

Partners:



Relinquishment Report PL708

January 2017_CED

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Relinquishment Report PL708

1 Summary and Conclusion

PL708 is located on the Finnmark Platform, approximately 84 km north of the town of Berlevåg Fig. 1 . The license group has through the license period had an extensive work program including acquisition of 3D seismic (ST9802), re-processing of 3D seismic (ST9802LNR13), seismic inversion studies, geological studies, geochemical studies, 2 core work shops, field excursion to the Perm area in the Ural mountains of Russia, seabed surveying and environmental studies. The evaluations of PL708 resulted in a large drillable prospect, the Ørnen North prospect, and a portfolio of smaller prospects spanning the geological time periods ranging from Carboniferous to Early Triassic. During 2014 the license group unanimously agreed to drill a well, the Ørnen well 7130/4-1, which had Late Permian, Late Carboniferous and Early Carboniferous targets.

The well 7130/4-1 was drilled during late 2015 into 2016 and proved gas in the Soldogg Fm, but the main target, the Late Permian spiculites of the Røye Fm, was dry with minor oil shows. The recoverable volumes of the gas discovery in the Soldogg Fm have been documented in the 'Discovery Report well 7130/4-1 (Ørnen)' and are estimated to be in the order of magnitude: 0.6 - 1.1 - 1.5 Gsm³ (Min-Base-High).

Following the drilling of well 7130/4-1 the remaining prospectivity within the license covered by 3D and 2D seismic has been evaluated, concluding that the currently mapped prospects and leads do not have the potential of becoming drillable prospects. As Point Resources has withdrawn from the license during autumn 2016, Lundin proposed that the remaining partners should take over Point Resources 10% equity on a pro-rata basis in order to continue work on maturing the license prospectivity towards the expiry date of the initial period on 21 June 2018. This was supported by Edison and Lundin while Lukoil and Lime did not support this. The License was dissolved 17.04.2017.

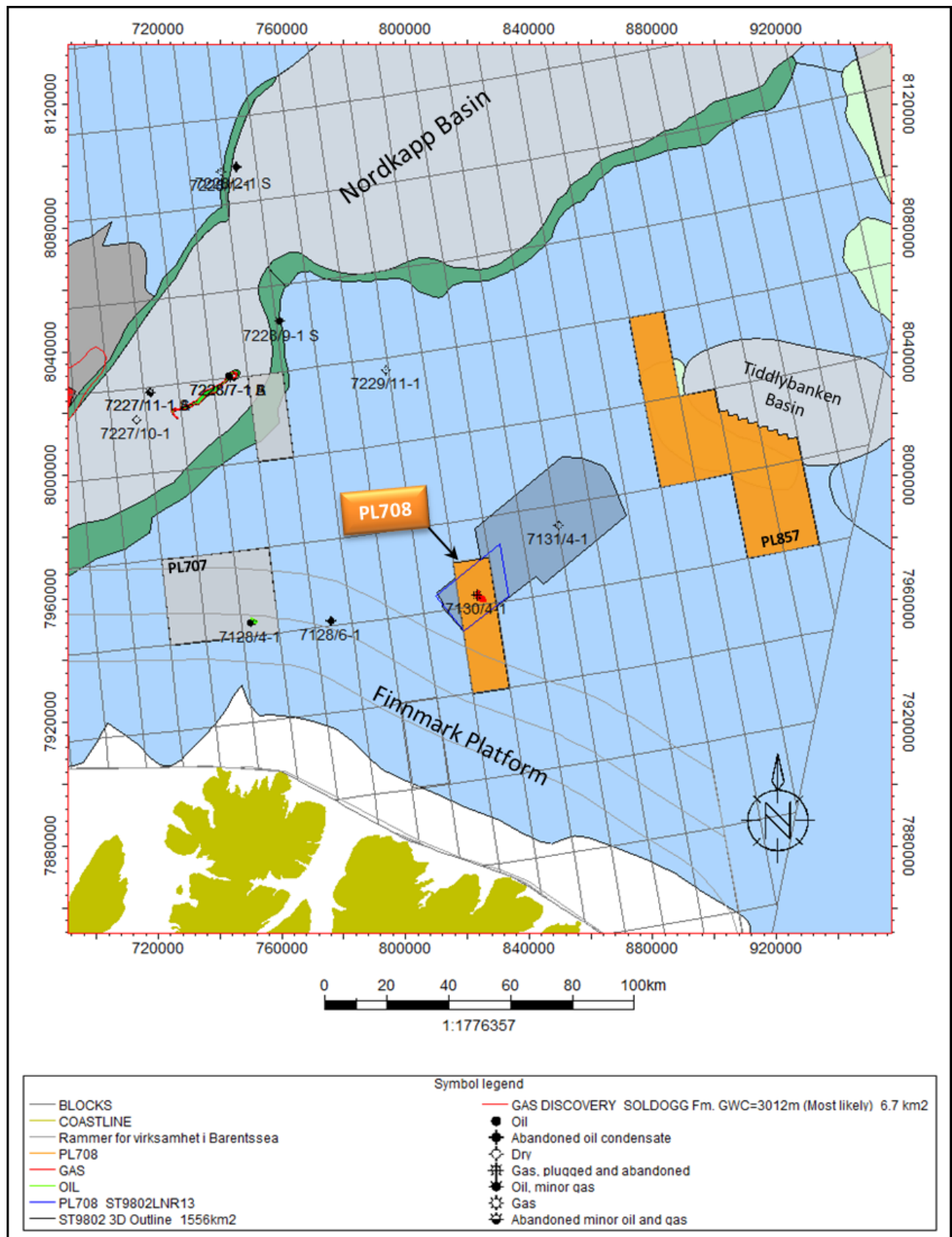


Fig. 1 Map of PL708, well 7130/4-1 and the Ørnen North spiculite prospect

2 License award and Expiry

The PL708 license was awarded in the 22 Round being granted on 21th of June 2013 and covers parts of block 7130/4 and all of block 7130/7. The original application map over prospects and leads as applied for by Lundin and Lukoil is shown in Fig. 2. The original license group comprised Lundin Norway AS (operator, 40 %), Edison International Norway Branch (now Edison Norge AS) (20 %), LUKOIL Overseas North Shelf AS (20 %) and North Energy AS (20 %). The license area was 506.709 km². The license group had a deadline for decision to drill (DoD) on 21/6 2015. The initial period expires on 21/6-2018. A positive drill decision was made unanimously by the license (on 23 September 2014) to drill an exploration well 7130/4-1 (Ørnen). The Ørnen well 7130/4-1 was drilled in the period 22/11-2015 to 08/01-2016.

The current license group is Lundin Norway AS (operator, 40 %), Edison Norge AS (20 %), LUKOIL Overseas North Shelf AS (20 %), Lime Petroleum Norway AS (10%) and Point Resources AS (10%). Point Resources AS posted a letter on 30 August 2016 to the PL708 Management Committee stating that they would withdraw from PL708 according to article 24 in the Joint Operating Agreement for PL708. As a consequence of not being able to redistribute the 10% equity from Point Resources amongst the remaining partnership the PL708 license has been dissolved 17 April 2017.

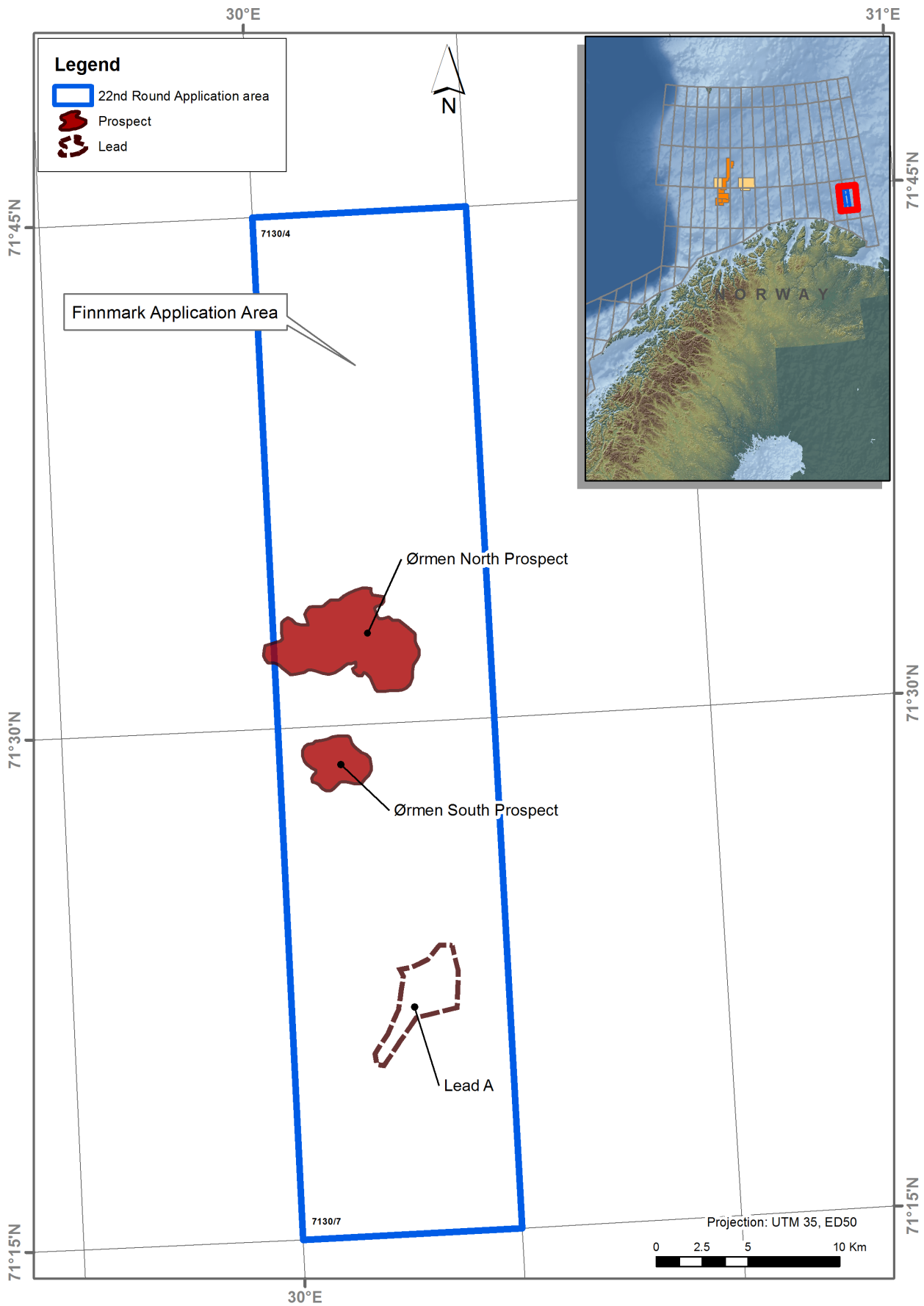


Fig. 2 Prospects and Leads and application area for the 22 Round
 Two prospects and 1 Lead were described in the 22 Round application, all defined at Top Permian (Røye Formation) level.

3 Completed work programme and special studies

The PL708 work commitment was within 21 June 2018 to:

1. Acquire 3D seismic within the license area already covered by previous 3D coverage (ST9802 3D). Deadline 21 June 2015.
2. Make a Drill or Drop decision to drill an exploration well. Deadline 21 June 2015.
3. Drill an exploration well. Deadline 21 June 2017.

The 3D seismic survey ST9802 covering parts of the PL708 license was acquired from Statoil and parts of this survey was reprocessed by DownUnder GeoSolutions Ltd (DUG) and completed during early 2014. The resulting reprocessing is named ST9802LNR13, see Fig. 3. DUG also performed a seismic inversion study for the license which was the main input to the drill decision and for the later location of well 7130/4-1. A positive drill decision was made unanimously by the license on 23 September 2014 to drill an exploration well 7130/4-1 (Ørnen) on the Ørnen North prospect. The Ørnen well 7130/4-1 was drilled in the period 22/11-2015 to 08/01-2016. The work commitment on the PL708 license is thereby fulfilled.

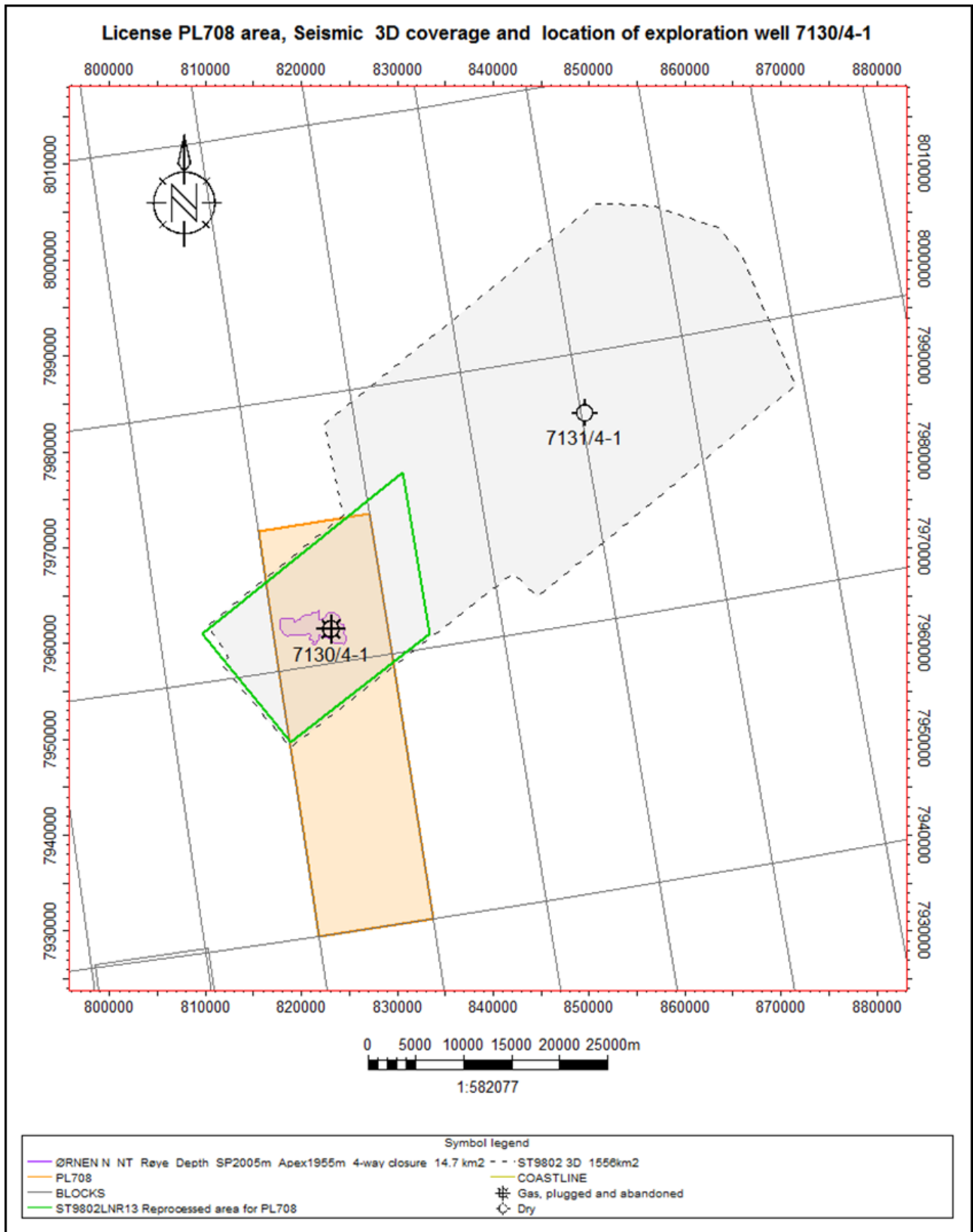


Fig. 3 PL708 license area, Seismic 3D coverage and well location 7130/4-1

4 Pre-drill prospectivity evaluation

Subregional and local seismic interpretation, geophysical, geological and geochemical analysis and an evaluation of license prospectivity within the 3D area was carried out prior to the drilling decision for well 7130/4-1. Fig. 4 shows a regional seismic line thru well 7130/4-1 (Ørnen) and the 3 closest correlation wells. The following evaluations have been performed:

- Seismic reprocessing of selected parts of 3D ST9802. Result was ST9802LNR13 processed by DUG
- Seismic inversion based on 3D ST9802LNR13 resulting in a porosity cube for the Late Permian Røye Formation with the aim to identify areas of high porosity in the Late Permian spiculites on the Ørnen North and Ørnen South prospects
- Seismic interpretation and mapping of all relevant horizons within the license 3D area and corresponding subregional mapping and seismic ties to nearby wells (primarily wells 7128/4-1, 7128/6-1, 7131/4-1)
- Site Survey mapping (LN15300) prior to locating well 7130/4-1
- Depth conversion of all relevant seismic time maps for prospect evaluations and for well prognosis for well 7130/4-1
- Prospect and Leads outlines, primarily mappable 4-way closures from Top Permian to Lower Carboniferous levels prior to deciding on where to locate the first exploration well on the license, Fig. 5
- Technical Economic evaluations of the Ørnen North prospect to prove that drilling the well 7130/4-1 was commercially interesting.
- Core Work Shop January 2014 in Stavanger with the partners to present the results of core studies on the relevant wells (primarily wells 7128/4-1, 7128/6-1) for the potential Permo-Carboniferous reservoirs
- Reservoir Microfacies Study performed by Cambridge Carbonates Ltd 2015 on wells 7128/4-1, 7128/6-1 and 7229/11-1
- License excursion May 2014 to the area around the Russian city of Perm in the Ural Mountains to study the Permo-Carboniferous reservoir analogs to the expected reservoirs in the Ørnen well.
- Petrophysical evaluations of wells 7128/4-1, 7128/6-1 and 7229/11-1 to estimate expected reservoir properties in the Ørnen prospect
- Geoterric/FFA evaluations on ST9802 3D to identify morphologies relevant for discussing the well location of well 7130/4-1 on the Ørnen North prospect
- Deterministic volumetric calculations in Petrel and Monte Carlo simulated volumetric calculations in @RISK to assess the in place and recoverable resource estimations for the Ørnen North prospect
- Environmental Baseline Study May 2014 covering the 2 prospects Ørnen North and Ørnen South.

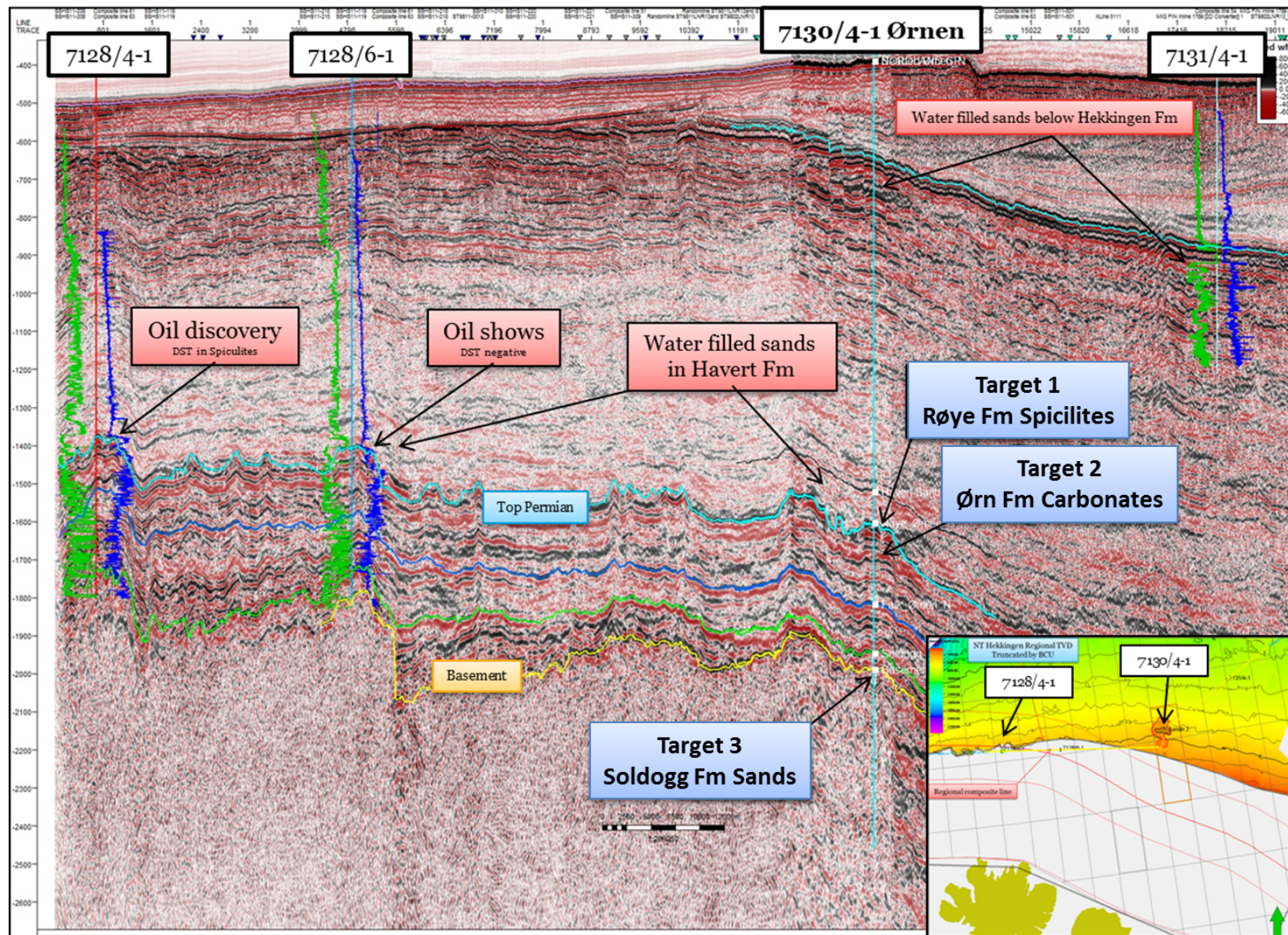


Fig. 4 Regional seismic line thru well 7130/4-1 (Ørnen) and the 3 closest correlation wells

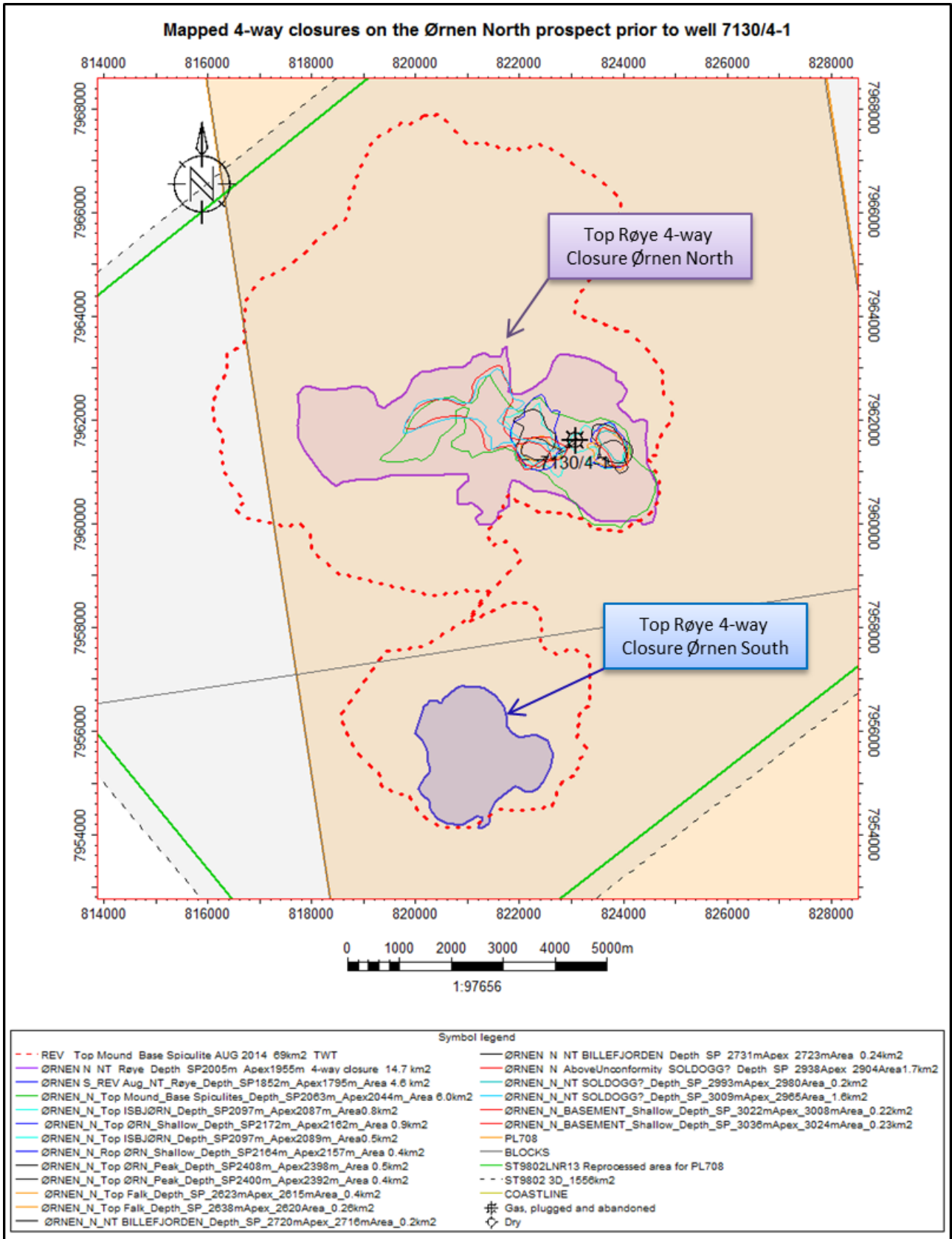


Fig. 5 Mapped 4-way closures all levels for Ørnen North prospect prior to drilling 7130/4-1
Also Top Røye 4-way closure outline for Ørnen South

The license discussed whether to drill Ørnen North or Ørnen South first, but decided on drilling the Ørnen North prospect first mainly due to better migration possibilities, higher expected resources volumes and higher probability for oil versus gas. After deciding to drill on the Ørnen North prospect the location criteria and objectives were discussed. It was decided that the well was to be a vertical exploration well designed to test the hydrocarbon potential of the Late Permian age Røye Formation spiculites (primary target) in an optimal porosity location based on the DUG porosity cube, and test the Ørn Formation carbonates (secondary target). In a discovery case, the well had an option to target the deeper sandstones of the Carboniferous Soldogg Formation (secondary target). The plan for coring was to core the transition from the Havert Fm silty/shaly cap rock into the porous spiculites of the primary target Røye Fm. The location of the well 7130/4-1 on the Ørnen North prospect was the crossing point between Inline 1718 and Xline 3224 in the ST9802LNR13 3D seismic, see Fig. 6 , Fig. 7, Fig. 8

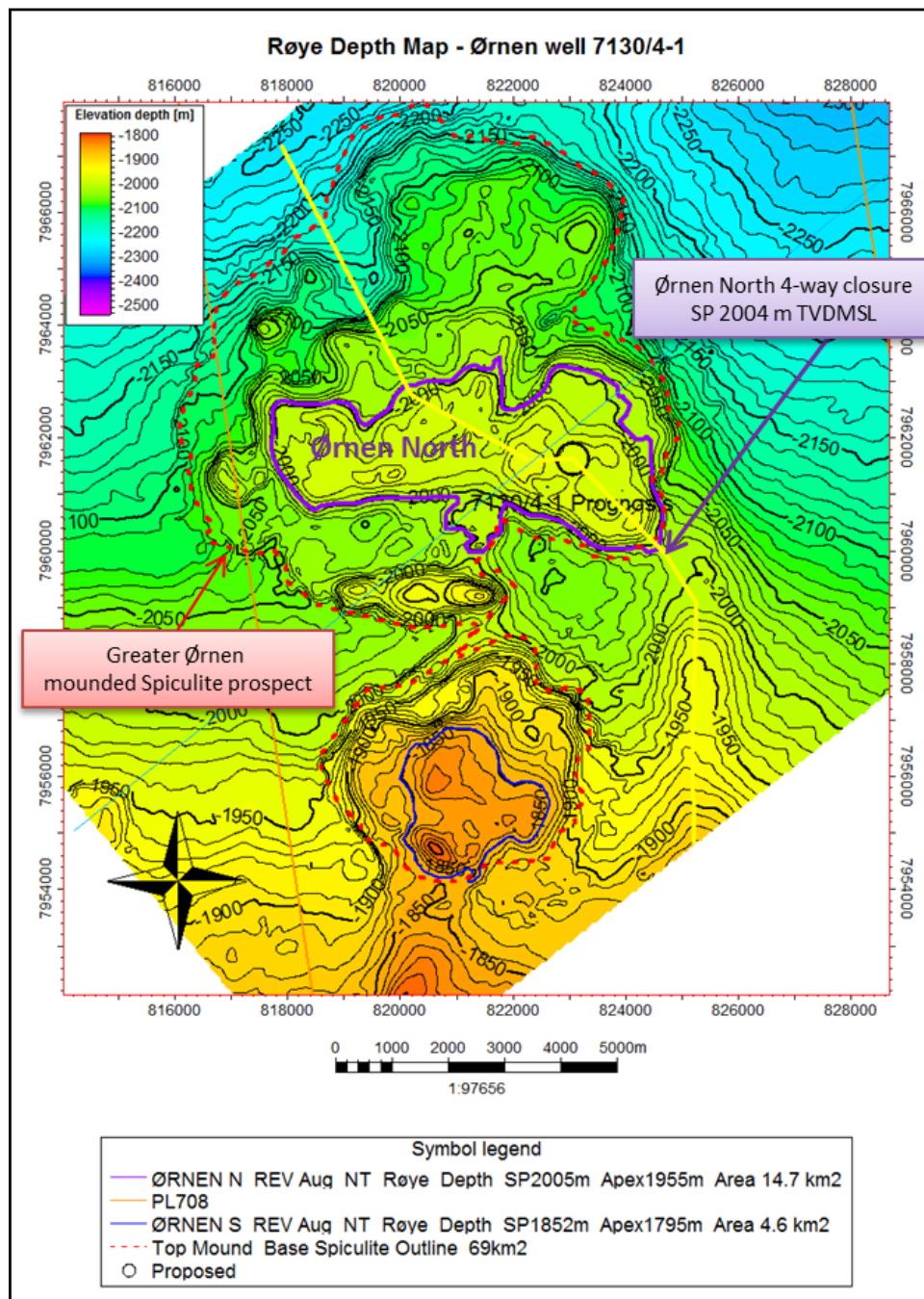


Fig. 6 Top Røye Fm Depth Map (Target 1) Ørnen North prospect and well 7130/4-1

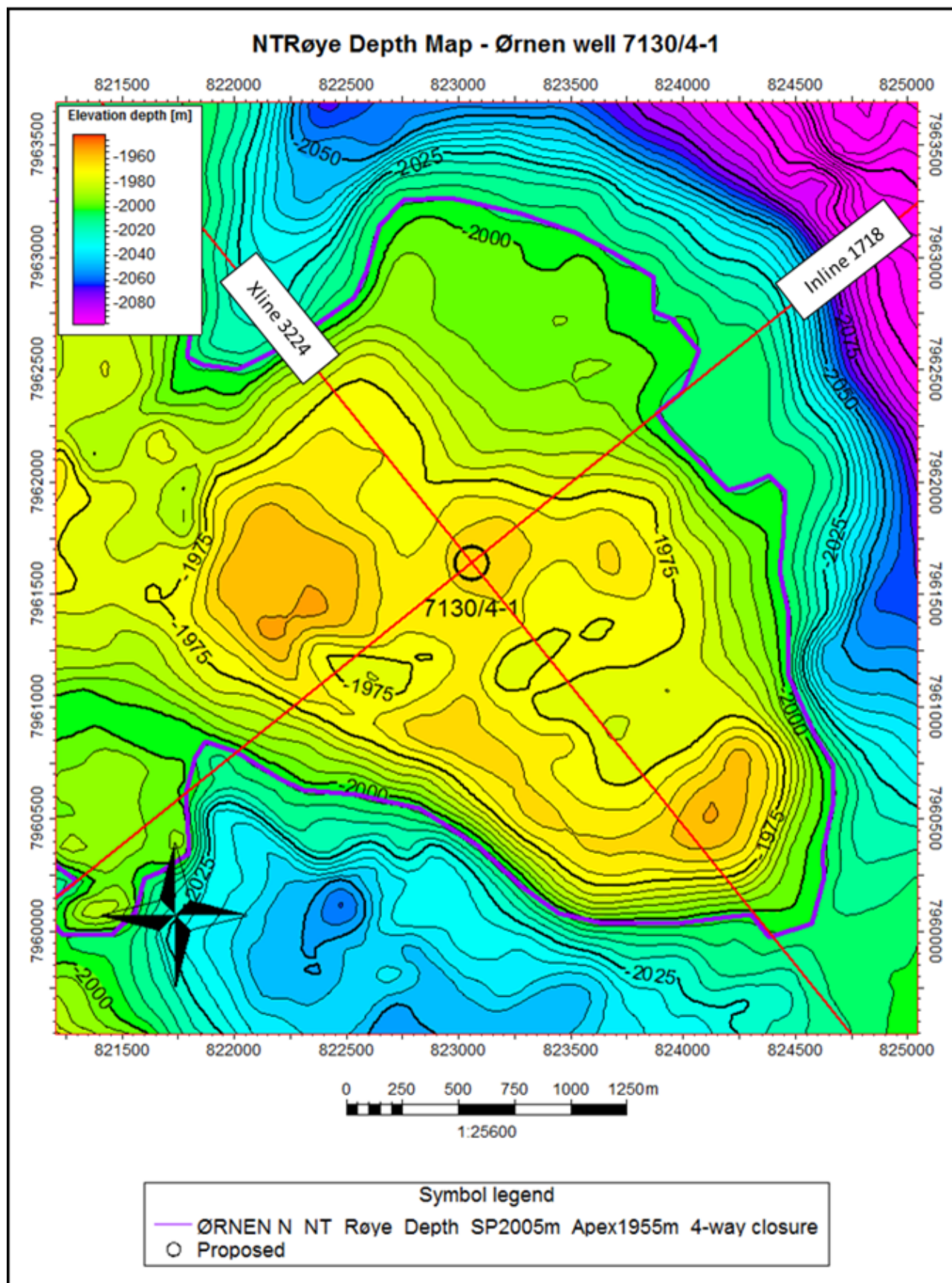


Fig. 7 NT Røye Depth map for Ørnen North prospect and well location 7130/4-1

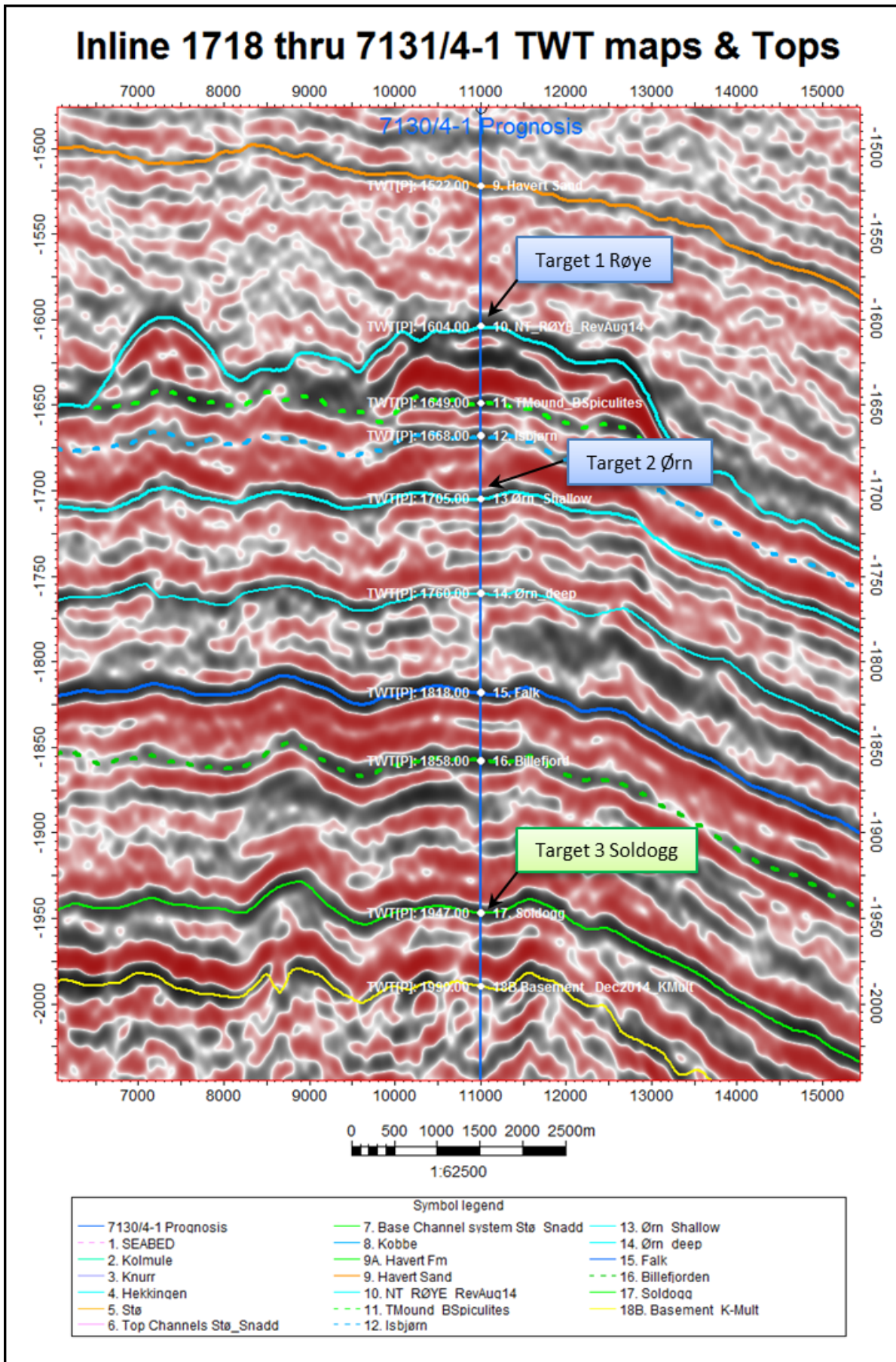


Fig. 8 Inline 1718 thru well 7130/4-1 and the prognosed 3 target zones

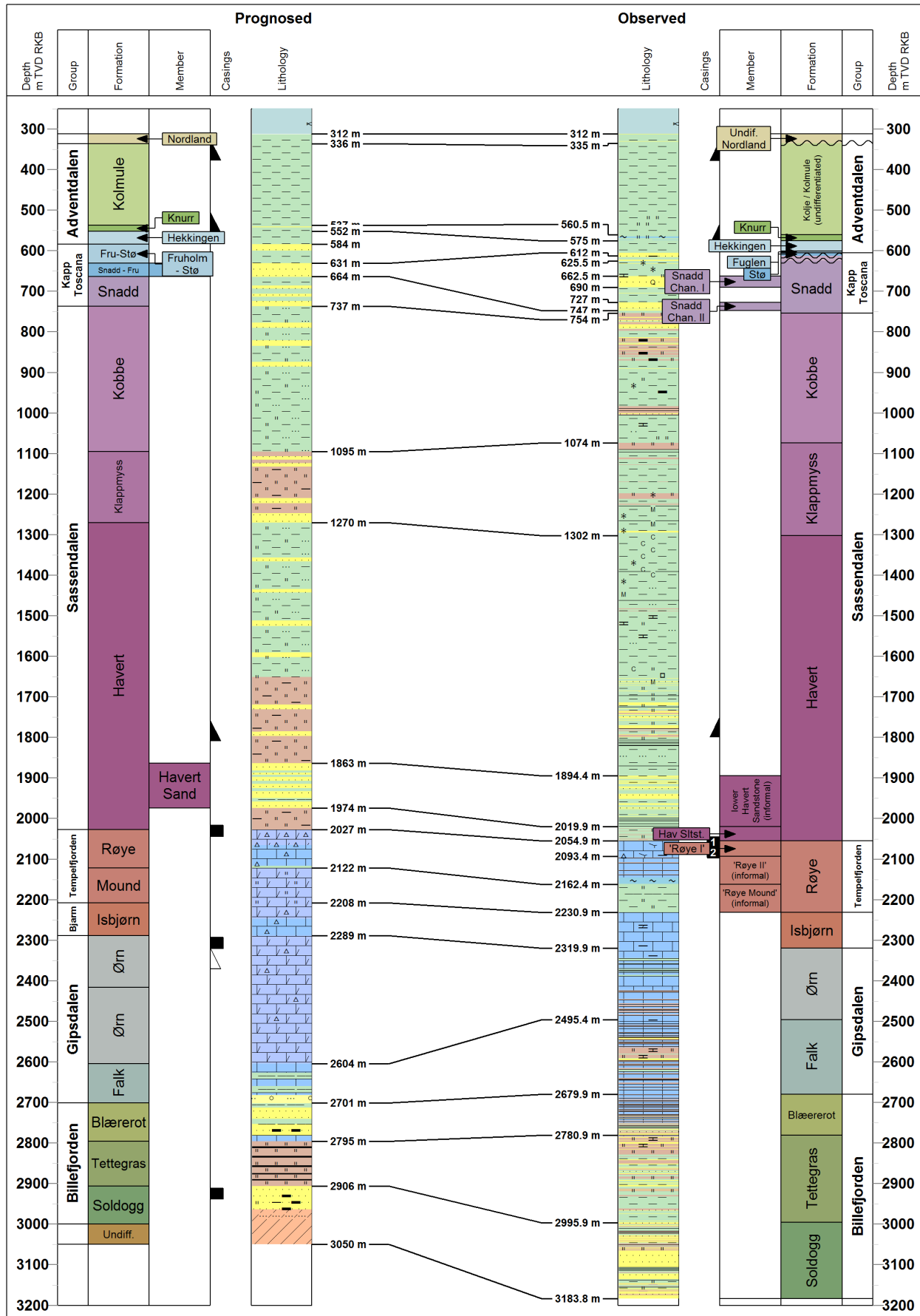
5 Well results

Well 7130/4-1 (Ørnen) was planned and drilled as a vertical exploration well at the following location:

Table 1 Well 7130/4-1 coordinates and seismic location

X: 823 063.11 m E	Y: 7 961 637.51 m N	UTM Zone 34N
Lat: 71° 31' 58.72" N	Long: 30° 10' 07.78" E	ED-50
Line intersection (ST9802LNR13):	Crossline 3224	Inline 1717

The well was drilled to a total depth (driller) of 3184 m MD RKB (3183.8 m TVD RKB) (3159.8m TVD MSL). Well TD was set in the Lower Carboniferous Soldogg Formation in the Billefjorden Group. The well was drilled with the semi-submersible rig Transocean Artic with an air gap of 24 m and a water depth of 288m MSL, Fig. 9 and Fig. 10. The well encountered the following hydrocarbon bearing zones: The well proved the presence of reservoir quality sands in the Lower Carboniferous Soldogg Formation with gas and is classified as a small gas discovery, Fig. 11. The main objective of the well was to test the hydrocarbon potential of the Late Permian spikulitic and carbonate section of the Røye Formation in the Tempelfjorden Group. Oil shows were observed in form of bleeding oil from the core in the uppermost 1 m of the Røye Fm spiculites, but MDT sampling immediately below the bleeding oil produced water as the movable fluid and a water gradient was further documented by MDT pressures.



Well: 7130/4-1

Gravitas template v2.05 [20110802] - AJC Document date 07.06.2016

Fig. 9 Prognosis well 7130/4-1 vs actual tops encountered

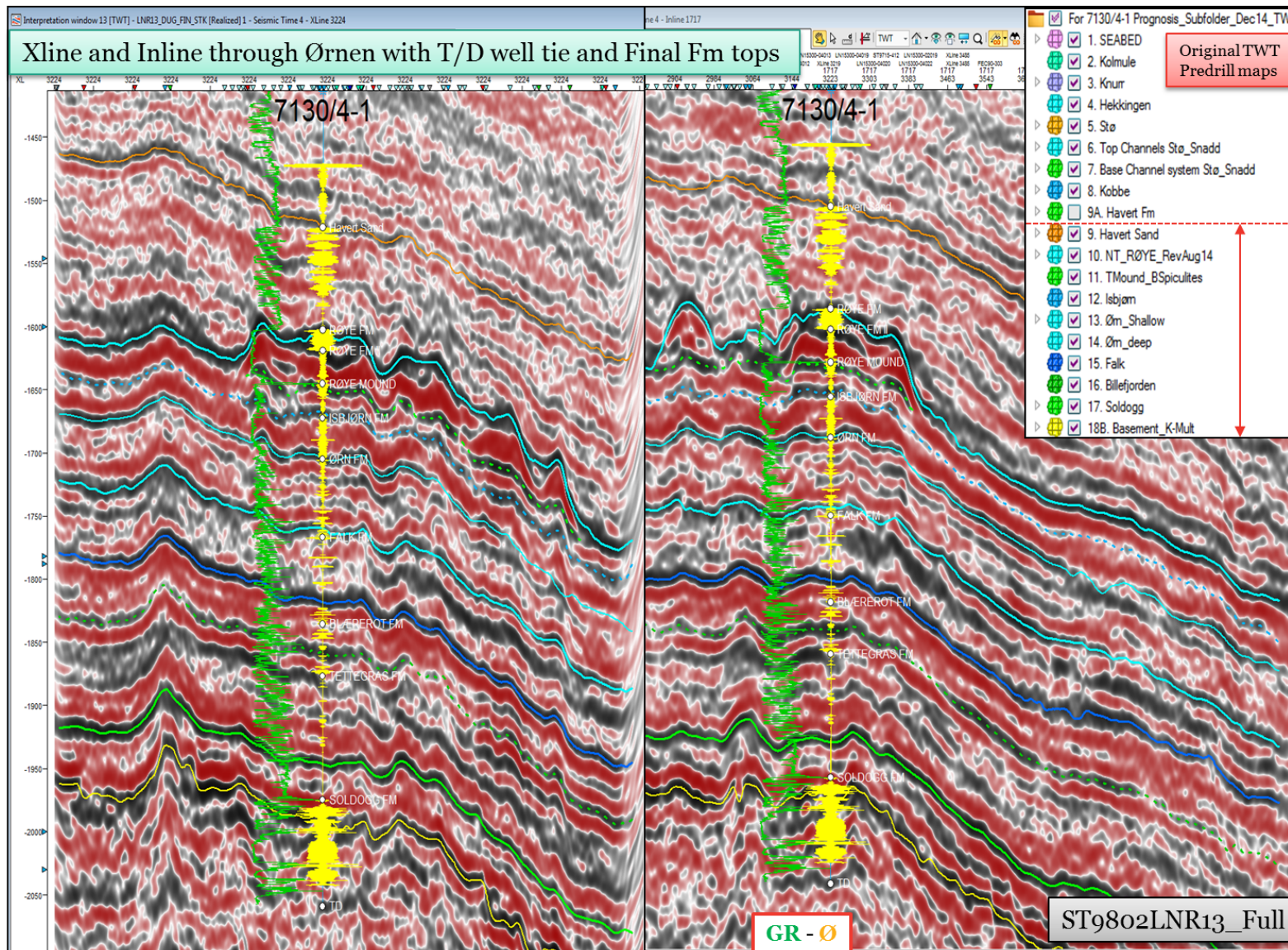


Fig. 10 Prognosis versus results on seismic horizons and well tops
 The prognosed basement horizon showed to be near Top Soldogg Fm, while Basement was not encountered in the well

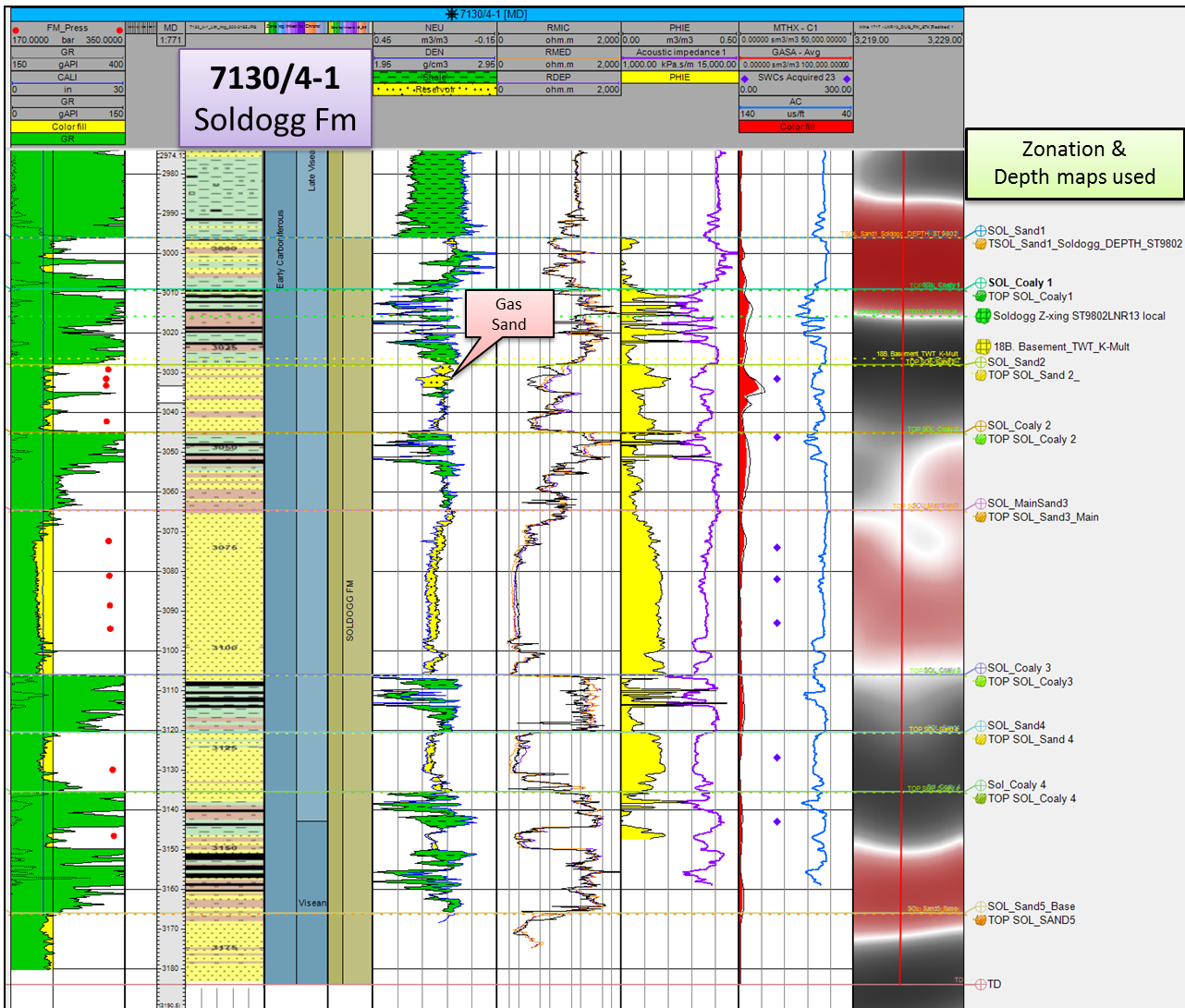


Fig. 11 Well logs and stratigraphy for the Soldogg Fm in well 7130/4-1

Secondary objectives were the limestones and dolomites of the Ørnen Formation in the Gipsdalen Group of Late Carboniferous - Early Permian age. No movable hydrocarbons were documented in a generally tight formation, but thin zones with gas increases were observed during drilling connected to minor porous zones.

The Tertiary target was to test the Mid-Late Carboniferous sandstones in the Soldogg Formation of the Billefjorden Group. A 5 m gas bearing sand was proven by MDT sampling and wireline logs in the upper parts of the Soldogg Formation. A well defined water gradient was documented below the gas bearing sand most likely in communication with the gas sands above. The reservoir quality of the Soldogg Formation sands are good given the assumed maximum burial depth. A volumetric assessment of the 5m gas discovery in the upper parts of the Soldogg Fm is not straight forward as no 4-way closure has been mapped at this level. A fault dependant down-thrown trap is the most likely based on the seismic observations. A deterministic 3 case approach was chosen to evaluate the possible range in the in-place resource potential, Fig. 12 and Fig. 13 . The recoverable resource potential has been calculated using a 70 % recovery factor for the in-place gas in the reservoir sands. This is primarily supported by the proven good mobility information collected by the MDT pressure tests and fluid sampling.

Base Case: 1613 x106 Sm³ Gas in Place. Recoverable Resources : 1129 x106 Sm³

Min. Case: 515 x106 Sm³ Gas in Place. Recoverable Resources : 360 x106 Sm³

Max. Case: 2192 x106 Sm³ Gas in Place. Recoverable Resources : 1534 x106 Sm³

The Soldogg Formation reservoir section in the well is confidently correlated on logs, seismic and datings to equivalent intervals in the nearby wells 7128/4-1 and 7128/6-1 west of the Ørnen prospect. The Ørnen well 7130/4-1 together with the 2 neighbouring wells penetrating the Soldogg Formation has firmed up the potential of this reservoir as an important play in the Finnmark Platform area.

As for the main target in the Ørnen well, the spiculites of the Røye Formation, the results were disappointing. The reservoir quality in the spiculites were poorer than expected based on situation seen in the nearby 2 wells. This may be for 2 reasons; depositional processes and paleo-water depth resulting in a less permeable reservoir. The other reason may be a diagenetic depth trend as the spiculite reservoir is located approximately 500 m deeper than in the 2 wells further to the west. The second disappointment was the poor indications of oil charge to the spiculites. This may again be due to the general poor reservoir quality making it difficult for the oil to enter the pore system or alternatively the migration pathway has been a problem either laterally along the Permian layers from the north or vertically from deeper situated potential source rocks.

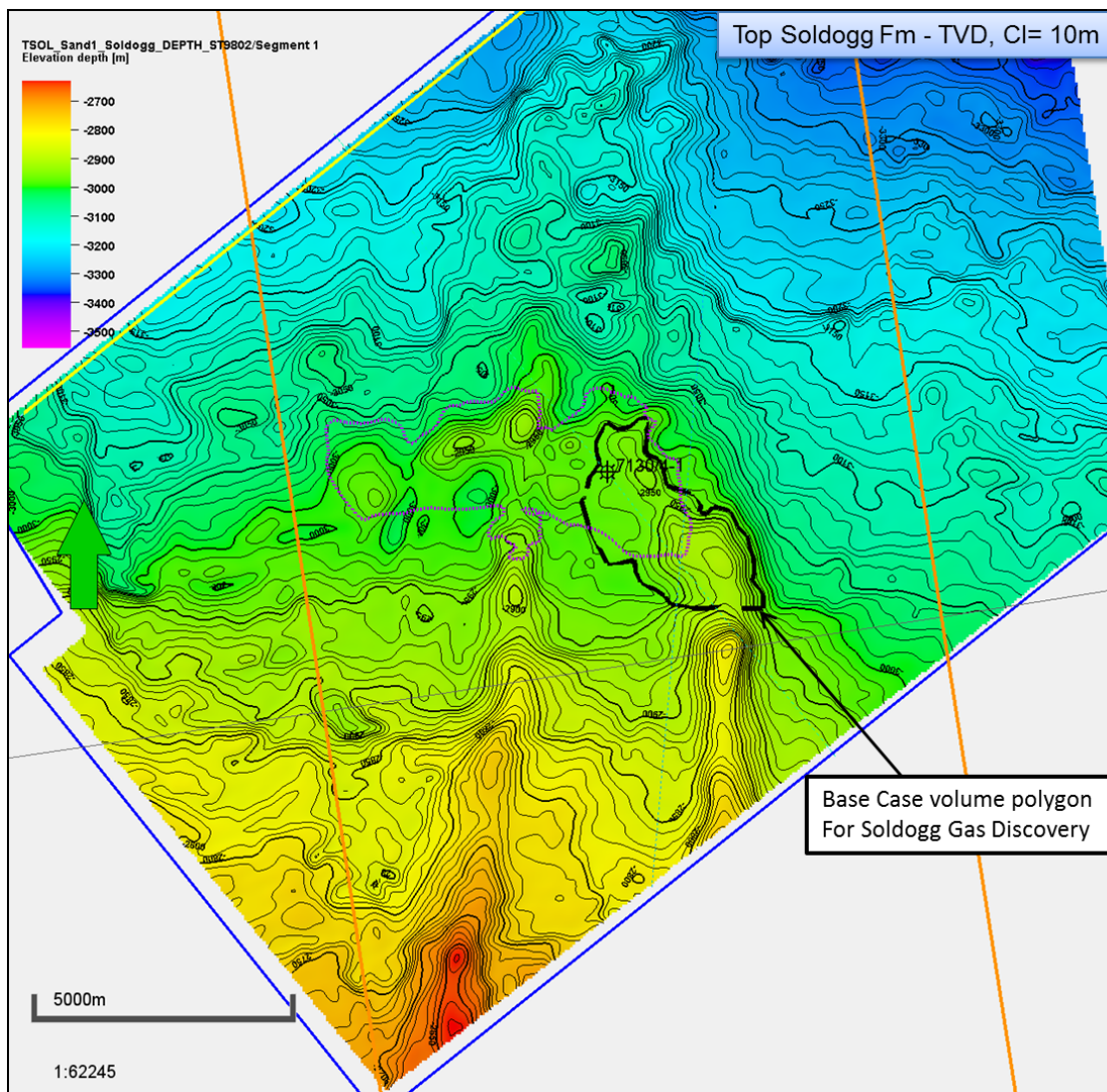


Fig. 12 Top Soldogg Fm Depth map after well results

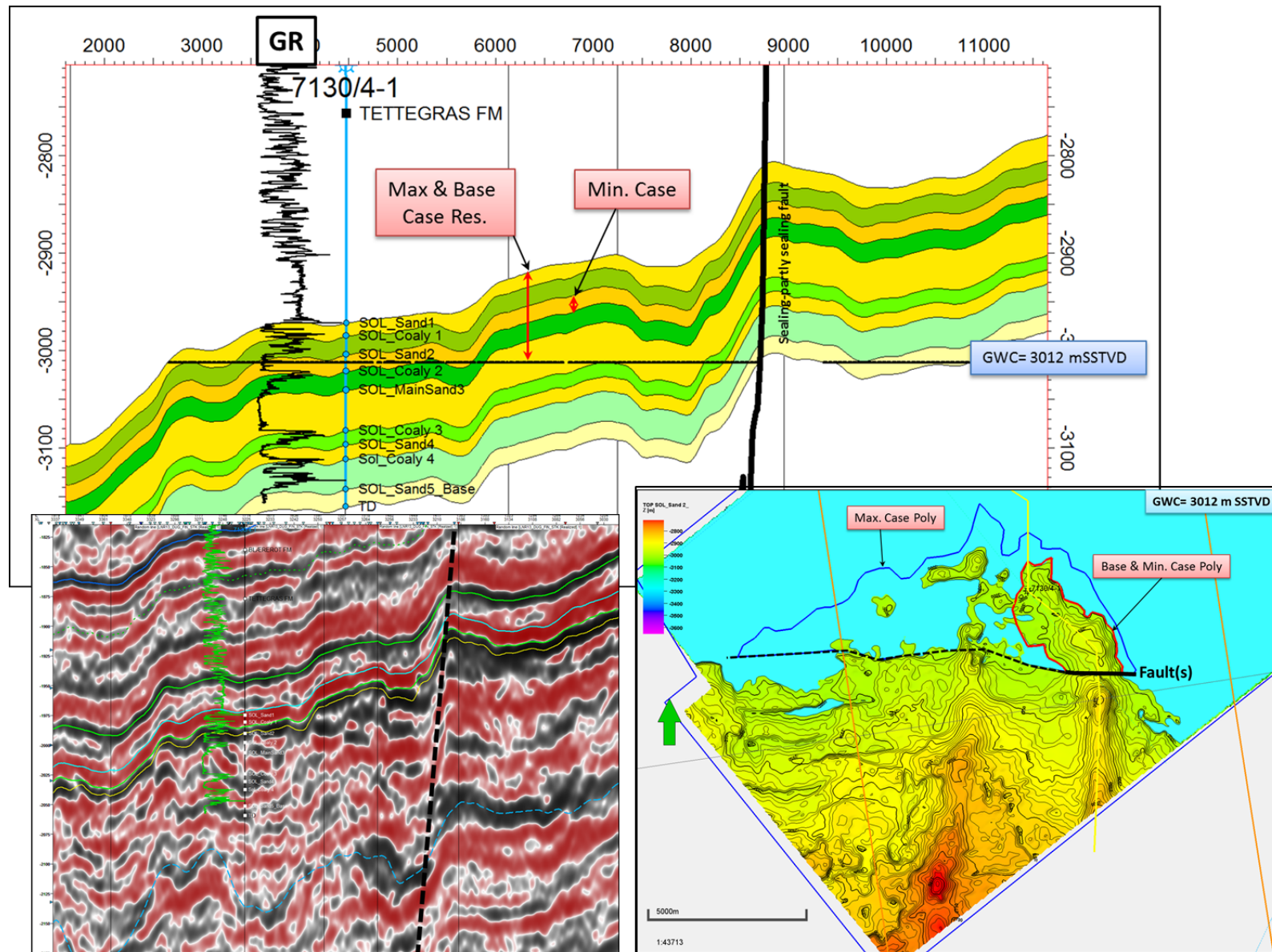


Fig. 13 Cases for the volumetric calculations for the Soldogg Fm gas discovery

6 Remaining prospectivity

The exploration strategy for the license after the Ørnen well 7130/4-1 has been to review the prospectivity of the southern parts of the license covered by 2D. The exploration effort on the Røye Formation Spiculite Play is down-focused and the Ørnen South spiculite prospect is currently not considered to be a drilling candidate, Fig. 14 . Outside the 3D area the Røye Formation may still be of interest along the 2 NE-SW trending transpressional ridges, Fig. 15 and Fig. 16 . A summary map showing the mapped gas discovery in Soldogg Formation, the mapped 4-way closures in the Ørnen area on 3D, the Lower Havert Formation Lead and the numerous small Røye Fm and Soldogg Fm Leads further south in PL708 is shown in Fig. 17

The Lower Havert Formation sand package and the Soldogg Formation sands has been the targets for further mapping with the aim to find new drilling targets. The main problem is the structural setting for all horizons within the PL708 area. The area is situated on the Kola-Finnmark monocline and generally dipping in a SSW direction with few indications of cross cutting faults that could trap migrating hydrocarbons from continuing updip and leaking to seabed, Fig. 18. Since the Soldogg Formation gas discovery in 7130/4-1 appears to be trapped by an E-W trending fault apparent only on 3D, it cannot be ruled out that new 3D coverage of the southern parts of PL708 could reveal faults that could set up similar fault dependant traps, Fig. 19.

The observation of a potential Lower Havert Formation Lead south in the license is promising and could be a new Play on the Finnmark platform. As seen in Fig. 20 a potential well penetrating the Lower Havert Formation Lead would also be able to test several of the deeper reservoir candidates creating a potential multi-target exploration well. The 4-way component of this lead is, however, small and would need 3D coverage to see if E-W faulting or stratigraphic trapping could increase the size of this Lead.

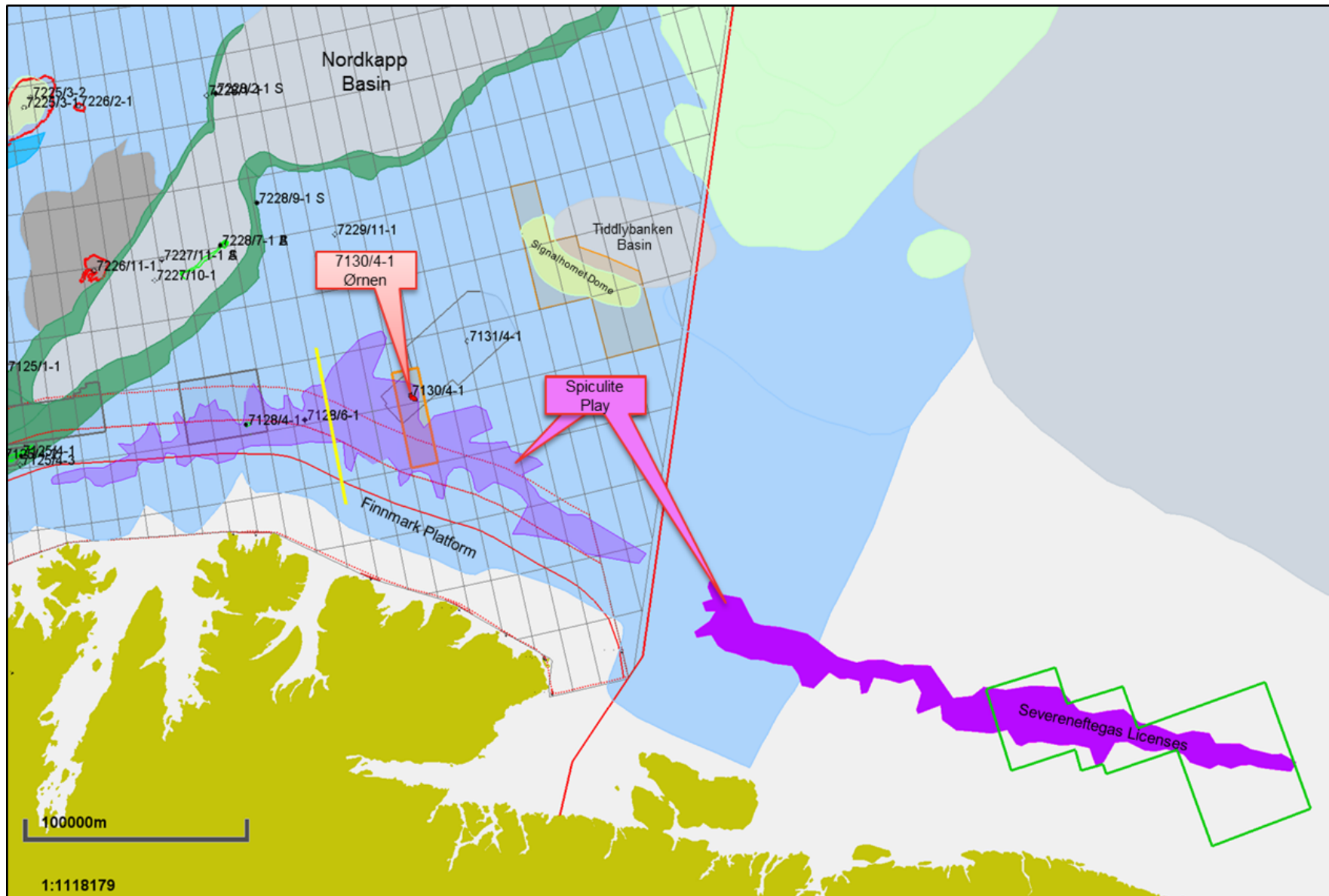


Fig. 14 The Spiculite Play in the Barents Sea

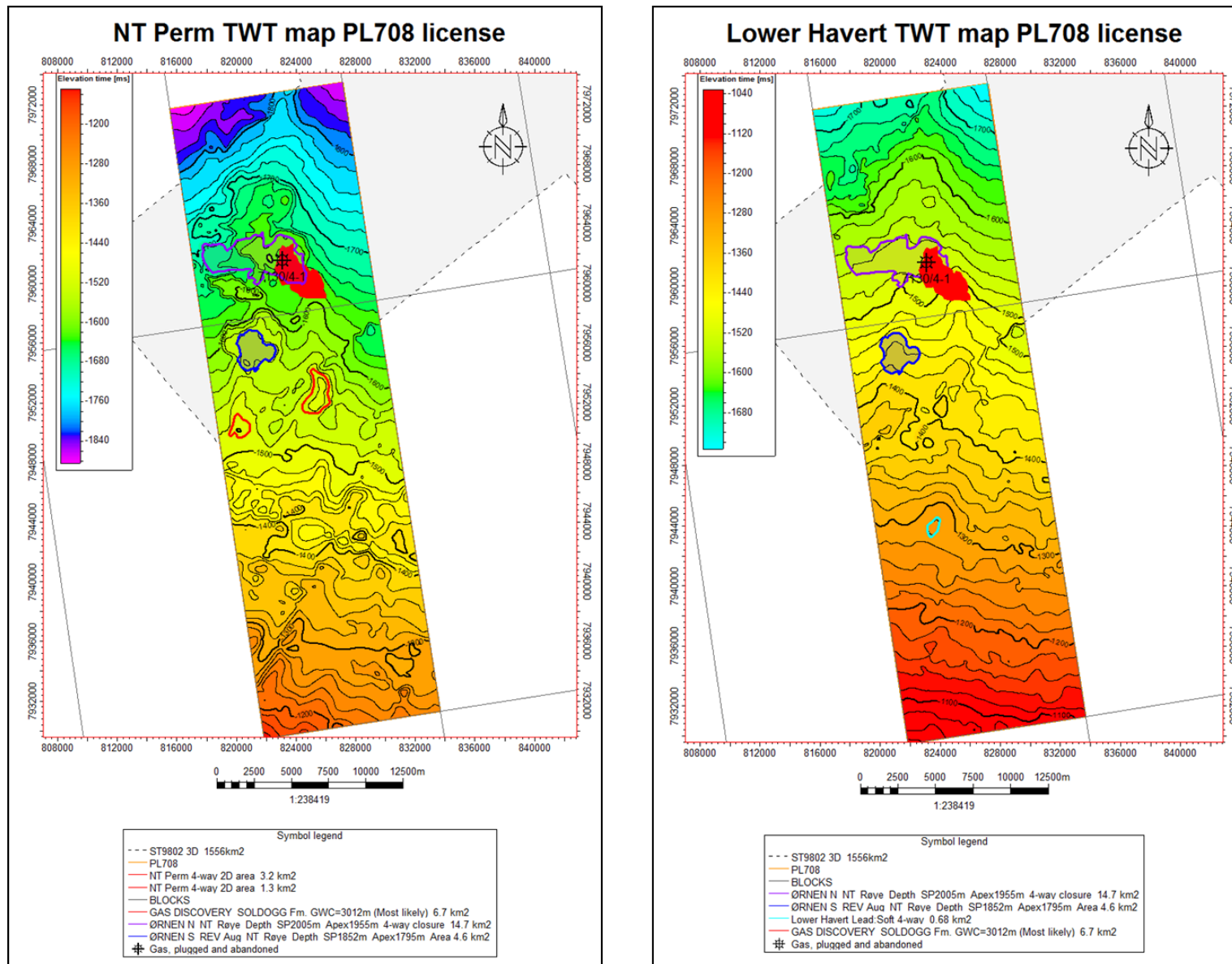


Fig. 15 Near Top Permian and Top Lower Havert TWT maps within PL708 license

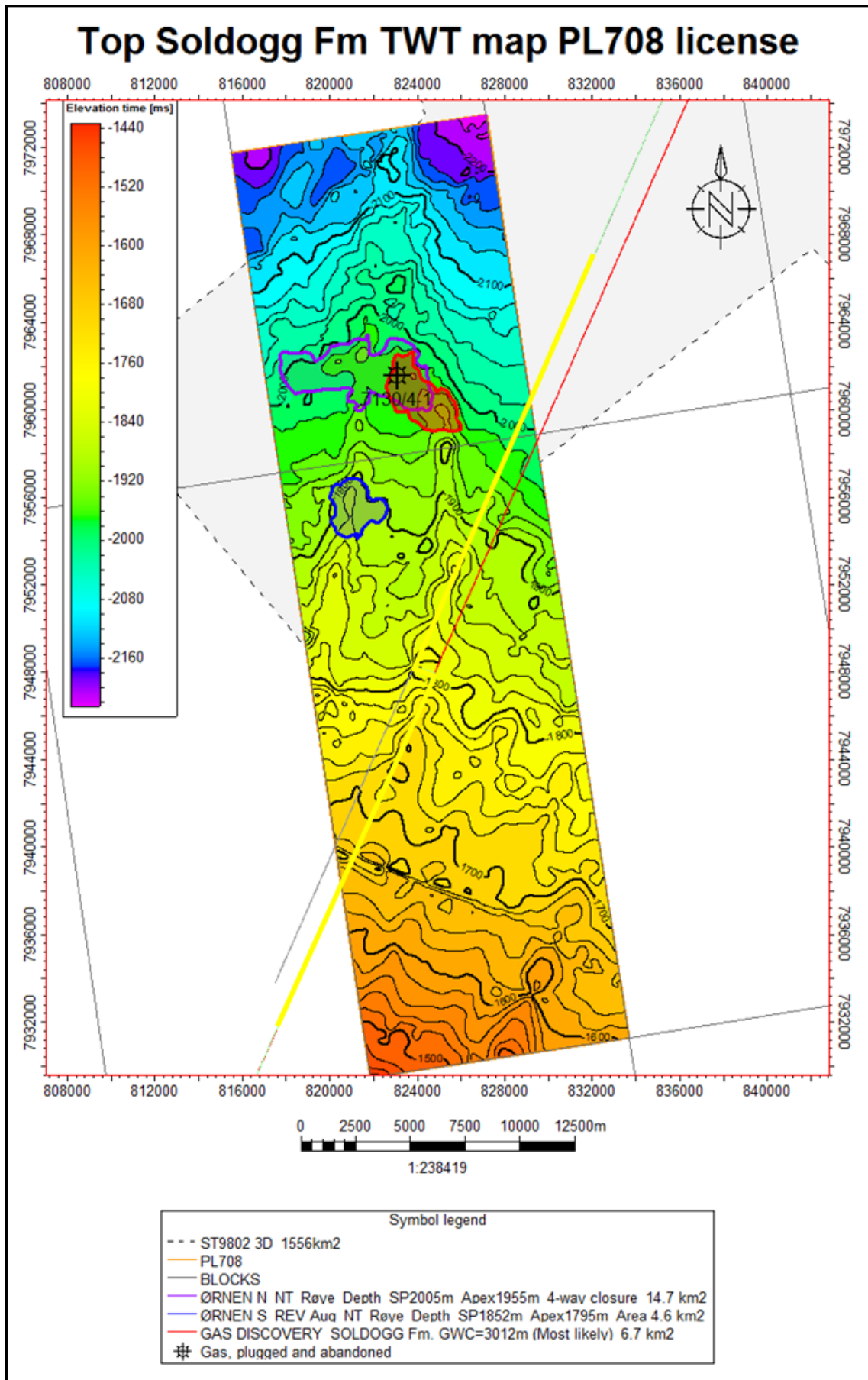


Fig. 16 Top Soldogg TWT w/ location of Composite 2D line

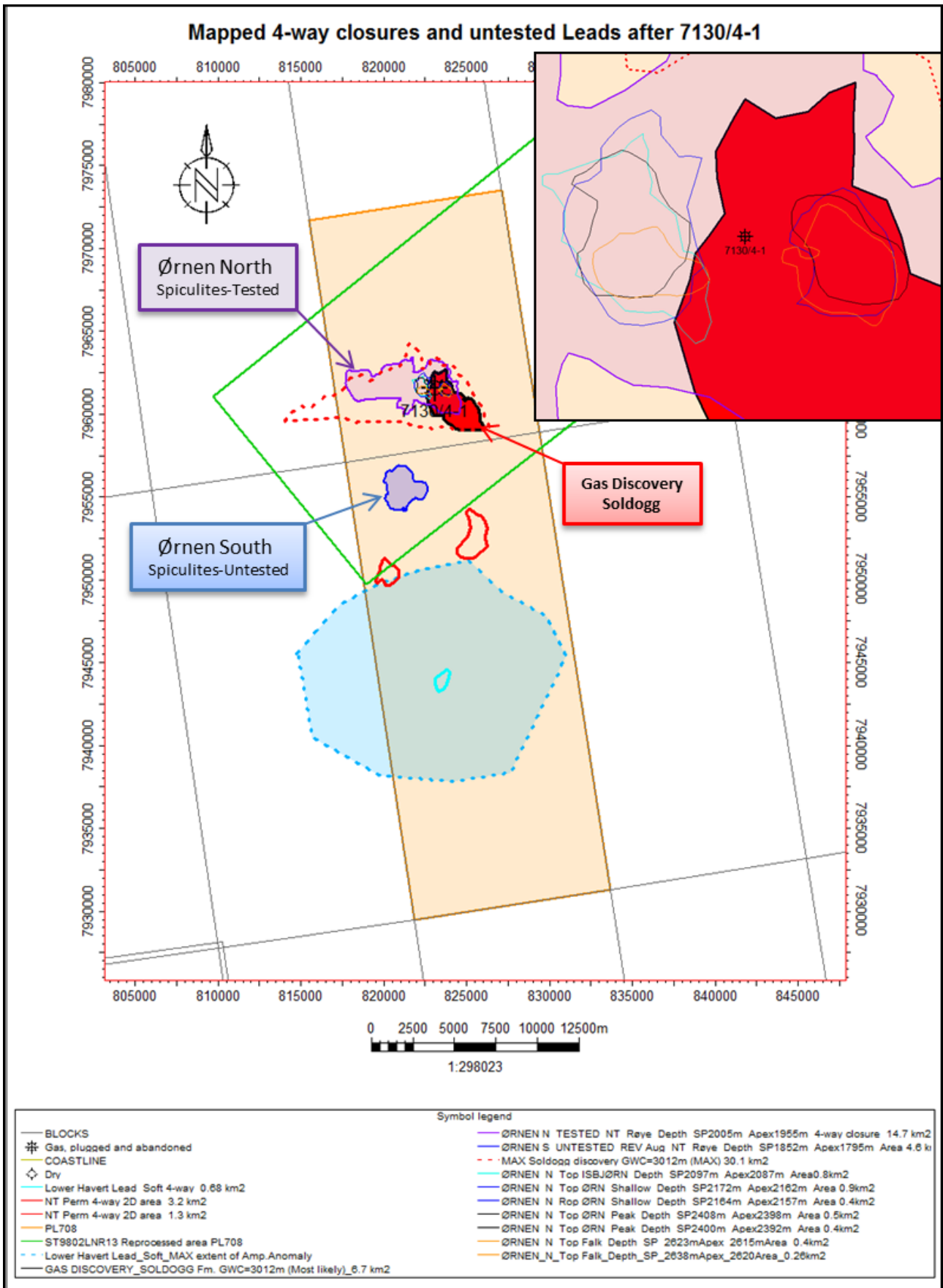


Fig. 17 Prospects & Untested Leads PL708 after well 7130/4-1

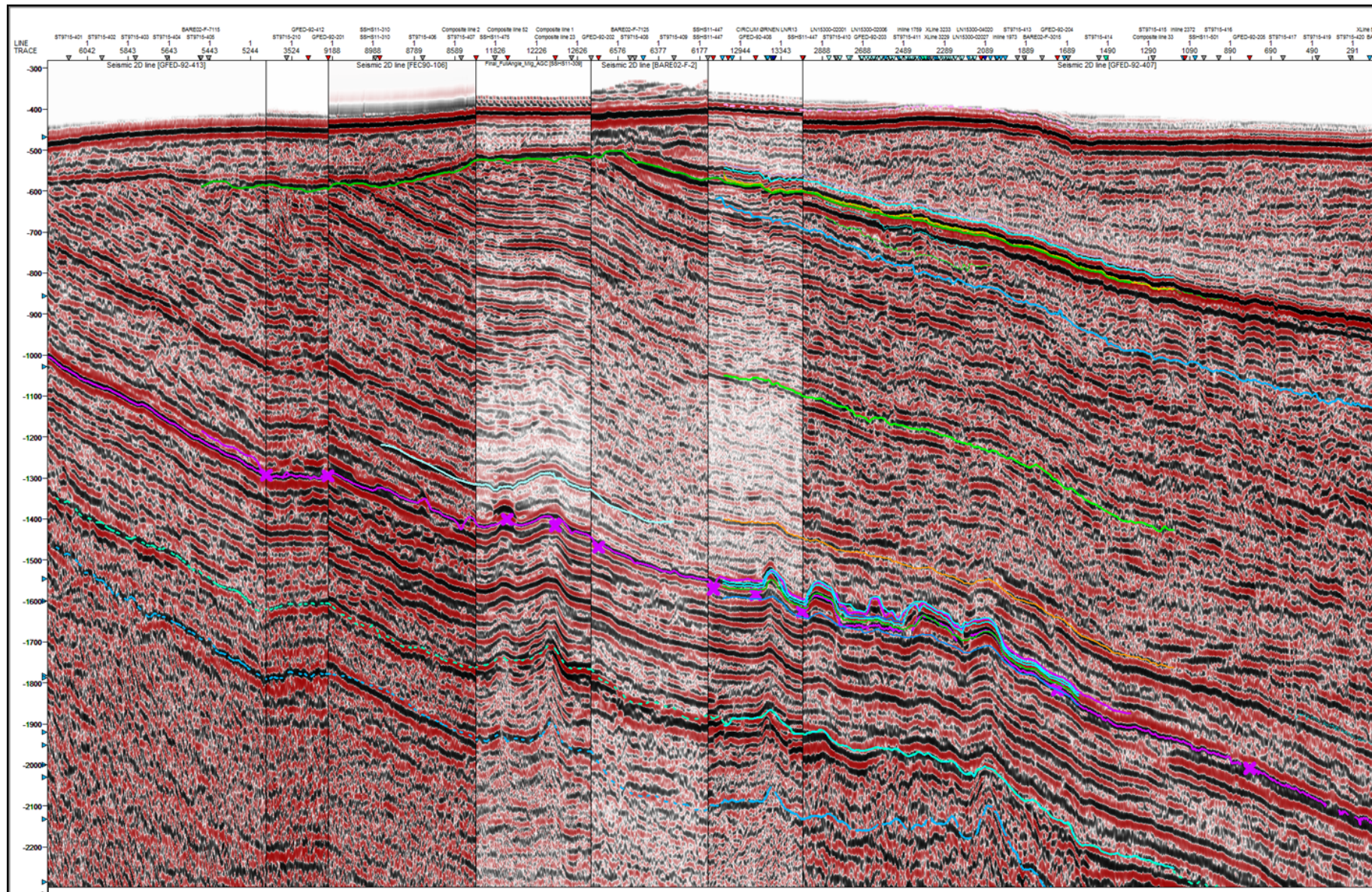


Fig. 18 Composite seismic line through license PL708

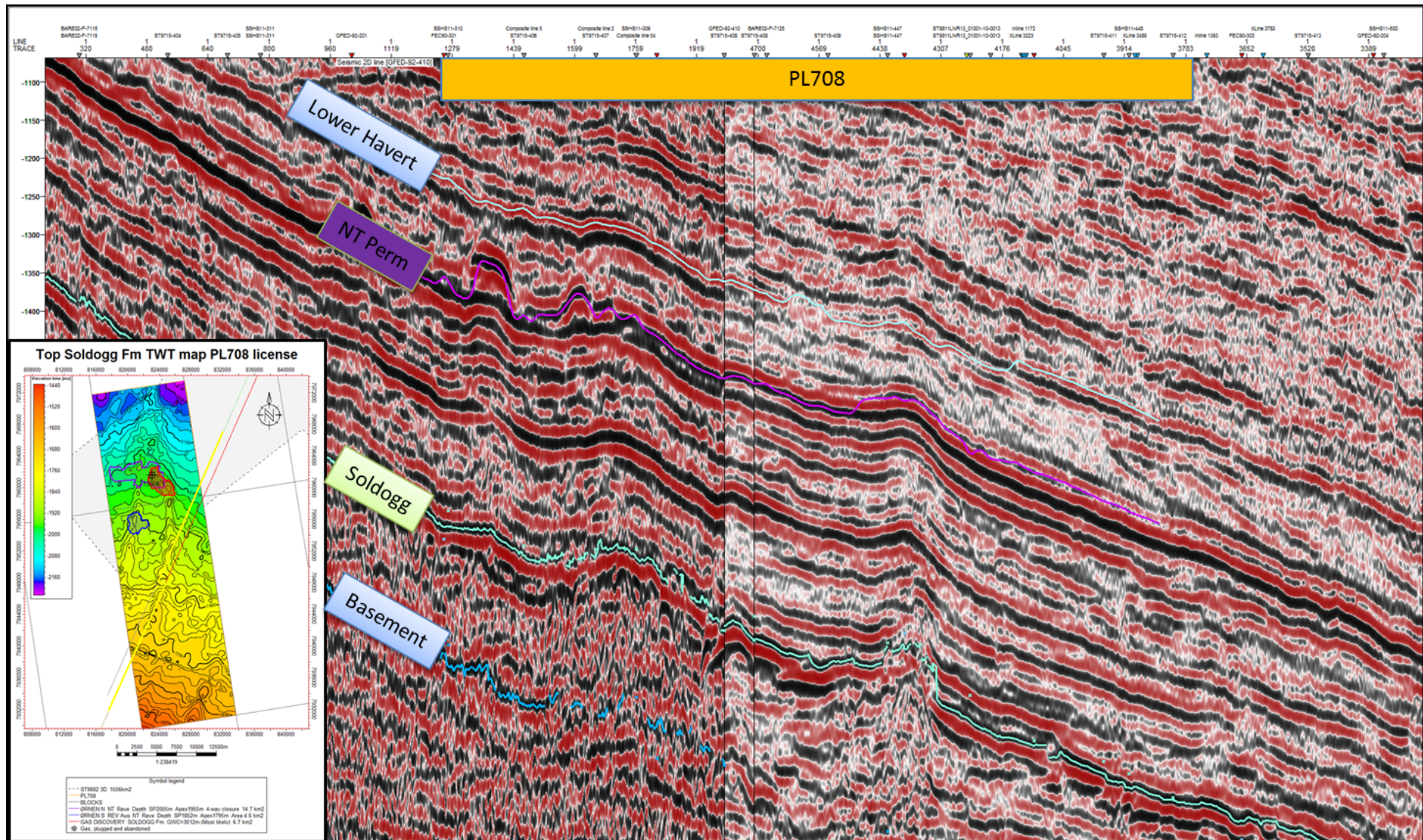


Fig. 19 Soldogg Fm interpretation Composite seismic line

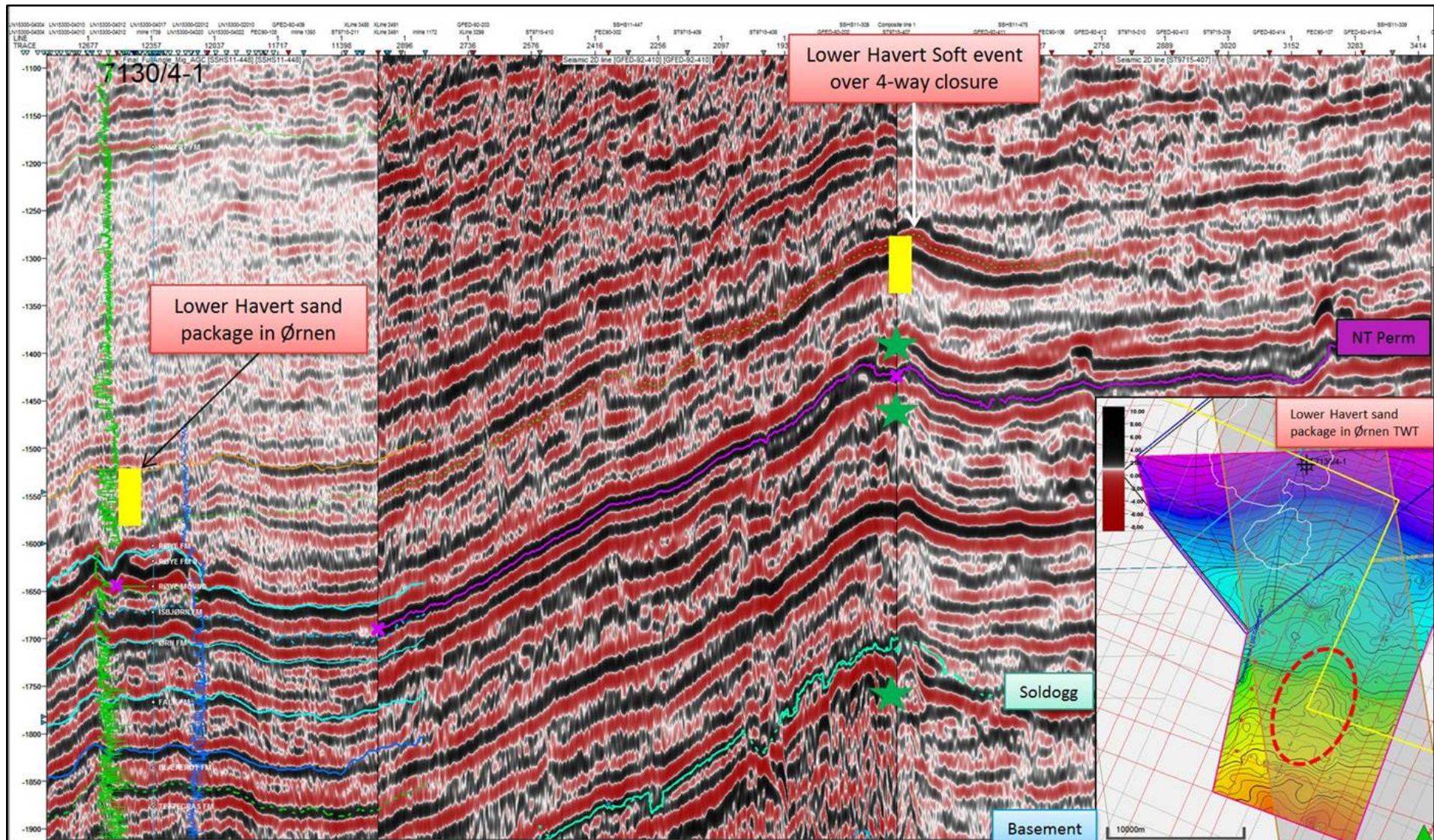


Fig. 20 Lower Havert Lead PL708