SPIRIT ENERGY

RELINQUISHMENT REPORT OF LICENSE PL 811 IN BLOCKS 7/9, 7/12 & 8/7

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1 KEY LICENSE HISTORY

Summary

License History

PL 811 is located in blocks 7/9, 7/12 and 8/7 in the southern part of the North Sea, north of the Ula Field (Fig. 1.1). The license was awarded to Centrica Resources (Norge) AS as the Operator February 5th 2016 as part of the 2015 APA licensing round. The license partnership on award was Centrica 40% and Operator, Origo Exploration Norway AS 20%, Tullow Oil Norge AS 20% and Faroe Petroleum Norge AS 20%. Several changes to the partnership occurred throughout the license period and the current partnership is shown in Table 1.1

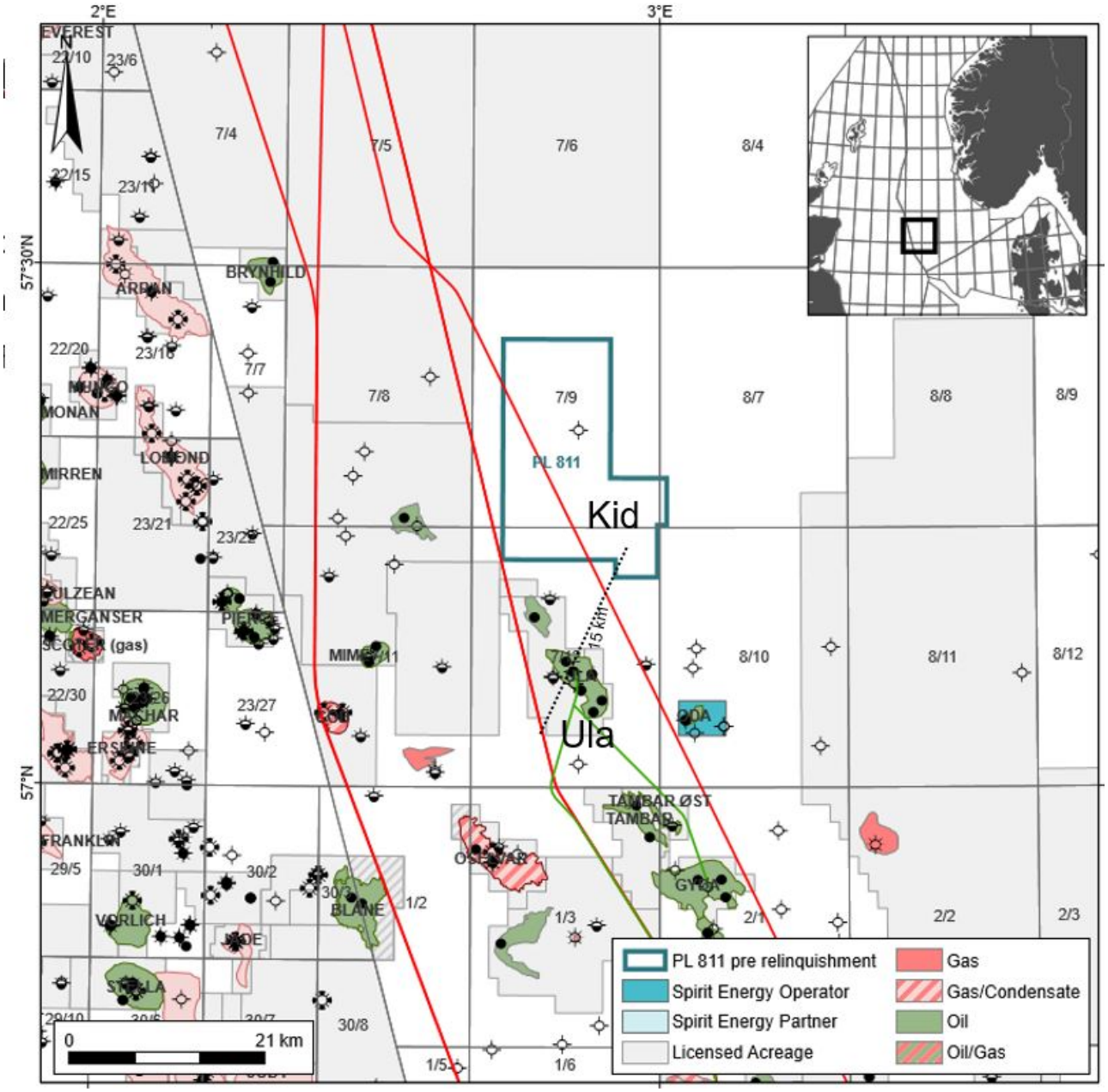

Fig. 1.1 PL 811 location in the Norwegian North Sea.

The PL 811 partnership wanted to await the results from the neighbouring PL 405 exploration well 8/10-7 S (Cassidy) drilled in 2018-2019 to allow for potential updated information from this well to be included in the final PL 811 prospect evaluation. The Cassidy well was seen as an important information point for de-risking the PL 811 prospects. The partnership hence applied for one year extension to the Drill or Drop decision from the original deadline of 5th of February 2019. The extension was granted in August 2018, and the new deadline for Drill or Drop decision in PL 811 was then February 5th 2020.

Table 1.1 Current PL 811 partnership and equity.

Company	Equity
Spirit Energy Norway AS	40%
DNO Norge AS	20%
A/S Norske Shell	20%
AkerBP ASA	20%

Overview of License Meetings

All meetings held in the license are summed up in Table 1.2.

Table 1.2 Overview of PL 811 meetings.

PL 811 License Meetings	2016	2017	2018	2019
EC Meeting	ECMC Meeting #1, Kick-off meeting, April 7	ECMC Meeting #3, November 6		ECMC Meeting #5, November, 14
	ECMC Meeting #2, November 18			
MC Meeting			MC Meeting #4, November, 29	
Work Meeting	Work Meeting, PGS seismic data viewing, December, 9	Work Meeting, April, 4	Work Meeting, Summing up Studies, April, 26 EC Work Meeting, August, 30	

Work Program

The PL 811 work program included both seismic purchase and geological and geophysical (G&G) studies. The seismic part of the work program was purchase of 3D seismic data, and this commitment was fulfilled by the licensing of the PGS 3D seismic dataset, MC3D-JHUN99-R09.

The G&G studies were designed to address the key risks for the prospectivity in PL 811. The following G&G studies were undertaken in the license:

Table 1.3 PL 811 G&G studies.

Vendor	Title	Topic
RPS Ichron	Depositional study	Understanding of Upper Jurassic depositional systems and generation of updated Gross Depositional Environment (GDE) maps
IGI	Basin modelling and migration study	Basin modelling and migration study to update the understanding of hydrocarbon expulsion potential and migration
FIT	Fluid inclusion analysis	Fluid inclusion analysis of cuttings in well 7/9-1 to investigate indications of charge and/or hydrocarbon accumulations

Identified Prospectivity

Two prospects were identified through the APA 2015 - Gullaxy and Kid.

Gullaxy - a 3-way dip closure at Ula Fm. level against north-south oriented fault complex separating the structure into two segments - see Fig. 1.2. Faults are offsetting the Ula Fm. and juxtaposing Ula Fm. against Jurassic/Triassic towards east. A major fault into Paleocene was seen to represent a top seal risk for Gullaxy. Thinning of Shetland Gp. seen on the seismic could be due to Cretaceous inversion.

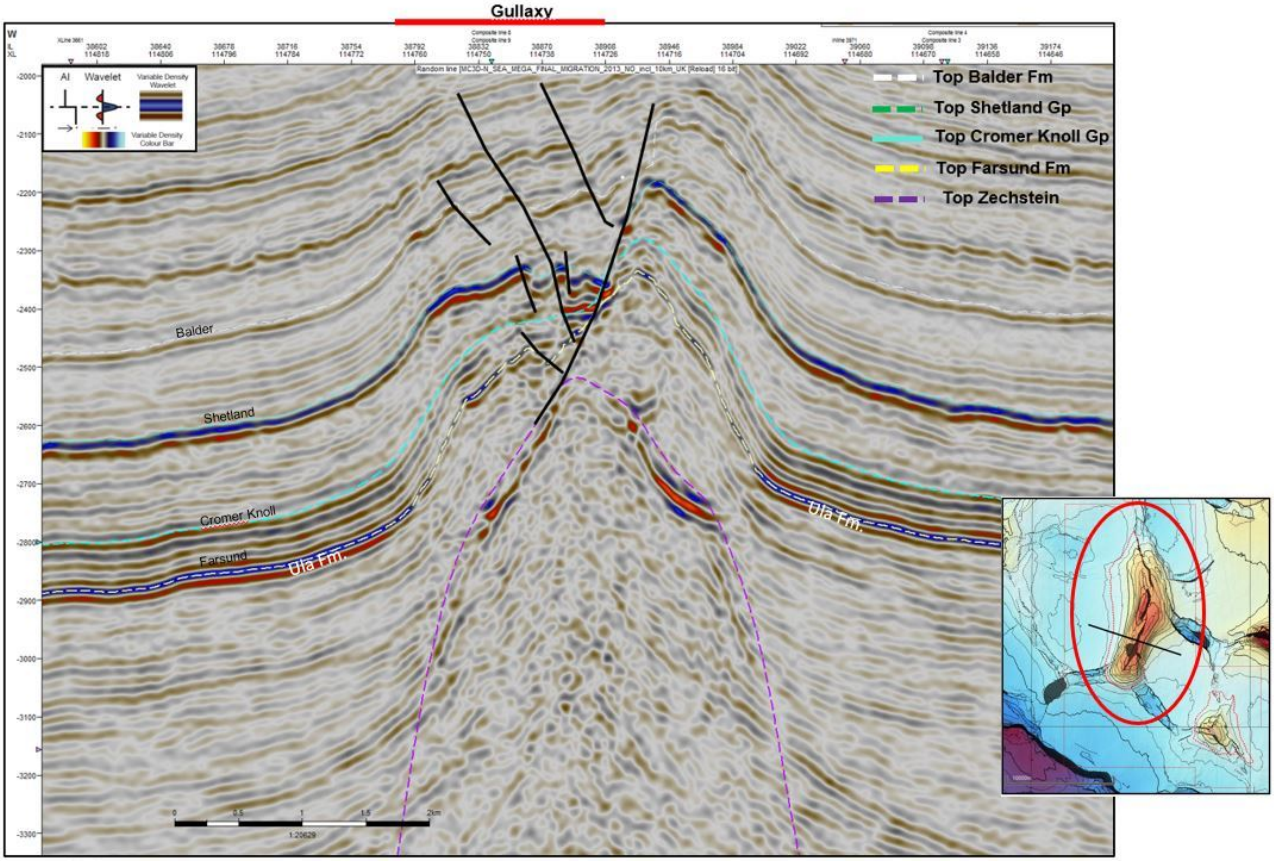

Fig. 1.2 Gullaxy prospect. *North-south oriented faulting separating Gullaxy into two segments; eastern segment containing the dry 7/9-1 well.*

Kid - a segmented 4-way salt induced dip closure at Ula Fm. level. Crestal faulting created segmentation of Kid. Upper Jurassic shales and Lower Cretaceous marls are present over the crest - see Fig. 1.3. Shallow faults into Paleocene are identified and these could represent a top seal risk. The crestal faulting observed on the seismic was seen to represent risk relating to juxtaposition chalks of the Cromer Knoll Gp. against Ula Fm. across these faults and hence a risk on trap. Thinning of the Shetland Gp. and Cretaceous inversion is observed on the seismic. Slight thickening of Cromer Knoll Gp. was interpreted to possibly result in an increase the accommodation space in the Jurassic.

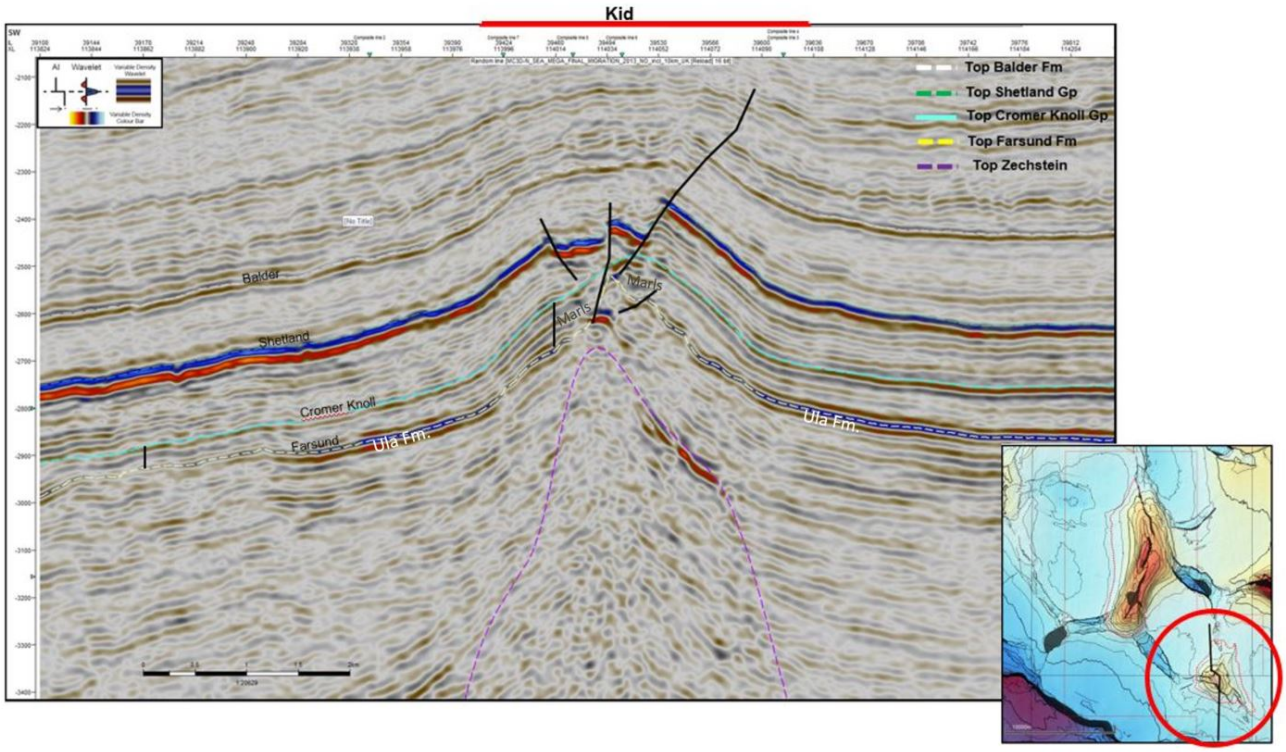

Fig. 1.3 Kid prospect. *Crestal faulting of Kid could create juxtaposition chalks of the Cromer Knoll Gp. vs. Ula Fm. across faulting.*

After the completion of the PL 811 work program in 2019, the only remaining prospect was Kid. Gullaxy was no longer seen as a valid prospect as the basin modelling work showed that the structure containing the dry 7/9-1 well directly to the east of Gullaxy would also be filled - see Fig. 1.4. As this dry structure was filled in all the modelled scenarios of migration of hydrocarbons from the kitchen areas, Gullaxy was no longer a prospect.

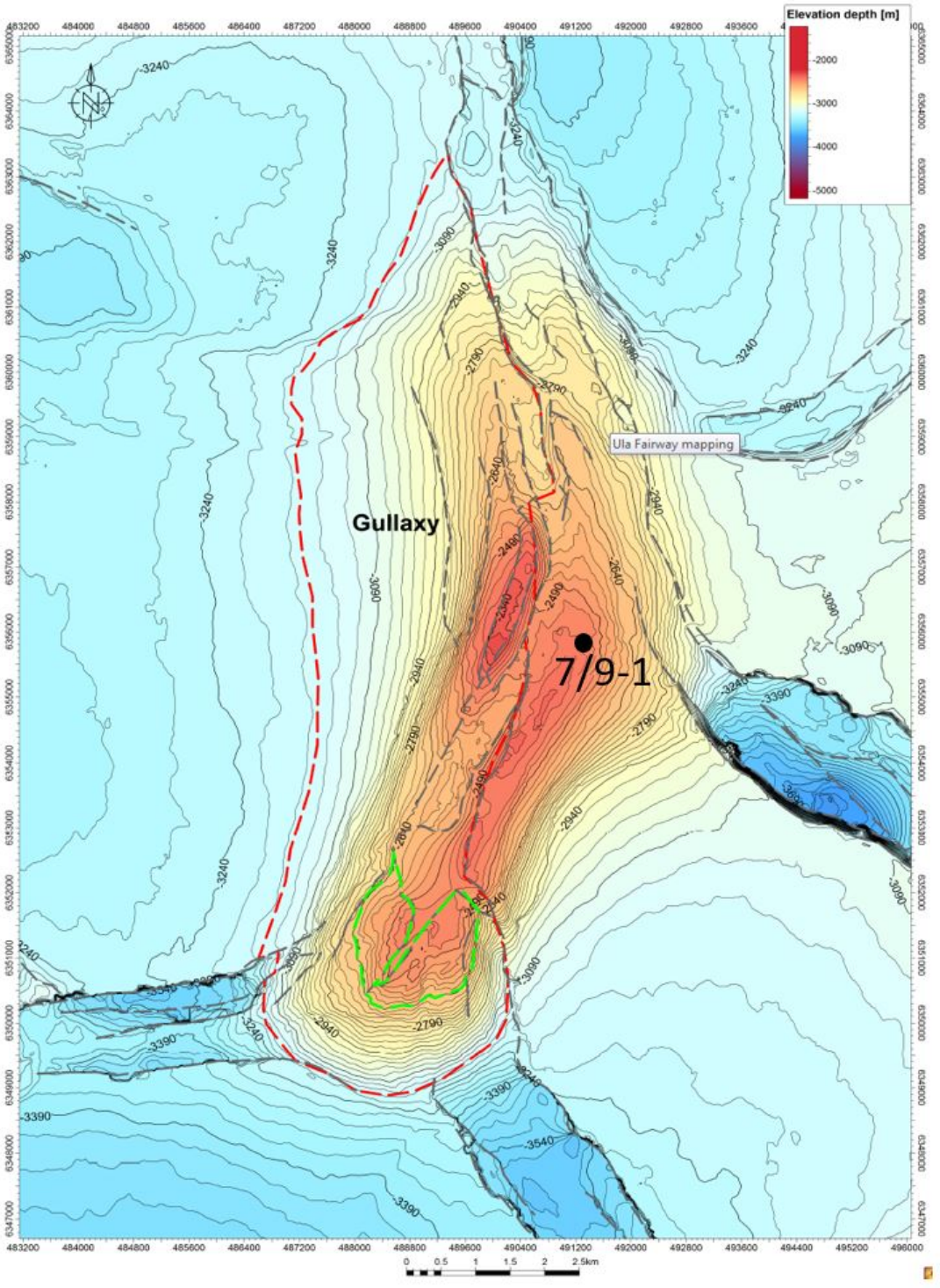

Fig. 1.4 Gullaxy prospect and dry 7/9-1 well to the east.

Reason for Relinquishment

The license partners decided to relinquish PL 811 on February 5th 2020. The work commitments are then fulfilled. The results from the 8/10-7 S well proved to have a negative impact on reservoir thickness and migration in Kid. These results contributed to a reduction of the Kid prospect gross rock volume, and the smaller volumes made Kid sub-economcial. The partnership in PL 811 made a drop decision and hence decided to relinquish the license.

2 DATABASE

Seismic Database

The primary seismic dataset used in the interpretation of this area is the 3D survey from PGS, MC3D-Mega Merge-JHUN99 (vintage 1999). The licensing of the reprocessed version MC3D-JHUN99-R09 (vintage 2009) was done as part of the work program in 2016. This 3D survey enabled detailed re-interpretation of the Kid and Gullaxy prospects. The same interpretation was used as input to the basin modelling study and to to the stratigraphic framework study. The data quality is generally good although several potential artefacts created by overburden geology and multiples were identified during the evaluation. The common seismic database is shown in Fig. 2.1 and listed in Table 2.1.

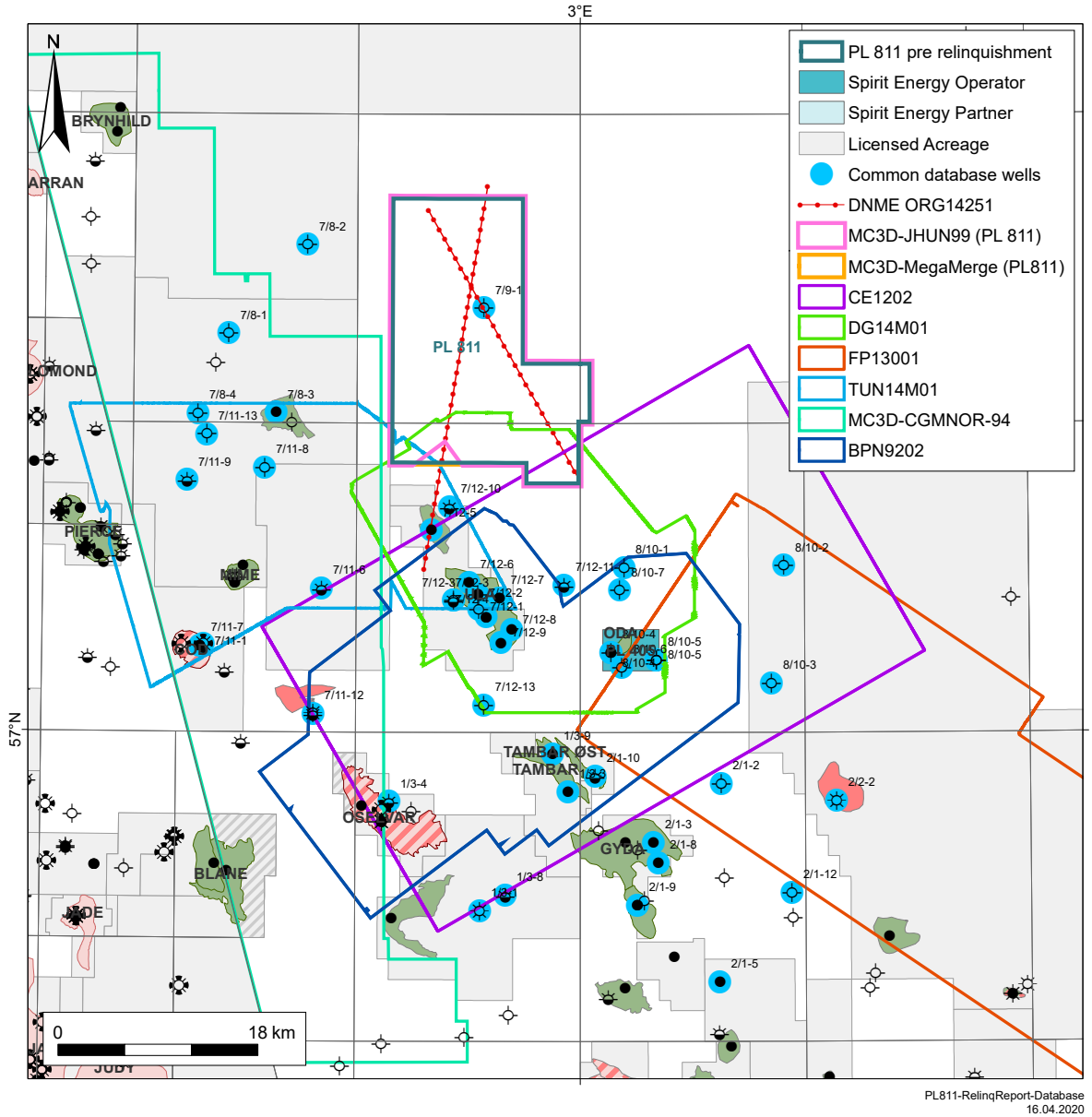

Fig. 2.1 PL 811 Common Database overview presenting a complete overview of the PL 811 Common Database: wells, seismic surveys and DNME lines. The MC3D-MegaMerge orange outline is outside of this overview.

Table 2.1 PL 811 Common Seismic Database.

Survey name	Vintage	Company	Public
MC3D-Mega Merge-JUHN99	1999	PGS	No
MC3D-JHUN99-R09	2009	PGS	No
CE1202	2012	Spirit Energy Owned	No
DG14M1	2014	DONG Owned	No
TUN14M01	2014	Tullow Owned	No
BPN9202	1992	BP Norway Owned	Yes
FP13001	2013	Faroe Petroleum Norge AS	No
MC3D-CGMNOR-94	1994	PGS Nopec AS	No

DNME Database

Several campaigns of acquisition of Differentially Normalised Method of Electrical (DNME) prospecting have over the years been completed in the area. DNME is based on the detection of two independent hydrocarbon indicators - resistivity and induced polarity (IP) contrasts. The combination of the two gives a unique hydrocarbon signature, and could in combination with conventional seismic aid in de-risking of a prospect.

DNME data was made part of the PL 811 common database. The DMNE lines were acquired by Centrica, Faroe Petroleum and Tullow as part of the survey ORG14251. See location of the DNME survey in Fig. 2.1.

Well Database

The publicly available exploration wells drilled in the greater PL 811 area are made part of the common license well database. In addition a few exploration wells are traded to become part of the common well database. All the wells decided to be part of the PL 811 common database are listed in Table 2.2. See also location of the wells in Fig. 2.1

Table 2.2 PL 811 Common Well Database.

Name	Operator	Completed	TD (m)	TD strat	Content
1/3-1	A/S Norske Shell	11.11.1968	4877.0	ZECHSTEIN GP	GAS
1/3-3	Elf Petroleum Norge AS	24.03.1983	4876.0	ZECHSTEIN GP	OIL
1/3-4	Elf Petroleum Norge AS	08.05.1983	3198.0	ZECHSTEIN GP	OIL SHOWS
1/3-8	Amoco Norway Oil Company	27.05.1997	5201.0	SMITH BANK FM	SHOWS
1/3-9 S	BP Norway Limited U.A.	31.07.1998	4516.0	ULA FM	OIL
2/1-2	BP Norway Limited U.A.	26.02.1978	3555.5	ZECHSTEIN GP	DRY
2/1-3	BP Norway Limited U.A.	29.03.1980	4297.0	ZECHSTEIN GP	OIL
2/1-5	BP Norway Limited U.A.	05.04.1983	4454.0	BRYNE FM	OIL
2/1-8	BP Norway Limited U.A.	23.11.1985	4151.0	SKAGERRAK FM	OIL
2/1-9	BP Norway Limited U.A.	06.07.1991	4298.0	ZECHSTEIN GP	OIL
2/1-10	BP Norway Limited U.A.	14.01.1992	4525.0	SKAGERRAK FM	OIL SHOWS
2/1-12	BP Norway Limited U.A.	10.02.1999	3550.0	BRYNE FM	DRY
2/2-2	Saga Petroleum ASA	27.08.1982	3127.0	ZECHSTEIN GP	GAS
7/11-1	Phillips Petroleum Company Norway	15.06.1968	3974.0	ZECHSTEIN GP	GAS/ CONDENSATE
7/11-6	Norsk Hydro Produksjon AS	20.10.1982	4500.0	SMITH BANK FM	SHOWS
7/11-7	Phillips Petroleum Company Norway	25.12.1983	4927.0	ZECHSTEIN GP	OIL
7/11-8	Norsk Hydro Produksjon AS	12.12.1983	4750.0	SMITH BANK FM	DRY
7/11-9	Norsk Hydro Produksjon AS	09.03.1986	4270.0	SMITH BANK FM	SHOWS
7/11-12 S	ConocoPhillips Skandinavia AS	16.07.2011	5420.0	SKAGERRAK FM	SHOWS

7/11-13	Det norske oljeselskap ASA	03.11.2012	3800.0	SKAGERRAK FM	DRY
7/12-1 S	Norwegian Gulf Exploration Company AS	18.10.1968	3311.0	ÅSGARD FM	DRY
7/12-2	BP Norway Limited U.A.	23.09.1976	3676.0	GASSUM FM	OIL
7/12-3	BP Norway Limited U.A.	03.06.1977	3710.0	ULA FM	DRY
7/12-3 A	BP Norway Limited U.A.	06.09.1977	4191.0	ZECHSTEIN GP	OIL SHOWS
7/12-4	BP Norway Limited U.A.	12.12.1977	3623.0	BRYNE FM	OIL
7/12-5	BP Norway Limited U.A.	07.06.1981	4440.0	ZECHSTEIN GP	OIL
7/12-6	BP Norway Limited U.A.	24.07.1981	3700.0	SKAGERRAK FM	OIL
7/12-7	BP Norway Limited U.A.	26.07.1988	3855.0	ULA FM	OIL
7/12-8	BP Norway Limited U.A.	23.12.1988	3900.0	SKAGERRAK FM	OIL
7/12-9	BP Norway Limited U.A.	14.05.1990	3820.0	SKAGERRAK FM	OIL
7/12-10	BP Norway Limited U.A.	29.08.1991	3667.0	SKAGERRAK FM	OIL SHOWS
7/12-11	BP Norway Limited U.A.	06.11.1991	3868.0	SKAGERRAK FM	SHOWS
7/12-12 S	BP Norway Limited U.A.	17.03.1996	6079.0	VESTLAND GP	DRY
7/12-13 S	Det norske oljeselskap ASA	18.05.2012	4575.0	HEGRE GP	DRY
7/9-1	Conoco Norway Inc.	29.05.1971	2931.0	ZECHSTEIN GP	DRY
7/8-1	Phillips Petroleum Company Norway	05.02.1969	3334.0	GASSUM FM	DRY
7/8-2	Phillips Petroleum Company Norway	29.08.1973	3006.0	ZECHSTEIN GP	DRY
7/8-3	Conoco Norway Inc.	12.12.1983	4320.0	ZECHSTEIN GP	OIL
7/8-4	Conoco Norway Inc.	20.02.1985	4400.0	SMITH BANK FM	DRY
8/10-1	Phillips Petroleum Company Norway	01.07.1969	3089.0	ZECHSTEIN GP	DRY
8/10-2	Phillips Petroleum Company Norway	17.03.1980	2997.0	ZECHSTEIN GP	DRY
8/10-3	ConocoPhillips Skandinavia AS	06.10.2010	5738.0	ROTLIEGEND GP	DRY
8/10-4 A	Centrica Resources (Norge) AS	18.12.2011	3639.0	SKAGERRAK FM	DRY
8/10-4 S	Centrica Resources (Norge) AS	27.10.2011	3071.0	ZECHSTEIN GP	OIL
8/10-5 A	Centrica Resources (Norge) AS	24.05.2014	2662.0	ZECHSTEIN GP	DRY
8/10-5 S	Centrica Resources (Norge) AS	06.03.2014	2925.0	ZECHSTEIN GP	DRY
8/10-6 S	Centrica Resources (Norge) AS	16.07.2014	2256.0	ZECHSTEIN GP	DRY
8/10-7 S	Spirit Energy Norway AS	04.01.2019	3155.0	ZECHSTEIN GP	DRY

3 REVIEW OF GEOLOGICAL FRAMEWORK

Geological Setting

PL 811 is located along the south western flank of the Sørvestlandet High and in the middle of the license the Reke Fault Zone runs through in a N-S direction. The structural framework reflects a complex tectonic history involving periods of salt movements setting up pod-interpod structures, extension and likely inversion Fig. 3.1. The Sørvestlandet High is a result of rifting during Permian and Triassic and later modified in Cretaceous by inversion and later thermal subsidence. On this high connected valley systems appear to be possible sites for Upper Jurassic sand accommodation space. The license is located close to existing infrastructure; Kid is closest to and located about 15 km from the Ula Field facilities Fig. 3.2.

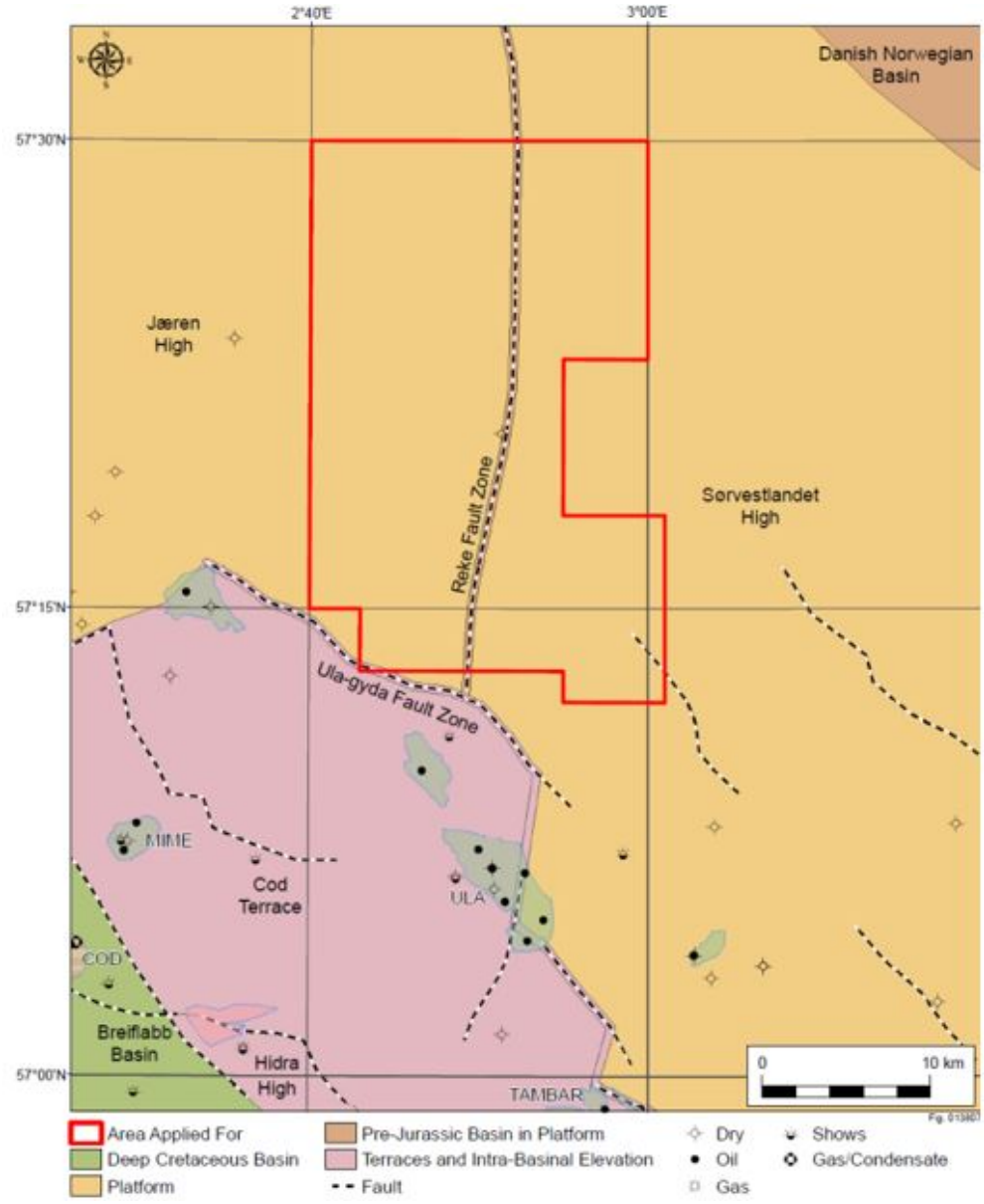

Fig. 3.1 Structural elements of the Sørvestlandet High. *PL 811 location in relation to the different structural elements of the Sørvestlandet High.*

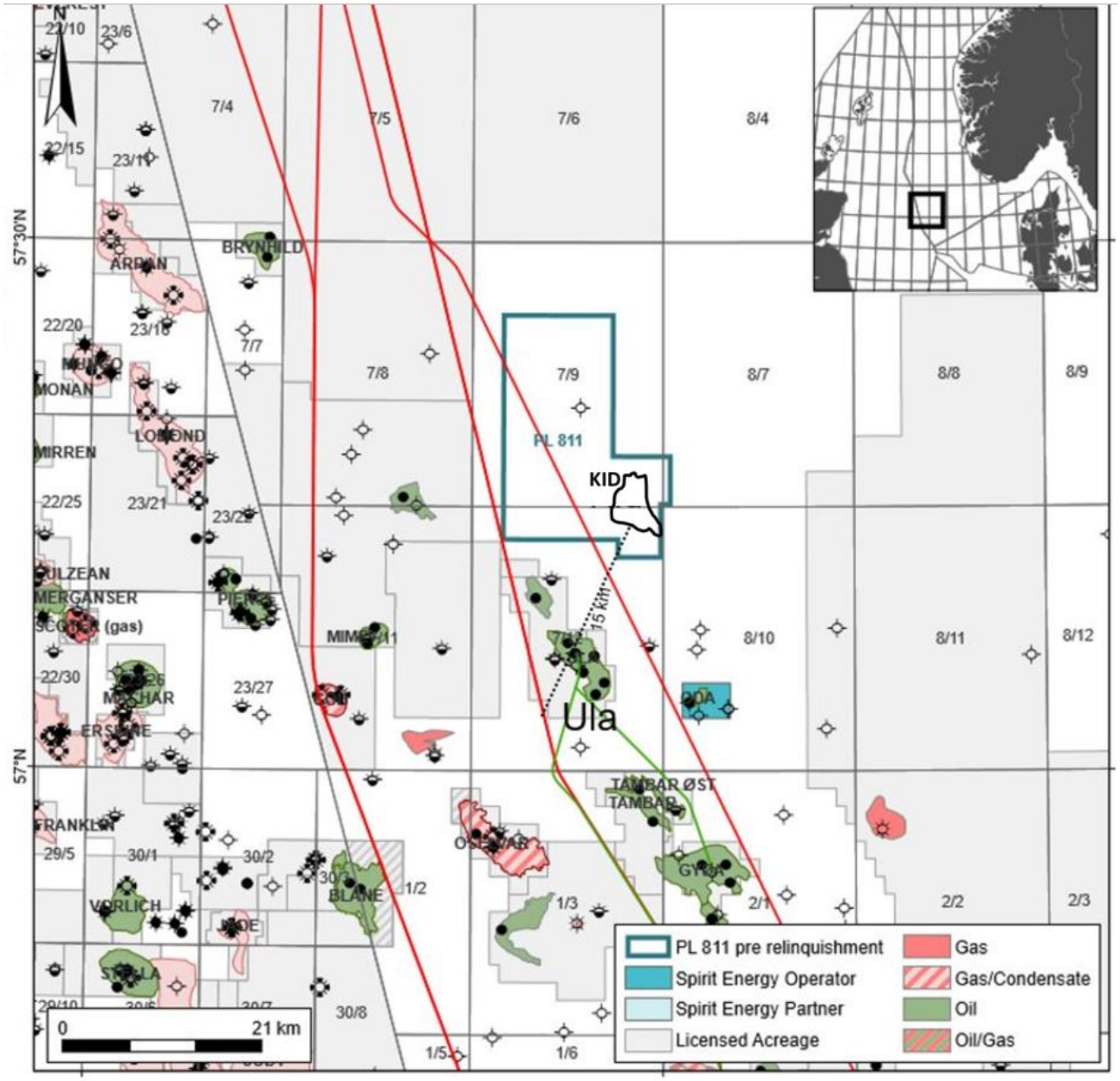

Fig. 3.2 PL 811 area facilities. *Distance from Kid prospect to Ula Field facilities is 15km.*

The analysis made from the results in well 7/9-1 triggered the interest in the PL 811 acreage - see Fig. 3.3. The FIT analysis in the well shows some evidence of charge/hydrocarbon presence in the lowest sections of the well - Lower Triassic and Upper Zechstein Gp. Fig. 3.4. These findings were interesting as they could indicate possible charge and migration into this location.

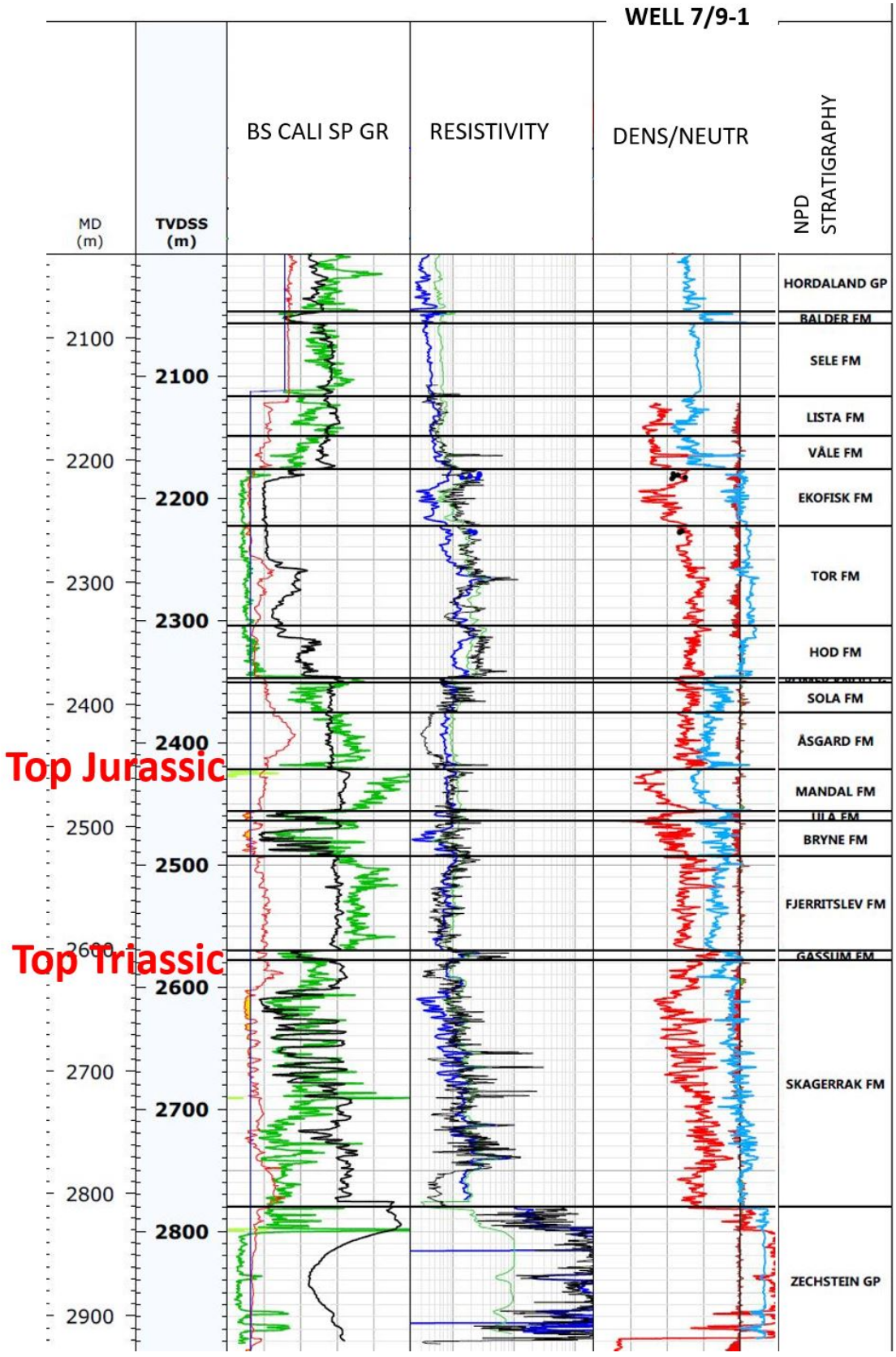

Fig. 3.3 7/9-1 well near Gullaxy.

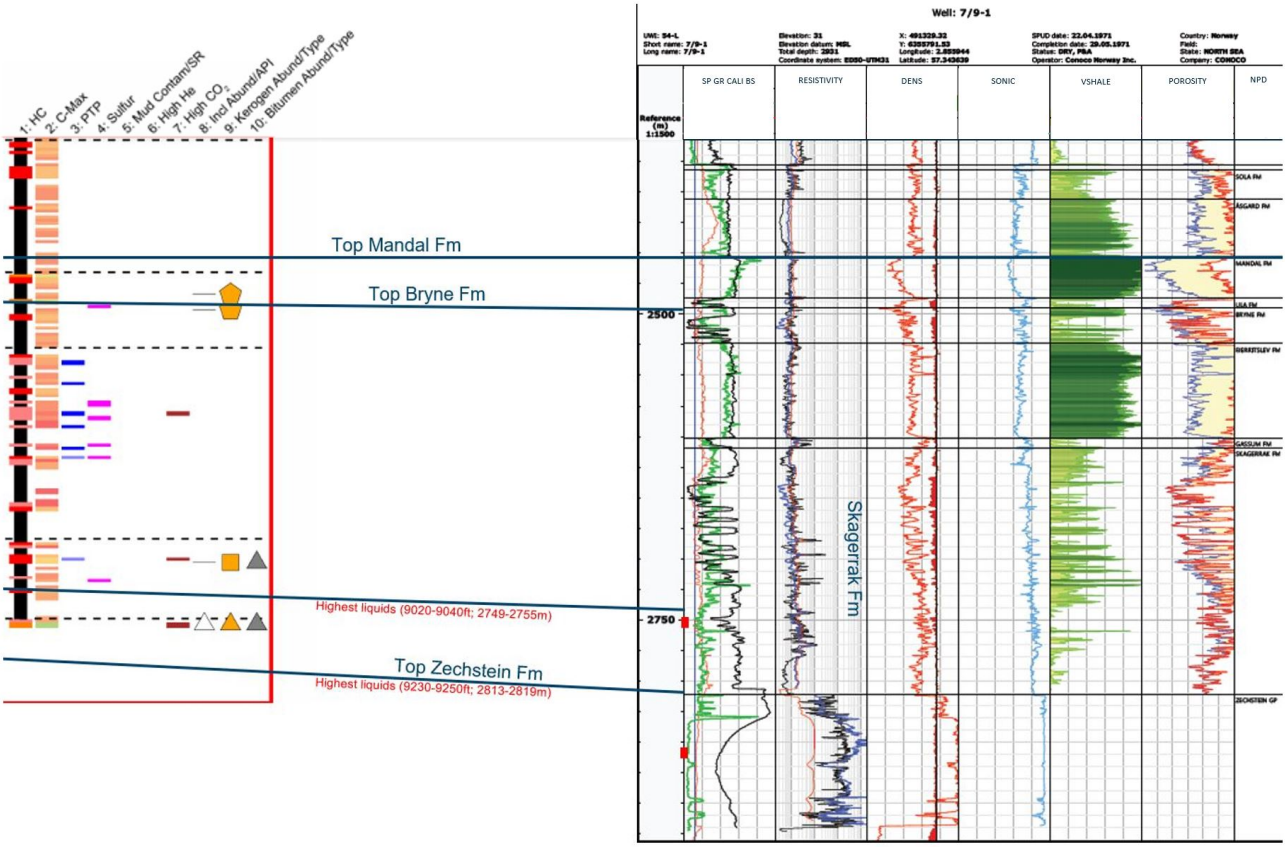

Fig. 3.4 7/9-1 FIT findings. *In the Skagerrak Fm. several occurrences of gas prone kerogen and several occurrences of oil prone kerogen are observed. Rare occurrences of dead stain are found. In the Zechstein Gp. rare, indeterminate gravity petroleum inclusions are found as well as rare occurrences of gas prone kerogen and rare occurrences of oil prone kerogen. Rare occurrences of dead stain are indicated.*

Prospectivity in PL 811 was seen as an interesting follow-up candidate in the event of a successful drilling of the PL 405 well, 8/10-7 S testing the Cassidy prospect with the same target in Upper Jurassic Ula Fm. as prospects in PL 811. 8/10-7 S was completed in early 2019.

4 PROSPECT UPDATE

PL 811 Pre Seismic Re-mapping

At the time of award in 2016, the prospectivity in PL 811 was mapped on 3D seismic from PGS MegaMerge, vintage 1999. Two prospects were identified in the APA 2015 - Gullaxy and Kid - see **Identified Prospectivity** in 1 Key License History.

PL 811 Post Seismic Re-mapping

An update to the interpretation was made in 2017 on the re-processed 3D seismic PGS MegaMerge dataset, MC3D-JHUN99-R09, time- and depth volumes (see Fig. 2.1 pink outline for MC3D-JHUN99-R09).

The focus for the updated interpretation was to do a more detailed mapping of the Gullaxy and Kid prospects with improved imaging of faulting and crestal definition. The re-interpretation over the Kid crest improved the structural details. From the seismic, the Upper Jurassic shales and lower Cretaceous marls look to be present over the crest of Kid. Potential juxtaposition chalk of the Cromer Knoll Gp. and Ula Fm. sands across the faults in Kid is not seen as a risk to trapping of hydrocarbons in the reservoir as these marls in the Cretaceous Rødby Fm. at this level would not be permeable and hence prevent leakage - see Fig. 4.1.

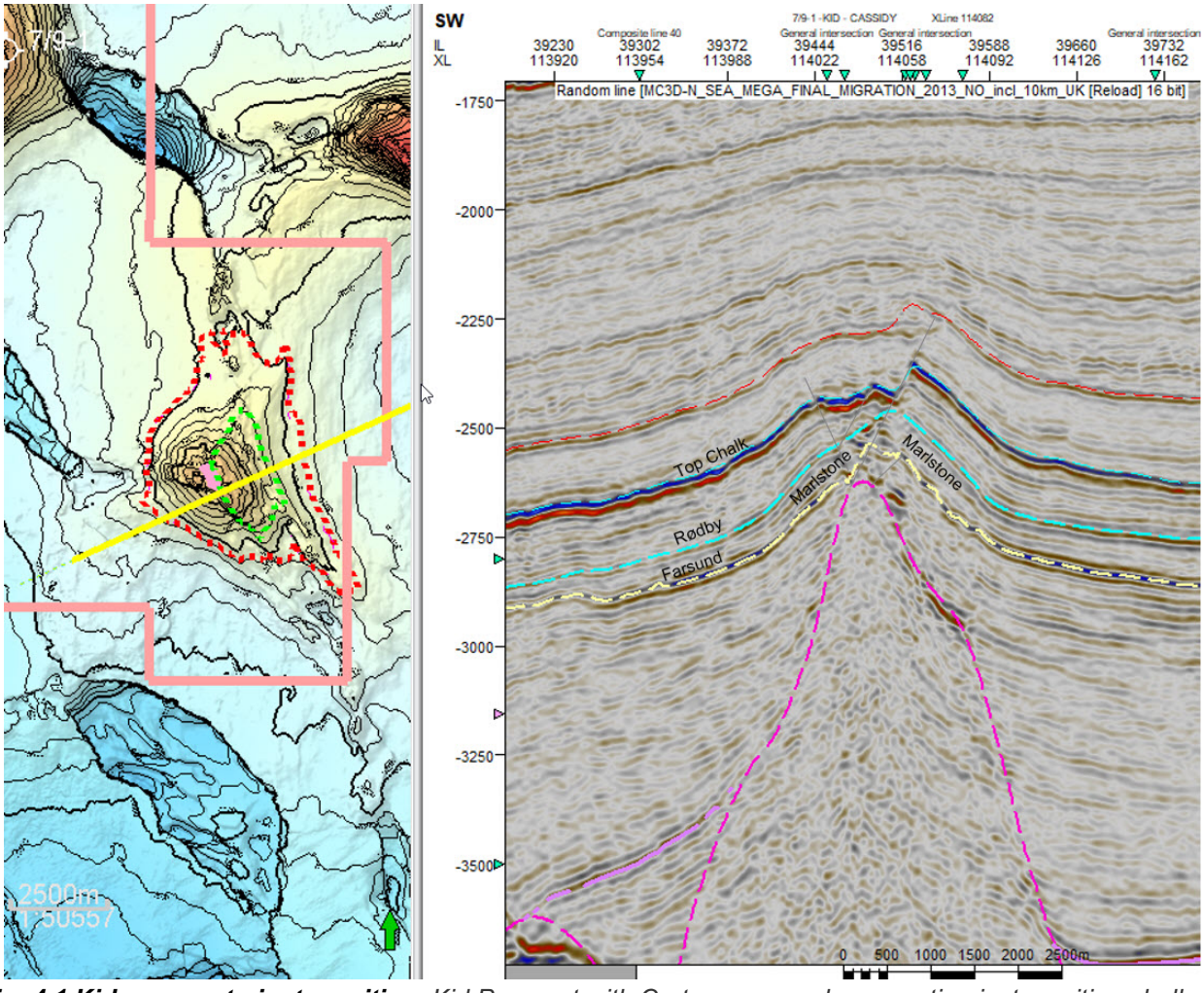

Fig. 4.1 Kid prospect - juxtaposition. *Kid Prospect with Cretaceous marls preventing juxtaposition chalk-Ula Fm. and hence leakage.*

The maps generated from the MC3D-JHUN99-R09 seismic were important input both for the stratigraphic framework study and the basin modelling study. All levels of interest have been mapped in detail with use of random lines to optimize interpretation directions. In general, the seismic quality of the MC3D-JHUN99-R09 3D cube is good and the updated interpretation provides maps of higher confidence. The Top Zechstein Gp. interpretation is still seen as difficult especially on the flanks of the salt walls where the salt hampers the seismic resolution. The Top Farsund Fm. depth map provides structural definition of Jurassic structures in the license area. This map is used as a pseudo Top Ula Fm. reservoir and is key input for migration modelling.

The following levels are interpreted on the re-processed 3D MC3D-JHUN99-R09:

- Seabed
- Top Hordaland Fm.
- Top Balder Fm.
- Top Sheltand Gp. (Top Chalk)
- Top Rødby Fm. – key for timing of fault movements (accommodation space during Upper Jurassic – Lower Cretaceous)
- BCU – key for structural definition and basin modelling
- Top Farsund Fm. – structural definition (volume calculation). Key for basin modelling (both maturation and migration modelling) (Fig. 4.2)
- Top Zechstein Gp. – key for pod/inter pod understanding. Both the reservoir distribution and basin modelling (Fig. 4.3)
- Top Rotliegend Gp. – key for deep fault interpretation controlling the salt distribution

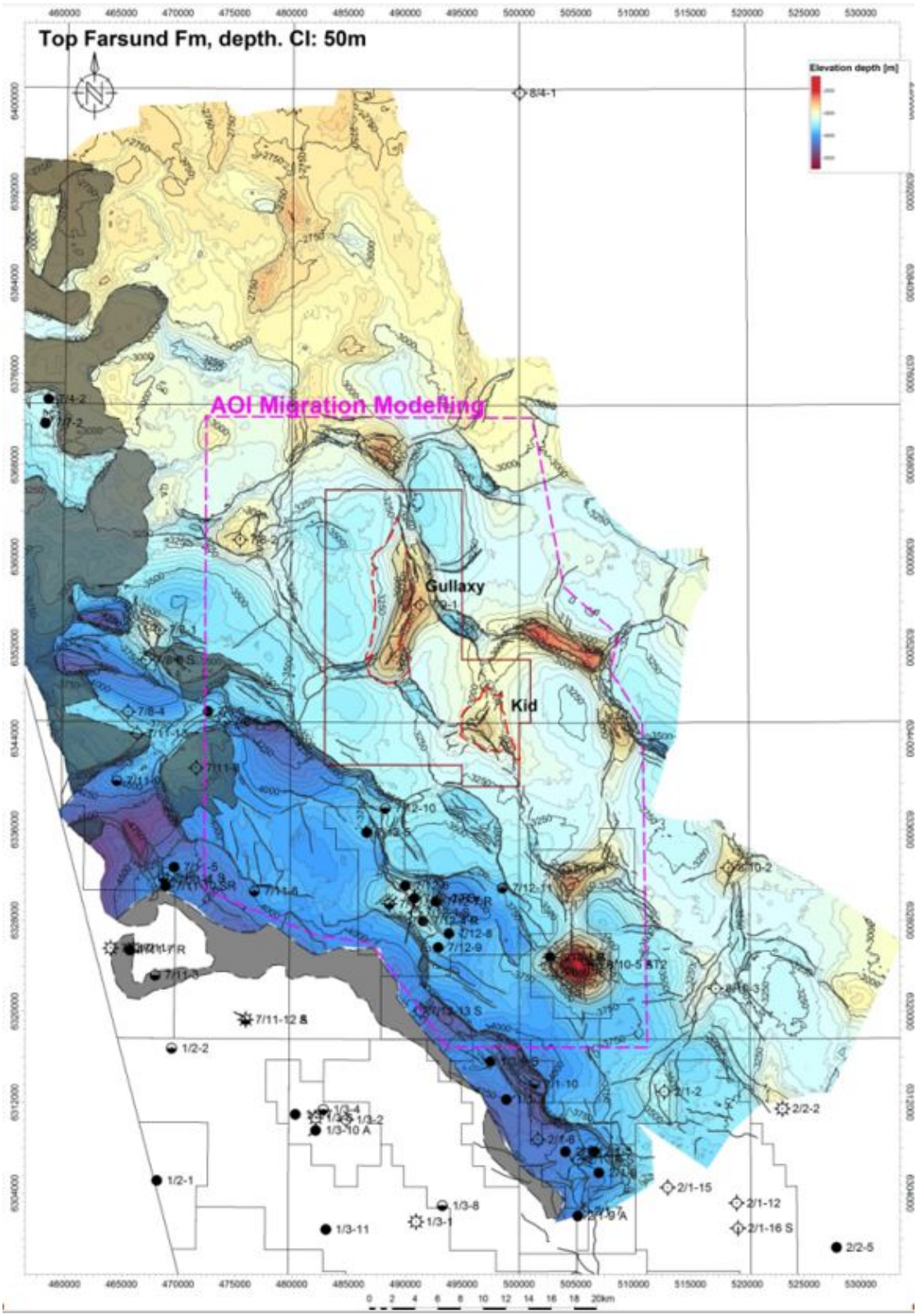

Fig. 4.2 Top Farsund Fm. depth map MC3D-JHUN99-R09. *Top Farsund Fm. depth map used for structural definition of the prospectivity and in volume calcualtion. Also used for basin modelling - maturation and migration modelling.*

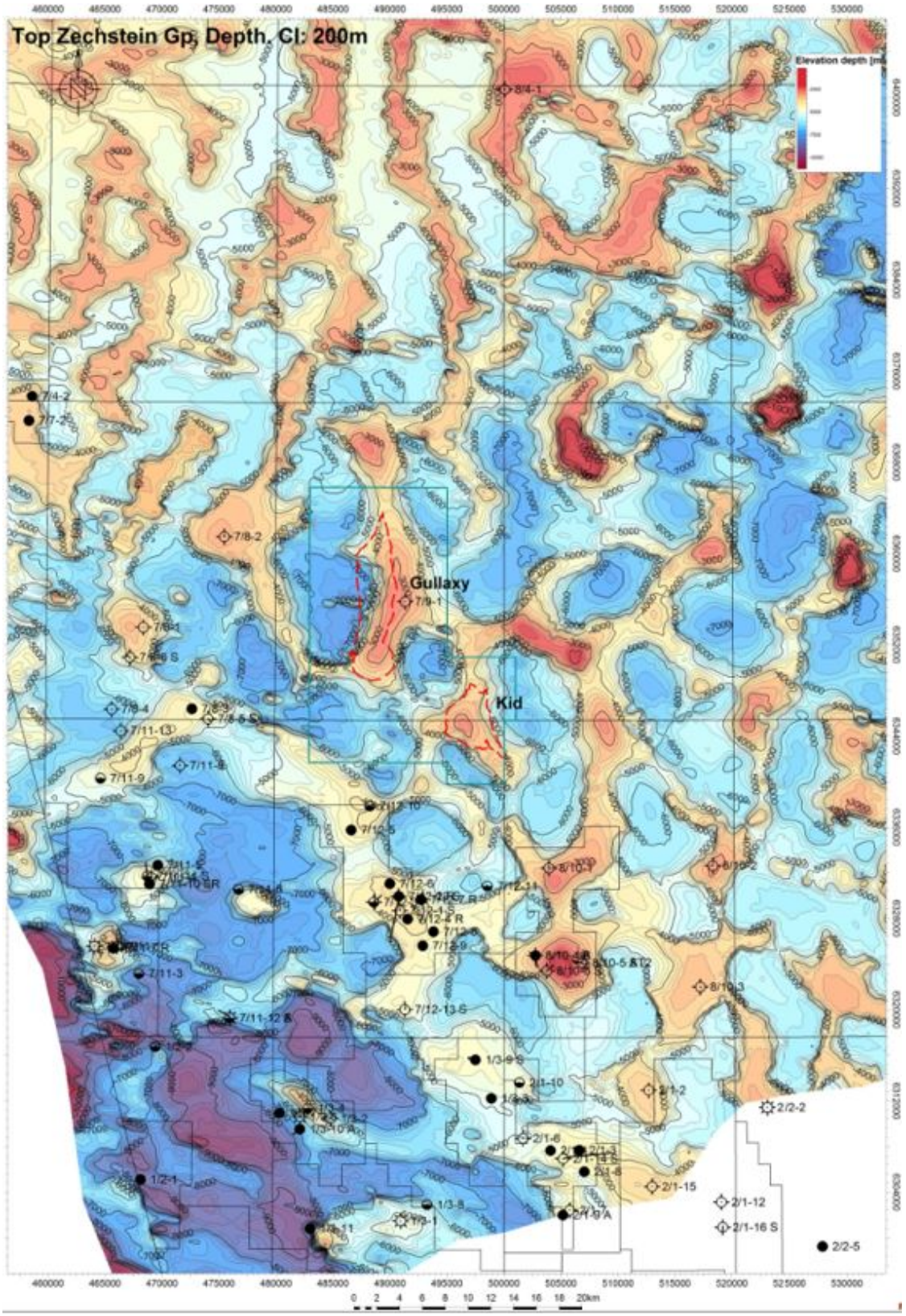

Fig. 4.3 Top Zechstein Gp. depth map. *The top Zechstein Gp. map is essencial to understand the pod-interpod setting in the area.*

PL 811 G&G Studies

Charge into Gullaxy and Kid prospects has always been the key risk. Expulsion from kitchen areas with mature Mandal and Farsund fms source rocks and further migration into the structures require permeable formation along the migration route as well as reservoir formation in the prospects. Also lateral charging across faults or downward migration was seen as possible ways of charging the prospects. For the work program for PL 811 a set of G&G studies were designed to address risk:

RPS Ichron

The updated maps resulted in better input models to improve the definition of the gross depositional environment (GDE) and as such the deposition of the reservoir sands over the greater PL 811 area. These maps showed that it is still difficult to conclude on both the precise deposition and the resulting thickness of the prospective Upper Jurassic sands (mainly of ages J62, J63 and J64) in Gullaxy and Kid, and hence there is still risk associated with the definition of the extent and thickness of the Ula Fm. reservoir sand.

This finding had an impact on both the prospect reservoir and thickness as well as defining the migration routes from the basin to the prospects where this reservoir sands are also the conduits for migration.

IGI Basin Modelling

The basin and migration modelling of hydrocarbons into the Gullaxy and Kid structures utilised the updated maps to define the likelihood of charge and migration into Gullaxy and Kid. The results from this work indicates that charge from local basins in close vicinity to Kid and Gullaxy generated limited volumes due to low maturation of source rocks in these local fetch areas. Furthermore, the modelling found that the Gullaxy prospect most likely is dependant on long migration charge in addition to local sourcing to fill the trap. The modelling also indicates that the leakage into the dry 7/9-1 well occurs in all modelled scenarios for migration. This could be related to the fault separating Gullaxy from the 7/9-1 well is not sealing, or that migration passes through Gullaxy and onwards to the up-dip salt structure where 7/9-1 is located and further on and out of the structure. This means that there is significant risk related to the filling of Gullaxy. The basin modelling study predicts Kid to recieve hydrocarbons from the kitchen areas in the south-west (see Fig. 4.4) in addition to small amounts from local fetch areas. The migration routes from the south-western kitchen areas are long and tortuous (fill/spill), and expected migration loss underway makes charge the main risk for Kid.

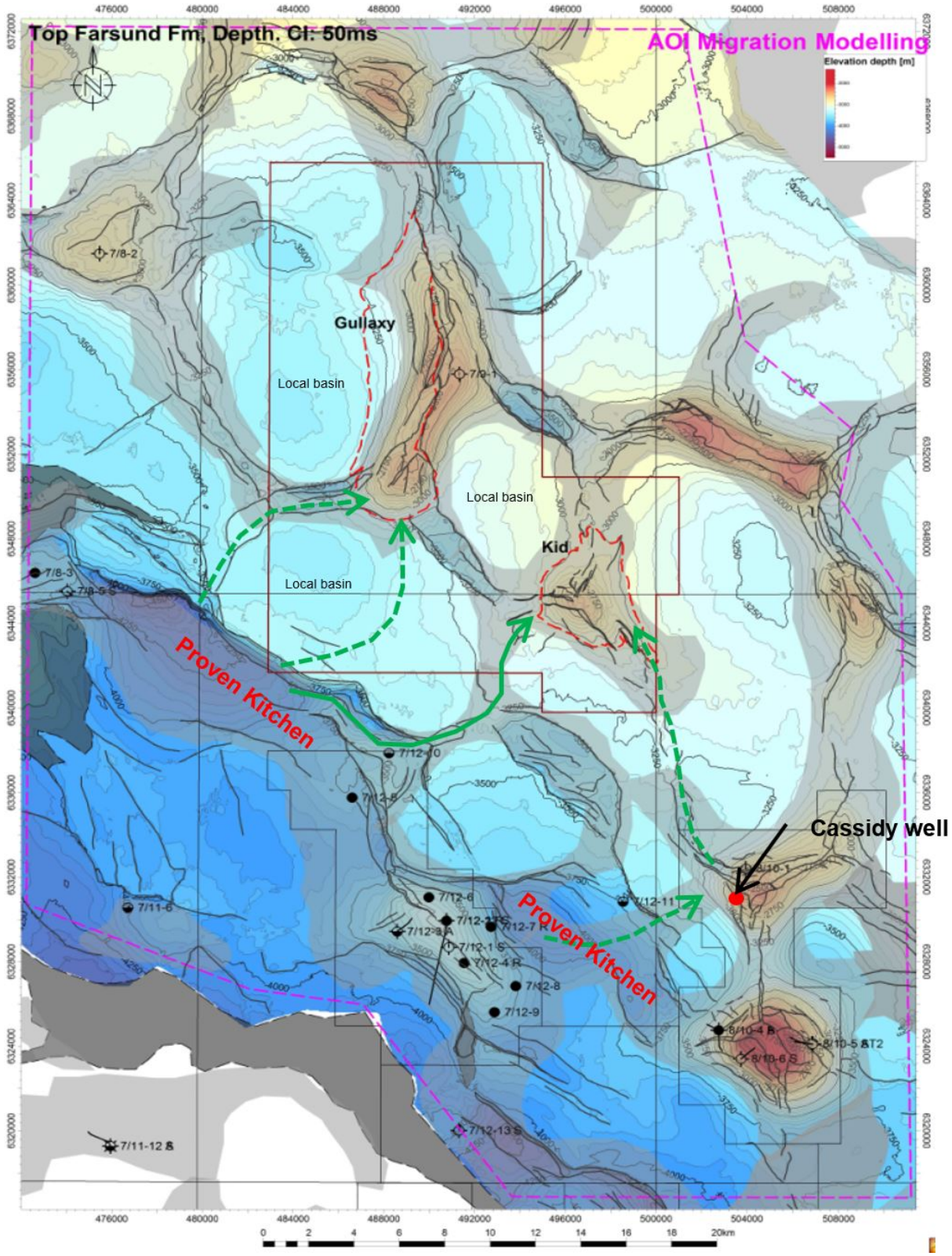

Fig. 4.4 Migration into PL 811 prospects. *Migration from the southern kitchen areas into the PL 811 prospects is possible along interpods. However, long distance migration and difficult routes (fill\spill) makes charge the main risk. Dashed green migration routes on the map are considered less likely than solid routes.*

FIT Fluid Inclusion

The fluid inclusion study was undertaken to perform a stratigraphic reconstruction of bulk volatile chemistry from the analysed fluid inclusions in well 7/9-1. This well is located next to the Gullaxy prospect, and the reported geochemical analyses of the deeper sections in the well could indicate traces of a source rock (see Fig. 3.4). This was seen as a scenario where a deeper source rock could be working, and observations made in the well reported small amounts of hydrocarbons. Minor amounts of gas were also recorded in organic shales of the Tertiary (1676-2207m) and Jurassic (2454-2484m) in the well. The study found that the highest amount of liquids in the well are found in two intervals at 2749-2755m and 2813-2819m in lower parts of the Skagerrak Fm. and in the Zechstein Gp.

Updated Well Information Applied

The PL 811 license was looked upon as follow-up potential after the drilling of the neighbouring salt diapir structure in PL 405, 8/10-7 S (Cassidy Prospect). The 8/10-7 S well was seen as an important data point to get insight into reservoir formation level and thickness as well as other reservoir related parameters useful to be able conclude on prospectivity and de-risk the prospects in PL 811. The license decided to apply to the Ministry of Petroleum and Energy for an extension of the initial period (Drill or Drop) to be able to include the results form the 8/10-7 S well in the final evaluation.

After the results from 8/10-7 S was concluded in 2019, it became clear that the well did not de-risk neither the presence of reservoir nor charge in Kid. The migration route via 8/10-7 S to PL 811 was now seen as even more difficult. 8/10-7 S did not provide any answers to the potential column height in PL 811 prospects. The Ula Fm. reservoir in 8/10-7 S was found poorer and thinner than predicted.

Updated Prospectivity Review in PL 811

Prospectivity evaluation in PL 811 done prior to the results from 8/10-7 S indicated that the Gullaxy and Kid prospects were depending on permeable formation along the migration route from the kitchen areas as well as in the prospects themselves to be hydrocarbon filled. Long distance migration from established kitchen areas as well as local charge from near-by kitchens were considered as potential charge mechanisms. For the long distance migration to fill the prospects in PL 811, there has to be a permeable route (see Fig. 4.4). Updated GDE maps were constructed, but these were not conclusive enough to be used as reservoir sand presence maps. The seismic resolution is not precise enough to conclude on sand presence.

Prior to the 8/10-7 S results, Cassidy and Kid prospects had a rather wide range of reservoir thickness included in the prospect volumetric. The reason for the wide range being that the wells in the vicinity and targeting the same Upper Jurassic Ula Fm. prospective sands have found this formation with a variety in thickness. The thickest Ula Fm. reservoir sands are found in prospects on similar salt diapirs as in 8/10-7 S and Kid.

The Ula Fm. found in the well 8/10-7 S had a negative impact on the prediction of sand thickness and quality in the PL 811 prospects. The lower end of the Ula Fm. thickness range in Kid when including the result in well 8/10-7 S was reduced from 25m to 10m. There is still possible to have thick Ula Fm. sand in Kid with the likes of Oda wells properties and thickness, but the lower range is now a thin Ula Fm. sand of 10m. The thickness of the Ula Fm. in the Oda field is kept as the high end of the range for reservoir thickness (50m) and properties in Kid. This gives an updated reservoir thickness range for Kid of 10m for the low end of the range and 50m for the high end.

Volume calcuations for PL 811 prospects Gullaxy and Kid - history

Volume calculation are made from running REP (Logicom) single distribution area versus depth defining a top surface (Farsund Fm. representing top reservoir Ula Fm.) and reservoir thickness. REP uses Monte-Carlo technique to resolve the volumetrics equation so that the uncertainty in each of the key input parameters can be properly reflected in the uncertainty in the result. Each of the factors which go into the standard volumetrics equation - gross rock volume, net-to-gross (N/G), porosity and water saturation (Sw), formation volume factors (FVF) and recovery factors - are entered as probability distributions.

At the time of award in APA 2015, Gullaxy and Kid were prospects with associated risk related mostly to charge (access to local basins, long distance migration) and reservoir (properties and thickness).

Gullaxy prospect

In the APA 2015 application, **Gullaxy** was the main prospect with the largest volumes - see Table 4.1. After having completed the work program with the updated seismic mapping and the G&G studies described above, the basin modelling study conclusion was that Gullaxy has too high risk on charge for it to remain a valid prospect. Gullaxy was therefore no longer considered to be a drilling candidate due to the high risk on charge - see Table 4.2.

Table 4.1 Gullaxy volumes.

Gullaxy	P90	P50	Mean	P10
Oil in place mmboe	19.5	92.0	143.8	345.0
Rec. resources	8.9	41.5	67.6	163.5

Table 4.2 Gullaxy Risking - historically.

Gullaxy	APA 2015	Post G&G studies
Trap	0.90	0.90
Seal	0.80	0.80
Reservoir	0.70	0.70
Charge	0.55	**0.35**
Total risk (GCOS)	0.28	**0.18**

Kid prospect

Kid was evaluated to have a lower total risk than Gullaxy (Table 4.3) in the APA 2015 application, but the volumes were also lower (see column to the left in Table 4.6). After the results from the drilling of the 8/10-7 S well, updates to the predicted Kid Ula Fm. reservoir thickness distribution was made (see Table 4.4) and updated volumes were calculated (see column to the right in Table 4.6) with the input parameters listed in Table 4.5.

The evolution over time for the risking of the Kid prospect can be seen in Table 4.3 and the explaning comments to this can be found here:

- Seismic re-mapping of Kid clarified that it is very likely that the trap configuration is understood and there are no obvious issues relating to chalk-sand juxtaposition.
- It is almost certain that there are no post-migration or retention challenges related to the seal for Kid.
- The Ula Fm. reservoir still has risk related to both presence and property.
- The risk on charge for Kid has increased after updating with the G&G studies results and having implemented the findings in the dry 8/10-7 S well.

As a result of the thinner Ula Fm. reservoir in the lower end of the reservoir thickness range, the updated volume potential in Kid is lower in the P50 case than previous evaluations (see the column with the P50 values in Table 4.6). This gives in an un-economical Kid prospect where P50 volumes are lower than current minimum economical field size (MEFS).

Table 4.3 Kid Risking - historically.

Kid	APA 2015	Post G&G studies	Post seismic re-mapping and 8/10-7 S results
Trap	0.90	0.90	0.80
Seal	0.80	0.80	0.90
Reservoir	0.80	0.80	0.80
Charge	0.50	0.60	0.40
Total risk (GCOS)	0.35	0.40	0.23

Kid reservoir thickness input is listed in Table 4.4.

Table 4.4 Kid cummulative reservoir thickness probability.

Kid Ula Fm. reservoir thickness (probability)	Thickness (m)
P99	5.2
P90	10.0
P50	22.3
P10	50.0
P1	96.3

REP input parameters used are shown in Table 4.5.

Table 4.5 Kid assessment REP input parameters.

Kid assessment REP input	Unit	Shape	Min	P90	P50	P10	Max	Mode	Mean	P1
N/G	%	Single	3.2	30	50	70	96.8	50	50	86.3
Porosity	%	Normal	8.2* (10)	13	16.3	19	20.7	17	16.2	20.7**
Sw	%	Beta	8.3	18	30.6	45	62.4	29	31.1	62.4
Oil FVF (Bo)	vol/vol	Beta	1.2	1.3	1.4	1.5	1.6	1.4	1.4	1.6**

GOR	m^3/m^3	Normal	1.5* (10)	25	42.5	60	83.5	42.5	42.5	74.3
Oil rec. factor	%	Normal	-3.5* (10)	20	37.5	55	70*	37.5	37.5	69.3

* = clipped

** = max

Table 4.6 Kid volumes pre- and post results from well 8/10-7 S.

Kid pre well 8/10-7 S (APA 2015)	**P90**	**P50**	**Mean**	**P10**
Oil in place mmboe	11.4	46.9	79.8	186.4
Rec. resources	4.9	21.1	37.2	87.7
Kid post well 8/10-7 S	**P90**	**P50**	**Mean**	**P10**
Oil in place mmboe	4.8	29.8	66.1	169.0
Rec. resources	1.6	**10**	24.5	63

5 TECHNICAL EVALUATIONS

The Kid prospect could potentially be developed with a similar development as the Oda Field, which is a subsea tie-back. Oda is the best host candidate. MEFS in the area is based on Oda data and assuming two wells in the exploration and appraisal phase and a simple 2+1 development with a 4 slot template. The MEFS calculations in the area are further based on the economical environment in February 2020.

The economical evaluation for the drilling of an exploration well on Kid is the following:

- Volume well above the P50 is required to ensure commerciality - Kid volumes are too low and fails to deliver volumes above current estimated MEFS.
- Capital Expenditure (Capex) per barrel of oil equivalent (BOE) will be high due to the low volume in the P50 (unless the development concept can be significantly simplified versus current evaluated).

Based on the low volumetric and hence the low economic potential, Kid is in the current environment not seen as a viable project to develop.

6 CONCLUSIONS

The initial period of the work program for PL 811 leading up to the Drill or Drop decision has been fulfilled by purchasing the MC3D-JHUN99-R09 seismic survey and the G&G studies in the license (see 4 Prospect Update). This led to maturing the Gullaxy and Kid prospects to a negative drill decision on 5th February, 2020. Based on the volume range and technical-economic evaluations, Gullaxy and Kid prospects do not meet the economic criteria needed to make a positive drill decision. Kid prospect is not economically viable to pursue any further based on the volume calculations and the minimum economic field size calculated for in the area.