

# The Triassic Hydrocarbon Potential Overlooked upside of the northern Dutch offshore

## The Triassic play in the Netherlands



The Triassic is a well studied stratigraphic interval in the Dutch subsurface and represents, volumetrically, the second largest gas play.

However, this play is often **overlooked** in the **northern Dutch offshore** and presents high upside potential.

Figure 1. Study area for the Triassic hydrocarbon potential in the northern Dutch offshore.

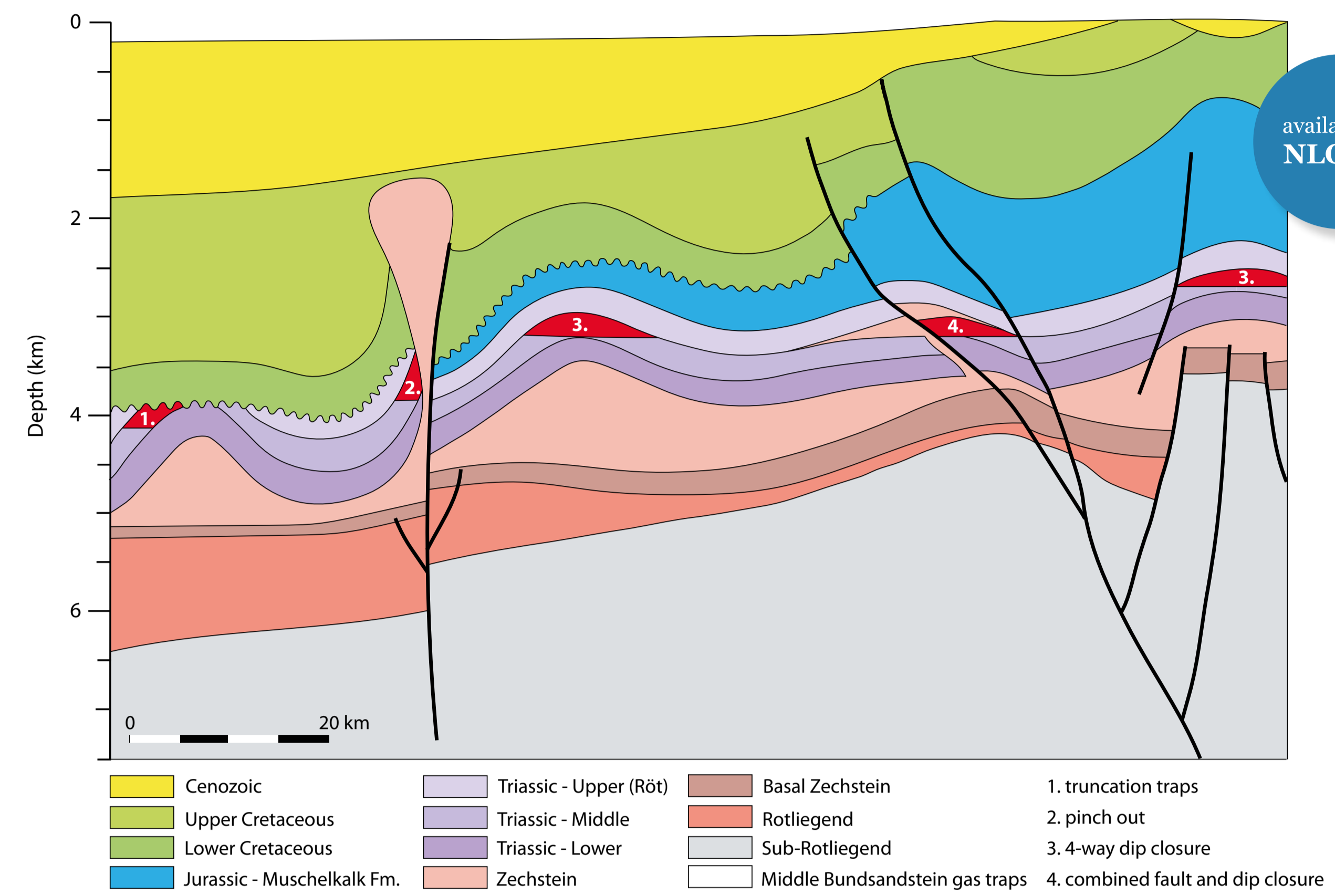


Figure 2. Schematic overview of the Triassic play concepts in the Netherlands (Petroleum Geological Atlas of the Southern Permian Basin Area, 2010).

## Reservoir

The present study focused on the **Volpriehausen Sst Member** as the main reservoir:

- In general, this member has a southern provenance and shales out towards the north
- Recent studies show additional reservoir potential in the form of **fluvial sands** deposited in **local depocentres**, and **local sourcing** of sediment from the north

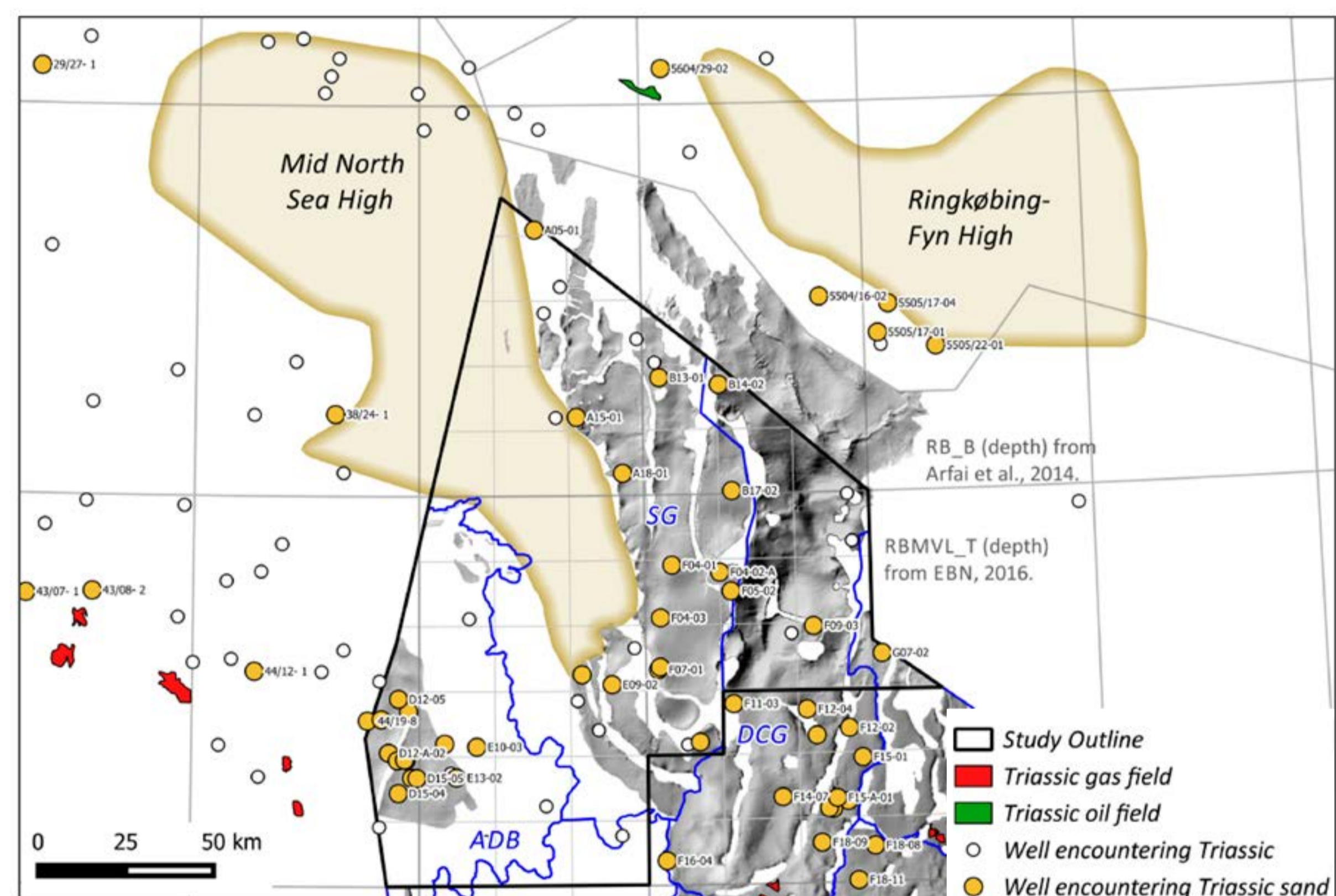


Figure 3. Top Lower Volpriehausen Sst Member depth map in the study area. Structural elements in blue (SG: Step Graben, DCG: Dutch Central Graben, ADB: Anglo-Dutch Basin) (Kombrink et al., 2012).

## Hydrocarbon charge and migration

Two different migration pathway mechanisms are identified:

- **'Classical' vertical migration** through Zechstein windows or along major faults
- Hydrocarbon migration via **Tertiary dykes**, where:
  - Charge bypasses the thick Zechstein via volcanic dykes
  - Significant lateral hydrocarbon migration is possible

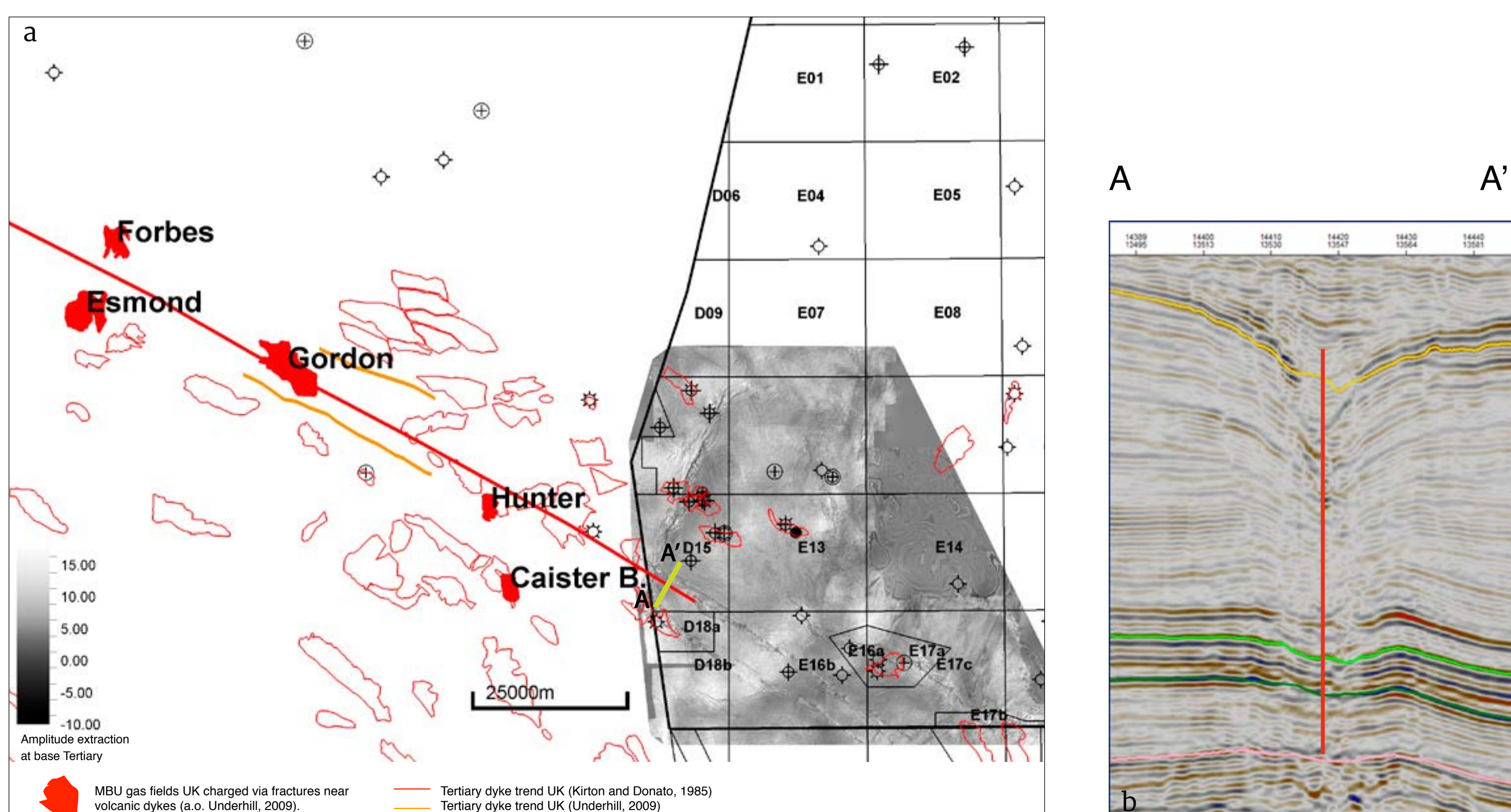


Figure 5a. Hydrocarbon migration via Tertiary dykes, b. Seismic section A-A' through Tertiary dyke. Location indicated in figure 5a.

## Source rock and charge

Recent studies show **potential presence and maturity** of several **source rock** intervals:

- **Coals:**
  - The **Elleboog Formation** shows a northward increase in coal content
  - Furthermore, the **Yoredale Formation** and **Namurian (Epen Formation)** contain coal; up to 7.5 m thick encountered in wells
- **Additional source rock potential** present through:
  - Migration from Westphalian coals
  - Migration from downthrown Posidonia shale
  - Charge from Namurian marine shales, present as a potential source rock in the southern region
  - Charge from bituminous Yoredale limestones

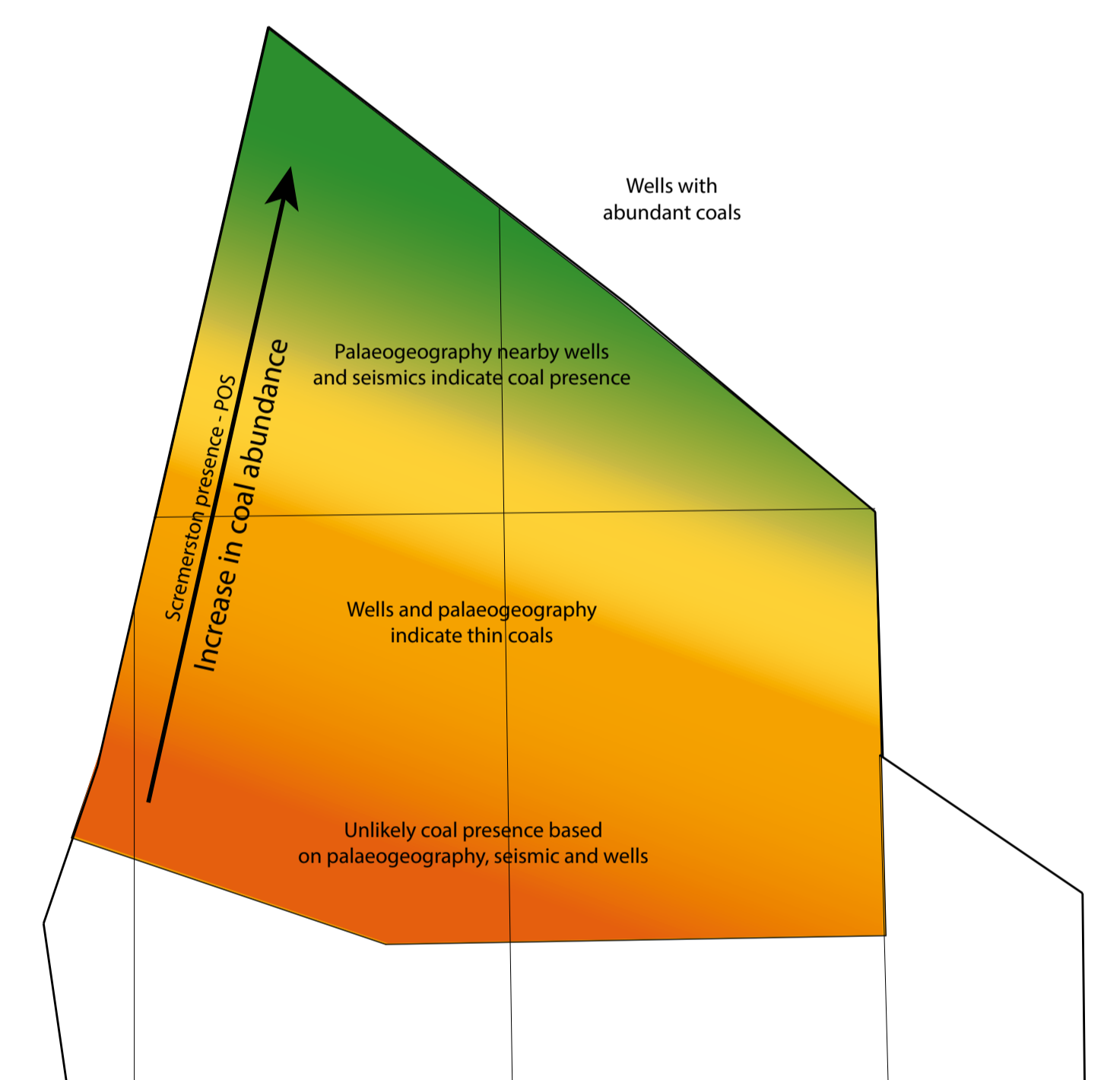


Figure 4. Source rock potential of the Elleboog Formation based on the coal content (Ter Borgh et al., 2018).

## Seal and overpressure

The Upper Triassic **Röt evaporites** are present across a large part in the area of interest and are a potential high quality seal.

**Overpressures** may restrict gas column height and potentially cause seal breach, however, they also offer an **opportunity** due to:

- Significantly higher reservoir pressures — **more GIIP**
- Arrest of (early burial) compaction and therefore better porosity — **more GIIP**

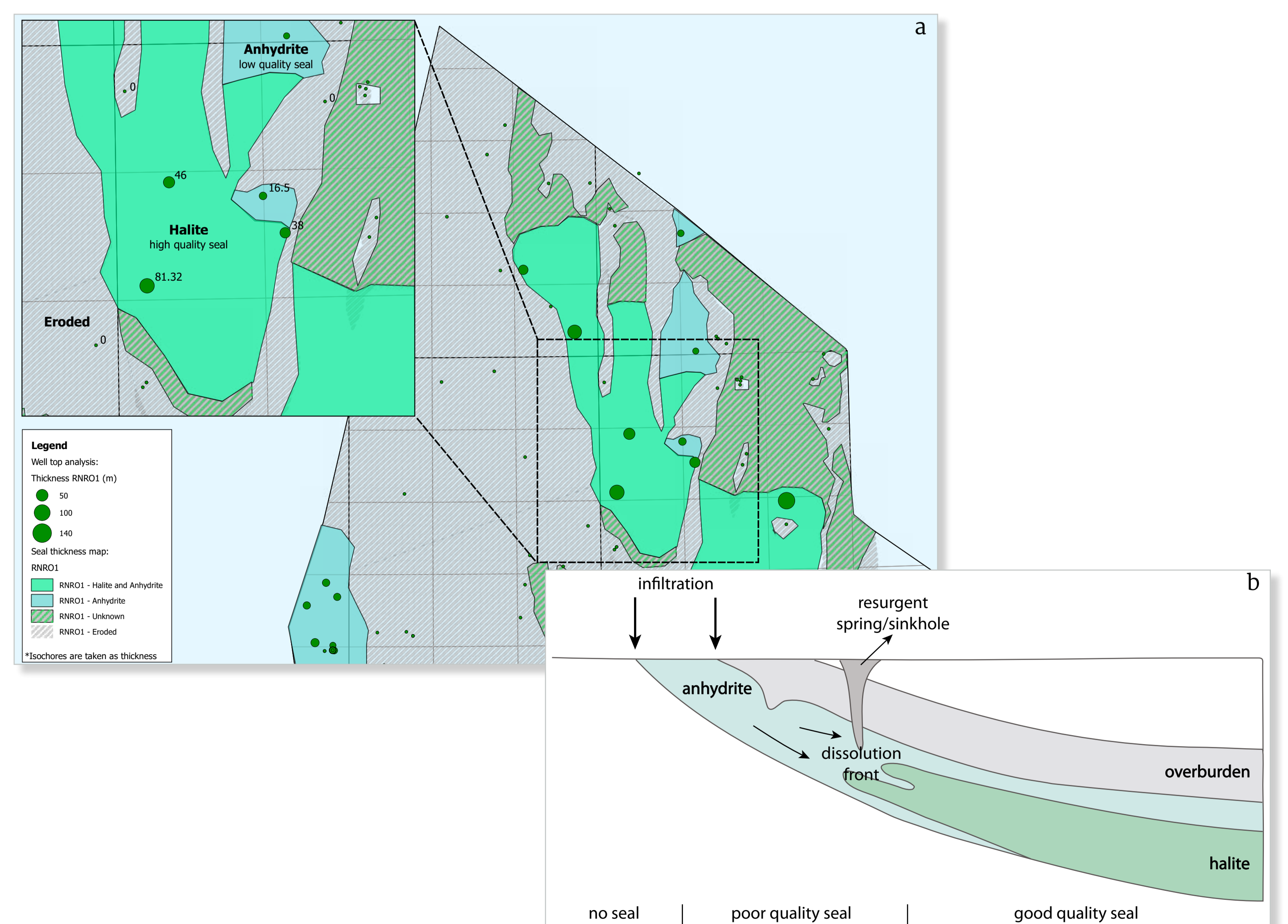


Figure 6a. Areal distribution of the Röt evaporites based on thickness found in wells, b. Schematic overview of the process of conversion of halite to anhydrite in relation to sealing quality.