

Petrolia Noco



## PL 933 Licence status report

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# 1 History of the production license

PL 933 is located in the Manet High area, in the transition between the North Sea and Norwegian Sea, just on the Norwegian side of the Norway-UK border (Figure 1). The license was awarded 2018-03-02, as part of the 2017 APA. Petrolia was awarded the operatorship with Equinor (60%) as partner. Work obligations for the first two years' work period were fulfilled, and a drill decision was made for the Molaris basement prospect. Equinor was assigned the operatorship 2020-05-01. In 2021, new production information from the main analogue, the UK Lancaster Field, led to drastic reduction of reservoir properties. This has significant negative consequences for the expected volumes in the Molaris prospect and hence on its value. 2021-12-22, the PL 933 partners submitted application for exemption of well commitment and for surrender of PL 933. 2022-03-02 the PL 933 License surrender.

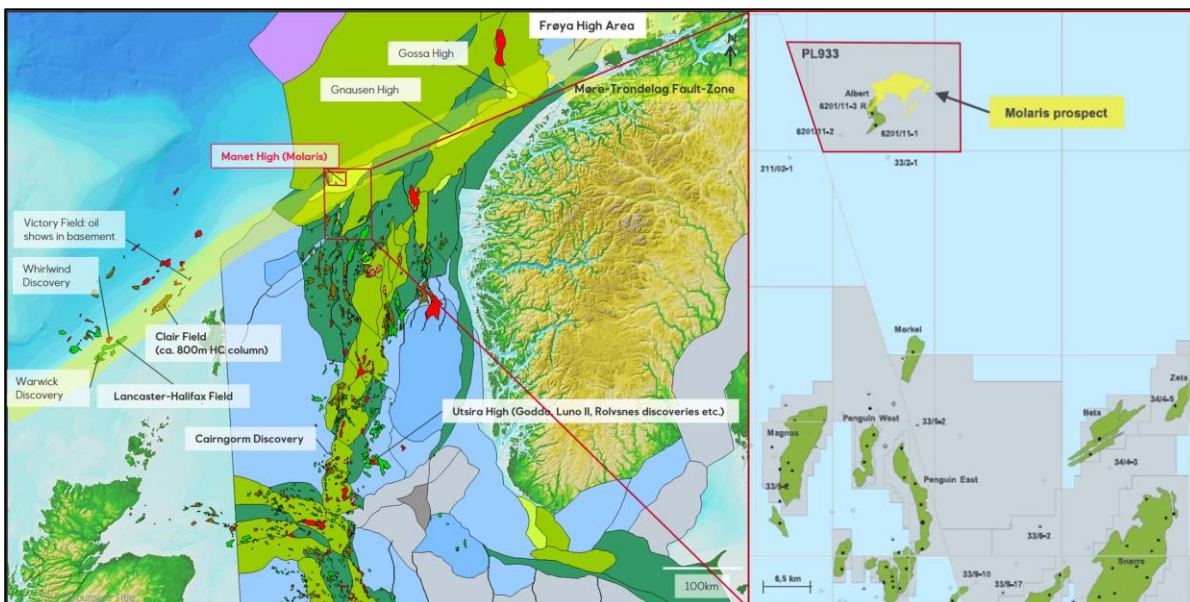


Figure 1: PL 933 License area (partly covering blocks 6201/10, 6201/11 and 6201/12)

Table 1: Key License Information

<b>PL 933</b>	
<b>Location</b>	Blocks 6201/10, 6201/11 and 6201/12
<b>Awarded</b>	02.03.2018 (APA 2017 application)
<b>Drill or drop</b>	02.03.2020
<b>(BoK) Beslutning om konkretisering</b>	02.03.2022. Dropped
<b>License period</b>	Expired 02.03.2025. Dropped
<b>License group</b>	Equinor Energy AS 60% (Operator), Petrolia NOCO AS 40%
<b>License area</b>	316.012 km <sup>2</sup>

## Work obligations:

Work obligations were to reprocess existing seismic, acquire 3D seismic and decide on a Drill or Drop within 2020-03-02. The work obligation for the first two years' work period is fulfilled. A drill decision was made for the Molaris basement prospect.

**Meetings held:**

**Table 2** Meetings held

<b>Date</b>	<b>Meeting</b>
06.04.2018	EC/MC Committee Meeting
21.06.2018	EC Committee Meeting
06.09.2018	EC Work Meeting
24.09.2018	EC Work Meeting
22.11.2018	EC/MC Committee Meeting
23.05.2019	EC Work Meeting
29.08.2019	EC Work Meeting
05.09.2019	EC/MC Committee Meeting
04.10.2019	EC Work Meeting
21.11.2019	MC Committee Meeting
19.03.2020	MC Work Meeting
27.03.2020	EC Work Meeting
31.03.2020	EC Work Meeting
07.05.2020	EC Work Meeting
11.11.2020	EC/MC Committee Meeting
05.02.2021	EC Work Meeting well planning
10.05.2021	EC Work Meeting
26.05.2021	EC Work meeting well planning
22.10.2021	EC Work Meeting

**Reason for surrender**

The Molaris Basement prospect was the main prospect in this license. The motivation for accessing the Manet High and the license was the Molaris prospect volume potential, and the play opener opportunity for basement reservoirs, stretching from the Rona Ridge (Lancaster Field) in the southwest to the Frøya High to the northeast (Figure 1). The Molaris prospect evaluation was based on the promising UK Lancaster field production data, operated by Hurricane Energy.

After some years of production, the Lancaster field has obtained a good history match which in turn has spurred a re-evaluation of reservoir properties with a significant reduction of effective porosity (pore volume), with consequent reduction of volumes. Because the volumes from the 2019 evaluation of the Molaris prospect strongly relied on a prospect model that drew strong analogies between reservoir properties in Molaris and those in the Lancaster field, the drastic reduction of reservoir properties in Lancaster Field has significant negative consequences on the expected volumes in Molaris prospect and hence on its value.

The Molaris well project was in the well planning/concept select phase and was scheduled for drilling, late 2021/2022. After re-assessment of the Molaris prospect, the updated estimates for recoverable volumes have a severe reduction. The exploration potential in PL 933 is now considered not economically viable, thus, the decision to apply for surrender of the license.

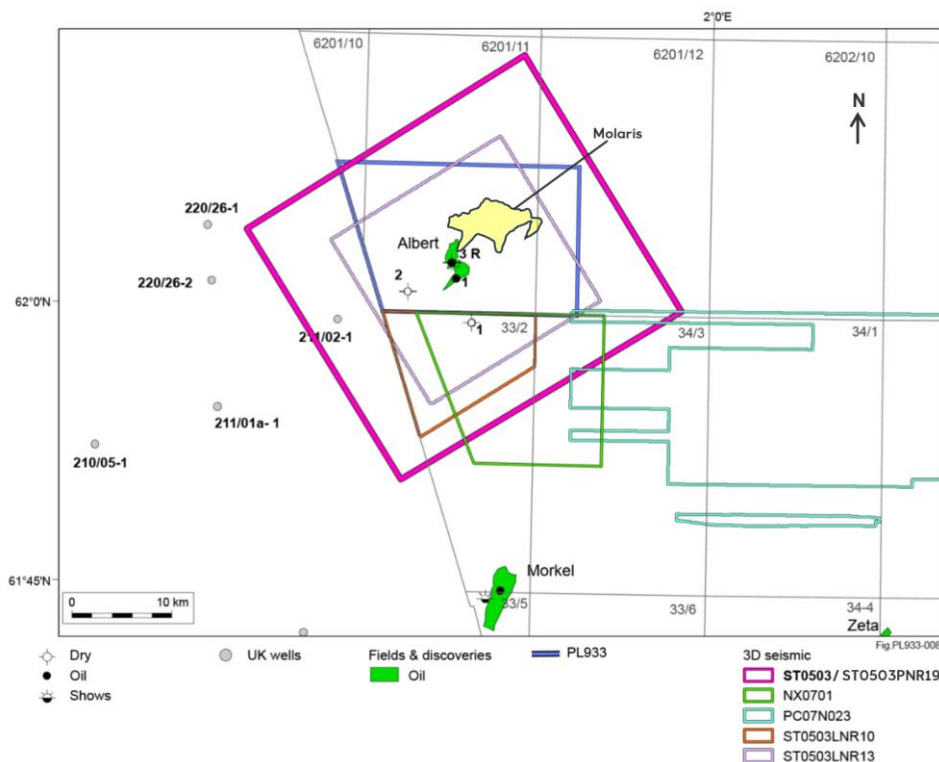
## 2 Database overviews

### 2.1 Seismic data

List of seismic surveys included in the common license database is listed in Table 3 and shown in Figure 2. ST0503 were acquired in 2005, parts were reprocessed in 2010 and in 2013 and full reprocessing was completed in the license in 2019. The ST0503PNR19 data was used as the main data set for seismic interpretation in PL 933.

**Table 3:** List of seismic surveys in the common license database

Survey Name	Data Type	Vintage	NPDID	Publicly available
GMNR-94	2D	1994	3650	N
MRR98	2D	1998	3918	N
ST0503	3D	2005	4312	N
NX0701	3D	2007	4466	N
PC07N023	3D	2007	4471	Y
ST0503LNR10	3D	2010	4312	Partially
ST0503LNR13	3D	2013	4312	-
ST0503PNR19	3D	2019	4312	Partially



**Figure 2:** Seismic Database and closest wells in Well Database. The ST0503PNR19 data was used as the main data set for seismic interpretation.

## 2.2 Well data

The well database utilized in the PL 933 technical evaluations are all relevant wells listed in Table 4. Well locations for closest wells are shown in Figure 1 and Figure 2. Location of the analogue Lancaster field is marked in Figure 1.

**Table 4:** List of wellbores in the common license database

Well name	Operator	Result	Completed	TVD m RKB	TD Fm./Gp.	Publically released	NPDID
6201/11-1	Statoil	Oil	1987	3845	Teist Fm.	Yes	1134
6201/11-2	Statoil	Shows	1991	3775	Heather Fm.	Yes	1549
6201/11-3 R	Lundin	Oil & shows	2012	3000	Zechstein Gp. (Permian)	Partially	7110
33/2-1	Lundin	Gas condensate	2014	4457	Statfjord Gp.	Partially	7391
33/5-2	Norsk Hydro		1981	4520	Lunde Fm.	Yes	405
33/6-2	Mobil Exploration Norway Inc	Shows	1997	3945	Statfjord Gp.	Yes	2873
33/9-10	Mobil Exploration Norway Inc	Dry	1978	3715	Statfjord Gp.	Yes	415
33/9-17	Mobil Exploration Norway Inc	Oil shows	1994	3230	Ness Fm.	Yes	2114
34/4-3	Saga Petroleum ASA	Dry	1982	4457	Lunde Fm.	Yes	423
34/4-5	Saga Petroleum ASA	Oil	1984	3910	Lunde Fm.	Yes	37
220/26-1	BP	Gas Shows	1985	2278	Lewesian Basement Gneis	Yes	UK
220/26-2	BP	Oil Shows	1986	4242	Permian	Yes	UK
220/02-1	BP	Oil Shows	1978	4061	Cormorant Fm. (Triassic)	Yes	UK
219/26-2Z	Sovereign	Gas Discovery	1984	4015	Devonian Basement	Yes	UK
219/28-1	Sovereign	Dry	1984	3733		Yes	UK
205/21-1A	Shell	Oil Shows	1974	1368	Lewesian Basement	Partially	UK

### 3 Results of geological and geophysical studies

Three previous exploration wells have been drilled on the Manet High: 6201/11-1, 6201/11-2 and 6201/11-3(R). The Molaris prospect is located adjacent to the 6201/11-1 Triassic oil and gas discovery (Figure 3). The prospect is a faulted 3-way closure within a rotated fault block. The Molaris Basement prospect is the main prospect in PL 933. G&G work in the license period thus focused on maturing the Molaris Basement as a drilling candidate. The seismic interpretation and depth conversion work performed resulted in a more detailed top reservoir depth map, particularly with improved definition of faults, and with higher confidence of the depth conversion (Figure 4). A summary of studies performed pre DoD is shown in Table 5.

**Table 5** List of studies at DoD 2020

Internal Petrolia	Projects involving external vendors
<b>Seismic Interpretation</b> (mapping horizons and faults, seismic attributes, prospect and lead definitions)	<b>Geochemical Analysis</b> , APT
<b>Sedimentology</b> (detailed core description and thin section analysis)	<b>Thin Section Preparation</b> , University of Bergen (create thin sections from core samples for Petrolia to analyse reservoir quality)
<b>Rock Physics</b> (investigation of basement velocities)	<b>Seismic Reprocessing</b> , WesternGeco (Focussed PSDM to improve top basement imaging and fracture network within basement)
<b>Analogue Field Work Study</b> (data gathering and mapping on Isle of Lewis and Harris to better understand the fracture network)	<b>Petroleum System Analysis</b> by GeoEight – Daniel Stoddart (oil populations and migration modelling)
<b>Topology Study</b> (analysis of the connectivity of the fracture system)	<b>Machine Learning</b> by Earth Science Analytics (to image faults and fractures, and improve fault characterisation)
<b>Structural Restoration</b> (to understand the structural evolution with respect to reservoir quality, trap emplacement and charge history)	
<b>Volume Calculations</b> (evaluating the volume potential using several methods)	

In addition, the following work have been performed post DoD:

- 2020: Molaris basement well planning
- 2021: G&G evaluations based on new information from main analogue, the UK Lancaster Field, history matching of production data from the Lancaster area, Molaris prospect reservoir modelling and new technical-economic evaluation. Submitted application for exemption of well commitment and for surrender of PL 0933
- 2022: PL 933 License Status Report

The prospects in PL 933 were interpreted on seismic survey ST0503PNR19 (reprocessed in 2018/2019 to enhance basement imaging), with medium to high confidence. Machine learning and seismic attribute analyses was applied to visualize potential faults and fracture systems on the basement high, as well as areas of potential presence of weathered basement (Figure 5).

The Manet high petroleum system basin model was investigated to better understand the potential expelled hydrocarbon volume range and fluid phase from the Viking Gp source rocks. The study showed that sufficient hydrocarbons, both oil and gas, are expected to be generated. The timing of the formation of the trap relative to the maturation of the source rock is important for the fluid phase possibly accumulated in the prospect, and both gas and oil was considered possible.

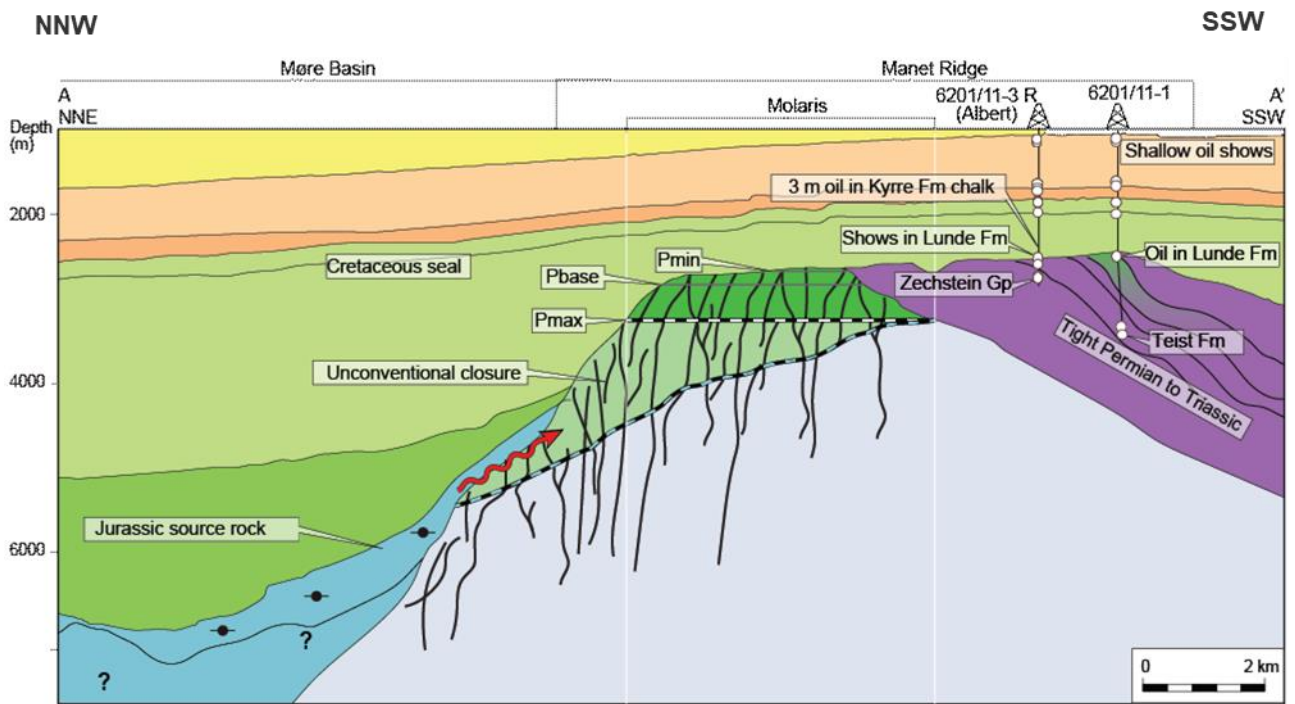


Figure 3: Geological cross section Molaris prospect. For location see Figure 4.

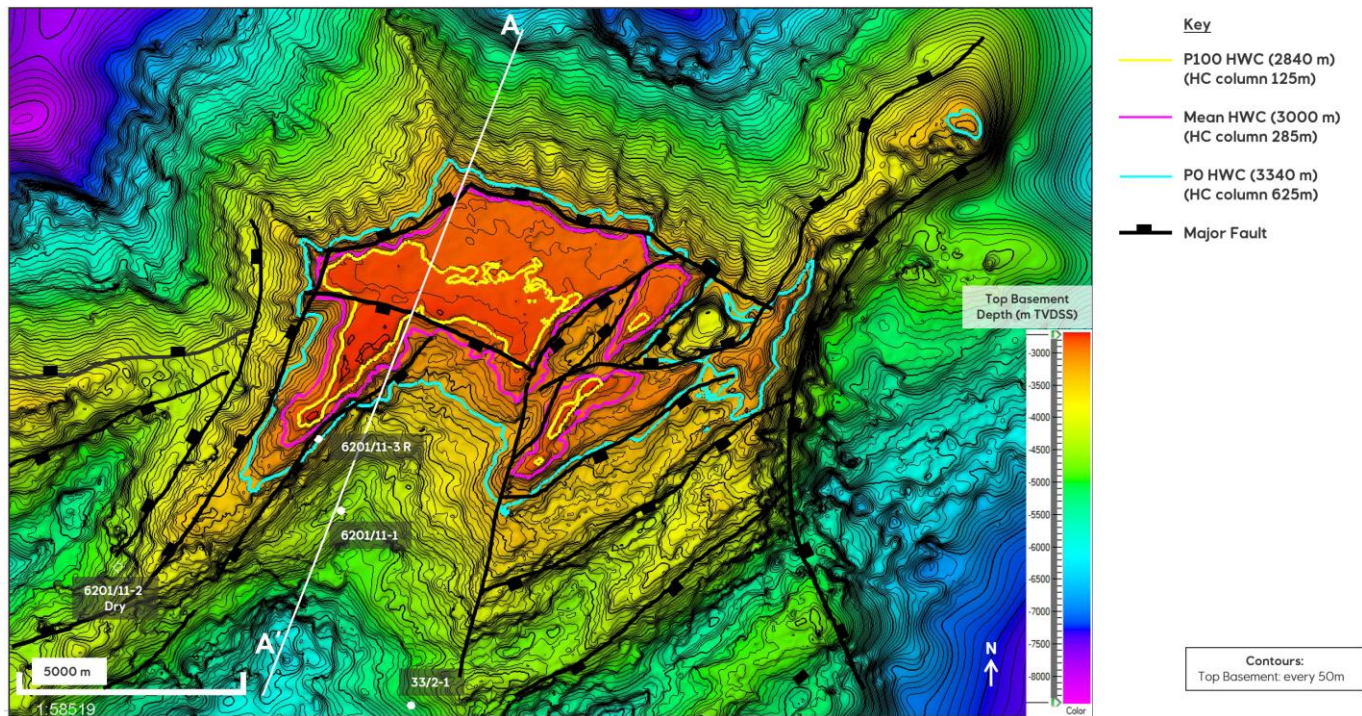
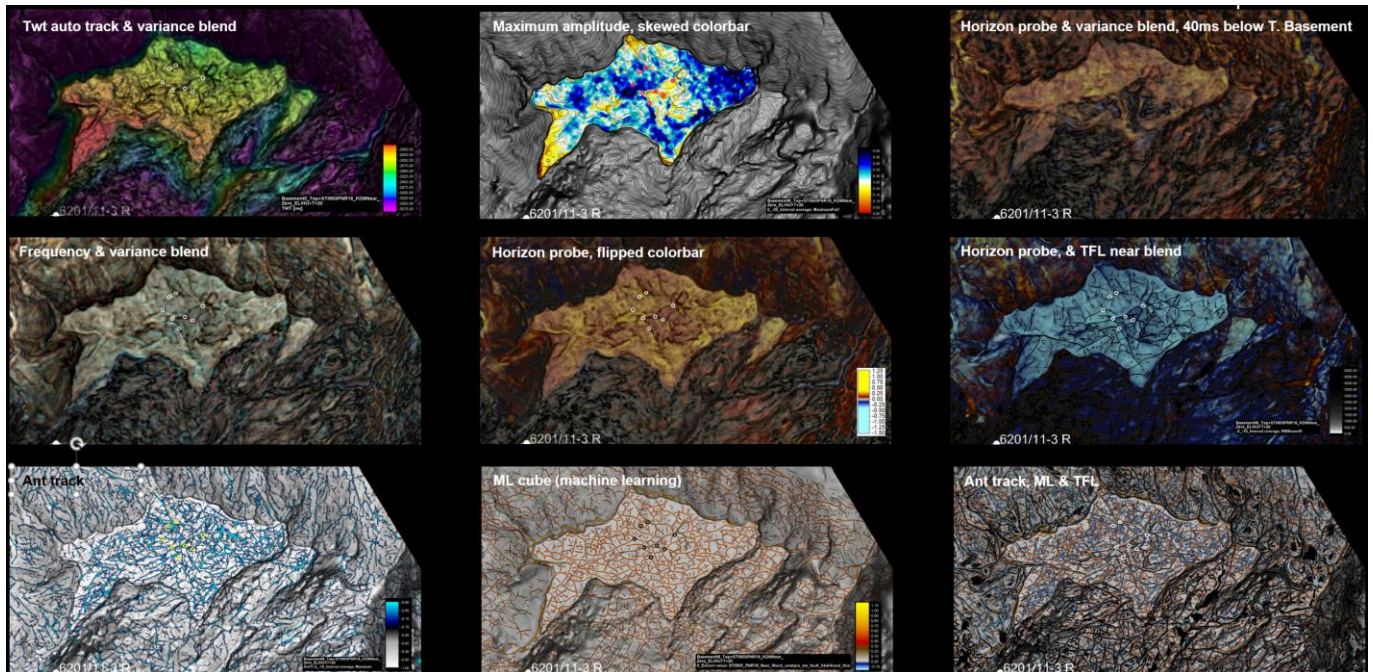


Figure 4: Top Basement depth map.





**Figure 5:** Top Basement attribute maps

The main analogue for the Molaris prospect is, the Hurricane Energy operated, UK Lancaster field. In analogy with the Lancaster field, originally the Molaris Basement prospect was divided in three segments based on the expected reservoir quality: FZ (faulted zone), FB (fractured basement, having poorer reservoir quality) and WB (weathered basement) on top.

The volumes (basis for the drill decision) from the 2019/2020 prospect evaluation of the Molaris prospect, strongly relied on a prospect model that drew strong analogies between reservoir properties in the Molaris prospect and those in the Lancaster field. Estimated total effective porosity (pore volume) for the main basement reservoirs (FZ and FB) was then mean 2.8%.

Drastic reduction of effective porosity (0.3%) reported from the Lancaster Field in 2021 has significant negative consequences on the expected volumes in the Molaris prospect. To assess these consequences a prospect re-evaluation was initiated by the PL 933 partners in 2021. To increase confidence in the re-assessment, the project has applied two independent methodologies to estimate the effective porosity:

- N/G and porosity in the Lancaster field were estimated based on a combination of available log suits.
- History matching of production data from the Lancaster area. In additions to the Lancaster basement volumes, also oil-bearing pore volumes from the connected Cretaceous and Jurassic sandstones were used in the history matching.

These two different methodologies resulted in very similar estimate for the effective porosity, 1-1,5% for the main basement reservoir (one segment). The Molaris basement recovery factors were modelled in Eclipse based on the new pore volume estimate.

## 4 Prospect update report

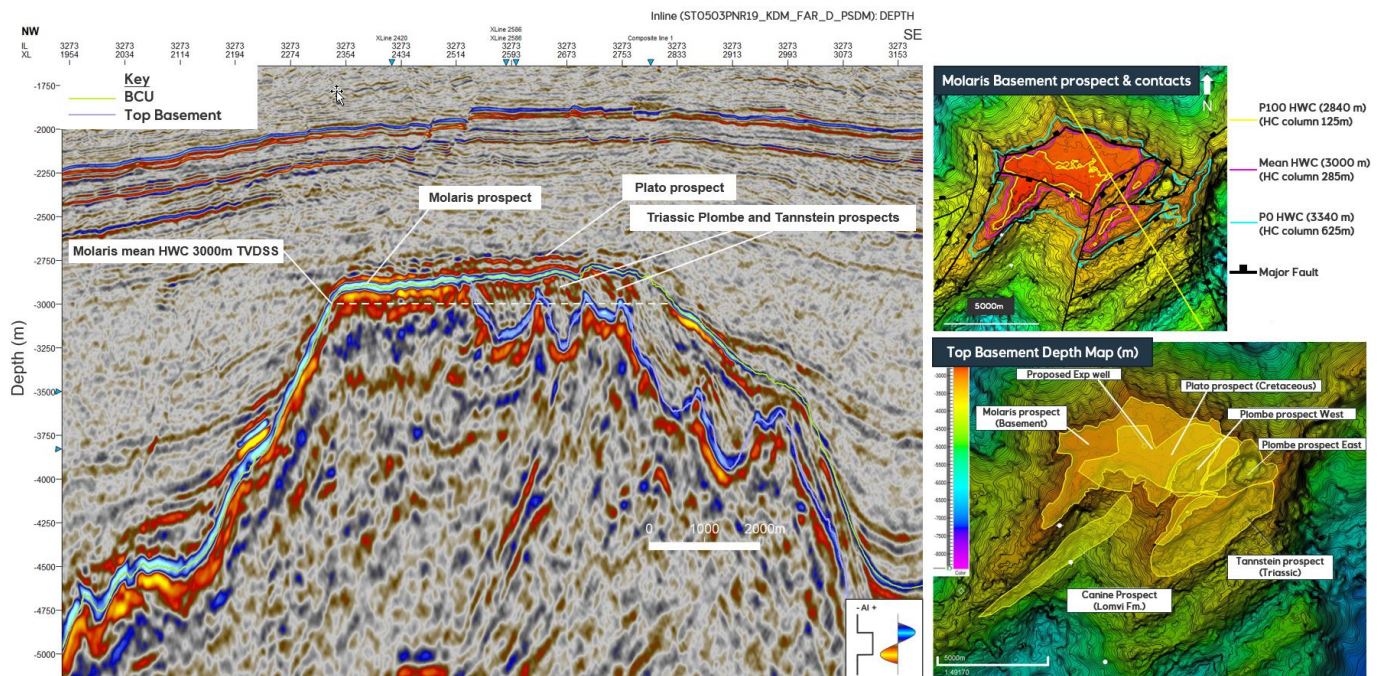
Compared to the 2020 evaluation, a revised basement reservoir model has been used in the updated prospect evaluation, only using one basement segment with effective pore volume of mean 1.5%, and with 11m Weathered Basement (WB) segment on top. The updated prospect evaluation has no changes from 2020 (Drill decision) for HC-columns, fluid parameters and risk, nor the input parameters for the WB. After re-assessment of the Molaris prospect, the updated estimates for recoverable volumes have a severe reduction from 2020. Potential recoverable resources are 1.9 – 8.9 – 19.6 MSm<sup>3</sup> oil (P90-mean-P10).

The Molaris prospect has a geological risk of 24.3%. The main risks are the presence of reservoir and trap.

For both Basement and Weathered Basement segments, an oil case (40%), a gas/oil case (30%) and a gas case (30%) have been calculated. As there is no development solution for a gas case, this is regarded as a failure in the technical economical evaluation. Pg for the oil cases is 17%.

### Additional prospectivity

Molaris prospect is the only prospect that potentially could have a stand-alone value in the license. The additional prospectivity mapped in Triassic (the Plombe, Tannstein and Canine prospects) and in the Cretaceous (the Plato prospect) have limited volumes ranging from 1-3 MSm<sup>3</sup> oil recoverable. An exploration well to the Molaris prospect could only be combined with the Cretaceous Plato prospect (Figure 6).



**Figure 6:** NE-SW seismic line over the Molaris prospect and map showing additional prospects

## 5 Technical evaluation

An update of the technical economical evaluation was performed for the Molaris mean case in 2021:

- One exploration well and two horizontal appraisal wells with DST
- Sub-sea tieback to Snorre A (+75 km)
- Drainage by six producer and two water injectors

The license is approximately 75 km north-west of the Snorre Field. The base case oil volume is not commercial.

By truncating by minimum economical volume (MEV) of 10MSm<sup>3</sup> oil recoverable, the Pc is 5.6%. In the very low probability case of an exploration well finding potentially economical volumes of oil in the Molaris basement prospect, an extensive appraisal campaign would have to be anticipated in addition to several DSTs to assess the productivity and connectivity of the basement. Considerable expenditure and long timeframe to clarify commerciality has to be expected.

## 6 Conclusion

The prospectivity of PL 933 has been thoroughly evaluated. The work obligation for the two first years' work period is fulfilled. Drill decision was made 02.03.2020.

New production information from the UK Lancaster Field (main analogue to the Molaris prospect) after the drill decision gives drastic reduction of reservoir properties. This has significant negative consequences on the expected volumes in the Molaris prospect and hence on its value. Updated recoverable resources are 1.9 – 8.9 – 19.6 MSm<sup>3</sup> oil (P90-mean-P10). The probability for an oil discovery is 17%. Probability for a success case is 5.6%. Base case oil volume has negative project economy based on the updated technical and economical evaluation.

The license partners consider the exploration potential in PL 933 not economically viable, thus the decision to apply for surrender of PL 933. The PL 933 partners submitted an application for exemption of well commitment and for surrender of PL 933, 2022-12-22. The partnership has unanimously applied to surrender PL 933 entirely.