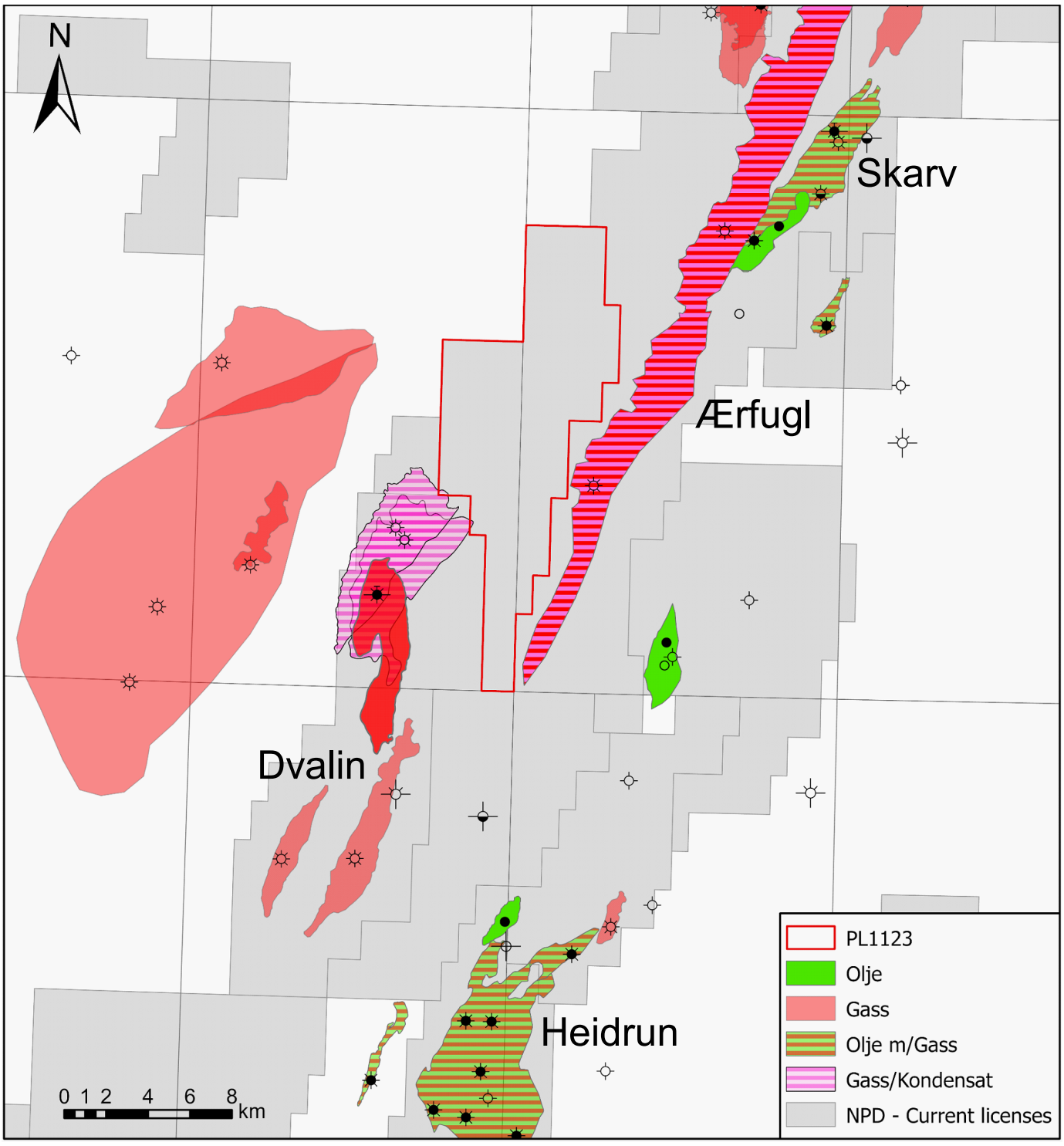
Status Report
PL1123



ConocoPhillips | AkerBP | ORLEN | Harbour Energy

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1 License History

Production license 1123 is located in the Norwegian Sea, 13km west of the Skarv field and approximately 30km north of the Heidrun field as shown in Fig. 1.1. The license was awarded February 19th, 2021 and consists of parts of blocks 6507/4 and 6507/5. The main prospect within the license is Havmus which is shown on the map in Fig. 1.1 , and one lead called Odd. The license work obligation was a geology and geophysics study over a period of two years before a drill or drop decision was required by February 19th, 2023. Due to the Sabina appraisal well being drilled in the neighbouring license 211CS, testing the same interval as Havmus, the licence applied for an extension to wait for the well results and integrate it into the evaluation of Havmus. The Sabina well was postponed several times, which required the license to apply for an additional two extensions. The final drill or drop decision date was set to February 19th 2025. The work program has been fulfilled by the operator and a decision to relinquish the license has been taken by the partnership. The partnership in the PL1123 license is listed in Table 1.1.

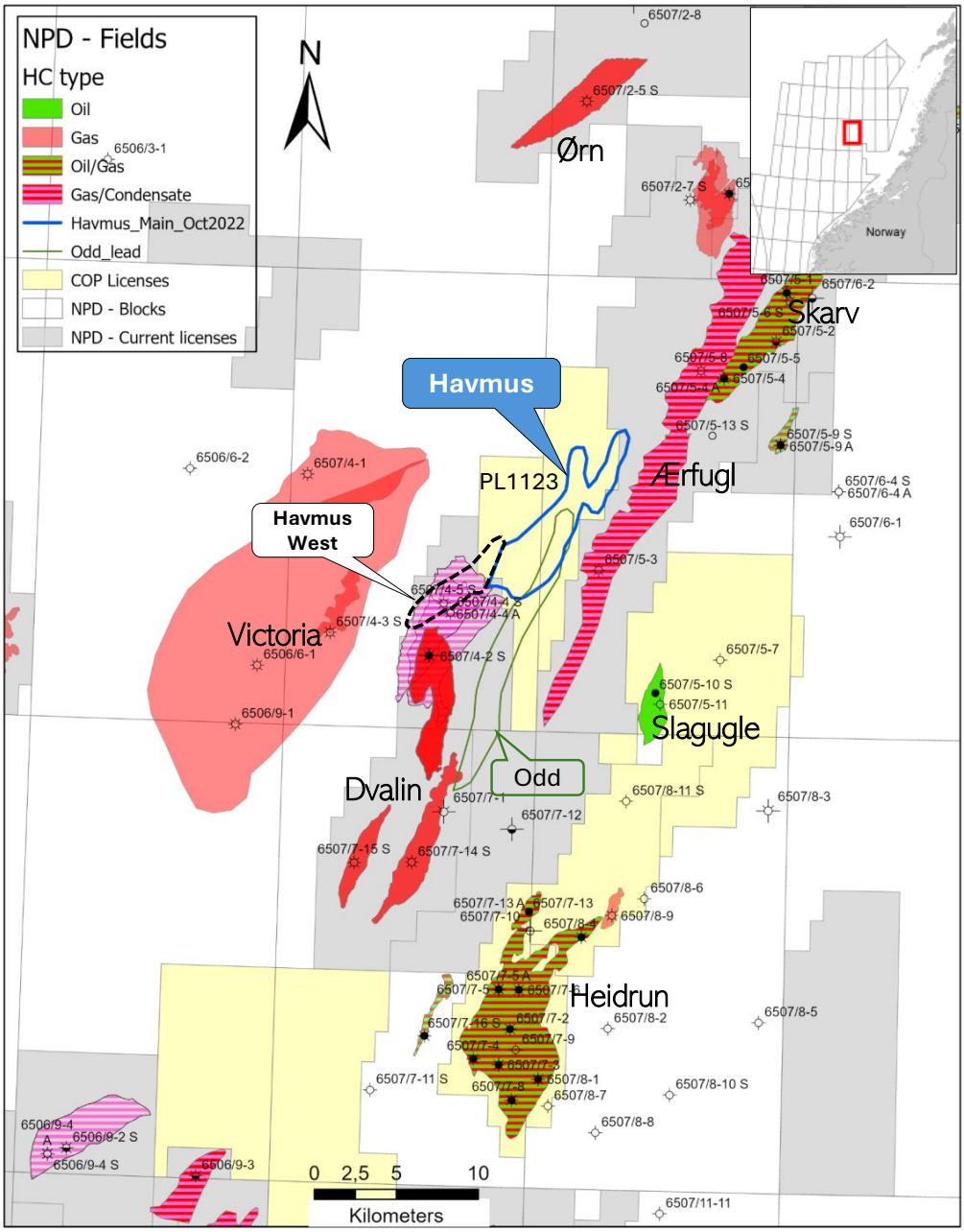

Fig. 1.1 PL1123 Location Map. PL1123 is located on the Dønna terrace in the Norwegian Sea. Havmus is the main prospect, Havmus West is a western segment located mainly outside the license boundary. Odd is a lead in the license.

Table 1.1 PL1123 Partnership

PL1123 Partnership	
ConocoPhillips Skandinavia AS (Operator)	40%
Orlen Upstream Norway AS	30%
AkerBP ASA	20%
Harbour Energy Norge AS	10%

Based on the overall prospect mapping, volume estimation and risking, ConocoPhillips and the partnership have evaluated the recoverable hydrocarbons within the prospects in the PL1123 license as being too small to warrant an exploration well and have decided to surrender the license. The estimated recoverable volume for the Havmus prospect is between 10 and 27 mmboe with a mean of 18 mmboe, and the main risk is seal. The key uncertainties are hydrocarbon phase, producibility and the risk of finding low saturation gas. The estimated probability of success is 35% for hydrocarbons and 24% for gas. Oil is considered a failure due to the expected producibility challenges. The PL1123 work obligations and license milestones are listed in Table 1.2.

Table 1.2 PL1123 Milestones

Work obligation	Decision	Original deadline	Extended deadline
Drill or drop	Not to drill	19.02.2023	19.02.2025
Drill exploration well	Decision to concretize (BoK)	19.02.2025	19.02.2027
Conceptual studies	Decision to continue (BoV)	19.02.2027	19.02.2029
Prepare plan for development	Submit plan for development (PDO)	19.02.2028	19.02.2030

A total of twelve meetings were held in the license including EC work meetings and ECMC meetings, as listed in Table 1.3.

Table 1.3 PL1123 License Meetings

Meeting Date	Purpose	Committee
April 19th 2021	Start-up	ECMC
December 9th 2021	Year-end	ECMC
May 12th 2022	Work meeting	EC
June 13th 2022	Mid-year	ECMC
October 6th 2022	Work meeting	EC
December 5th 2022	Year-end	ECMC
June 8th 2023	Mid-year	ECMC
November 22nd 2023	Year-end	ECMC
June 10th 2024	Mid-year	ECMC
November 14th 2024	Year-end	ECMC
December 16th 2024	Sabina appraisal well follow up	ECMC
January 23rd 2025	DoD recommendation	ECMC

Table 1.4 Applications for extension of deadlines

Application	Date of application	Drill or Drop date applied for	Drill or Drop date granted
Application of extended deadlines #1	17th February 2023	19th February 2024	19th February 2024
Application of extended deadlines #2	2nd February 2024	19th February 2025	19th August 2024
Application of extended deadlines #3	5th August 2024	19th May 2025	19th February 2025

2 Database

2.1 Seismic Database

HVG2011, HVG2012, HVG2013 and PGS14005 are all modern broadband seismic surveys in the PL1123 area, acquired using the PGS Geostreamer technique. PGS16909NWS is a merge of these seismic datasets and was in 2019/2020 merged with the southern part of PGS16005 and reprocessed in-house by ConocoPhillips to be used for the regional evaluation of the Cretaceous play. The reprocessing is called COP_PGS16909NWS_R20 and covers a relatively large area shown in Fig. 2.1 (blue polygon).

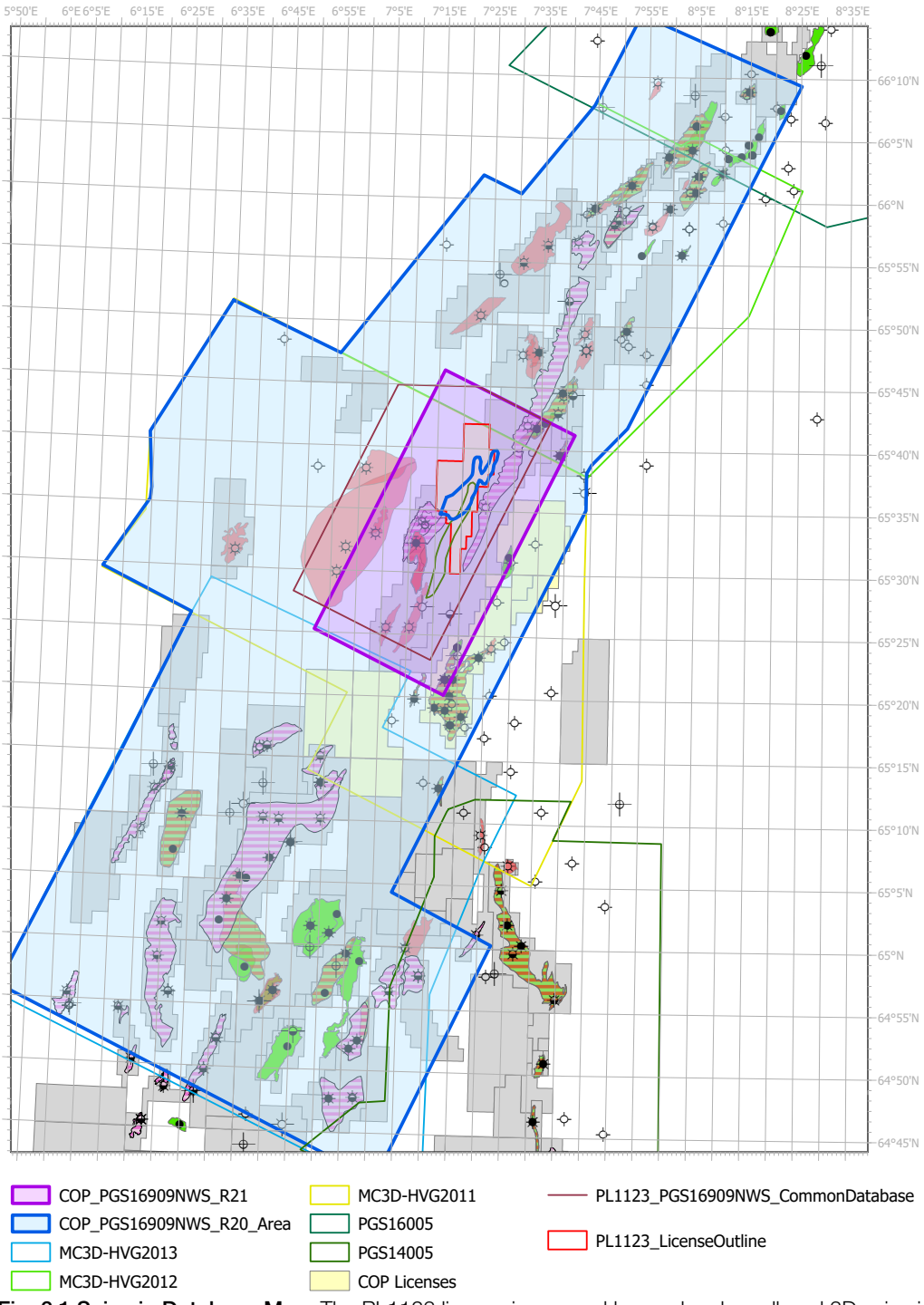

Fig. 2.1 Seismic Database Map. The PL1123 license is covered by modern broadband 3D seismic and in-house reprocessed seismic data.

This survey was used in the evaluation for the 2020 APA application. The operator and the partnership agreed to perform a further gather conditioning of the data in a limited area within the PL1123 common seismic database. The purpose was to have a targeted gather conditioning for trace amplitude preservation for AVO analysis, and improved seismic resolution. This conditioning was performed by Sharp Reflections and finalised late 2021 and is called COP_PGS16909NWS_R21 (purple polygon in Fig. 2.1).

2.2 Well Database

The wells included in the common database for the PL1123 license are listed in Table 2.1

Table 2.1 PL1123 Common well database.

Well	NPDID	Name	Operator	Status	Content	Year	Availability (raw data)
6406/3-9	6594		Maersk Oil	Discovery	Oil in Lysing and Lange	2012	Public
6407/1-6 S	7086	Rodriguez	Wintershall	Discovery	Gas/condensate in Lange	2013	Public
6407/1-7	7412	Solberg	Wintershall	Discovery	Gas/condensate in Lange	2014	Public
6407/1-7 A	7413	(Solberg)	Wintershall	Appraisal	Gas/condensate in Lange	2014	Public
6507/2-5 S	8775	Ørn	Equinor	Discovery	Gas in Garn/Not	2019	Public
6506/3-1	4344	Harran-Grong	Chevron	Dry		2001	Public
6506/5-1 S	8961	Nidhogg	Aker BP	Discovery	Gas in Lysing	2020	Public
6506/6-1	4122	Victoria	Mobil	Discovery	Gas in Jurassic	2000	Public
6506/6-2	6960	Albert	Maersk Oil	Dry		2013	Public
6506/9-1	5980	Victoria	Total	Appraisal	Gas in Jurassic	2009	Public
6506/9-2 S	6332	Fogelberg	Centrica	Discovery	Gas/cond in Garn and Ile	2010	Public
6506/9-3	7207	Smørbukk Nord	Statoil	Discovery	Gas/cond in Lange/Jurassic	2013	Public
6506/11-1	1216		Det norske		Gas shows in Lysing/E-Lange/Fangst	1988	Public
6506/11-2	1754	Lange	Statoil	Discovery	Oil/gas in Lange/Ile/Tilje	1991	Public
6506/11-3	1973		Det norske		Oil/gas shows in Lysing & Lange	1992	Public
6506/11-7	3322	Morvin	StatoilHydro	Discovery	Oil/gas in Jurassic	2001	Public
6506/11-8	5295	Morvin	Statoil ASA	Appraisal	Oil in Jurassic	2006	Public
6506/11-10	8317	Hades/iris	OMV	Discovery	Gas/cond in E.Cret/M.Jurassic	2018	Public
6506/11-12 S	9057	Hades	OMV	Appraisal	Low saturation gas in Lange	2020	Public
6506/11-4 S	2736	Åsgard	Statoil		Oil/gas in Fangst/Båt	1996	Public
6506/12-12 S	6144	Åsgard	StatoilHydro	Discovery	Oil/gas in Cromer Knoll & Jurassic	2009	Public
6506/12-3	458	Smørbukk Sør	Det norske	Discovery	Oil/gas in Lysing/Fangst/Tilje	1985	Public
6506/12-5	852	(Smørbukk Sør)	Det norske	Appraisal	HC in Lysing and Garn	1986	Public
6507/2-1	911		Norsk Hydro		Oil shows in Lysing/Lange/Fangst/Båt	1986	Public
6507/2-2	1840	Marulk	Norsk Hydro	Discovery	Gas/cond in Lysing & Lange	1992	Public
6507/2-3	2299		Norsk Hydro		Oil shows in Cretaceous	1994	Public
6507/2-4	5685	Marulk	Eni	Discovery	Gas/cond in Lysing & Lange	2008	Public
6507/3-13	8720	Black Vulture	Equinor	Discovery	Oil and gas in Lange	2019	Public
6507/4-1	9110	Warka	ConocoPhillips	Discovery	Gas in Albian Lange sst	2020	Public
6507/4-2 S	9251	Dvalin North	Wintershall Dea	Discovery	Gas in Lysing and Lange	2021	Public
6507/5-1	3683	Skarv	Amoco	Discovery	Oil/Gas/cond in Lange/Fangst/Båt	1998	Public
6507/5-2	3756	Skarv	Amoco	Discovery	Gas/cond in Garn	1999	Public
6507/5-3	4059	Ærfugl	BP Amoco	Discovery	Gas in Late Cretaceous	2000	Public
6507/5-4	4209	Skarv	BP Amoco	Discovery	Oil/gas in Lange & Jurassic	2001	Public
6507/5-5	4428	Skarv	BP Amoco	Discovery	Oil in Garn	2002	Public
6507/5-8	8379	Skarv	Aker BP	Discovery	Gas in Late Cretaceous	2018	Public
6507/6-2	1520		Saga		Oil shows in Lysing	1991	Public
6507/7-1	138		Conoco		Gas shows in Jurassic	1984	Public
6507/7-12	3812		Conoco		Oil shows in Lange	1999	Public
6507/7-14 S	6367	Dvalin	RWE Dea	Discovery	Gas in Fangst Gp	2010	Public
6507/7-15 S	6730	Dvalin	RWE Dea	Discovery	Gas in Middle Jurassic	2012	Public
6607/12-3	7039		Statoil	Discovery	Gas in Lange/Ile/Åre	2012	Public
6607/12-2 S	6642	Alve North	Total	Discovery	Oil/gas in Lange & Jurassic	2011	Public
6608/8-2	2989	Bjørk	StatoilHydro	Dry	Dry (Cromer Knoll: 79m net sand, 23% porosity)	2007	Public
6608/10-12	5949	Skuld	StatoilHydro	Discovery	Oil in Lysing & Åre	2008	Public
6608/10-12 A	6029	Dompap	StatoilHydro	Appraisal	Shows in Lange (wet), oil in Åre	2009	Public
6608/10-17 S	8065	Cape Vulture	Statoil	Discovery	Oil/gas in Cretaceous	2017	Public
6608/10-18	8506	Cape Vulture	Equinor	Appraisal	Oil in Cretaceous	2018	Public
6608/10-18 A	8507	Cape Vulture	Equinor	Appraisal	Oil in Cretaceous	2018	Public
6608/10-18 B	8508	Cape Vulture	Equinor	Appraisal	Dry	2018	Public

The Sabina discovery was made in 2021 by the 6507/4-2 S well, which found oil and gas in the Middle and Lower Lange formation just south of Havmus (Fig. 1.1). Due to the close proximity to Havmus, it was decided to apply for license extension for PL1123 to wait for the results of the Sabina appraisal well, as this would potentially drill through the western segment of Havmus.

The Sabina appraisal well 6507/4-5 S was spudded on Aug 26th, 2024, after the initial appraisal well (6507/4-4A) had to be aborted in February 2024 due to technical problems. The well was completed on Nov 29th, 2024. In the primary exploration target (Lange Fm), the well encountered a 41-metre gas column in sandstone rocks totalling 17 metres, with poor to moderate reservoir quality. The gas/water contact was not encountered. The well also encountered two sandstone layers in the Middle and Lower Lange Formation of around 4 and 21 meters, with poor reservoir quality but with traces of hydrocarbons.

The well drilled through the western segment of Havmus (Fig. 1.1) and found only poor reservoir quality in the Cenomanian sands in the middle and lower Lange Formation. These results were discouraging for the Havmus prospect, with a negative impact on the reservoir quality distribution, recovery factor and volumes (4.3 Volumes).

3 Results of Geological and Geophysical studies

The work program for PL1123 included geological and geophysical studies conducted over a period of 2 years. The main studies performed are summarized below.

Seismic reprocessing and prospect mapping on new gather conditioned data

The new reprocessed dataset, COP_PGS16909NWS_R21, was used in the seismic interpretation and prospect mapping of Havmus.

Havmus is an upper Cretaceous stratigraphic pinch out trap of Cenomanian age, onlapping onto the K51 unconformity below, as shown in Fig. 3.1. The trap is defined by pinch out and/or shale out to the east and north, and with a dip closure and fault seal to the west and southwest. The risk of having thin thief sands of younger or older age was highlighted as one of the key risks for the prospect. The new seismic is of slightly better resolution than the one used in the previous evaluation and it was therefore possible to map out two seismic events within the prospect. This indicated potential stacked sand units with different extent and amplitude response. The lower unit is less extensive and more dim and was therefore not included as part of the main prospect and volume estimation.

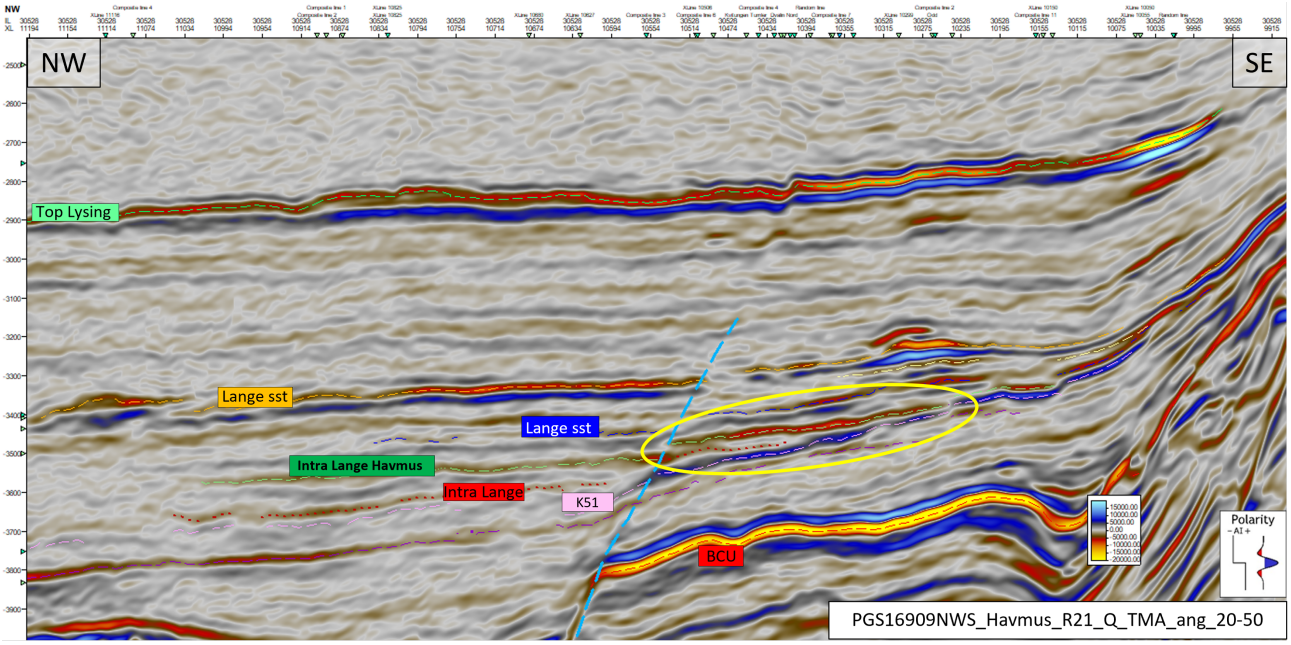

Fig. 3.1 Dip line across the Havmus prospect. Line location is shown on Fig. 3.3.

Ikon rock physics study

A rock physics study by Ikon was initiated to better understand the amplitude and AVO response in the Lange formation. The main objective was to determine the rock properties of the target reservoirs and non-reservoirs and their sensitivities to lithology and fluid variation. The wells included in the study are highlighted in Fig. 3.2. The study concluded that the sensitivity to fluid saturation in the Lange formation is moderate to low and is mainly controlled by net to gross and porosity.

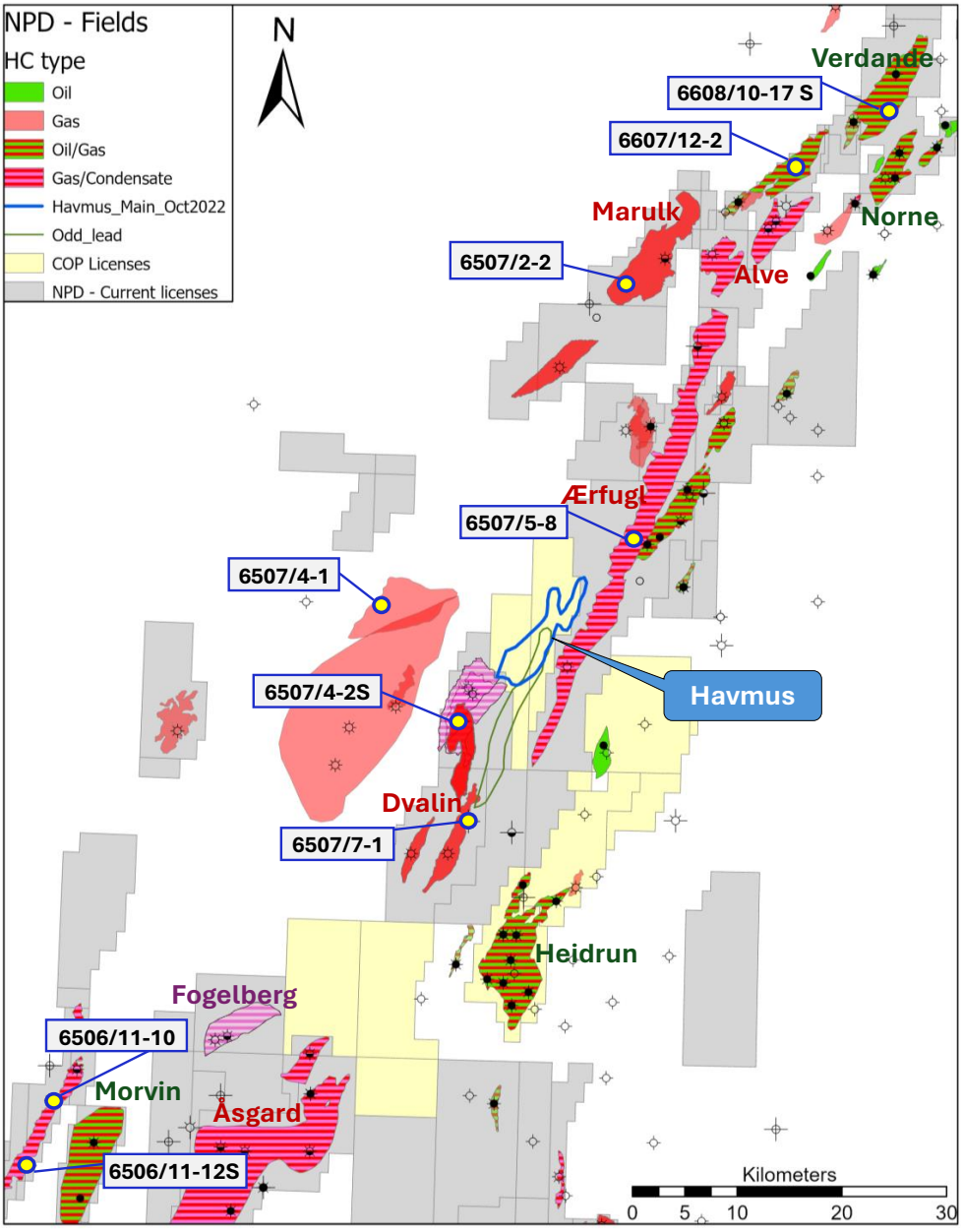

Fig. 3.2 Wells included in Rock Physics study. Wells included in study are highlighted in blue.

Amplitude analysis and incorporation of rock physics study

Havmus was considered an amplitude driven prospect and a large effort was put into rock physics understanding and amplitude analysis. Based on the rock physics study and 2D modelling the amplitudes on Havmus could be an indication of relatively good reservoir filled with water, or more moderate to poor reservoir with gas, non producible gas or oil. Based on nearby wells and the general understanding of the area, the most likely case was poor to moderate reservoir with gas, but with a significant chance of non producible gas. This, in addition to limited amplitude conformance to structure, led to no amplitude uplift to the prospect risking. However, the amplitudes and amplitude pattern support the depositional model and the presence of sand in the prospect. A minimum amplitude map extracted around the Havmus reflector (20ms window) from the extended far stack (20-50deg) is shown in Fig. 3.3, the contours on the map are depth contours with 100m interval. The cross section in Fig. 3.1 is indicated with a black dotted line on the map.

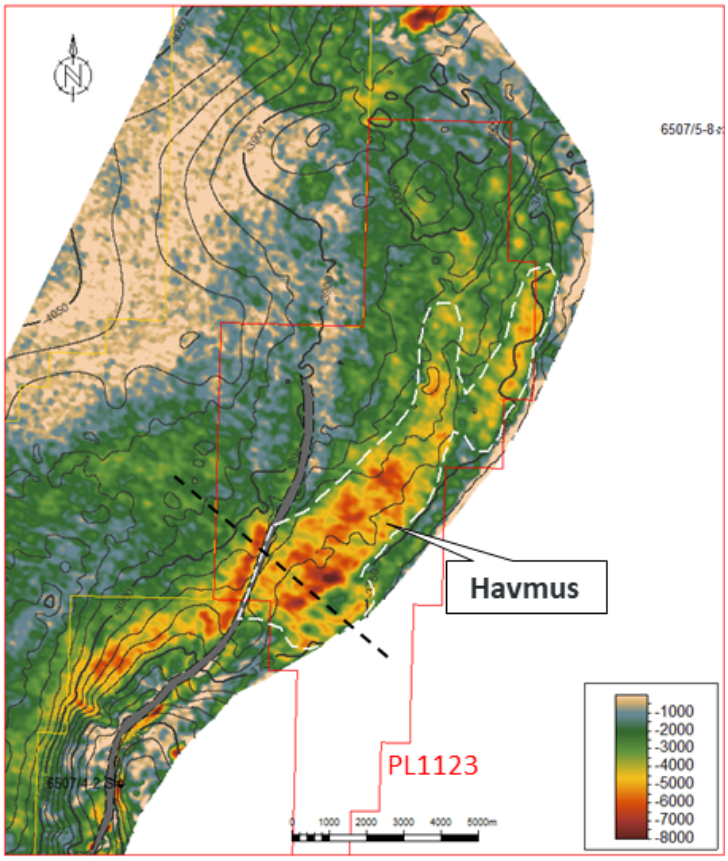

Fig. 3.3 Amplitude Map Havmus. Minimum amplitude extracted from the extended far stack (20-50deg).

Seal modelling study

A seal capacity and fault seal study was performed in-house by ConocoPhillips. Based on this study, top and side seal are seen as robust at Havmus, indicating shale seal capacity, which does not reflect the risk of thief sands. Fault modelling suggests that the fault cutting across the prospect, indicated both on the cross section in Fig. 3.1 and the map in Fig. 3.3, is likely to be sealing. This means that it is likely different columns on either side of the fault, with a deeper contact in the hanging wall to the west, and that the Havmus prospect should be treated as two separate segments. Due to this, the hanging wall part of the trap was excluded from the main prospect since most of this is located outside of the PL1123 license.

Reservoir quality study

A review of all available porosity and permeability data from Lange Formation sands in the area was undertaken to better assess the input to be used in GeoX for prospect characterisation and volumetric calculation. Reservoir thickness and N:G parameters in offset wells were also reviewed with regards to where they were drilled in the depositional system. This was key as many of the wells have had Lange Fm as the secondary target, and were not necessarily optimally placed to test the thickest part of the Cretaceous prospectivity.

Basin model study

A study was initiated with IGI to integrate geochemical data from recently traded 6507/4-2 S Sabina and recently drilled 6507/4-3 S Peder wells in the area.The Sabina well was of particular interest, as it found condensate in the upper Lange Fm, and oil in the lower Lange Fm, in addition to gas in the Lysing Fm. The Peder well also sampled gas/condensate in the Lange Fm. IGI did a comparison of regional Cretaceous discoveries comparing Lysing and Lange geochemistry. Based on the integrated data from IGI and updated basin model, it was concluded that the fluid expectation in Havmus was still likely gas-condensate, but with a 30% chance of finding oil.

4 Prospect Updates

4.1 Prospect mapping

The target prospect in the PL1123 license is the Late Cretaceous Cenomanian Havmus prospect identified during the 2020 APA application round. The prospect is characterised as an amplitude driven stratigraphic pinch out trap interpreted to be Lange turbidite sands deposited from the north. The key risks identified at the time of the application were seal and reservoir quality.

Fig. 4.1 shows the Havmus prospect outline in the 2020 APA application in grey and the updated 2023 outline in blue. The outline differences are mainly related to the southwestern part of the prospect being excluded due to the sealing fault (3 Results of Geological and Geophysical studies), new conditioned seismic and new interpretation.

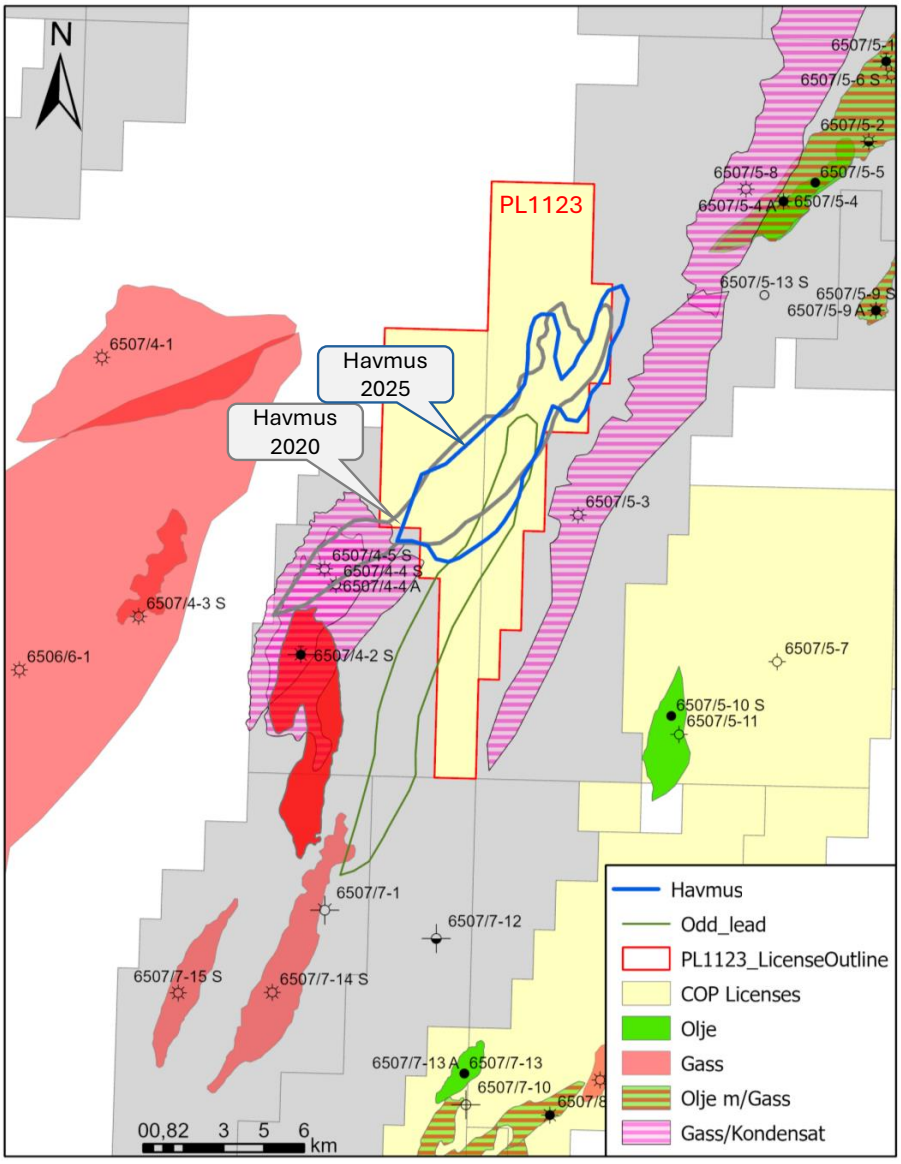

Fig. 4.1 PL1123 Havmus prospect outline. Showing outline from 2020 APA application and 2025 final prospect evaluation.

At the time of application the volumes were estimated to be 42-97mmboe with a mean of 67mmboe, with 80% within the license area. After the license work and updated prospect evaluation was performed, the volumes were significantly reduced to 10-27 mmboe with a mean of 18mmboe, 95% of this was located within the license area. More details on the volume estimation can be found in 4.3 Volumes.

4.2 Risking

Source Presence and Quality: Underlying mature Spekk, Melke and Åre formations makes the source risk very low.

Reservoir Presence and Quality: The risk of reservoir presence in Havmus is considered low based on the amplitudes and AVO response on the seismic. Key offset Lange Fm wells have been used as input in the reservoir quality distribution, and therefore it is seen as high likelihood of getting onto the distribution.

Trap Geometry: Havmus is a stratigraphic pinch out trap with some risk of thin lateral sands continuing updip along the unconformity preventing a functioning trap.

Charge: This is considered to be of low risk due to the effective underlying source rock, and migration via faults/fractures and laterally via carrier beds, is seen as likely.

Seal and Retention: The seal capacity of the overlying Lange shales is not considered a risk for the prospect. However, there is a considerable risk of leakage if the reservoir is connected to younger or older sand layers.

Amplitude risking: Based on amplitude analysis, rock physics study and results from nearby wells in similar amplitude anomalies, it was decided not to give an amplitude uplift to the prospect. The chance of finding non producible gas is considered significant and the seismic cannot distinguish this from cases with high saturation, producible gas.

Combining all of the risks above resulted in a Ps, probability of success, of 35%. Gas condensate is the expected fluid phase, however there is considered to be a 30% chance of finding oil. Since oil is a likely failure case due to the low permeabilites expected in this reservoir, the Ps was mulitplied by 70% to calculate the possibility for finding gas (Pgas). All risk numbers can be found in the table below:

Table 4.1 Havmus Prospect Risking

Havmus Prospect	Probability
Reservoir Presence and Quality	0.8
Trap Geometry	0.8
Seal and Retention	0.6
Source Presence and Quality	1
Migration	0.9
Ps	**0.35**
Pgas	0.24

4.3 Volumes

The estimated recoverable volume for the Havmus prospect is between 10 and 27 mmboe with a mean of 18 mmboe. The volumes since the APA 2020 application have been significantly reduced due to several factors:

- Area reduction: Fault seal analysis is indicating that the Havmus fault is most likely sealing, which resulted in the prospect being treated as two different segments. The part of the prospect that was on the western, downthrown part of the fault is outside of the PL1123 acreage, and was therefore excluded in the updated outline of Havmus. The prospect outline was also modified due to updated seismic and interpretation

- Reservoir quality reduction: Data from recent offset wells indicate lower N:G, porosity and permeability values. The effective porosity range in GeoX was updated to 10-12-16%, while the permeability range was updated to 0.1 – 0.4 – 2mD.

- Reservoir thickness reduction: The prospect was divided into two sand units (vertically): Only the upper sand unit is included in the main GeoX case. The lower sand was excluded due to it's limited areal extent and dimmer amplitudes, which were interpreted to mean lower thickness and/or N:G.

- Recovery factor reduction: A lower recovery factor was used in the updated GeoX model based on a review of offset/analog wells.

4.4 Leads

The only lead identified in the license is a Cretaceous amplitude called Odd, which was identified during the 2020 APA application round. The lead is characterized as an elongated channel-like amplitude which brightens up on far angle stacks. Odd is interpreted to be of lower Turonian age, slightly younger than Havmus, and similar to Sabina and Peder. Fig. 4.2 shows a minimum amplitude map extracted from the extended far angle data (20-50 deg) and clearly shows Odd together with Sabina to the west and Peder even further west.

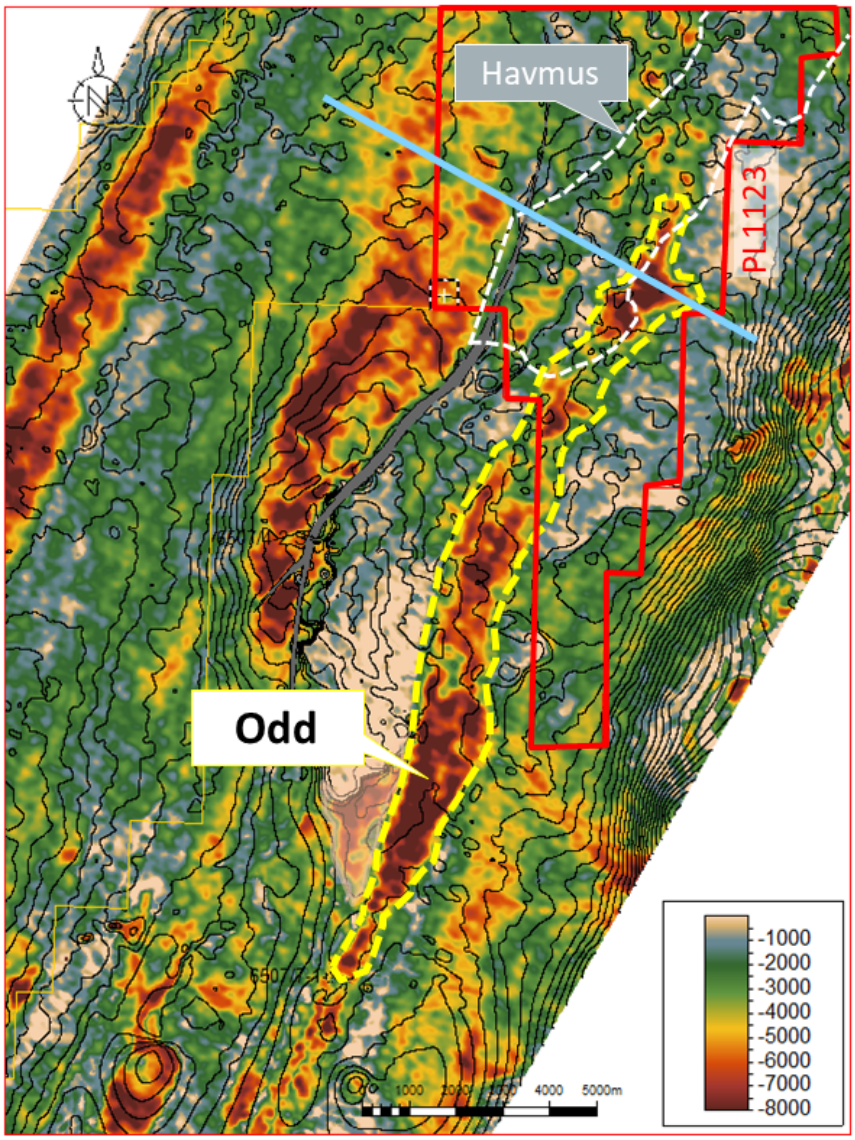

Fig. 4.2 Odd Amplitude Map. Minimum amplitude map extracted 20ms around the Odd surface. Odd prospect highlighted in yellow.

Fig. 4.3 shows a dip line across the lead, where Odd is partly overlying the Havmus prospect. Odd is also considered a stratigraphic trap defined by the amplitudes, with the key risk being trap. Most of the lead and the brightest amplitudes are located south of the PL1123 license as the map in Fig. 4.2 shows. Only approximately 30% of the Odd volumes are located within PL1123 and are not large enough to be a driving prospect for the license.

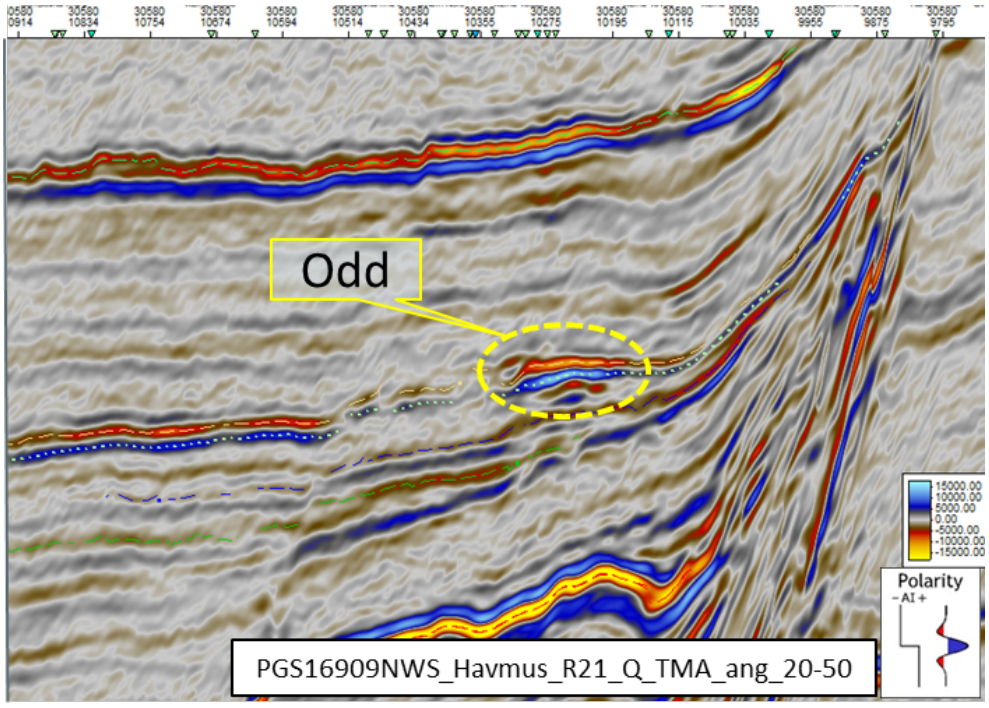

Fig. 4.3 Dip line across Odd. Seismic cross section across the Odd lead above Havmus. Line is indicated in blue on the Odd amplitude map in Fig 4.1.

5 Technical Evaluations

An economic evaluation was conducted assuming 13 km subsea tie back to Skarv but this was sub-commerical and non competetive.

6 Conclusions

The work program in the PL1123 license has been fulfilled and the geological and geophysical studies have concluded that the recoverable hydrocarbon volume for Havmus is too low and therefore not of interest for the PL1123 partnership. The management committee has agreed to not drill a well in PL1123 and to surrender the license in 2025.

7 References