

# Relinquishment JETTE UNIT

## PL 027D, PL 169C and PL 504

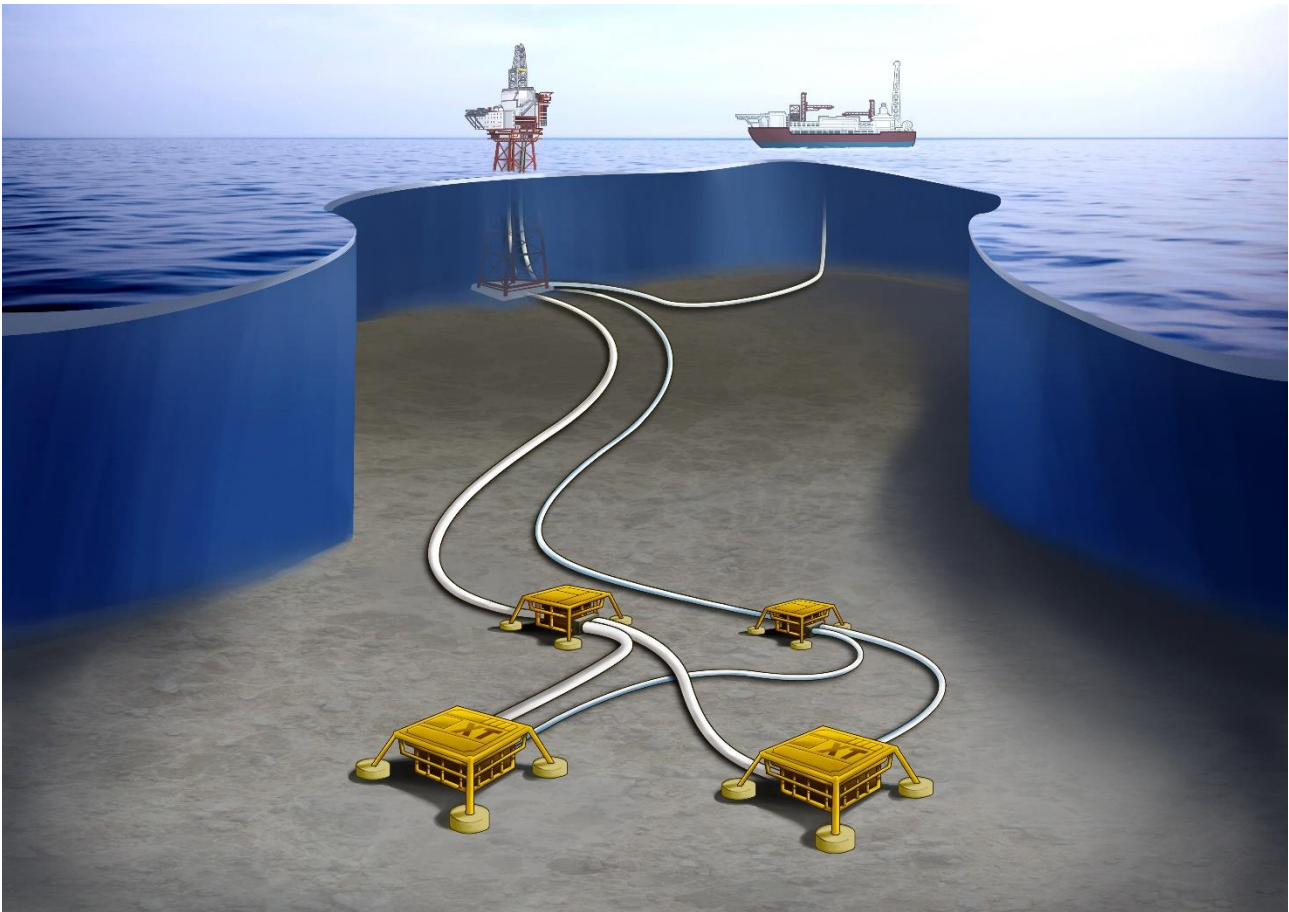


Figure 1 Jette Field

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# 1 KEY LICENCE HISTORY

## 1.1 Introduction

The Jette Field is located in the central part of the North Sea, six kilometers south of Jotun, se Figure 2. The water depth is 127 meters. Jette was established in 2009 and a plan for development and operation (PDO) was approved 28.02.2012. The field was developed with two production wells connected to the Jotun A facility. Production started in 2013.

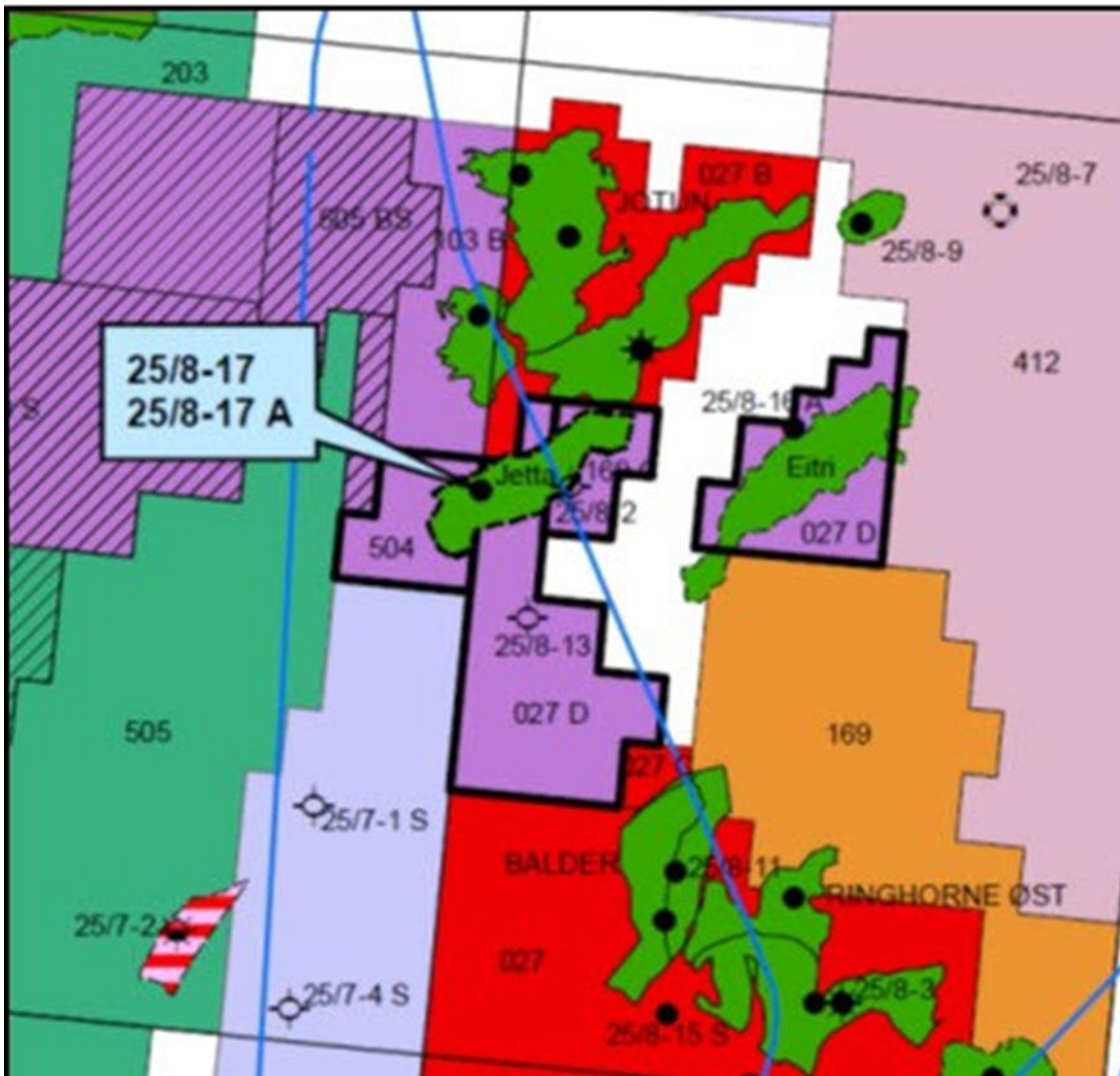


Figure 2 License area

The Jette Field produced oil from sandstone of the Late Paleocene age in the Heimdal Formation. The reservoir is a marine fan system about 2200 meters deep. Pressure support was from natural water drive. The well stream was transported to Jotun B and on to Jotun A for processing and loading. The Jette well stream was commingled with the Jotun well stream at Jotun B wellhead platform at the test/production manifolds and transferred to Jotun A FPSO by flexible flowlines. Final processing, oil storage, offloading and gas export was performed at Jotun A. The Jotun facilities were operated by ExxonMobil on behalf of the Jette Unit

partners. The oil was off-loaded to shuttle-tankers from the Jotun A FPSO. The gas was processed to export quality on Jotun A together with the gas from Jotun and Ringhorne, and exported into Gassled. Production was completed in 2016 and the subsea facility was removed in 2019.

Reference is made to the “Agreement relating to the unitisation and operation of the Jette Field” effective as of 11<sup>th</sup> January 2012. The “Production License” is stated to include PL 027D, PL 169C and PL 504. For this reason, the relinquishment for all licenses are described here.

## 1.2 License Owners

### Jette Unit:

Aker BP ASA	70 % (Operator)
Petoro AS	30 %

### PL 027D:

Aker BP ASA	100 % (Operator)
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### PL 169C:

Aker BP ASA	50 % (Operator)
Petoro AS	50 %

### PL 504:

Aker BP ASA	52.407 % (Operator)
Petoro AS	47.593 %

## 1.3 Award and Work Program

Production license (PL) 027D was separated from PL 027B on the 07.12.2007, PL 027B was separated from PL 027 on the 15.12.1999 and PL 027 was awarded in the 2-A licensing round on the 23.05.1969. There was no work commitment associated with the separation. The license was valid until 23.05.2015.

PL 169C was separated from PL 169 on the 27.03.2009 and PL 169 was awarded in the 13<sup>th</sup> licensing round on the 01.03.1991. There was no work commitment associated with the separation. The license was valid until 01.03.2030.

Production license (PL) 504 was awarded in APA 2008 on the 23.01.2009 with a firm drill decision to drill two exploration wells, whereof one exploration well was dependent on the results from the first well, within three years. The licensees were free to drill the well(s) in PL 027D or PL 504. The license had an initial period of five years.

The initial partners in the license were Det norske oljeselskap ASA (58.5% and operator), Dana Petroleum

Norway AS (38.5%) and Petoro AS (3%).

The following transactions and name changes have taken place:

- In July 2009 Bridge Energy AS acquired an 8.5% share from Dana Petroleum Norway AS
- In March 2010 Bridge Energy AS changed name to Bridge Energy Norge AS
- In January 2012 Petoro AS acquire a 29.23% share from Det norske oljeselskap ASA
- In April 2012 Dana Petroleum Norway AS withdrew from the license and their equity share was distributed proportionally between the other licensees
- In August 2013 Bridge Energy Norge AS withdrew from the license and their equity share was distributed proportionally between the other licensees
- In September 2016 Det norske oljeselskap ASA changed name to Aker BP ASA

License work obligations for PL 504:

- 1) Drill two firm exploration wells whereof one is contingent within three years
- 2) Beslutning om Videreføring (BOV) within three years
- 3) Submit PDO within five years

The work obligations have been fulfilled.

In 2009 the explorations wells 25/7-17 and 25/8-17 A drilled in PL 027D made a discovery – Jette. The Jette discovery extended into PL 027D, PL 169C and PL 504.

The Jette Unit was established in 05.01.2012.

## 1.4 Production history

The Jette field consisted of two separate oil accumulations, Jette North and Jette South. Production from Jette started on May 19, 2013. The original plan for the Jette development was to produce the Jette North segment and the Jette South segment by 2000 m long horizontal reservoir sections in each segment. As a result of difficulties during drilling of the first well in the Jette South segment, the planned length of the horizontal reservoir sections in the well was not achieved. It was decided to place both wells in Jette South segment and to drill the Jette North segment at a later stage. The two wells in the Jette South segment have reservoir sections of 560 meters (Well D-1 AH) and 1220 meters (Well E-1 H). The change was approved by the MPE 11.04.2013 with the condition to make an updated plan for the Jette North area by 31.12.2014.

As the recoverable volumes are significantly lower by draining only the Jette South part of the Jette field, Det norske performed subsurface, facilities and risk evaluations together with economic analysis in order to evaluate if the Jette North was possible to develop. The study of Jette North is documented in the reports: "Jette North Evaluation Summary Report" and "Jette North Subsurface Evaluation". The subsurface modeling demonstrated a large uncertainty on the reservoir potential in Jette North, due to the reservoir characteristics with thin sands and turbidite deposits not resolved by seismic. Further subsurface work was not evaluated to reduce the uncertainty significantly as long as no new data was made available. Due to a combination of high reservoir uncertainties, uncertain production framework conditions and poor economics, the decision was not to drill a new well in the Jette North area.

Production from Jette was completed in December 2016, as production at Jotun B was completed. The wells were temporarily abandoned in accordance with Norsok D-10, and the production pipes were cleaned in March 2017. The closure plan that was sent to the authorities in September 2015, assumed that production from Jette would cease in January 2016. Based on planned closure on 1 January 2016, the disposal activities would be completed in 2018. Production from Jette ceased first in December 2016 and as a result production extension, the plan for P&A of wells and removal was postponed by approximately one year to 2019.

## 2 DATABASE

### 2.1 Seismic Database

The latest seismic data acquisition at Jette, MC3D-NVG10M (geostreamer data), was carried out during 2010 and the final time processing was delivered summer 2011. Compared with older data sets (NO07M01, ES9403R10) these data, improved the data quality in the Jette area. However, the nature of the geology of the Heimdal sands is very complex and caused challenges in identifying sandstones on the seismic data. The conclusion from the seismic study at Jette was that the individual sandstones layers could not be interpreted. Instead, Top Heimdal and an intra Heimdal reflector were interpreted, see Figure 3.

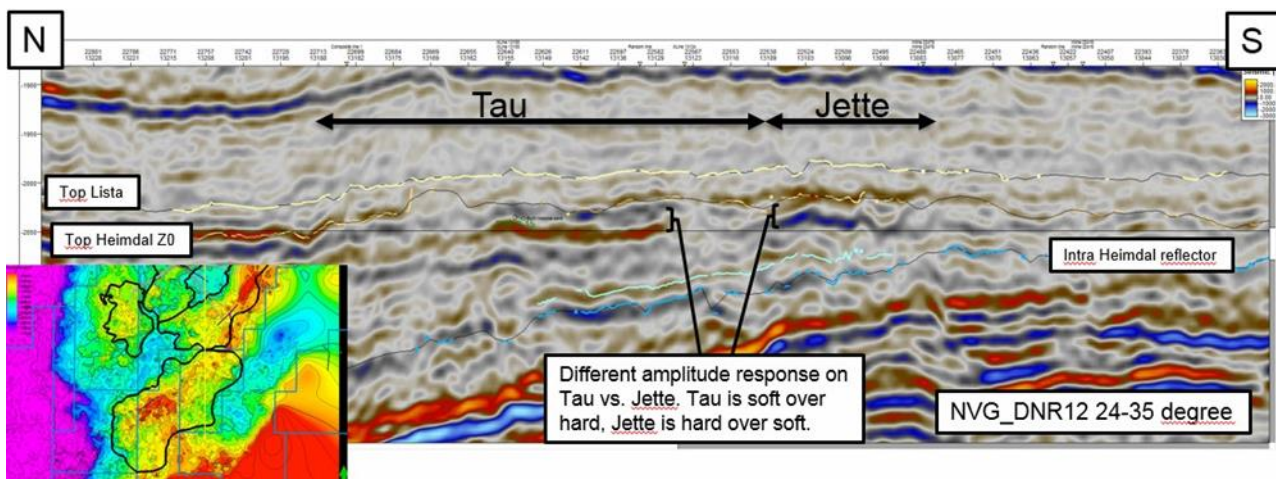


Figure 3 Seismic section showing the correlation between Jotun Tau and Jette North area. A different Top reservoir response is seen between Jotun Tau and Jette North on the latest NVG\_DNR12 far offset data

To further improve the MC3S-NVG-10M seismic data a PSDM re-processing project was initiated in 2012. The goal was to increase the seismic resolution to improve Heimdal sand prediction. Depth conversion of the time interpretation was carried out in EasyDC using stacking velocities.

## 2.2 Well Data

The wells used for evaluating the area are shown in Figure 2. All wells are also presented in 1 which includes well names, status, year drilled, TD depth and TD Formation.

Table 1 Well database

Well	Status	Year	TD MD m	TD Formation
25/8-17	Oil	2009	2233	Ty
25/8-17 S	Oil	2009	2945	Ty
25/8-2	Dry	1975	2578	Statfjord
25/8-13	Dry	2001	2276	Statfjord
25/8-D-1 H	Oil (observation pilot)	2012	2256	Ty
25/8-D-1 AH	Oil (production well)	2012	4506	Heimdal
25/8-E-1 H	Oil (production well)	2012	4387	Heimdal



### 3 SUBSURFACE EVALUATION

The latest subsurface evaluation is documented in “Jette North Evaluation Subsurface Support Document”. The subsurface evaluation was based on the Jette PDO submitted September 2011, new data acquired during the development drilling campaign in 2012 (geo-pilots and several horizontal well trajectories), well production data from May 2013 from the two Jette production wells and comprehensive reservoir modeling incorporating both static and dynamic reservoir data. Various modeling uncertainty sensitivities were evaluated and all of them matched to the actual production history.

The complexity of the Jette geology was not fully realized before the horizontal production wells was drilled. These wells encountered sandstones with varying thickness, from cm scale to meter scale with highly varying dipping layers which cannot be explained by normal stratigraphically dips.

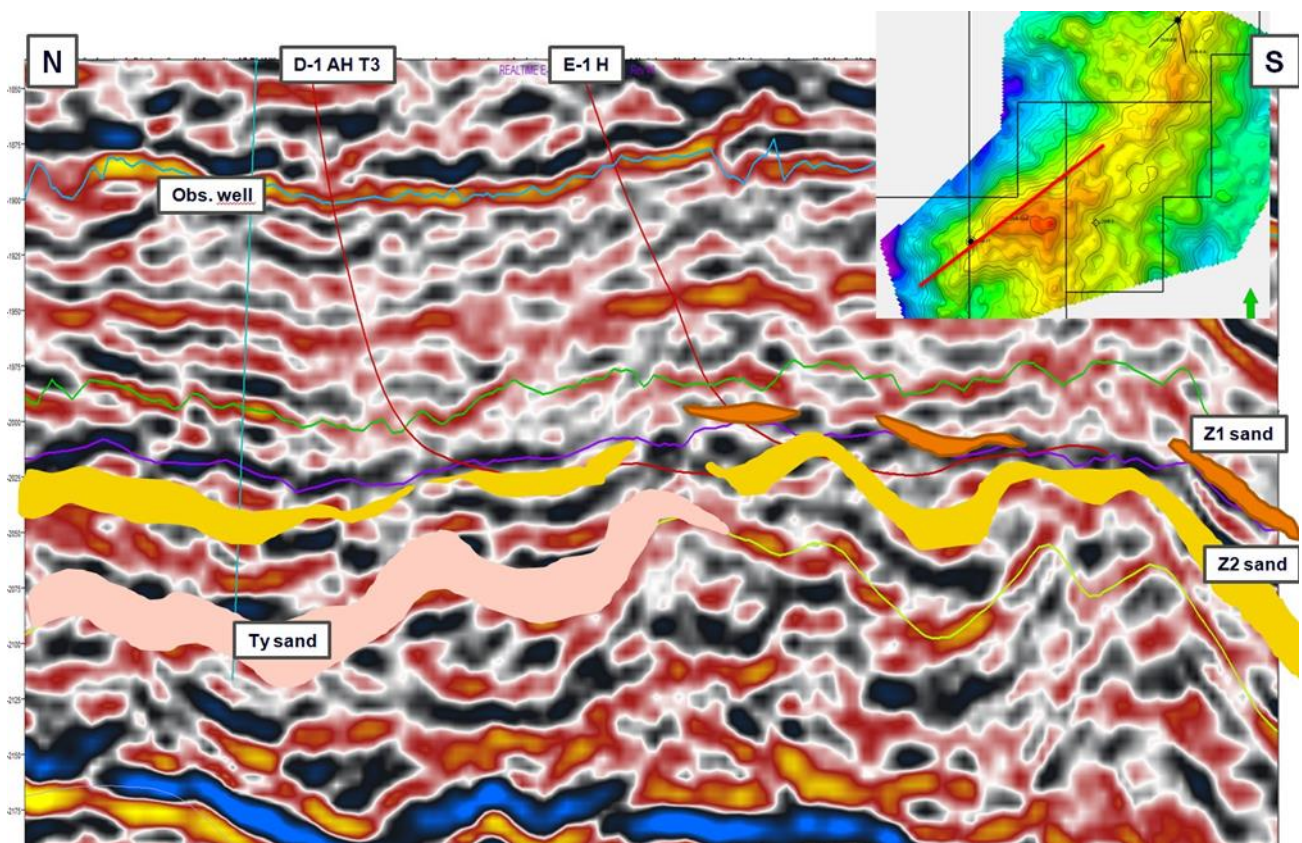


Figure 4 Pre production wells geological concept

Figures 4 and 5, illustrates difference between the geological model pre drill vs. post drill. As illustrated in these figures, the pre drilled model indicates a more layer cake geology where the sand thicknesses are more similar to what was observed in the exploration wells 25/8-17 and 25/8-17A (Figure 6). The post well geological model is updated based on observations during drilling including a "deep directional resistivity" LWD tool.

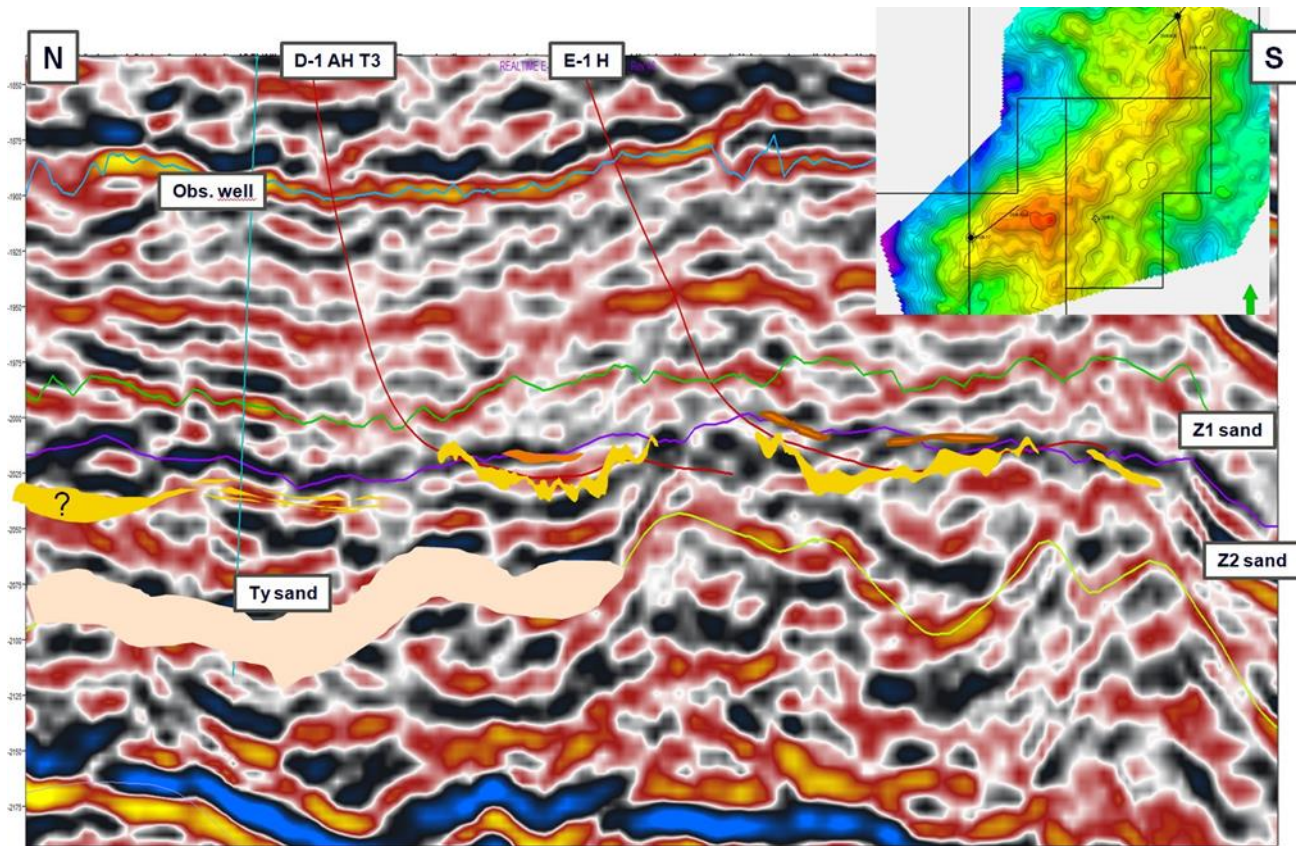


Figure 5 Post production well geological concept

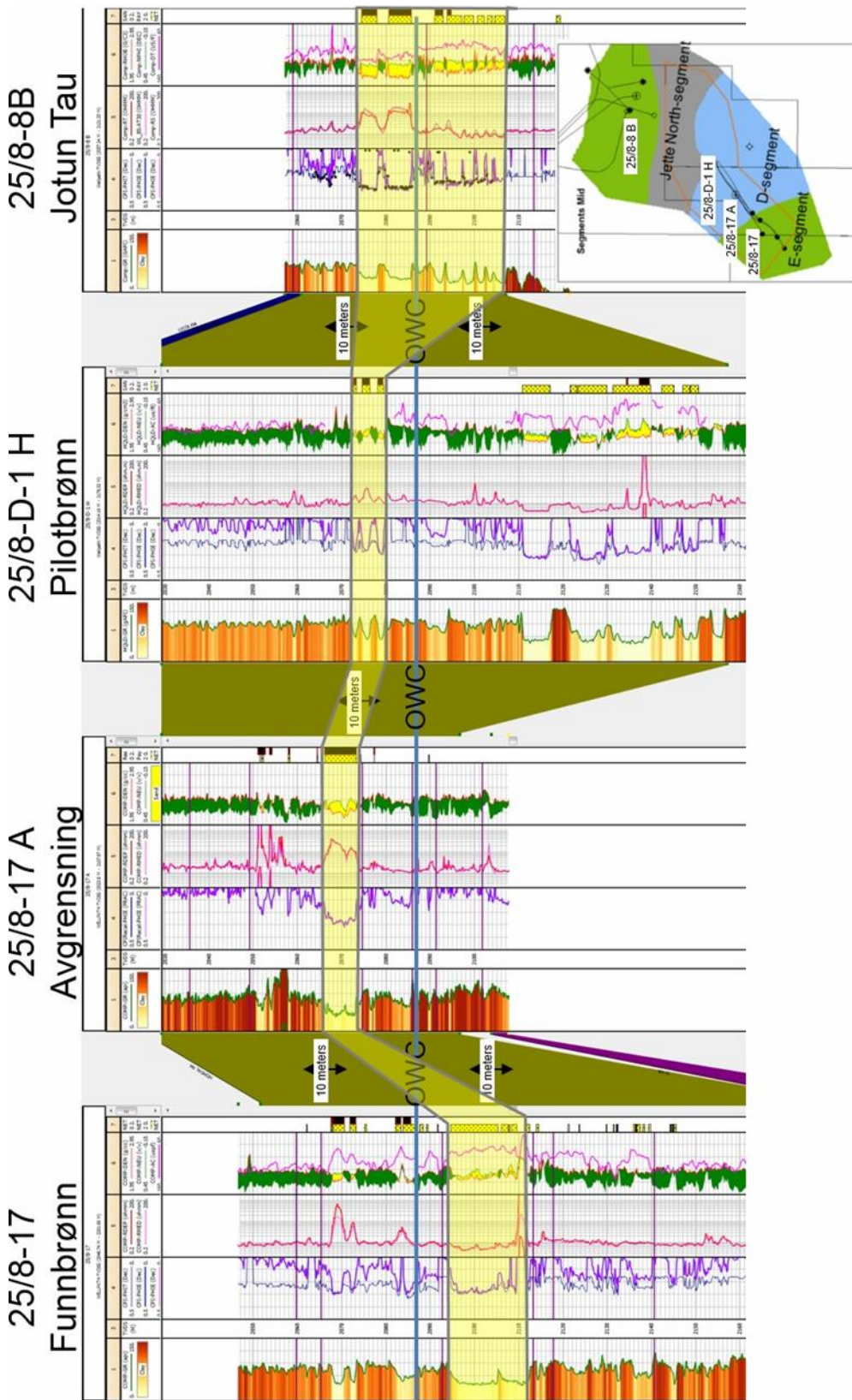


Figure 6 Well correlation. Correlation from Jette exploration wells, pilot wells and 25/8-8B well showing the variation in sand along the Jette structure.

## 4 PROSPECT UPDATES

The area near the Jette field contained several prospects and prospect opportunities. The size of these prospects, however, were small. In addition, there is a small oil discovery called Eitri in PL 027D.

Two main areas were evaluated to represent potential additional resources in the same formation as the main field; the north-eastern structure is in PL 169C and south-southeast the structures of PL 504 and PL 027D, see Figure 7. Resources on these were expected to be of the same magnitude the main part of the Jette field. Presence of hydrocarbon-filled sand on the eastern flank had greater uncertainty. In addition, this area continues to rise towards the Utsira High, with higher chance for leakage.

On the south-eastern flank of the Jette field, the trend and inversion models indicated presence of sand with volumes for a possible third well. These resources, on the other hand, had to be demonstrated with a dedicated observation well. The Ty Formation could also potentially be hydrocarbon-filled in this area.

The upside in the northeast has 25/8-8 B (Tau) as the nearest well. Tau has been in production, and 4D seismic indicated significant recovery from this area. However, a large fault separates the eastern flank of the Tau from the northern area of the Jette field. These were reserves that was planned tested with an extension of the Jette North well.

The remaining prospectivity after relinquishment, is believed to be below economical field size and not interesting for further evaluation.

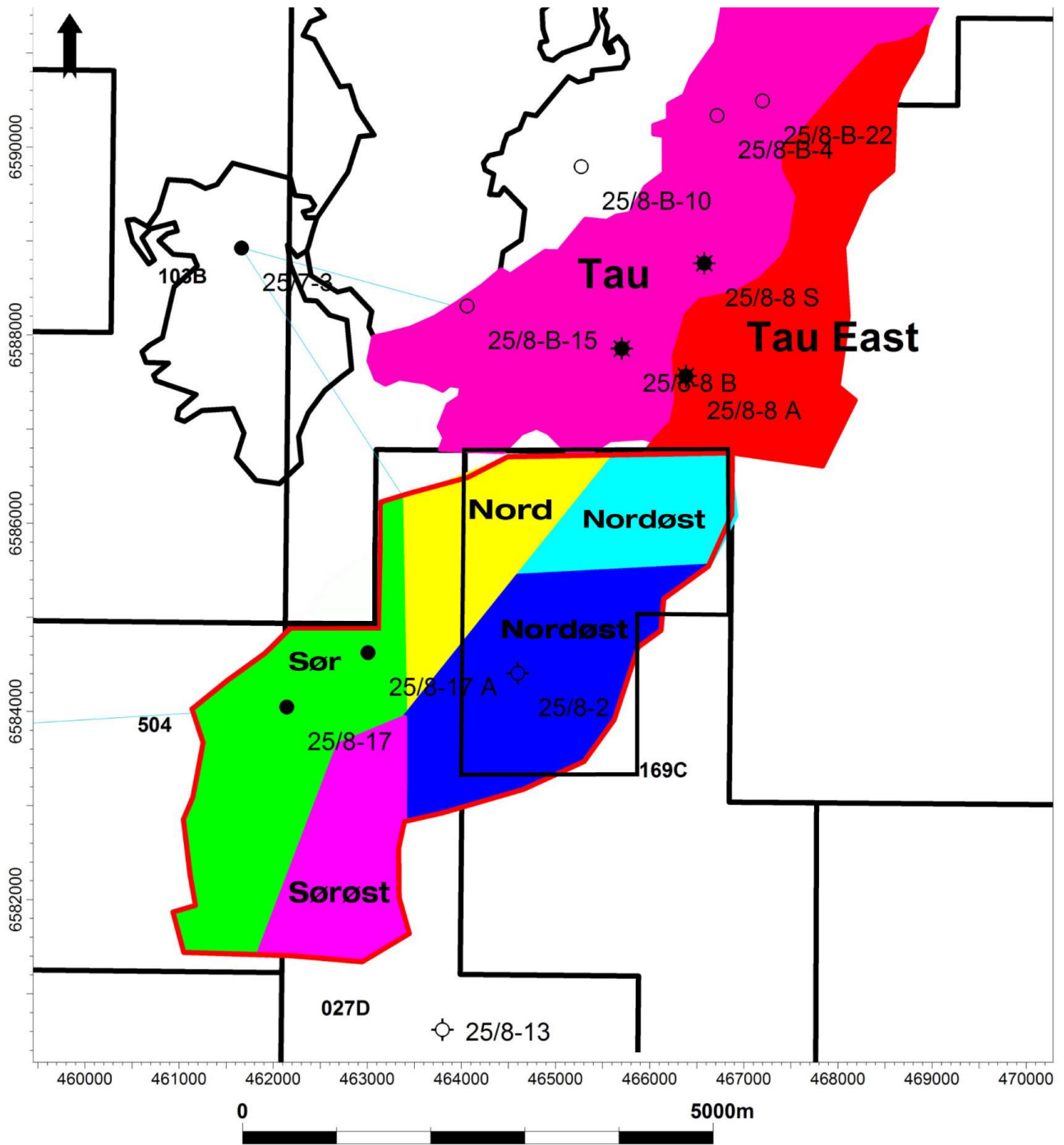


Figure 7 License area and subdivision of main segments

## 5 TECHNICAL EVALUATION

The production from Jette ceased December 2016. Aker BP, as operator of the Jette field, has performed the P&A of the two wells and removal of the subsea facilities.

During the 2018 summer offshore campaign the subsea flowlines/ jumpers were cut, the PLEM was removed and the wells inspected.

In May-June 2019 P&A of the two wells were performed and the two x-mas trees removed.

During September- October 2019 decommissioning of the remaining objects were performed:

- Subsea distribution unit, SDU, including protective structure
- Two wellheads including flow base and protective structures
- Onshore disposal of all structures brought onshore (see Figure 8)
- Seabed clean-up and rock dumping

In addition, Vår Energy has disconnected the 8" flexible flowline from the riser and cut the umbilical at the jacket seabed.

- Remaining work for 2020 are onshore disposal of umbilical inside j-tube and gravel dump of pipeline and umbilical at Jotun end.

A letter was sent to NPD regarding abandonment of the production license by end of 2019.



Figure 8 The Jette subsea installations brought onshore

## 6 CONCLUSION

The base case recoverable reserves in the early development phase of the Jette development was evaluated to be 11.5 mmbob (oil 1.45 MSm<sup>3</sup>, gas 0.36 GSm<sup>3</sup>). This case was based on draining Jette North and Jette South with one long horizontal well in each area.

As only the Jette South segment is developed, the final total recoverable oil and gas volumes (RNB2020) are reduced:

- Total oil production: 0.485 MSm<sup>3</sup>
- Total gas production: 0.089 GSm<sup>3</sup>
- Total water production: 2.033 MSm<sup>3</sup>

Production from Jette was completed in December 2016, as production at Jotun B was completed.

During campaigns in 2018 and 2019, AkerBP has performed P&A of the two wells and removed the subsea facilities and cleaned up the seabed.

## 7 REFERENCES

**Det norske (September 2011):** Plan for utbygging og drift av Jette

**Det norske (December 2014):** Jette North Evaluation Summary Report

**Det norske (December 2014):** Jette North Evaluation Subsurface Support Document

**Det norske (June 2016):** Avslutningsplan for Jette feltet

**AkerBP (January 2018):** Avslutningsplan for Jette feltet – søknad om forlengelse av disponering