



■ BASF Group

Report title:

# PL472/472B Relinquishment Report

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## Key license history

### Summary

PL472 was awarded in the 2007 APA round and is located to the South of the Lavrans Discovery. Prospects were identified in LM Jurassic and Cretaceous levels. Imsa is the principal prospect, but approximately 40% of Imsa prospect lay within PL255 to the South. In the 2008 APA round the southern extension to the Imsa prospect was awarded to Wintershall as PL 472B. 3D seismic was merged and reprocessed over the whole area, subsequently interpreted and finally the prospectivity was evaluated. Reservoir presence as well as effectiveness and fault seal are the main risks. However the reason for relinquishment is that partners disagreed on size and economics and did not decide to drill a well.

### Introduction

License PL472/472B comprises 124,6km<sup>2</sup> and covers part of blocks 6406/2, 3 and 5. The license was awarded to Wintershall on 29.2.2008 (PL472B 23.1.2009) for a six year initial period with a drill-or-drop decision on 28.2.2010. Partners in the license are Wintershall (40%) and Maersk (35%) and Bridge (25%). The commitments for the initial period were to reprocess and merge 3D seismic and to carry out G&G studies, which have been fulfilled. Four prospect and leads were identified in the application report (Fig. 1).

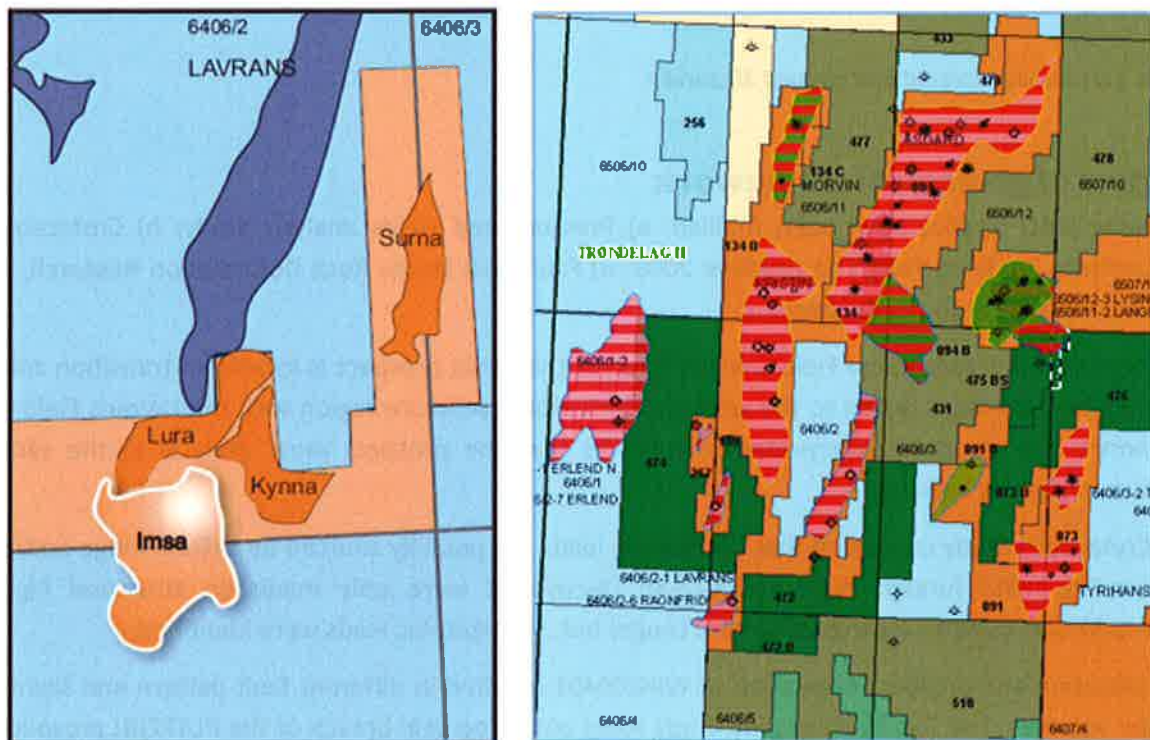
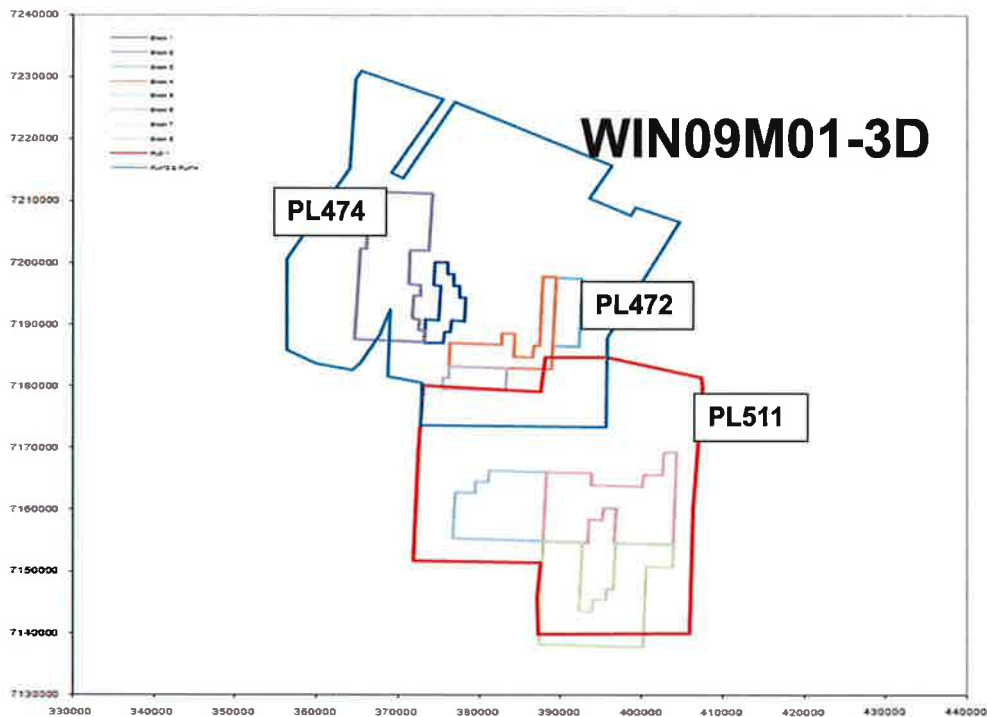


Figure 1 Prospects and leads in PL472 area and new southern extension PL472B.

## Database

The newly reprocessed and merged seismic 3D survey WIN09M01 covers an area of 1750km<sup>2</sup> and includes all mapped prospectivity with minimum 4km beyond of full fold.



**Figure 2** Newly reprocessed and merged 3D survey.

## Review of geological framework

Following G&G Studies have been fulfilled: a) Pressure and Fields analysis Study; b) Cretaceous Prospectivity Study; c) Field Trip Loedevé 2009; d) Fault Seal Study: Rock Deformation Research; e) Top Seal Integrity Study Haltenbanken.

Outcome of the Pressure and Field analysis Study is that Imsa prospect is located in transition zone between high pressure region to the west and hydrostatic pressure region with the Lavrans Field to the north. The structural interpretation indicates that the prospect most likely is in the same pressure regime as Lavrans.

The Cretaceous Study concluded that Cretaceous leads are possibly sourced by Sklinna Ridge and/or surrounding relict Jurassic highs (6406/2-3). Discoveries were only made on structural highs (Smorbukk Sor, 6506-11-2 Lange, 6406-1-2 Lange) but, stratigraphic leads were identified.

Interpretation and prospect evaluation of WIN09M01 resulted in different fault pattern and slightly smaller volumes. The Top Seal Integrity Study ruled out a Top Seal breach of the PL472(B) prospects and as main risk remains presence and effectiveness of the reservoir. The reservoir presence and effectiveness risk is however the reason why the partners disagree on prospect size and economics.

## Prospects update

The following is a description of the prospects in license PL472, starting with the principal prospect.

### Imsa prospect

Imsa is on the high side of a rotated fault block where interacting fault systems result in fault seal dependant three-way dip closure (Fig.2). Target is a stacked reservoir of LM Jurassic Fangst and Båt gps (Garn, Ile and Tofte fms). Main risk is presence and effectiveness of these reservoirs. This risk relates to primary facies, burial, faulting and possible erosion. Seal is represented by the Upper Jurassic shales of the Melke and Spekk fms (main source rock), as well as by the intraformational shales of the Not and Ror fms. A Top Seal Integrity Study indicates that top seal breach does not constitute a risk. The structural interpretation shows that the prospect most likely is in the same pressure regime as Lavrans Discovery. Charge is proven by nearby fields in the area and confirmed by basin modelling studies, and gas with condensates is the expected hydrocarbon phase. A gas chimney above structure and brightening at L Cretaceous level indicates gas presence. Presence of gas in the overburden is not seen as a negative factor, as numerous field and discoveries in the area are associated with gas chimneys. As partners Maersk and Bridge dropped out Wintershall decided to relinquish the license and to reapply again in APA round 2010.

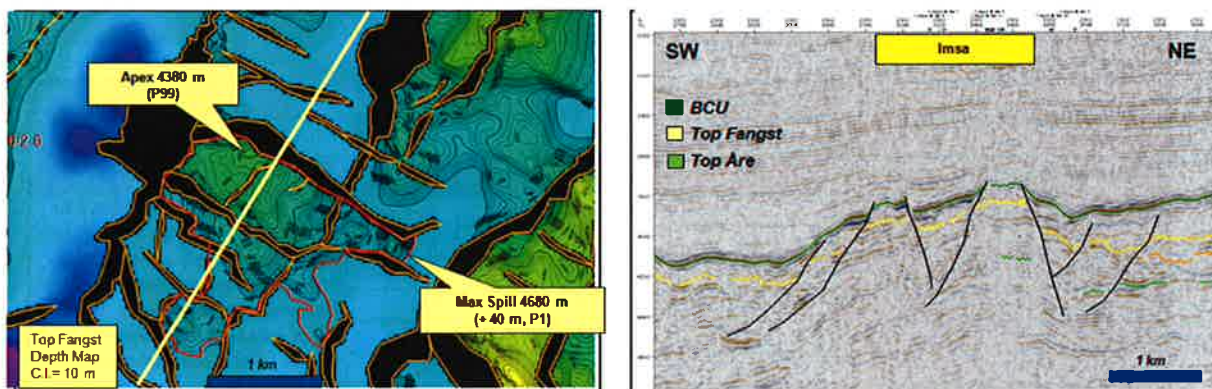


Figure 3 Top Garn Fm depth structure map and Imsa prospect SW-NE seismic line.

Block	Prospect name	Discovery/Prospect/Lead	Prospect ID (or New?)	NPD approved?	
6406/1, 6406/2, 6406/3	Imsa		<i>NPD will insert data</i>	<i>NPD will insert data</i>	
Play (name / new)	Structural element	Company/ reported by / Ref. doc.		Year	
<i>NPD will insert data</i>	Halten Terrace	Wintershall			
Oil/Gas case	Resources IN PLACE				
Gas/Condensate	Main phase			Ass. phase	
	Low	Base	High	Low	High
Oil 10 <sup>6</sup> Sm <sup>3</sup>	3.09	10.6	23.8		
Gas 10 <sup>9</sup> Sm <sup>3</sup>	2.21	7.59	17		
	Resources RECOVERABLE				
	Main phase			Ass. phase	
	Low	Base	High	Low	High
Oil 10 <sup>6</sup> Sm <sup>3</sup>	0.651	2.45	5.97		
Gas 10 <sup>9</sup> Sm <sup>3</sup>	0.887	3.27	7.74		
	Which fractures are used as:	Low:	P90	High:	P10
Type of trap	Water depth (m)	Reservoir Chrono (from - to)	Reservoir Litho (from - to)		
3 way fault closure	300	Lower - Middle Jurassic	Garn, Ile, Tofte, Tilje Fm		
Source Rock, Chrono	Source Rock, Litho	Seal, Chrono	Seal, Litho		
Early-Late Jurassic	Åre, Melke, Spekk fms.	Middle-Late Jurassic	Melke-Spekk Fm shale		
Seismic database (2D/3D):	WINO9M01 (3D survey)				
Probability of discovery:					
Technical (oil+gas case, consolidated)	0.87		Prob for oil/gas case		
Probability (fraction):	Reservoir (P1)	Trap (P2)	Charge (P3)	Retention (P4)	
	0.56	1	1	0.8	
Parameters (Garn Fm):	Low	Base	High	Comments	
Depth to top of prospect (m)		4385		These numbers are derived from the Garn Fm only, since the volumes and probability of discovery have been derived from a consolidated case with the internally used software "REP" which does not provide specific average of reservoir parameters for all four reservoirs.	
Area of closure (km <sup>2</sup> )	3.4	6.3	8.4		
Reservoir thickness (m)	62	84.81	116		
HC column in prospect (m)	180	260	320		
Gross rock vol. (10 <sup>9</sup> m <sup>3</sup> )	212	395	636		
Net / Gross (fraction)	34.8	56	90		
Porosity (fraction)	12.7	14.7	17		
Water Saturation (fraction)	13	24.5	46		
Bg. (I/Bg)	270	278	287		
Bo. (>1)					
GOR, free gas (Sm <sup>3</sup> /Sm <sup>3</sup> )					
GOR, oil (Sm <sup>3</sup> /Sm <sup>3</sup> )					
GasC Ratio (Sm <sup>3</sup> /Sm <sup>3</sup> )	0.00059	0.00075	0.000954		
Recovery factor, main phase (GasC)	30	43.1	62		
Recovery factor, ass. phase					
Temperature, top res (deg C):	160	Pressure, top res (bar):	556		
<b>For NPD use:</b>					
Innrapp. av geolog:		Registrert:		Map OK:	Nr.
Dato:		Dato:		Dato:	

Figure 4 Prospect data from APA 2010. Resources are derived from consolidated case; considering Tilje, Tofte, Ile and Garn fms as main reservoirs.

## Surna prospect

Surna prospect is a narrow horst structure. The northern part is only ca 400m wide and heavily eroded. Melke Unconformity has removed Fangst Gp units, and likely only Tilje Fm is present on structure. Main risk is presence and effectiveness of Tilje Fm. Additional risk is lateral seal effectiveness. The Top seal Integrity Study indicates that top seal breach does not constitute a risk. Charge is proven by nearby fields in the area and confirmed by basin modelling studies, and gas with condensates is the expected hydrocarbon phase.

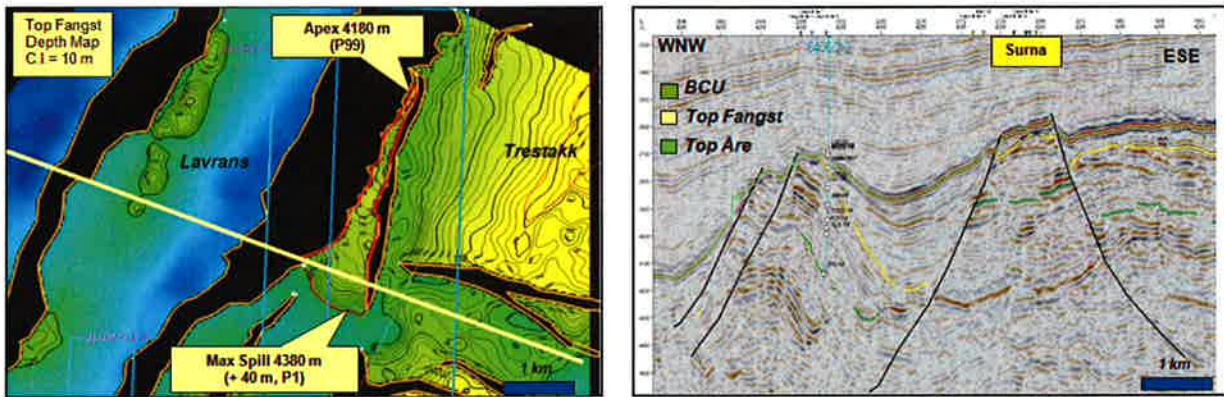


Figure 5 Top Garn Fm depth map and Surna prospect WNW-ESE seismic line.

## Kynna and Lura prospects

No further work has been done on Kynna and Lura prospects.

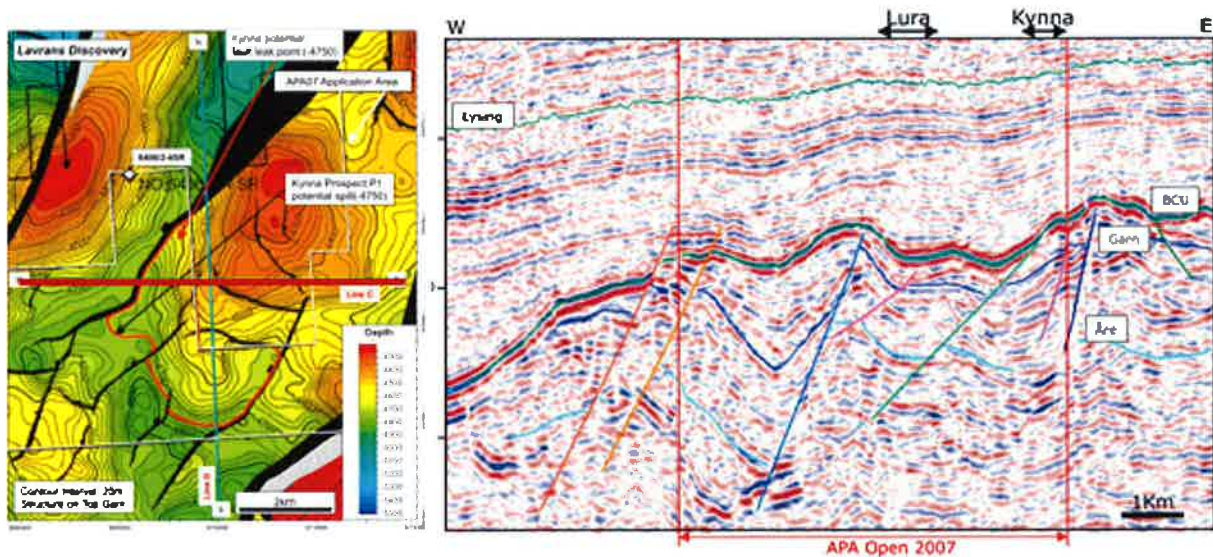


Figure 6 Top Garn Fm depth map and Kynna and Lura prospect W-E seismic line.

## Conclusion

Wintershall is still convinced that Imsa prospect contains economic reserves and reapplied for the Imsa prospect area again in 2010 APA round. In 4.2.2011 PL589 was awarded to Wintershall (40%), Repsol (30%) and RWE DEA (30%) with a firm well commitment.

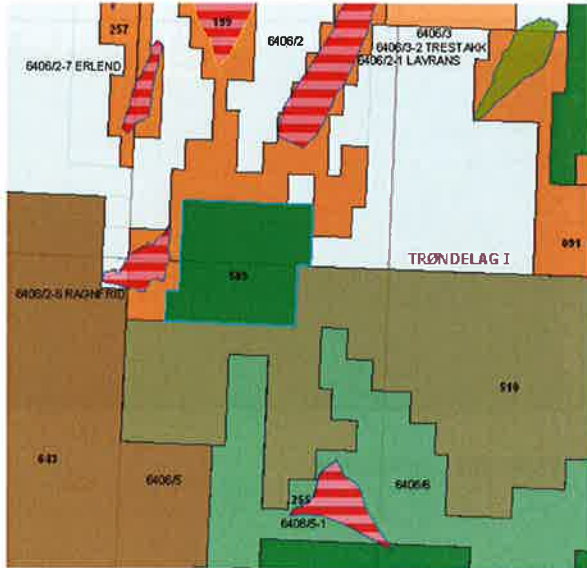


Figure 7 Location of PL589 license.