0.53		0.57	0.63						
GOR, free gas [Sm <sup>3</sup> /Sm <sup>3</sup> ] (> 0)	180		235	290						
GOR, oil [Sm <sup>3</sup> /Sm <sup>3</sup> ] (> 0)										
Recov. factor, oil main phase [fraction] (0.00-1.00)	0.05		0.15	0.25						
Recov. factor, gas ass. phase [fraction] (0.00-1.00)										
Recov. factor, gas main phase [fraction] (0.00-1.00)										
Recov. factor, liquid ass. phase [fraction] (0.00-1.00)										
Temperature, top res [°C] (>0)	110				<b>For NPD use:</b>					
Pressure, top res [bar] (>0)	475				Innrapp. av geolog-init:	NPD will insert value	Registrert - init:	NPD will insert value	Kart oppdatert	NPD will insert value
Cut off criteria for N/G calculation	0.125 Porosity	GR 41deg API	3.		Dato:	NPD will insert value	Registrert Dato:	NPD will insert value	Kart dato	NPD will insert value
								NPD will insert value	Kart nr	NPD will insert value

Table 4.6 Prospect data "Outsider"

Block	33/6	Prospect name	Outsider Statfjord	Discovery/Prosp/Lead	Prospect	Prosp ID (or Newl)	NPD will insert value	NPD approved (Y/N)		
Play name	NPD will insert value	New Play (Y/N)		Outside play (Y/N)						
Oil, Gas or O&G case:	Oil	Reported by company	Suncor	Reference document	PL 375, PL375b and PL375C - Report on Partial Relinquishment	Assessment year		2015		
This is case no.:	1 of 1	Structural element	Southern Beta High	Type of trap	Hangingwall fault b	Water depth [m MSL] (>0)	375	Seismic database (2D/3D)	3D	
<b>Resources IN PLACE and RECOVERABLE</b>		<b>Main phase</b>			<b>Associated phase</b>					
<b>Volumes, this case</b>		Low (P90)	Base, Mode	Base, Mean	High (P10)	Low (P90)	Base, Mode	Base, Mean	High (P10)	
In place resources	Oil [10 <sup>6</sup> Sm <sup>3</sup> ] (>0.00)	3.57		12.70	25.00					
	Gas [10 <sup>9</sup> Sm <sup>3</sup> ] (>0.00)									
Recoverable resources	Oil [10 <sup>6</sup> Sm <sup>3</sup> ] (>0.00)	0.82		4.04	8.51					
	Gas [10 <sup>9</sup> Sm <sup>3</sup> ] (>0.00)					0.11		0.63	1.35	
Reservoir Chrono (from)	Rhaetian	Reservoir litho (from)	Sandstones	Source Rock, chrono primary	Tithonian	Source Rock, litho primary	shales	Seal, Chrono	Lower Jurassic	
Reservoir Chrono (to)	Lower Jurassic	Reservoir litho (to)	Sandstones	Source Rock, chrono secondary		Source Rock, litho secondary		Seal, Litho	shales	
<b>Probability [fraction]</b>										
Total (oil + gas + oil & gas case) (0.00-1.00)	0.17	Oil case (0.00-1.00)	1.00	Gas case (0.00-1.00)	0.00	Oil & Gas case (0.00-1.00)	0.00			
Reservoir (P1) (0.00-1.00)	0.90	Trap (P2) (0.00-1.00)	0.80	Charge (P3) (0.00-1.00)	0.40	Retention (P4) (0.00-1.00)	0.60			
<b>Parameters:</b>										
Depth to top of prospect [m MSL] (> 0)	Low (P90)	Base	High (P10)	Comments - Resources volumes are displayed as P90 - Mean - P10 and reservoir parameters are give as P90 - P50 - P10; Average permeabilities are estimated to range between about 100 mD in the low case to more than 650 mD in the high case - for comparison: the Beta Statfjord discovery shows average in situ permeabilities of more than 650 mD as confirmed by test and core data.						
Area of closure [km <sup>2</sup> ] (> 0.0)		3790								
Reservoir thickness [m] (> 0)		2.5	5.8	13.3						
HC column in prospect [m] (> 0)		60	85	120						
Gross rock vol. [10 <sup>9</sup> m <sup>3</sup> ] (> 0.000)		150	300	450						
Net / Gross [fraction] (0.00-1.00)		0.166	0.324	0.910						
Porosity [fraction] (0.00-1.00)		0.20	0.30	0.40						
Permeability [mD] (> 0.0)		0.15	0.18	0.20						
Water Saturation [fraction] (0.00-1.00)		0.25	0.33	0.40						
Bg [Rm3/Sm3] (< 1.0000)										
1/Bo [Sm3/Rm3] (< 1.00)		0.68	0.72	0.76						
GOR, free gas [Sm <sup>3</sup> /Sm <sup>3</sup> ] (> 0)										
GOR, oil [Sm <sup>3</sup> /Sm <sup>3</sup> ] (> 0)		95	155	215						
Recov. factor, oil main phase [fraction] (0.00-1.00)		0.20	0.30	0.40						
Recov. factor, gas ass. phase [fraction] (0.00-1.00)										
Recov. factor, gas main phase [fraction] (0.00-1.00)										
Recov. factor, liquid ass. phase [fraction] (0.00-1.00)										
Temperature, top res [°C] (>0)	100				Innrapp. av. geolog-init:	NPD will insert value	Registrert - init:	NPD will insert value	Kart oppdatert	NPD will insert value
Pressure, top res [bar] (>0)	500				Dato:	NPD will insert value	Registrert Dato:	NPD will insert value	Kart dato	NPD will insert value
Cut off criteria for N/G calculation	0,125 Porosity	GR 40deg API	3.					Kart nr		NPD will insert value

## 5 Technical evaluations

Special attention was paid to the evaluation of the existing discoveries in Zeta Cook and Beta Brent, i.e. redefinition of their size using the newly acquired 3D seismic and evaluation of potential reservoir producibility - also see studies in Table 3.1. The main target was to evaluate whether modern drilling and completion techniques could provide technical and economical feasibility of field development of the Beta Brent and/or Zeta Cook discoveries and what implications development as add-ons to Beta Statfjord would induce.

### Well Performance Evaluation

Understanding well performance in a potential development scenario was deemed a key aspect of PL 375 prospects review. To this end, well performance analysis was conducted to evaluate the key drivers for producibility and injectivity in existing discoveries in the Zeta Cook and Beta Brent Formations.

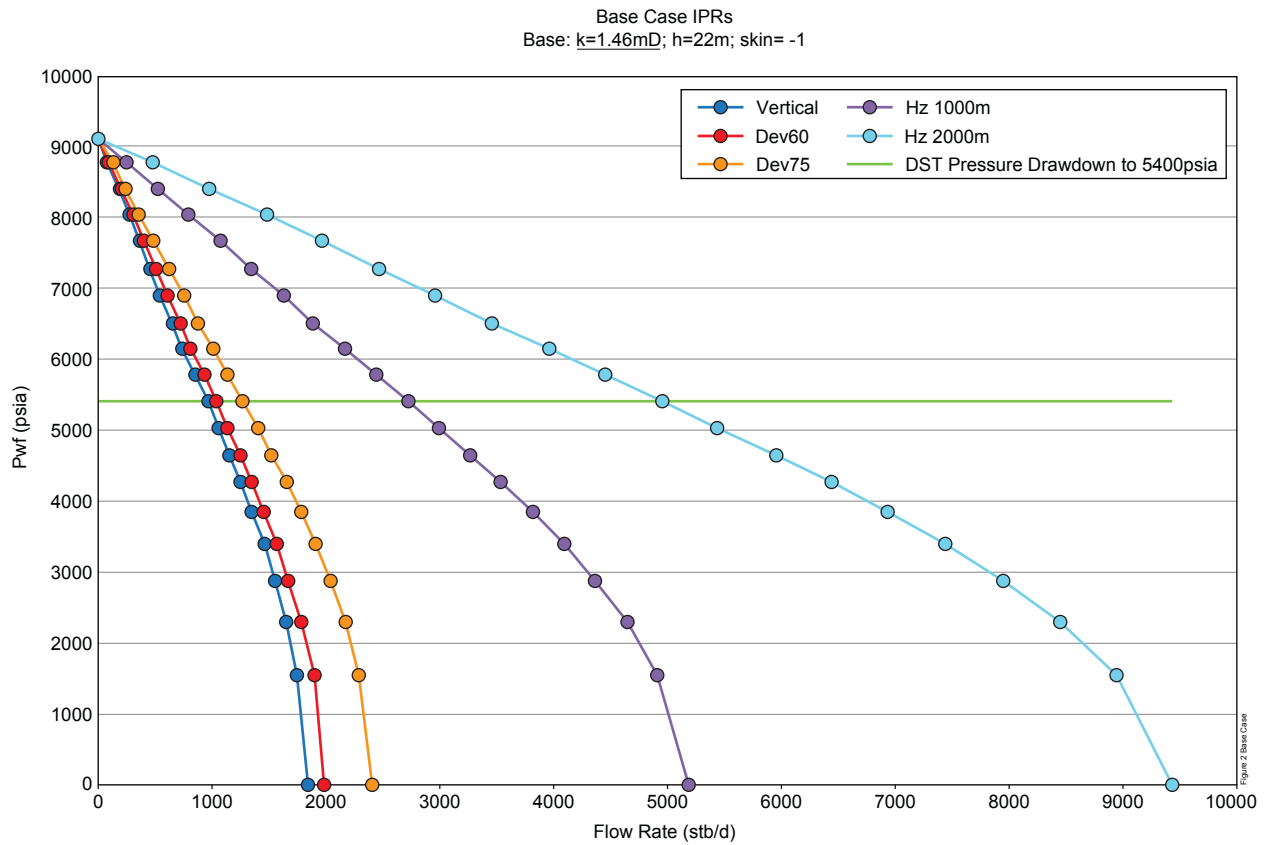
### Zeta Cook

The evaluation of the Zeta discovery was facilitated by data obtained from the 34/4-5 wildcat End of Well Report (EOWR) which documented results from DSTs performed for the Statfjord and the Cook formations. A summary of the DST data is given in Table 5.1 . Since Zeta Statfjord produced 100% water on test and no oil properties were available to enable generating a reference PVT model, the Zeta Cook DST was the focus of this reservoir performance evaluation.

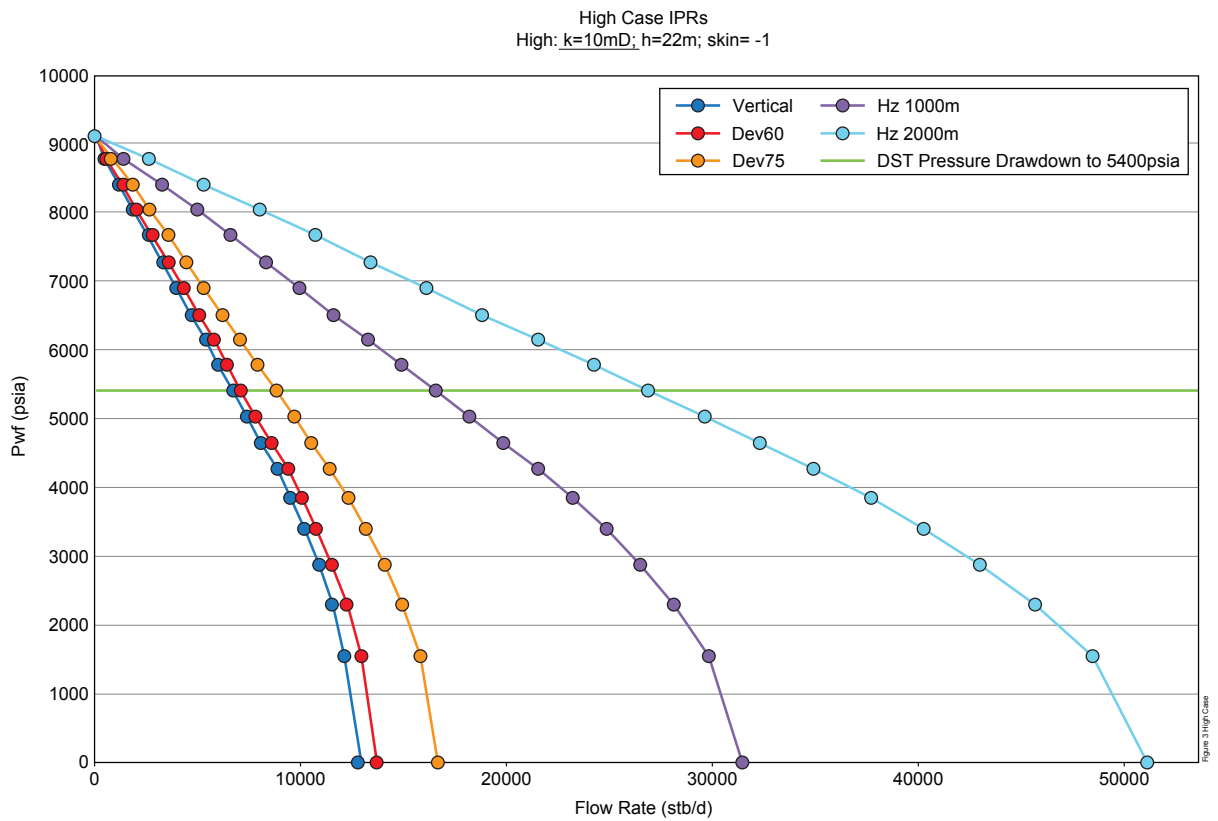
**Table 5.1 34/4-5 DST Data**

DST #	Formation	Test Interval (m)	Oil Flow Rate (stb/d)	Water Flow rate (stb/d)	Water Cut (%)	GOR (scf/stb)	WHP (psig)
1	Zeta Statfjord	3558.5 - 3599.0	Trace	170	100	n/a	350
2	Zeta Cook	3462.7 - 3480.7	300	70	19	1350	1965

Reservoir and fluid properties obtained from petrophysical analysis and DST provided input for a well model using Petroleum Experts PROSPER software to assess Inflow Performance Relationship (IPR) model. The model was matched to the production rate and observed bottomhole flowing pressure. Well performance sensitivities run for various wellbore inclinations, permeability, net thickness and skin indicated permeability and well inclination had the greatest impact on the well IPR. For the base case permeability of 1.5mD (reference from DST), the calculated well productivity indices (PI) ranged from 0.27 stb/d/psi to 1.34 stb/d/psi for simple vertical inclination and 2000m horizontal section respectively . A high case permeability assumption of 10mD indicated a sixfold increase in estimated well PI. A similar modeling exercise was performed for injectors with results showing well injectivity indices (II) ranging from 0.2 to 1.0 stb/d/psi; approximately 25% less than corresponding producer well PI cases Figure 5.2



**Figure 5.1 Base Case IPRs for Various Producer Well Inclinations**

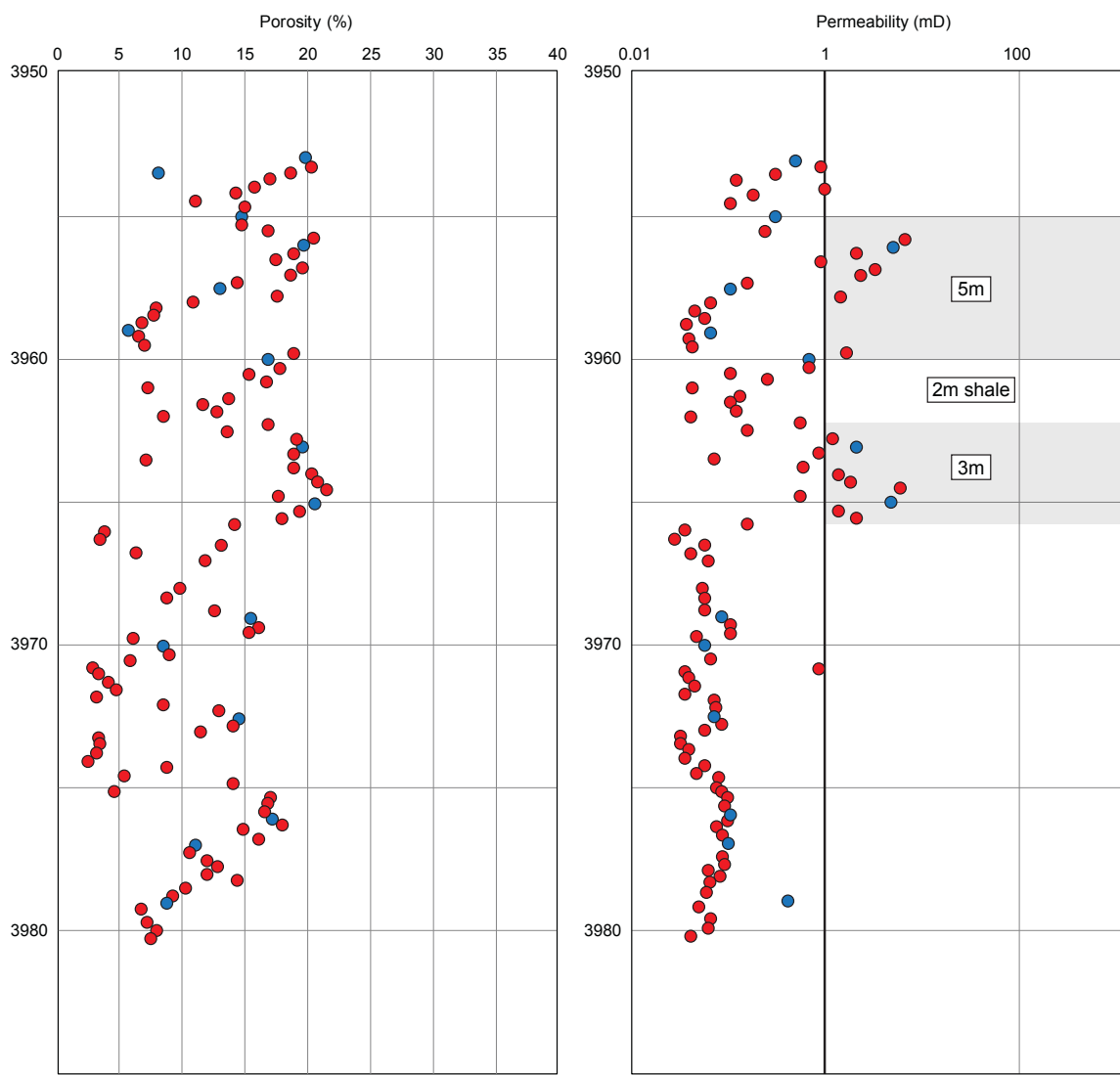


**Figure 5.2 Impact of Higher Permeability on Producer IPR**

The well performance analysis suggests that horizontal wells would deliver the greatest productivity and injectivity in Zeta Cook, albeit with significant drawdowns required to achieve commercial rates due to low well PI. However, vertical anisotropy may pose a challenge for horizontal wells. A high well count due to envisaged 1:1 injector-producer ratio, would be required to recover reserves. The Zeta discovery is now re-assessed to contain expected recoverable resources of 0.2 to 0.8\*10<sup>6</sup> Sm<sup>3</sup> (1 to 5 MBO) and development appears uneconomic - the main critical points being recovery factor, small accessible reserves per area and achievable flow rates per well, as can be inferred from sedimentological and reservoir quality assessment - Table 3.1.

**Beta Brent**

Beta Brent well deliverability was assessed in a similar manner to Zeta Cook, with the notable difference pertaining to unavailability of measured well performance data as no DST had been carried out. Available porosity and permeability core data from well 34/4-10R Figure 5.3 suggested a layered reservoir architecture comprising 3 - 5m thick sand flow units with low permeabilities (~1mD), separated by shale layers up to 2m thick. A multi-layer IPR model was used in Prosper to represent this architecture.



**Figure 5.3 Porosity / Permeability Core Data from Well 34/4-10R**

Best intervals are in lower-middle shoreface sandstones where permeabilities reach only up to 10 -15 mD - reason: illitisation.

Vertical and deviated (75°) wellbore inclinations were assessed with sensitivities on permeability and skin. Permeability was observed to have most significant impact on IPR. Deviated wellbore inclination cases resulted only marginally better productivities than the vertical case due to the thinness of the reservoir packages. Injector well assessment yielded similar results to producers.

Horizontal wells were not considered in this evaluation due to the multiple reservoir layers and low net pay thickness of each layer. Horizontal well placement would be a challenge in these thinly-bedded zones and such a development scheme would require a higher well count to access individual zones. Resources in the Beta Brent discovery reduce to 0.5 to  $1.3 \cdot 10^6$  Sm<sup>3</sup> (3 to 8 MBO) development of which is very likely to be uneconomic - the main critical points being a low recovery factor, small accessible reserves per area and achievable flow rates per well.

## 6 Conclusions

During the first term of the PL 375 license period and based on the then used pre-stack merge and reprocessing of existing 3D seismic surveys, the Ducati prospect (now called Kappa prospect) could not be derisked towards drillable stage; similarly the Cretaceous leads Trigger and Panter became more doubtful. Therefore, the exploration well 34/4-11 (2009/10) in PL375 was targeted up-dip and north of the 34/4-10R Brent discovery well for further evaluation of Brent reservoir discovery. The new well confirmed low permeabilities and even thinner net reservoir for the sandstones in the Brent Group. However about 160 m below, the well encountered a full oil column in sandstones of the Statfjord Group with unexpectedly good reservoir quality and an oil-down-to 4183m TVDSS. A subsequent appraisal well flowed >1400 to 1750 Sm<sup>3</sup> per day from the upper Statfjord Group IS-1 sandstone. Two further appraisal wells established the OWC of Beta Statfjord in the IS-1 sandstone reservoir at about 4345mTVDSS while the southern part of the Beta High was confirmed to be dry.

The new Beta Statfjord discovery lies in upper Statfjord IS-1 sandstones in Segments 1A and 1C and 1B (Figures 3.1 and 3.2), with possible resources in the unappraised adjacent Segment 6-North. Beta Statfjord likely contains expected recoverable resources between 2.5 and 5\*10<sup>6</sup> Sm<sup>3</sup> (15 and 30 MBO) which are assumed developable using a single producer & water-injector well pair. Unappraised potential in adjacent segments and undefined volumes in the lower Statfjord sandstones (well 34/4-11) may account for an additional 1 - 2\*10<sup>6</sup>Sm<sup>3</sup> (ca. 5 - 10 MBO) of expected possible recoverable resources. The partners Suncor and Core Energy have proposed to retain the area of the Beta Statfjord Discovery on the northern Beta High in order to further investigate feasibility of a field development.

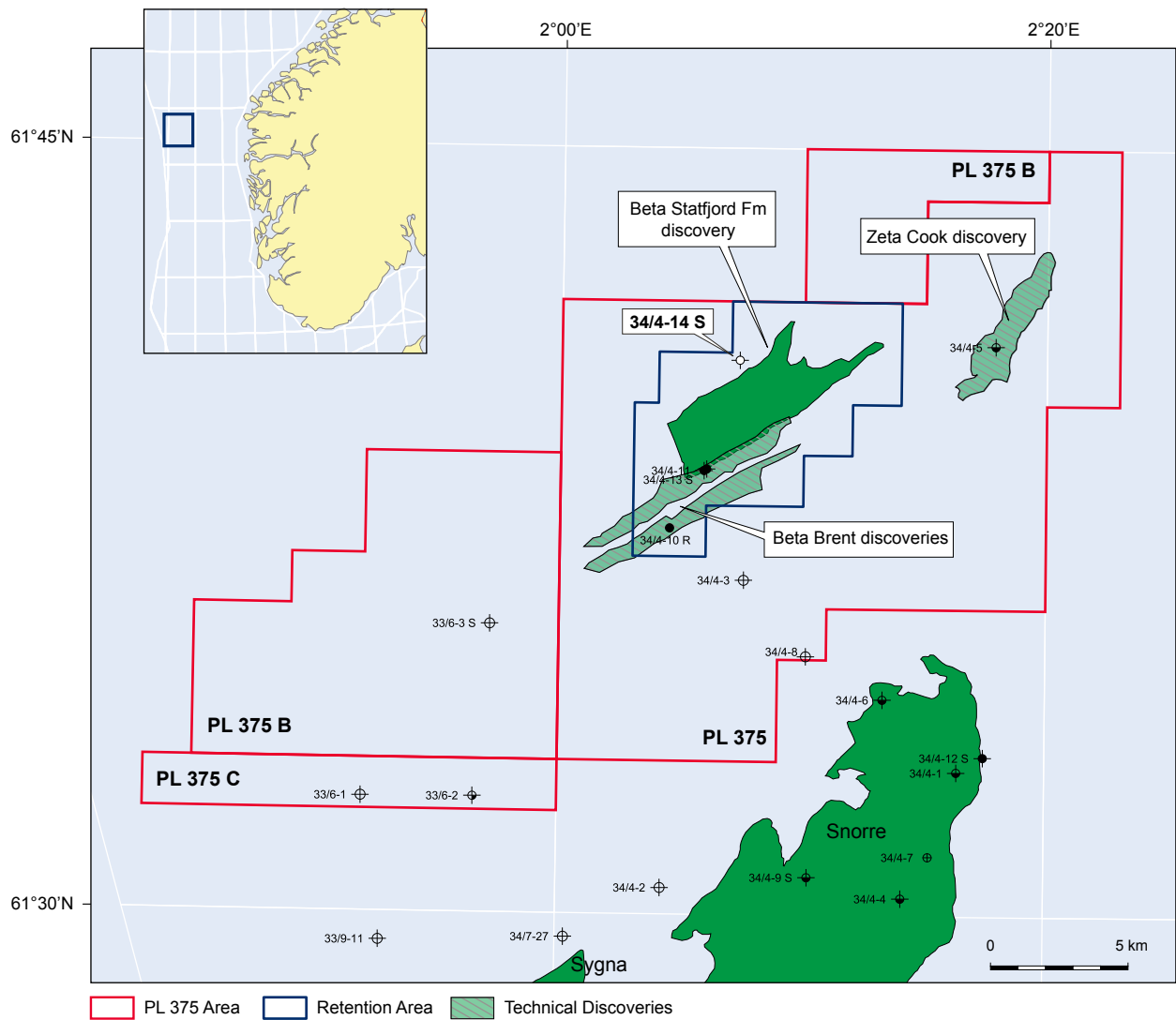
### Potential in other discoveries.

The Beta Brent and Zeta Cook discoveries are in elongate narrow structures with strong fault segmentation (newly acquired seismic SUN13001). Oil in place volumes are small, reservoir permeabilities are poor as confirmed by Brent cores (illitisation) and DST in Zeta Cook. Both discoveries therefore are judged unattractive for development in view of expectedly poor well production performance, poor recovery efficiency and high required well count for effective drainage of resources.

### Exploration potential.

Remaining exploration potential in PL 375 has been judged as unattractive. The Statfjord and Upper Jurassic prospects along the Tampen Spur master fault appear rather small and lie in synthetic hanging-wall structures. This implies lack of up-dip seal as the main risk for both, the Kappa prospect (previously called Ducati) and the Gamma and Ninja leads. Competition for charge by channels in the Jurassic Draupne Formation and illitisation causing tight reservoir add risk. The Omega lead is a stratigraphic trap in the Cook Formation, located to the west of the Zeta Discovery (34/4-5). Though seismic amplitudes and AVO effect would indicate the presence of a sand fan, the AVO anomaly appears dis-conformable with structure. Omega is a stratigraphic trap with a chance of success of COS 10%. In the south of PL375, Outsider (South) is a hanging-wall structure down-dip of the dry well 33/6-1. Leakage because of juxtaposition to sandy foot-wall series and competition for charge are the main risks - Outsider Statfjord COS 17% and Brent COS 9%.

In view of the very limited exploration potential, the PL375 group with Suncor 80% and Core Energy 20% decided to relinquish most of the PL 375 area and retain the area over the Beta Statfjord discovery. Figure 6.1



**Figure 6.1 PL 375 location map**

*Beta Statfjord discovery (green) and most of Beta Brent dirsccovery (pale green hatched) lie within the retention area.*