PL730 Relinquishment Report

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1 Key Licence History

PL 730 was originally awarded on 7th February 2014 as part of the APA2013 to E.ON (now DEA) E&P Norge AS (70%, Operator) and Det norske oljeselskap ASA (30%). PL 730B was subsequently awarded in 2014 following an approval for extension under the original License terms.

Initial work obligations and work periods:

Within two years of award

- Acquire 3D seismic data
- Carry out relevant geological and geophysical (G&G) studies
- Reach drill or drop decision

Within five years of award

- Make a Beslutning om videreføring (BOV) or drop license

Within seven years of award

- Submit Plan for development and operations (PDO) or drop license

Work obligations and work periods for PL 730B (extension awarded 2014) were merged into those of PL 730.

Overview of meetings held:

- EC/MC #1 February 18, 2014
- EC/MC #2 November 5, 2014
- EC/MC #3 June 15, 2015
- EC/MC #4 November 26, 2015

Reason for relinquishment:

License Summary:

The initial work obligation was satisfied by the purchase of PGS Multiclient Geostreamer survey MC3D-CGR2013 (PSTM and PSDM) (Fig. 2.1) and completion of G&G special studies (Table 3.1).

A full prospect evaluation of Flagstad and Fannaråken with volumetrics, risking, reservoir profiles, field development studies and economic studies were performed and presented to the partnership in November 2015. An oil case was run on Flagstad giving mean recoverable resources of approximately 5.6 mmSM3 OE and a GCF of 19% (high risk). The main risks are associated with seal/retention and reservoir quality. A gas/condensate (appraisal) case was run on Fannaråken giving mean recoverable resources of approximately 2.9 mmSM3 OE

The high risk and poor economics of the prospect meant that it was not possible to support it as a drilling candidate. It was therefore recommended to the partnership to drop the license. The Partnership supports the recommendation.

2 Database

The most recent mapping of the license is done on the PGS Multiclient Geostreamer survey MC3D-CGR2013 (PSTM and PSDM) (Fig. 2.1). Both the PSTM and PSDM were processed as part of the License commitment. No new seismic surveys were shot during the License period.

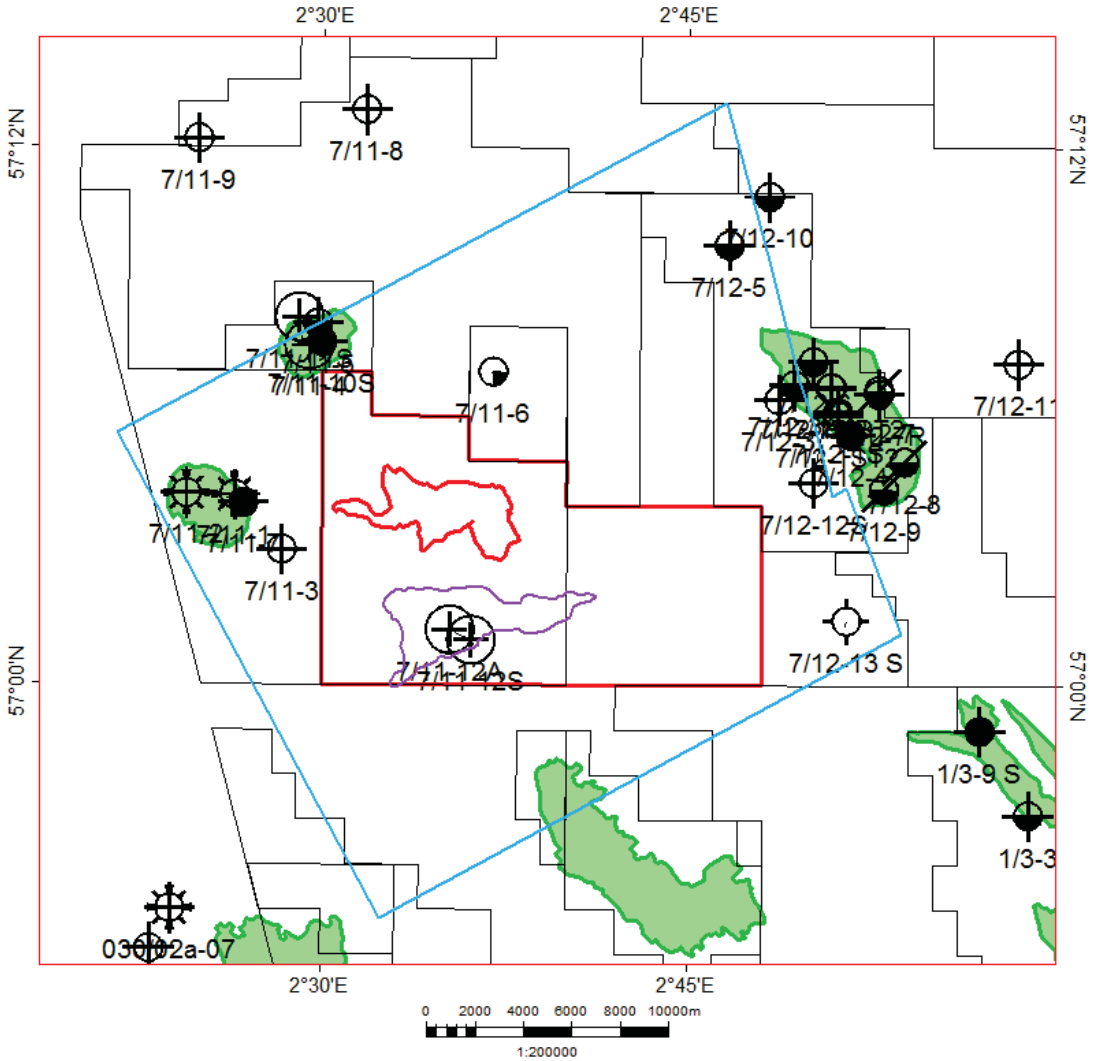

Fig. 2.1 License, wells and seismic outline

2.1 Well Database

Table 2.1 Well Database

Name	Content	P&A	TD Age	Discovery Field
1/2-1	Oil	1989	Paleocene	Blane
1/3-1	Gas	1968	Late Permian	
1/3-3	Oil	1983	Late Permian	Tambar
1/3-4	Dry	1983	Late Permian	
1/3-5	Dry	1985	Early Permian	

Name	Content	P&A	TD Age	Discovery Field
1/3-6	Gas	1991	Cretaceous	Oselvar
1/3-9 S	Oil	1998	Late Jurassic	
1/3-12 S	Dry	2010	Late Jurassic	
2/1-2	Dry	1977	Permian	
2/1-3	Oil	1980	Permian	Gyda
7/11-1	Gas	1968	Late Permian	Cod
7/11-2	Gas	1968	Upper Cretaceous	Cod
7/11-3	Dry	1969	Paleocene	Cod
7/11-4	Dry	1969	Paleocene	
7/11-5	Oil	1982	Triassic	Mime
7/11-6	Dry	1982	Triassic	
7/11-7	Oil	1983	Late Permian	
7/11-8	Dry	1983	Triassic	
7/11-9	Dry	1986	Early Triassic	
7/11-10 S	Oil	1990	Triassic	Mime
7/11-11 S	Dry	2007	Triassic	Mime
7/11-12 A	Dry	2011	Triassic	Agn
7/11-12 S	Dry	2011	Triassic	Peking Duck
7/11-13	Dry	2012	Triassic	
7/12-2	Oil	1976	Triassic	Ula
7/12-3	Dry	1977	Late Jurassic	Ula
7/12-3 A	Oil Shows	1977	Late Permian	Ula
7/12-4	Oil	1977	Triassic	Ula
7/12-5	Oil	1981	Late Permian	
7/12-6	Oil	1981	Triassic	Ula
7/12-7	Oil	1988	Late Jurassic	Ula
7/12-8	Oil	1988	Late Triassic	Ula
7/12-9	Oil	1990	Triassic	Ula
7/12-10	Dry	1991	Triassic	
7/12-11	Dry	1991	Late Triassic	
7/12-12 A	Gas	2011	Triassic	
7/12-12 S	Dry	1996	Triassic	
7/12-13 S	Dry	2012	Middle Jurassic	
7/7-1	Dry	1993	Triassic	
7/7-2	Oil	1992	Late Permian	
7/7-3	OS	1993	Late Permian	
7/8-2	Dry	1973	Late Permian	
7/8-3	Oil	1983	Late Permian	Discovery
7/8-4	Dry	1985	Triassic	

The wells listed in Table 2.1 in PL730 Relinquishment Report in Alex Dunbar's Personal Project were considered most applicable for exploration in PL 730

2.2 Seismic Database

MC3D-CGR2013 PSTM and PSDM (see Fig. 2.1 in PL730 Relinquishment Report in Alex Dunbar's Personal Project)

PGS Megamerge survey

3 Review of Geological Framework

In connection with the license work and the preparation to be able to take a drill or drop decision, the following geological studies were undertaken.

Table 3.1 G&G Special Studies

Year	Study	Author
2015	Regional Pore Pressure Analysis of the PL730 License	Ikon
2015	Biostratigraphic, Sedimentological & Quality of the Ula Fm in the PL730 License	Ichron
2015	Basin Modelling	E.ON E&P Norge AS
2015	AVO Study and Inversion Feasibility Study of the PL730 License	E.ON E&P Norge AS
2015	Structural and fault seal analysis of the Flagstad prospect, PL730.	E.ON E&P Norge AS

The work carried out over the course of the initial license period was primarily to;

- Map the pre-Cretaceous seismic events in order to understand the interplay between the underlying Carbo-Perm tectonic alignment, the overlying salt and Triassic pod-interpod setup and the distribution and thickness of the Upper Jurassic shallow water sediments,
- Understand the regional and local pressure regimes,
- Make facies and reservoir quality predictions away from well control into the PL730 license,
- Understand the AVO environment and determine if fluids and/or lithologies could be mapped from inverted seismic data,
- Determine the likely fault seal capacity of low throw reservoir faults.

Results of block evaluation

- In the APA Application the level of detailed mapping of pre-Cretaceous events using PGS Megamerge seismic data was severely limited (Top salt, Triassic) or not possible (Top and Base Ula). The CGR2013 PSTM and PSDM data quality also allowed a much more detailed fault interpretation to be carried out. Together the fault interpretation and Top/Base Ula interpretation allowed for a more robust prospect definition that was subsequently used for volumetrics assessment.
- The Ikon pressure study verified high (600 bar at Flagstad) to very high (1000 bar at Fannaråken) pressure regime exists in the PL730 license
- The Ichron Reservoir study concluded that reservoir quality in the J56-J63 aged sands would degrade with increasing depth (Flagstad>4300mSS, Fannaråken>5000mSS). Alternatively, J64-J65 detached shelf sands could retain higher porosity due to presence of microquartz. However these sand packages were volumetrically small and difficult to predict areally.
- The AVO study concluded that fluid prediction was ruled out due to the depth of the prospects while lithology prediction of the Ula Fm was inconclusive due to the varying hardness of the overlying unit (Farsund).
- The Fault seal study found that reservoir fault offsets between 5-15m could theoretically hold a 50m hydrocarbon column.

Major changes

- The original Application used "amplitude shutoff" as a hydrocarbon indicator. The subsequent AVO study found that amplitudes associated with hydrocarbons couldn't be supported.
- The improved seismic data quality allowed a top and base reservoir pick as opposed to the inferred top Ula using a constant isochore from BCU which was used in the original application.

4 Prospect update

The license is located approximately 20 km west of the Ula Field in block 7/11 and 7/12. The focus of work has been on the Upper Jurassic shallow marine Ula Formation. During the 2013 License Application E.ON identified one main prospect (Flagstad) and two leads while Det norske oljeselskap ASA identified one main prospect (Fannaråken) in a separate license application (Fig. 4.1). Both applications were awarded and merged into one license with E.ON as the Operator. Flagstad was subsequently pursued as the main prospect with Fannaråken reviewed as a gas/condensate discovery with possible upside potential.

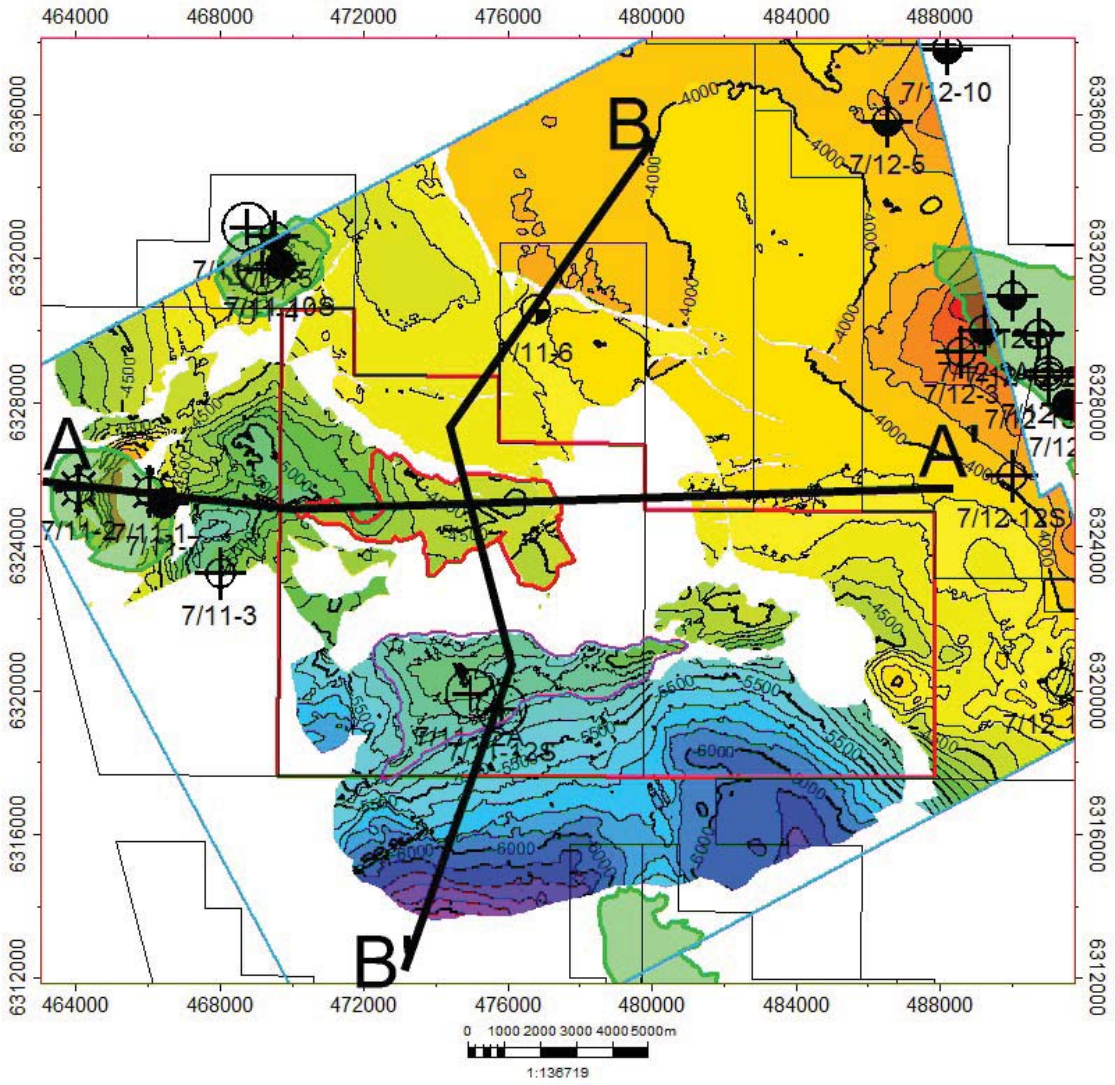

Fig. 4.1 Top Ula Fm Depth Structure

Flagstad Prospect

The Flagstad prospect (Fig. 4.2) was an attempt to extend the Pod-Interpod play away from the main Ula trend (Ula, Gyda, Tambar Fields) further into the Cod Terrace. Flagstad is a downthrown complex combination trap featuring fault and sedimentary onlap/erosional components. Accommodation space was created along the hangingwall associated with salt withdrawal into the Cod and Mime structures. It requires a stratigraphic trap component to the east along a Triassic high and footwall erosion to the south as the main hangingwall fault dies out to the east into a series of low throw, partially connected fault segments.

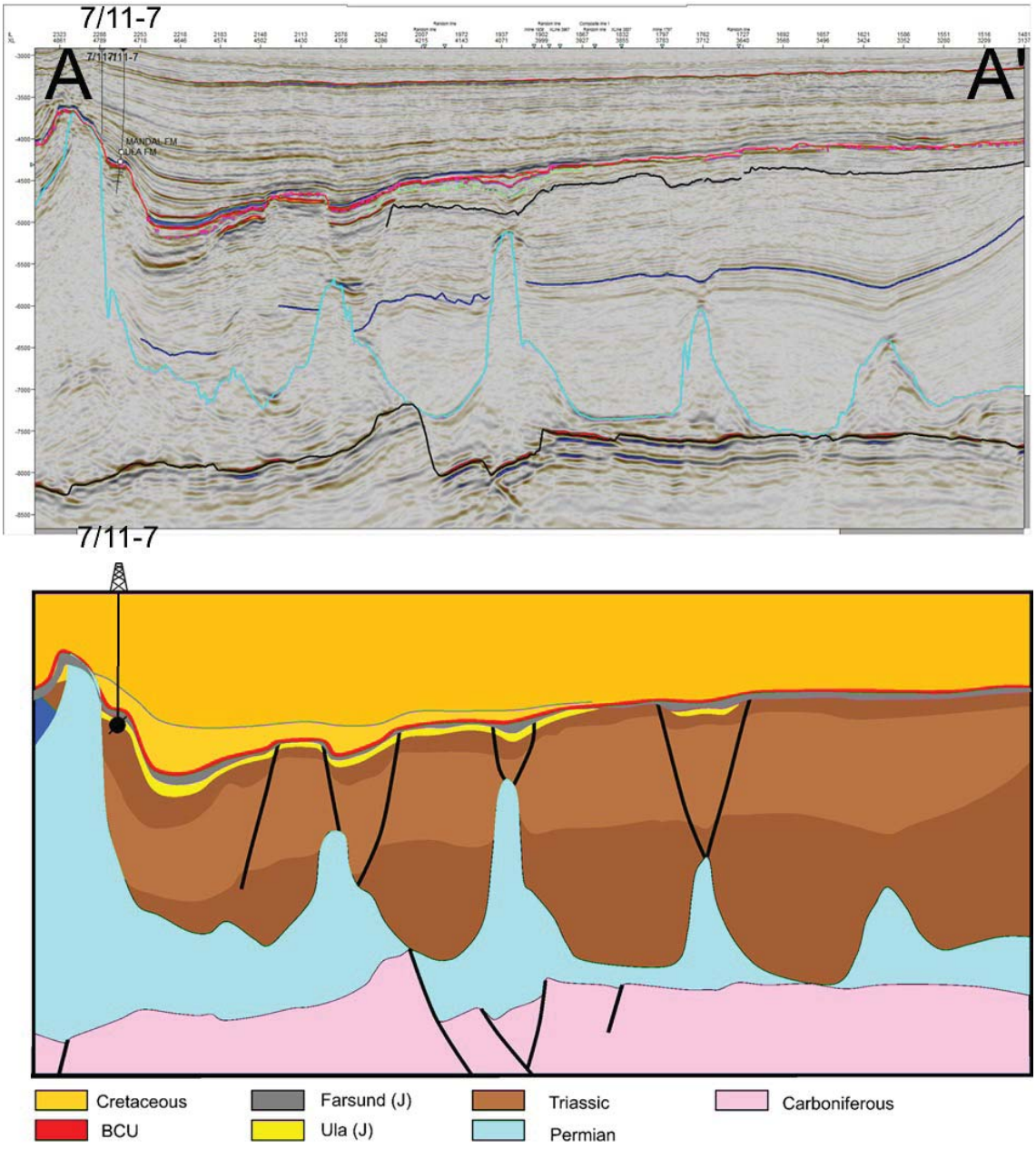

Fig. 4.2 Flagstad E-W cross-section

The western segment of the original Flagstad prospect required a pinchout or fault against the Cod-Mime salt wall. Processed modern seismic data (MC3D-CGR2013) allowed for a detailed top and base Ula Fm interpretation which did not support this previous interpretation.

The eastern segment was defined in its updip limit by a series of low throw faults. Subsequent interpretation concluded that it was likely that the Ula Fm was either thin, absent or eroded over a Triassic pod. The original 80m P50 thickness was reduced considerably by the interpreted onlap over an emergent Triassic high. A revised NPD Table 5 is included (Fig. 4.3)

Fig. 4.3 NPD Table 5: Flagstad

Table 5: Prospect data (Enclose map)

Block	7/11	Prospect name	Flagstad	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&Gas	Reported by company	DEA E&P Norge	Reference document	E.ON E&P Norge APA 2013 Application for part of block 7/11			Assessment year	2016
This is case no.:	1 of 1	Structural element	Cod Terrace	Type of trap	Struc/strat	Water depth [m MSL] (>0)	80	Seismic database (2D/3D)	3D
Resources IN PLACE and RECOVERABLE		**Main phase**				**Associated phase**			
Volumes, this case		Low (P90)	Base, Mode	Base, Mean	High (P10)	Low (P90)	Base, Mode	Base, Mean	High (P10)
In place resources	Oil [10^6 Sm^3] (>0.00)	2.70	11.50	12.80	24.50				
	Gas [10^9 Sm^3] (>0.00)					0.60	2.70	3.10	6.20
Recoverable resources	Oil [10^6 Sm^3] (>0.00)	0.80	3.70	4.50	9.10				
	Gas [10^9 Sm^3] (>0.00)					0.18	0.90	1.10	2.30
Reservoir Chrono (from)	Oxfordian	Reservoir litho (from)	Ula Fm	Source Rock, chrono primary	Ryazanian	Source Rock, litho primary	Mandal Fm	Seal, Chrono	Ryazanian
Reservoir Chrono (to)	Volgian	Reservoir litho (to)	-	Source Rock, chrono secondary	Volgian	Source Rock, litho secondary	Farsund Fm	Seal, Litho	Mandal Fm
Probability [fraction]									
Technical (oil + gas + oil & gas case) (0.00-1.00)	#VALUE!	Oil case (0.00-1.00)	0.00	Gas case (0.00-1.00)	0.00	Oil & Gas case (0.00-1.00)	1.00		
Reservoir (P1) (0.00-1.00)	0.60	Trap (P2) (0.00-1.00)	0.80	Charge (P3) (0.00-1.00)	0.80	Retention (P4) (0.00-1.00)	0.50		

Parametres:	Low (P90)	Base	High (P10)
Depth to top of prospect [m MSL] (> 0)	4440	4440	4440
Area of closure [km^2] (> 0.0)	7.8	8.7	9.6
Reservoir thickness [m] (> 0)	30	57	68
HC column in prospect [m] (> 0)	60	135	210
Gross rock vol. [10^9 m^3] (> 0.000)	0.830	0.924	1.100
Net / Gross [fraction] (0.00-1.00)	0.25	0.45	0.65
Porosity [fraction] (0.00-1.00)	0.13	0.15	0.17
Permeability [mD] (> 0)	100	200	500
Water Saturation [fraction] (0.00-1.00)	0.80	0.70	0.60
Bg [Rm3/Sm3] (< 1.0000)			
1/Bo [Sm3/Rm3] (< 1.00)	0.66	0.59	0.54
GOR, free gas [Sm^3/Sm^3] (> 0)			
GOR, oil [Sm^3/Sm^3] (> 0)	150	250	350
Recov. factor, oil main phase [fraction] (0.00-1.00)	0.20	0.35	0.50
Recov. factor, gas ass. phase [fraction] (0.00-1.00)	0.20	0.35	0.50
Recov. factor, gas main phase [fraction] (0.00-1.00)			
Recov. factor, liquid ass. phase [fraction] (0.00-1.00)			

Comments: Reservoir thickness values are net pay thickness at 4440m depth

Temperature, top res [°C] (>0)	120			For NPD use:					
Pressure, top res [bar] (>0)	700			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	VSH < 0.40	PHIT > 0.10		Dato:	NPD will insert value	Registrert Dato:	NPD will insert value	Kart dato	NPD will insert value
								Kart nr	NPD will insert value

Fannaråken (Peking Duck/Agn) Gas/Condensate Discovery
Fannaråken is a re-examination of volumes looking for upside potential of the Peking Duck/Agn gas/condensate discoveries (7/11-12S & 7/11-12A) (Fig. 4.4). The structure is a well-defined hangingwall rollover that is 3-way dip closed against a major fault. The hangingwall creates a robust rollover anticline which has a portion of crestal collapse in the east as salt moves stratigraphically higher beneath it

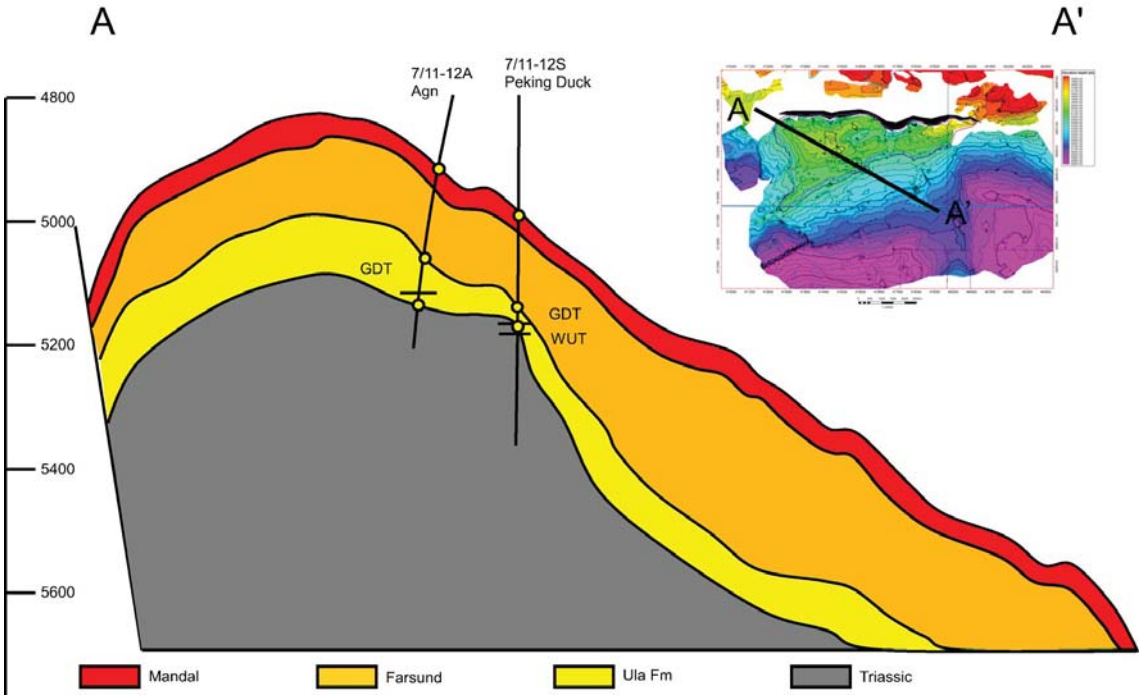

Fig. 4.4 Fannaråken cross-section

A gas down to (GDT) is identified in the Upper Jurassic Ula Fm and a water up to (WUT) in the Triassic. In the APA License Application it was assumed that a barrier exists between the Triassic and Jurassic, which allowed for the possibility of a deeper contact in the Ula Fm. However, the latest evaluation of the 7/11-12S well assumes communication between the Triassic and the Ula Fm. The updated model of the Fannaråken Prospect uses a common contact between the Ula Fm and the Triassic and the WUT identified in the 7/11-12S well is the deepest hydrocarbon contact in the Fannaråken Prospect.

Petrophysical logs and reservoir property analysis of the 7/11-12A & S indicates poor reservoir quality/producibility of the Fannaråken Prospect due to the depth of the prospect. Although the reservoir study indicated a possibility for better reservoir properties (J64 aged sands and younger) further to the north-east of the 7/11-12A & S wells, the accommodation space available for the sediments is negligable. The risk on the Fannaråken Prospect is high due to the uncertainties related to the reservoir properties. There is also an economic issue related to the HPHT regime in the area due to the volumes calculated by the new model indicating no deeper filling of the 7/11-12A & S discovery. A revised NPD Table 5 is included (Fig. 4.5)

Table 5: Prospect data (Enclose map)

Block	7/11	Prospect name	Fannaråken	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:	Gas	Reported by company	DEA E&P Norge	Reference document	E.ON E&P Norge APA 2013 Application for part of block 7/11			Assessment year	2016
This is case no.:	1 of 1	Structural element	Cod Terrace	Type of trap	Struc/strat	Water depth [m MSL] (>0)	80	Seismic database (2D/3D)	3D
Resources IN PLACE and RECOVERABLE		**Main phase**				**Associated phase**			
Volumes, this case		Low (P90)	Base, Mode	Base, Mean	High (P10)	Low (P90)	Base, Mode	Base, Mean	High (P10)
In place resources	Oil [10^6 Sm^3] (>0.00)					2.10	3.80	4.00	6.20
	Gas [10^9 Sm^3] (>0.00)	2.90	5.60	6.00	9.50				
Recoverable resources	Oil [10^6 Sm^3] (>0.00)					0.30	0.80	0.90	1.50
	Gas [10^9 Sm^3] (>0.00)	0.80	1.90	2.10	3.70				
Reservoir Chrono (from)	Oxfordian	Reservoir litho (from)	Ula Fm	Source Rock, chrono primary	Ryazanian	Source Rock, litho primary	Mandal Fm	Seal, Chrono	Ryazanian
Reservoir Chrono (to)	Volgian	Reservoir litho (to)	-	Source Rock, chrono secondary	Volgian	Source Rock, litho secondary	Farsund Fm	Seal, Litho	Mandal Fm
Probability [fraction]									
Technical (oil + gas + oil & gas case) (0.00-1.00)		Oil case (0.00-1.00)		Gas case (0.00-1.00)		Oil & Gas case (0.00-1.00)			
Reservoir (P1) (0.00-1.00)		Trap (P2) (0.00-1.00)		Charge (P3) (0.00-1.00)		Retention (P4) (0.00-1.00)			
Parametres:	Low (P90)	Base	High (P10)	**Comments: Evaluated as a discovery**					
Depth to top of prospect [m MSL] (> 0)	4960	4960	4960						
Area of closure [km^2] (> 0.0)	10.5	11.7	12.9						
Reservoir thickness [m] (> 0)		78							
HC column in prospect [m] (> 0)		240							
Gross rock vol. [10^9 m^3] (> 0.000)	0.978	1.090	1.193						
Net / Gross [fraction] (0.00-1.00)	0.10	0.16	0.22						
Porosity [fraction] (0.00-1.00)	0.11	0.13	0.14						
Permeability [mD] (> 0)	1	10	100						
Water Saturation [fraction] (0.00-1.00)	0.40	0.30	0.20						
Bg [Rm3/Sm3] (< 1.0000)	0.0033	0.0022	0.0017						
1/Bo [Sm3/Rm3] (< 1.00)									
GOR, free gas [Sm^3/Sm^3] (> 0)									
GOR, oil [Sm^3/Sm^3] (> 0)									
Recov. factor, oil main phase [fraction] (0.00-1.00)									
Recov. factor, gas ass. phase [fraction] (0.00-1.00)									
Recov. factor, gas main phase [fraction] (0.00-1.00)	0.20	0.35	0.50						
Recov. factor, liquid ass. phase [fraction] (0.00-1.00)	0.12	0.21	0.30	For NPD use:					
Temperature, top res [^{o}C] (>0)	155			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)	1000			Dato:	NPD will insert value	Registrert Dato:	NPD will insert value	Kart dato	NPD will insert value
Cut off criteria for N/G calculation	VSH < 0.40	PHIT > 0.10						Kart nr	NPD will insert value

Fig. 4.5 NPD Table 5: Fannaråken

5 Technical Evaluation

A full prospect evaluation of Flagstad with volumetrics, risking, reservoir profiles, field development studies and economic studies was performed and presented to the partnership in November 2015. An oil case was run giving recoverable resources of approximately 4.8 mill SM3 OE and a GCF of 19% (high risk). The main risks are associated with seal/retention and reservoir quality.

A complete technical evaluation on Fannaråken with volumetrics was performed and presented to the partnership in November 2015. A gas/condensate case was run giving recoverable resources of approximately 2.7 mill SM3 OE.

Development Assumptions (P50)

- 49mmboe recoverable (7.8MSm3)
- Wellcount 2OP + 2WI (Snilehorn lookalike)
- Nearest identified facilities are Ula (19 km) and Gyda (34 km)
- P50 concept based on subsea tieback to Ula platform
- All processing to be at Ula platform
- Water injection and controls at Ula platform
- Gas could be sold to Ula license for reinjection

Economic analysis showed that this development scenario would not be commercial.

6 Conclusions

The majority of fields and discoveries in the immediate area target salt supported traps. Most, if not all have been tested. Remaining petroleum potential outside the PL730 license would have to be away from the salt supported interpod play as the Flagstad prospect was testing. Accommodation space, sediment input and a trapping mechanism away from a salt supported interpod model would have to be identified.

A full prospect evaluation of Flagstad and Fannaråken with volumetrics, risking, reservoir profiles, field development studies and economic studies were performed and presented to the partnership in November 2015. An oil case was run on Flagstad giving mean recoverable resources of approximately 5.6 mmSM3 OE and a GCF of 19% (high risk). The main risks are associated with seal/retention and reservoir quality. A gas/condensate (appraisal) case was run on Fannaråken giving mean recoverable resources of approximately 2.9 mmSM3 OE with the main risk being reservoir quality.

The high risk and poor economics of the prospect meant that it was not possible to support it as a drilling candidate. It was therefore recommended to the partnership, and subsequently approved, to drop the license.