

## The Triassic Main Buntsandstein play – New prospectivity in the Dutch northern offshore

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The Early Triassic Main Buntsandstein (MBU) is an established hydrocarbon play in the Southern North Sea. Aeolian Volpriehausen sandstone forms the main reservoir rock. It is generally perceived that reservoir presence and abundance decrease towards the north and that prospectivity of the MBU play in the Dutch northern offshore is limited. Access to charge from the Carboniferous is often seen as an additional risk for this play. Consequently, few wells have tested Triassic reservoir and this part of the basin remains under-explored. A recent study has mapped the lithologic character and stratigraphic extent of the northern Triassic in detail and presents evidence of alternative reservoir provenance in the marginal Step Graben system. Numerous untested Triassic leads were identified and their prospectivity is being assessed.

The EBN evaluation of the MBU play in the Dutch northern offshore incorporates well and seismic data from the Dutch, German, Danish and British North Sea sectors. A thorough borehole review including well tops, reservoir development and post-mortem analysis, suggests that fluvial sands with (local) northern provenance may have been preserved in the north-western area of the Step Graben system (*Figure 1*). Syn-tectonic strata in local depocentres may have been formed in this area due to early halokinesis in the Triassic, in analogy to the Central North Sea described in Smith et al. (1993). Olivarius et al. (2015) analyse provenance area for Early Triassic sandstones in the North German Basin (NGB). They identify a southern source of aeolian sands from the Variscan mountains and a northern – local – source of fluvial sands from the Ringkøbing High in the NGB. The distinct log character of well A15-01 and A05-01 in the marginal basin system of the northern Dutch Step Graben describes a series of sandstone beds that may also be subject to local sediment provenance (*Figure 1*). The Danish Bertel-01 shows a similar log response (not shown).

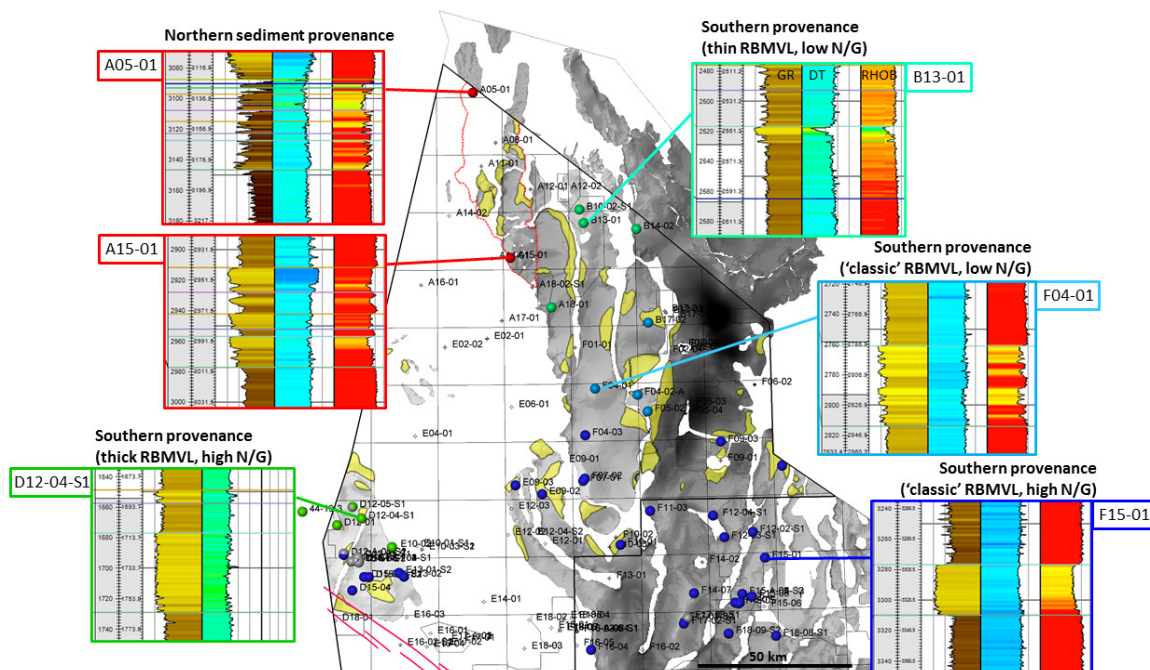
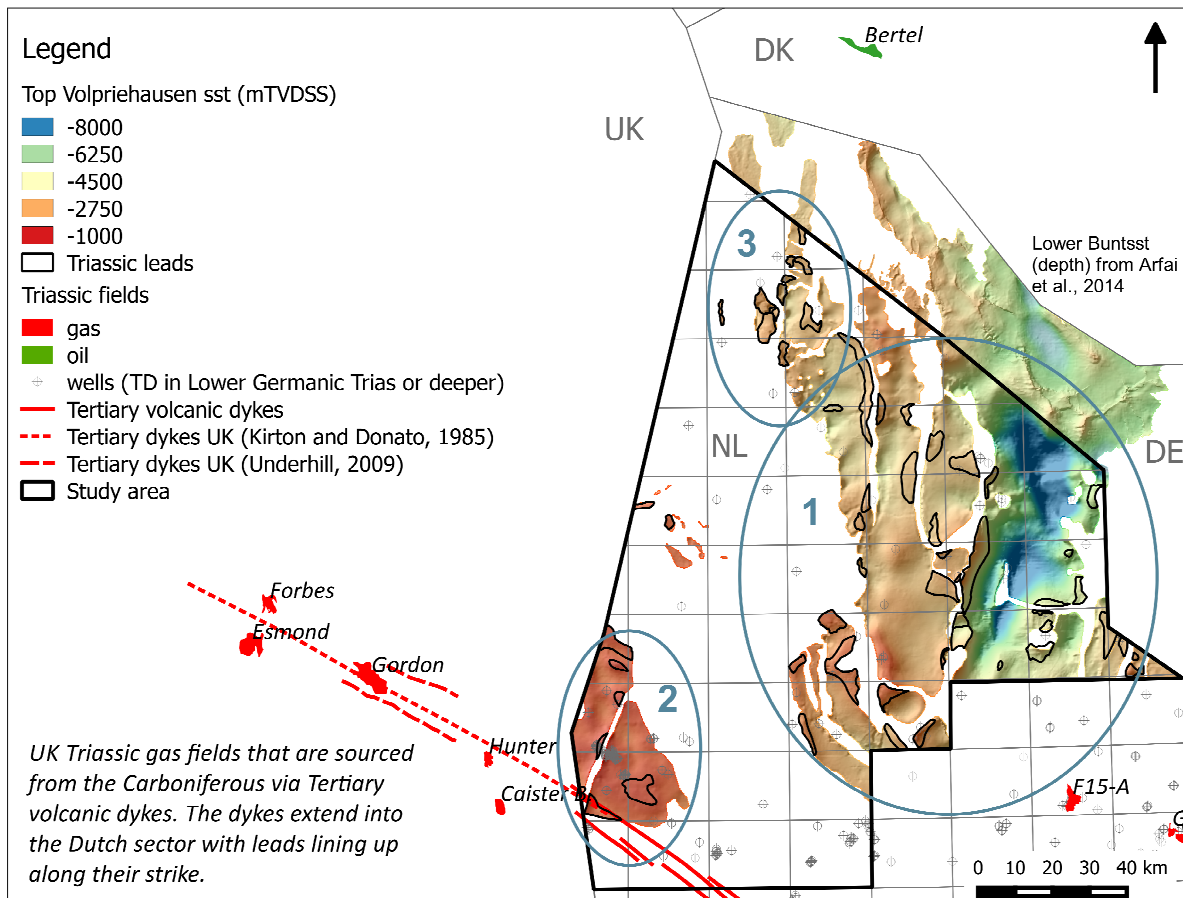


Figure 1: Regional reservoir architecture – typical well log response for different types of Volpriehausen sandstone (RBMVL). Study area is outlined in solid black, yellow polygons indicate Triassic leads.

In both the A05-01 and Bertel-01 there is an age-dating uncertainty for the Triassic rocks. Analyses of biostratigraphy, heavy minerals, clay mineralogy, grain size distributions and quartz surface microtextures on cuttings and core material from the Dutch northern offshore are currently being performed to assist in understanding age, provenance and depositional environment of the Triassic in the study area.

Regional mapping of the Volpriehausen sandstone enabled us to identify more than 50 untested structures in the study area. These leads roughly cluster in three types and areas (*Figure 2*): 1) 'classic' leads with proven types of trap, source, seal and reservoir, 2) leads which may be sourced with hydrocarbons via Tertiary volcanic dykes and 3) leads with reservoir provenance from the north. Un-risked P50 GIIP for 29 structures screened to date range between 1-9 BCM each and total 80 BCM.



*Figure 2: Top Volpriehausen sandstone depth map in the study area. The identified leads are separated in three types (1- 'classic', 2- sourced via volcanic dykes, 3- northern reservoir provenance).*

#### References:

- Olivarius, M., R. Weibel, H. Friis, L.O. Boldreel, N. Keulen, and T.B. Thomsen, 2015. Provenance of the Lower Triassic Bunter Sandstone Formation: implications for distribution and architecture of aeolian vs. fluvial reservoirs in the North German Basin. *Basin Research*. Published electronically July 25, 2015. [Doi:10.1111/bre.12140](https://doi.org/10.1111/bre.12140).
- Smith, R.I., N. Hodgson, and M. Fulton, 1993. Salt control on Triassic reservoir distribution UKCS Central North Sea. *Petroleum Geology of Northwest Europe: Proceedings of the 4<sup>th</sup> Conference*, ed. J.R. Parker (London: Geological Society), 547-557.