

Stratigraphic and Sedimentological Evolution of the Bunter Sandstone Formation, UK Southern North Sea: Implications for CCS

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Abstract

The Bunter Sandstone Formation's (BSF) characteristically high net-to-gross ratio, relative homogeneity, and proximity to the industrial clusters of northeast England (among other favourable characteristics) have made it a principal saline aquifer target for CO₂ storage in the UK Southern North Sea. The BSF currently lacks a regionally applicable sedimentological and stratigraphic framework detailing the depositional evolution of the unit. Potential pressure impacts of CO₂ injection necessitate the more detailed understanding of connectivity and saline aquifer properties at both regional and local scales.

This study compiled a large database containing high resolution sedimentological data and normalised petrophysical log data. These data were constrained using stratigraphical units extrapolated from the Dutch North Sea. We present a new sedimentological and stratigraphic framework alongside a comprehensive depositional evolution model. This highlights multiple periods of system advance and retreat, alongside shifting origins of sediment influx into the depositional basin. These sedimentological and stratigraphical classifications were applied to the porosity-permeability data to identify trends related to depositional controls, as well as to recognise and mitigate against more localised diagenetic influences. The results are discussed in the context of the likely impact on CO₂ storage operations.