PL348C Relinquishment report

Table of contents

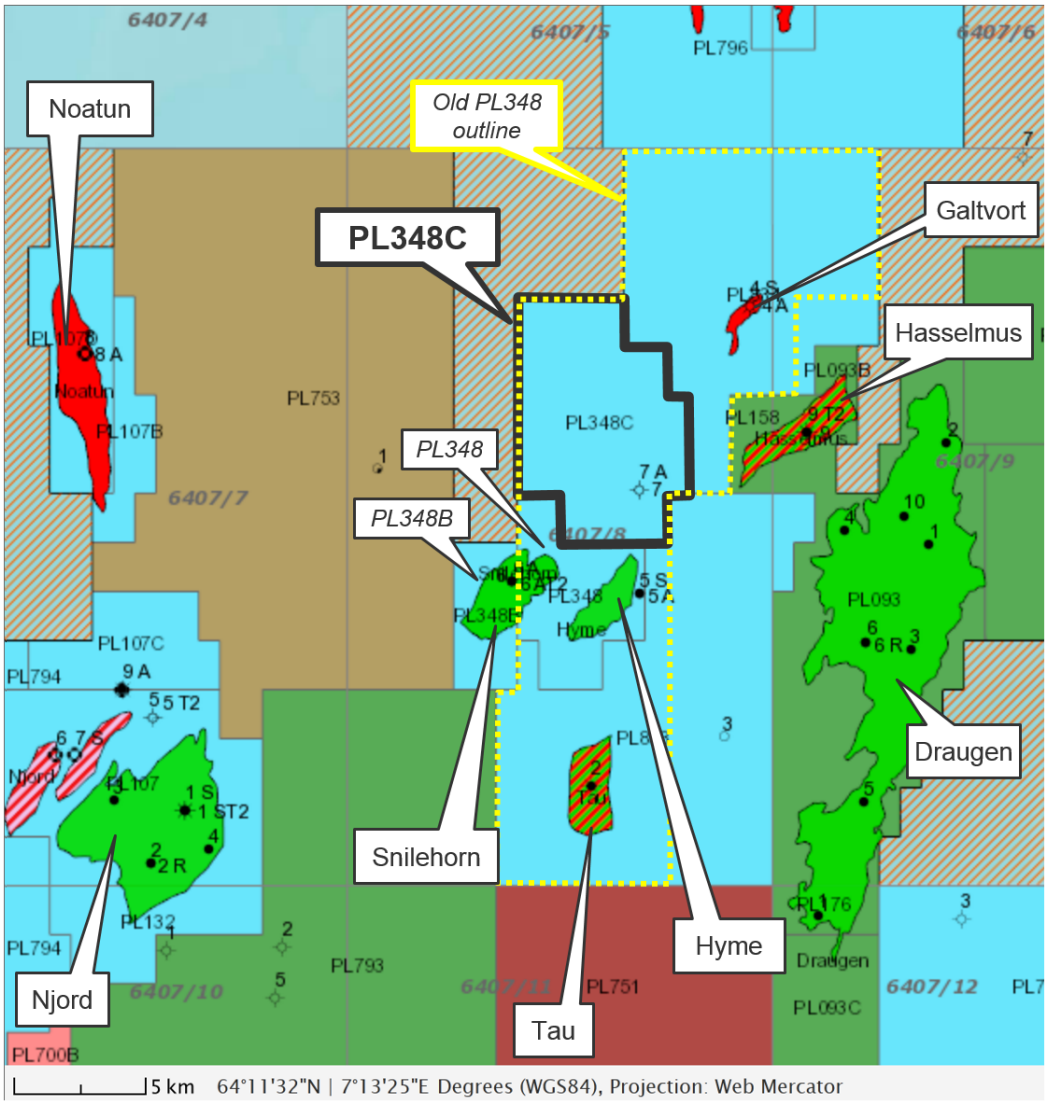

Figure 1. Area map with licenses, fields, discoveries and wells. Former PL348 extent before carve out of PL348C is the dotted yellow line. PL348C outline is the bold black outline.

1 Key license history

PL348C was carved out from PL348 on 17.12.2014 following an application to extend PL348 license after the 10 years' license period was reached (Figure 1). The PL348C initial period was postponed until 17.12.2029. The PL348C license had a first drill or drop decision on 17.12.2015 which was fulfilled by drilling of wells 6407/8-7 and 6407/8-7 A which tested the Bister prospect. A second drill or drop decision had to be taken on 17.12.2016 which led to a drop decision. The license area was 49.28km2 in block 6407/8. Statoil operated licence PL348C with variable partner equity. Full license history is summarised in Table 1 and Table 2.

Rettighetshaver gyldig fra dato	Rettighetshaver gyldig til dato	Selskap, langnavn	Andel [%
26.05.2016		Statoil Petroleum AS	35.00000
		Point Resources AS	22.50000
		DEA Norge AS	17.50000
		ENGIE E&P Norge AS	15.00000
		Faroe Petroleum Norge AS	7.50000
		VNG Norge AS	2.50000
18.05.2016	26.05.2016	Statoil Petroleum AS	35.00000
		Core Energy AS	22.50000
		DEA Norge AS	17.50000
		ENGIE E&P Norge AS	15.00000
		Faroe Petroleum Norge AS	7.50000
		VNG Norge AS	2.50000
13.01.2016	18.05.2016	Statoil Petroleum AS	35.00000
		Core Energy AS	22.50000
		Dea E&P Norge AS	17.50000
		ENGIE E&P Norge AS	15.00000
		Faroe Petroleum Norge AS	7.50000
		VNG Norge AS	2.50000
30.04.2015	13.01.2016	Statoil Petroleum AS	35.00000
		Core Energy AS	22.50000
		E.ON E&P Norge AS	17.50000
		GDF SUEZ E&P Norge AS	15.00000
		Faroe Petroleum Norge AS	7.50000
		VNG Norge AS	2.50000
13.02.2015	30.04.2015	Statoil Petroleum AS	35.00000
		GDF SUEZ E&P Norge AS	20.00000
		E.ON E&P Norge AS	17.50000
		Core Energy AS	17.50000
		Faroe Petroleum Norge AS	7.50000
		VNG Norge AS	2.50000

Table 1. Licensee history

Meeting date	Meeting type
13.02.2015	EC work meeting (*combined with PL348)*
13.03.2015	MC (*combined with PL348)*
26.03.2015	MC (review Bister) (*combined with PL348)*
16.04.2015	EC (Bister well)
11.05.2015	EC work meeting (Bister)
28.05.2015	MC
26.08.2015	EC (*combined with PL348 RC)*
07.12.2015	EC/MC
11.03.2016	EC work meeting
18.08.2016	EC work meeting
11.10.2016	EC work meeting
01.11.2016	EC/MC

Table 2. Meetings held in the license

Reason for relinquishment

The exploration well 6407/8-7 and sidetrack 6407/8-7 A (Bister prospect) was drilled in the license during April and May 2015. The wells were dry. Results of the dry Bister well evaluation and evaluation of the remaining hydrocarbon potential within PL348C suggested that volumes were not significant enough to retain the license, even if developed with a tieback to the Snilehorn discovery in PL348 and PL348B. Therefore, a notification of relinquishment was delivered to the authorities on the 14th December 2016 and licence was relinquished on the 17th December 2016.

2 Database

Common database in PL348C is inherited from PL348, only the new PGS14005 dataset was included afterwards. It consists of wells shown in Table 3 and seismic data listed in

Table 4. Database data are shown on Figure 2 map. Moreover, some Norwegian Sea wells not included in the common database with upper Jurassic sands were analysed as analogues for the upper Jurassic prospectivity review.
In addition, early results from wells 6407/7-9 S and 6407/7-9 A drilled in license PL107C during August and September 2016 not included in the common database were analysed concerning potential modification of the volume and risk evaluation of the middle Jurassic prospectivity.

Table 3. Wells in PL348C common database

Well names	NPDID	Well names	NPDID
6407/8-1	1859	**6407/8-5 S**	6110
6407/8-2	2434	**6407/8-6**	7265
6407/8-3	3092	**6407/8-6 A**	7266
6407/8-4 A	5814	**6407/8-7**	7684
6407/8-4 S	5813	**6407/8-7 A**	7707
6407/8-5 A	6153	**6407/9-9 T2**	1990

Table 4. Seismic data in PL348C common database

Seismic data names	NPDID	Data type
ST11M03, merged of BPN9501 (3706), MC3D-GRANAT06 (4353), ST10021 (7343)	N/A	3D
ST10021Z14	N/A	3D
PGS14005, part of dataset	8054	3D

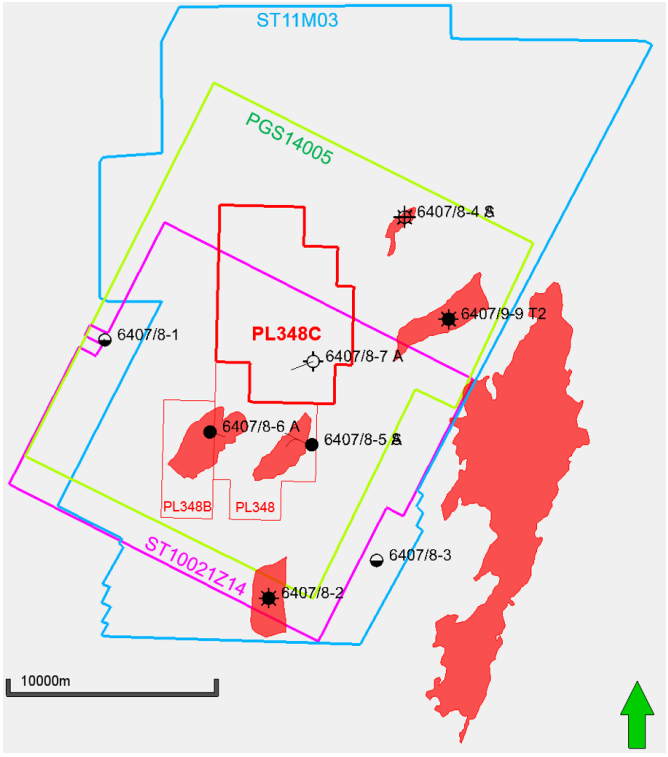

Figure 2. Common database in PL348C

3 Review of geological and geophysical studies

The geological framework for PL348C is based on studies done when it was part of PL348. PL348C work has been focused on 6407/8-7 and 6407/8-7 A (Biser prospect) well planning, post well evaluations and update of the remaining prospectivity accordingly. A review of the PL348C upper Jurassic potential has also been performed. For the studies performed in PL348, see the EC/MC meetings documentation on L2S, special reports on L2S, Final Well Reports for wells 6407/8-4 A/S, 6407/8-5 A/S, 6407/8-6 (A) and other special reports from these wells.

The PL348C license is located inside the Bremstein Fault Complex which is the result of a Late Jurassic – Early Cretaceous rift phase. Due to the structural complexity of the Bremstein fault complex, Middle Jurassic horizons are interpreted using jump correlation across faults (Figure 3). The Melke Fm contains an erosion event, the intra-Melke unconformity, which generates significant thickness variations of the Fangst and Båt Gp. The base cretaceous unconformity also erodes the entire Jurassic what further complicate the interpretation across faults.

The main reservoirs formations consist of the lower to Middle Jurassic (Rhaetian to Bathoninan) Åre Fm, Tilje Fm, Ile Fm and Garn Fm which are part of the pre-rift sequence and represent a transition from a continental fluvial environment (Åre Fm) to a shoreface setting (Garn Fm). These represent the reservoirs of most of the Norwegian Sea discoveries including the Njord, Hyme and Mikkel fields and the Snilehorn, Galtvort, Hasselmus and Tau discoveries in the vicinity of PL348C (Figure 1).
During late Jurassic (Bathonian to Thitonian), marine shale deposits from the Melke Fm and Spekk Fm were deposited with possibility for embedded turbiditic sands respectively named “Melke sandstones” and Rogn Fm. These sediments are part of the syn-rift sequence and present large thickness variations. Thin upper Jurassic sands have been proven in number of wells in the Bremstein Fault Complex including two in the former PL348 area in the 6407/8-6 A Snilehorn (“Melke sandstone”) and the 6407/8-4 S Galtvort (Rogn Fm), both hydrocarbon filled. The Draugen field has the Rogn Fm as main reservoir, but is not an analogue for PL348C in term of depositional setting.

Early-mid Jurassic play reservoirs produce a clear geophysical response when filled with hydrocarbon in the PL348C area as proven in all discoveries (Galtvort, Hyme, Snilehorn, Tau, Hasselmus) except the Tilje in the Snilehorn sidetrack (6407/8-6 A). After the Snilehorn well, a seismic illumination study was performed to understand why the hydrocarbon filled Tilje reservoir does not generate such geophysical response. The poor illumination area seemed to fit with the well result and was therefore used to derisk the Bister geophysical response what led to the drilling of the Bister wells (6407/8-7 and 6407/8-7 A). The dry wells results indicate that the Tilje lack of geophysical response in Snilehorn 6407/8-6 A is in fact most likely related to a cap rock (Ror Fm) variation. This is discussed in more details in the next chapter.

All the discoveries within the fault complex are related to 4-way closure traps. The recent wells on Njord north-flank 6407/7-9, 6407/7-9 A are the first ones proving a working down faulted trap mechanism. But on the other hand proved challenging reservoir quality. These north flank discoveries are deeper than most of PL348C prospectivity and only the Nilus Ile and Tilje segments can be considered as analogue. The preliminary well results are not considered to provide a significant uplift to the Nilus Ile and Tilje segments, because if they increase the fault seal likelihood of the main fault, they also increase the risk on the internal faults to be sealing and therefore add some risk on the producibility and lowers the recovery factor.

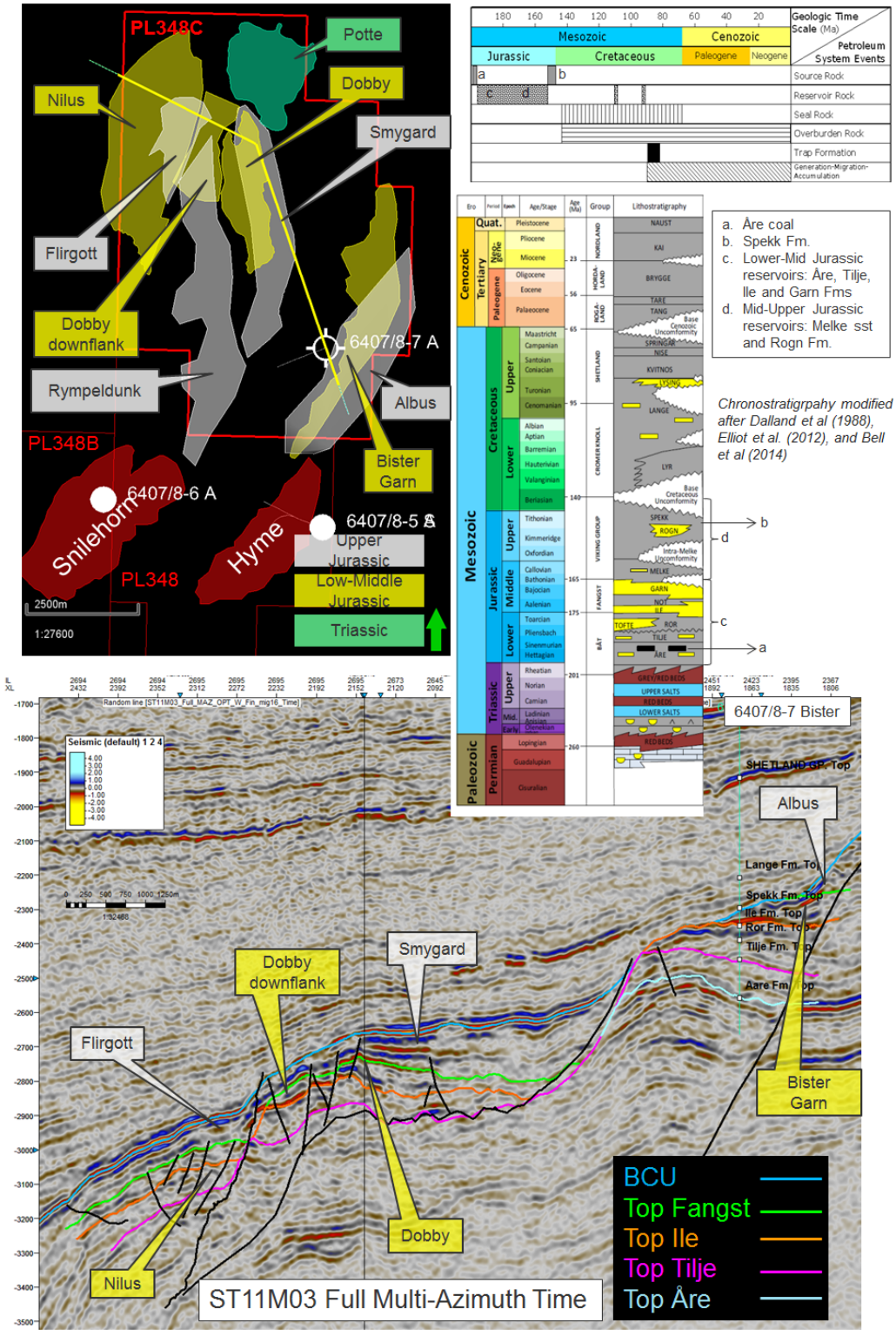

Figure 3. Top-left: Map view of PL348C with the prospect outlines (Nilus, Dobby and Dobby downflank prospects, only outline of the Garn segments are displayed). Top-right: Petroleum system event chart and Chronostratigraphy for the study area. Bottom: Random section accross 6407/8-7 Bister well and the two main remaining prospects Dobby and Nilus.

4 Prospect update

PL348C was awarded based on the potential of the Bister, Dobby and Nilus prospects. The main evaluations of these prospects were done in PL348. After the carve out, the Bister well was drilled in the PL348C license and then the new PGS14005 seismic data was acquired. Existing prospect evaluations have been updated based on these new data. In addition, the upper Jurassic prospectivity has been evaluated.

The Bister prospect and 6407/8-7 & 6407/8-7 A (Bister) well results

The Bister prospect is a downfaulted block from the Hyme field. It can be also described as a relay-ramp inside the Bremstein Fault Complex deeply eroded by the BCU in its western part (Figure 4). The main reservoirs were the Ile Fm and Tilje Fm as in the nearby Hyme and Snilehorn.

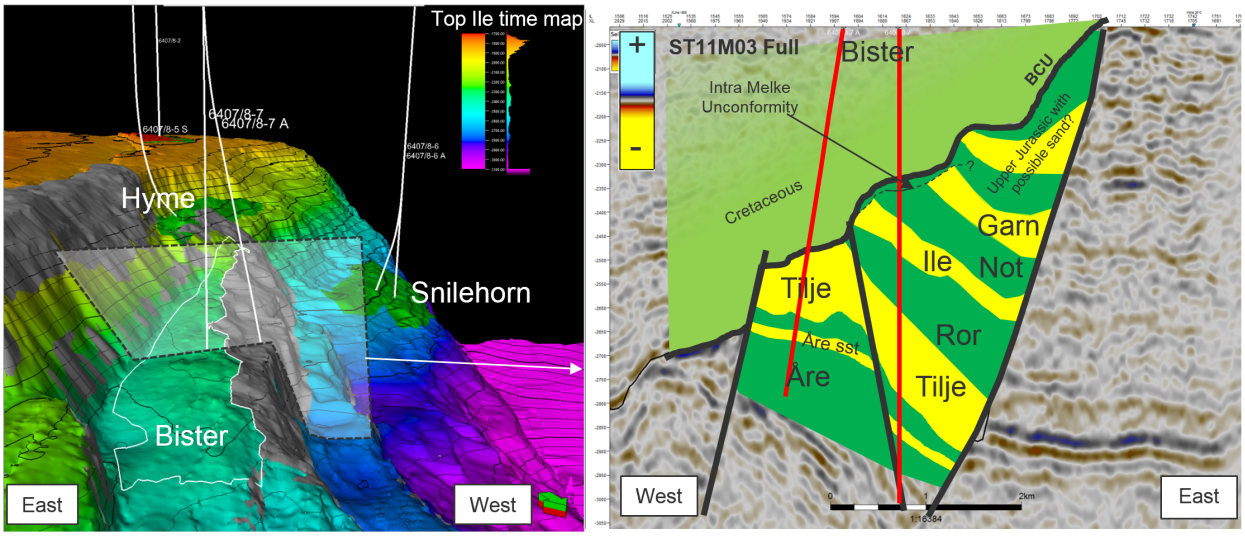

Figure 4. Bister prospect settings and post-well interpretation.

The Bister main update following the Snilehorn discovery was in the interpretation of the geophysical response which was present on only half of the prospect. In all surrounding discoveries in the early-middle Jurassic reservoirs, a clear geophysical response related to hydrocarbon content is identified on the various seismic data. But in Snilehorn, the sidetrack 6407/8-6 A found the Tilje Fm to be hydrocarbon bearing without any geophysical response.

Acquired log data in 6407/8-6 A could not explain this lack of AVO response, therefore an illumination study was performed which showed that the 6407/8-6 A Tilje segment was located in the shadow of the main fault located between Snilehorn and Hyme (Figure 5) and the illumination shadow area could explain the lack of Tilje response in 6407/8-6 A. The Bister prospect did present a similar setting in the Ile Fm with a clear geophysical response in the west part of the prospect but none in the east along an analogue large fault. This observation was used to derisk the prospect and include the scenario that the limited geophysical response could then be a hydrocarbon response with a possible depth consistent shut-off towards north.

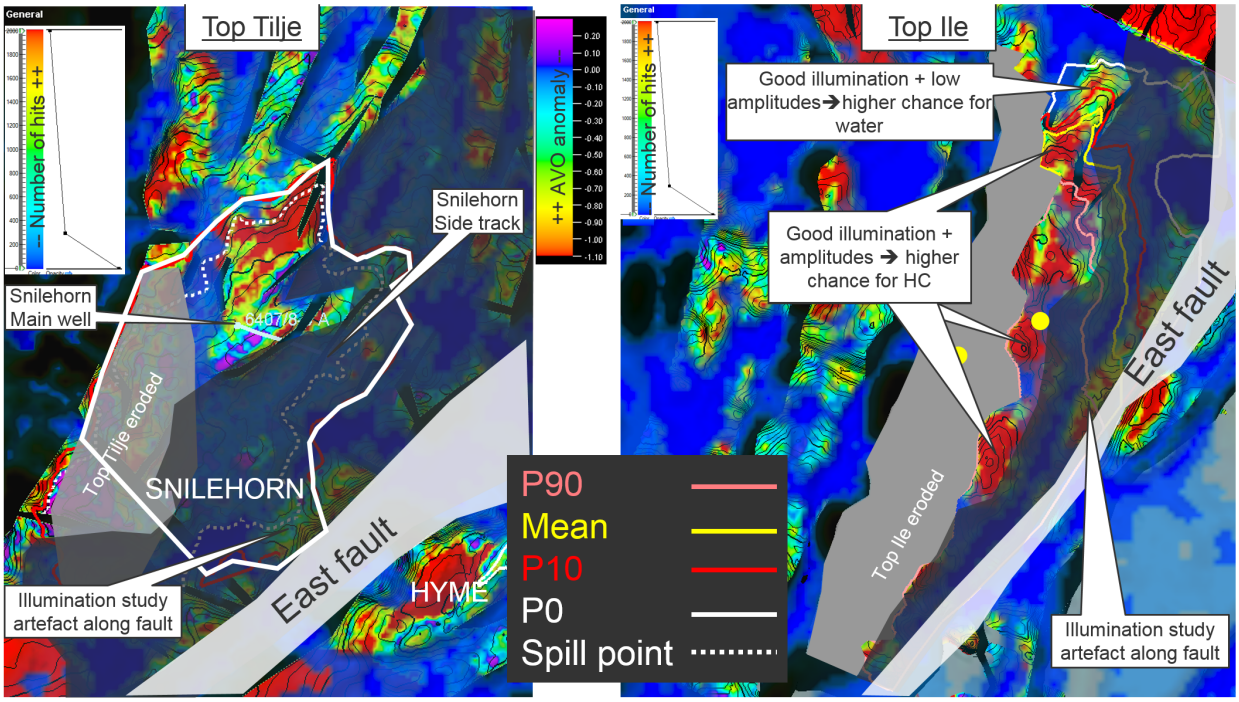

Figure 5. Depth maps with AVO anomaly attributes. Eroded areas are represented in gray. From the illumination study, in blue are location with low number of hits at a given point on the surface. In black transparent is overlayed the proposed interpretation of the bad illumination area.

<u>Left map:</u> Top Tilje map over Snilehorn. The AVO anomaly is only convincing and with a depth consistent shut-off in a small area in the north of the closure. In the west, the Top Tilje is eroded what explains the lack of consistent geophysical response. But the lack of response in the east had could not be explained. The poor illumination area does fit well with the area without geophysical response. The illumination shadow is created by the east large fault.

<u>Right map:</u> Top Ile map over Bister pre-well. The AVO anomaly is only present in the west part of the prospect. Along the east fault, an area without geophysical response does fit well with the bad illumination area from the illumination study. Bring together as in Snilehorn, these 2 observations fit with a new interpretation of a hydrocarbon filled Ile Fm in Bister with a depth consistent shut-off towards north.

The Bister well results were aligned in term of depth and reservoir prognosis, but it proved the Top Ile to be incorrectly interpreted on the base of an intra-Not hard shale. The Top Ile is a deeper weak trough without any geophysical response over the entire prospect which fits with the well being dry. It is not understood why the base intra-Not shale geophysical response disappears towards the east fault and north, but a lithological variation could likely explain it as the intra-Not shale in Bister is different from the one drilled in surrounding wells 6407/8-5 A/S (Hyme), 6407/8-6 A (Snilehorn) and Galtvort (6407/8-4 S).

Also the Bister main well 6407/8-7 fluid replacement study indicated that if the Tilje Fm had been filled with hydrocarbons, then the Top Tilje would have not presented any geophysical response. This lead to reinterpretation of the 6407/8-6 A Tilje (Snilehorn sidetrack) lack of geophysical response as a consequence of a cap rock variation which is not modelled using the 6407/8-6 A log data probably due to not optimal log quality. Therefore, the illumination study cannot use the 6407/8-6 A (Snilehorn sidetrack) Tilje lack of geophysical response as a calibration point and the exact impact of the illumination problem along faults on AVO response is uncertain.

No hydrocarbon shows were found in the well, but a possible thin accumulation in the Tilje Fm in the sidetrack 6407/8-7 A is possible based on petrophysical evaluation. If such accumulation represents the base of the hydrocarbon accumulation, then the accumulated volume is not economical.

Remaining prospectivity

Remaining prospectivity consists of an extensive set of prospects or leads listed in Table 5.
The Dobby and Nilus prospects were considered as the best remaining opportunities. The upper Jurassic potential has also been re-evaluated in more details but did not present any significant volume. The only scenario of interest is if the Smygard Upper Jurassic prospect is in full communication with the Dobby Garn segment, but due to lack of data supporting this scenario, it is only considered as an unlikely upside scenario.

Table 5. PL348C prospectivity - Volume and risk in (Total MSm3 OE)

Dobby QC	**Oil / Gas**	**Pg**	**In place**	**Recoverable**		
			Mean	**P90**	**Mean**	**P10**
Garn	80 / 20	**58 (30[1])**	4.1	0.6	**1.6**	2.9
Ile		**36**	2.7	0.4	**0.9**	1.5
Tilje		**14**	3.9	0.5	**1.3**	2.3
TOTAL	-	**69**	6.1	0.7	**2.2**	4.1
Nilus QC	**Oil / Gas**	**Pg**	**In place**	**Recoverable**		
			Mean	**P90**	**Mean**	**P10**
Garn	80 / 20	**15**	9.4	1.3	**2.9**	5.2
Ile		**12**	5.8	0.9	**1.5**	2.2
Tilje		**17**	3.8	0.5	**1.0**	1.7
TOTAL	-	**38**	7.4	0.6	**2.1**	4.1
Dobby downflank	**Oil / Gas**	**Pg**	**In place**	**Recoverable**		
			Mean	**P90**	**Mean**	**P10**
Garn	80 / 20	**16**	1.2	0.2	**0.4**	0.7
Ile		**32**	1.3	0.1	**0.5**	1.0
Tilje		**31**	1.6	0.0	**0.6**	1.7
TOTAL	-	**39**	2.9	0.1	**1.0**	2.2
Smygard, *Upper Jurassic, scenarios*	**Oil / Gas Scenario likelihood**	**Pg**	**In place**	**Recoverable**		
			Mean	**P90**	**Mean**	**P10**
Smygard North+South *stand-alone*	80 / 20 - 20%	***19***	*3.0*	*0.1*	***1.1***	*3.1*
Smygard North+South *communication*	80 / 20 - 20%	***25[1]***	*9.9*	*2.3*	***3.8***	*5.6*
Smygard North *stand-alone* (some geophysical support)	80 / 20 - 30%	**19**	0.8	0.0	**0.3**	0.8
Smygard North *communication* (some geophysical support)	80 / 20 - 30%	**27[1]**	2.5	0.6	**1.0**	1.4
Combined Smygard + Dobby multiscenario outcome		**52**	-	-	**1.6**	-
Other prospects		**Pg**	**In place**	**Recoverable**		
			Mean	**P90**	**Mean**	**P10**
Bister Garn, *Upper Jurassic*	80 / 20	**17**	2.7	0.2	**1.1**	2.6
Albus, *Upper Jurassic*	80 / 20	**22**	3.6	0.5	**1.4**	2.5
Rumpeldunk, *Upper Jurassic*	80 / 20	**16**	3.3	0.2	**1.3**	2.6
Flirgott, *Upper Jurassic*	80 / 20	**19**	1.3	0.1	**0.5**	1.2
Potte, *Triassic* - **lead**	100 / 0	**23**	0.4	0.0	**0.1**	0.3

[1] Pg if Dobby Garn and Smygard are in communication is different from stand-alone because of different trap mechanism and DFI uplift/downgrade through dependencies.

5 Technical evaluations

The PL348C is neighbouring the PL348 and PL348B licenses. It is located respectively 5-10km north of the Hyme field and the Snilehorn discovery, 23km east of the Njord field, 13km west of the Draugen field and 28km south of the Mikkel field (Figure 1).

The Dobby and Nilus development base case solutions were based on an oil discovery tie-in to the Snilehorn discovery which would then be tied to the Njord field. Various scenarios assuming injection support or pure depletion have been considered, however all cases show no or very limited economic value due to low probability of discovery (Nilus) or limited volume potential (Dobby). No technical evaluations were done on the other opportunities as having smaller volumes and lower chance of discovery than the Dobby prospects.

6 Conclusion

Due to the lack of economically viable prospects, it has been decided to drop the PL348C license. The main reasons for this decision are detailed in the Prospect update chapter.
The Bister prospect was assessed pre-drill as having the largest volume potential in PL348C and the best place to test the illumination study conclusion with a potential to derisk the other prospects. The well has shown that a local cap rock change could explain the Snilehorn Tilje sidetrack and therefore has weakened the impact of the illumination study for the remaining prospectivity. The new multiclient PGS14005 survey did not contain significant new information compared to the previous ST11M03 dataset. Therefore, the remaining prospects evaluations have been kept as or slightly downgraded compared to the license extension application.