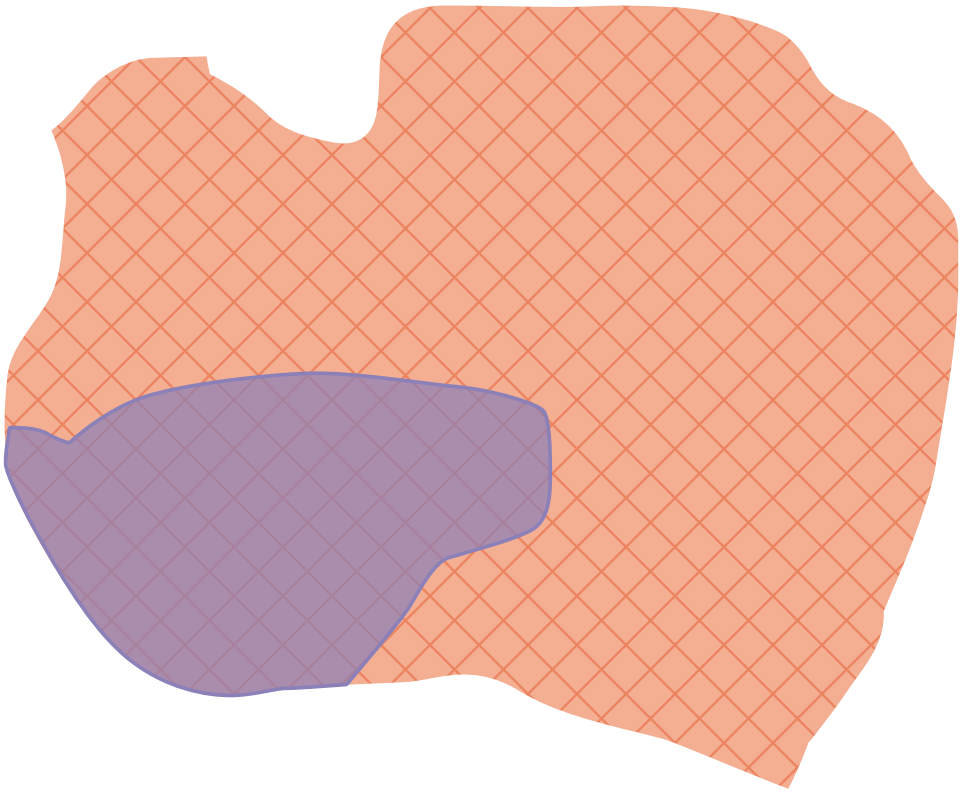
Radioactive Waste Management



East Anglia

SUBREGION 3

Contents

Clicking on words in green, such as sedimentary or lava will take the reader to a brief non-technical explanation of that word in the Glossary section. By clicking on the highlighted word in the Glossary, the reader will be taken back to the page they were on.

Clicking on words in blue, such as Higher Strength Rock or groundwater will take the reader to a brief talking head video or animation providing a non-technical explanation.

For the purposes of this work the BGS only used data which was publicly available at the end of February 2016. The one exception to this was the extent of Oil and Gas Authority licensing which was updated to include data to the end of June 2018.

Our work shows that we may find a suitable geological setting for a GDF in a small part of this subregion.

Although rock cannot generally be seen at the surface in this subregion except in man-made excavations such as quarries or road cuttings, some deep boreholes and geophysical investigations give us an understanding of the rocks present and their distribution.

Geophysical investigations have indicated that there are likely to be granites and similar strong rocks, in which we may be able to site a GDF, between Ely, Cambridge, St Ives and Chatteris. We would need to do more work to find out whether these rocks have suitable properties and thicknesses in the depth range of interest for a GDF.

There are no known coal, oil, gas or metal resources in this subregion which means that it is unlikely that future generations may disturb a facility.

Introduction

This subregion comprises the south-western part of East Anglia including the areas around Cambridge, Ely and Newmarket.

Rock type

Figure 1 shows where in the subregion there are likely to be Higher Strength Rocks (HSR) within the depth range of interest, there are no Lower Strength Sedimentary Rocks (LSSR) or Evaporites in the subregion. In the depth range of interest, this subregion mainly comprises basement rocks about which relatively little is known because only a few deep boreholes have been drilled. The available boreholes have identified sedimentary rocks of Silurian to Cambrian age (approx. 420 to 540 million years old) including sandstones, siltstones and mudstones. However, geophysical survey data also indicates that Ordovician granitic rocks are likely to be present throughout the depth range of interest between Ely and Huntingdon.

In parts of the subregion, older sedimentary rocks may occur above the basement rocks at the top of the depth range of interest. These rocks are likely to be sandstones and limestones of Carboniferous and Devonian age (approx. 300 to 420 million years old).

Insufficient information is available to evaluate whether the basement rocks have the properties suitable to host a GDF. They are not overlain by any LSSR rocks that would provide hydraulic separation between deep groundwater in the basement rocks and that near the surface.

A summary of the geological attributes of the East Anglia region can be found here, including a simplified rock column showing the oldest and deepest rocks at the bottom, with progressively younger rock units towards the top.

Rock structure

No major faulting or folding has been identified to date in this subregion. However this is largely based on geophysical data as the rocks are not exposed at the surface and very few boreholes have sampled the basement rocks in this subregion. The presence of folding and faulting would need to be investigated further as part of the siting process[1].

Groundwater

There is very little information on groundwater in the depth range of interest for a GDF, 200 to 1,000m below NGS datum, although there is information on groundwater in aquifers above 200m. There are no principal aquifers present across most of the subregion, although the Chalk aquifer occurs at shallow depths in the east of the subregion. However, as the basement rocks are not overlain by any LSSR rocks there may not be significant hydraulic separation between groundwater in the basement rocks and groundwater near the surface.

There are 3 small areas (approximately 1km^2 each) where the presence of deep exploration boreholes may influence the connectivity between shallow and deep groundwater which would need to be considered during the siting of a GDF (see Figure 2). There are no thermal springs in this subregion to suggest rapid flow of deep groundwater to the surface.

Resources

There are no known resources in this subregion and therefore the likelihood of future human intrusion is considered to be low.

Natural processes

Earthquakes and glaciations are unlikely to significantly affect the long-term safety of a GDF in the UK. Therefore, whilst a GDF would need to be sited and designed to take account of natural processes which may occur during its lifetime, they are not considered further as part of this screening exercise.

[1] Faults occur on a diverse range of scales, from centimetres to kilometres, and the subsurface is criss-crossed by networks of numerous individual faults. However our work includes only those faults identified by the BGS with throws (vertical offset) of 200m or more. This is because the data available to the BGS are not able to resolve all faults consistently, across all thirteen regions, with throws less than 200m. We recognize the potential importance of smaller scale faults to the integrity of a GDF and will need to survey them in detail as part of the site evaluation process.

Figure 1 The areas of the East Anglia subregion 3 where Higher Strength Rock Types of Interest are present between 200 and 1,000 m below NGS datum.

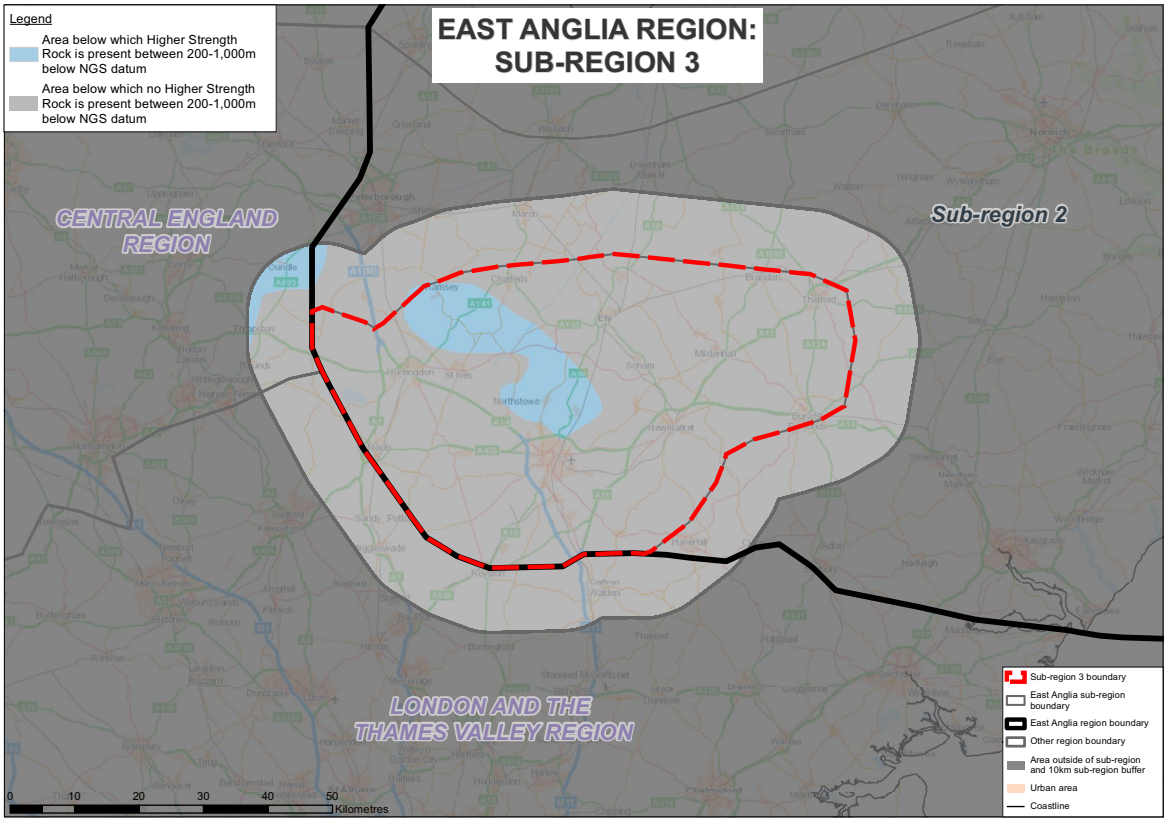
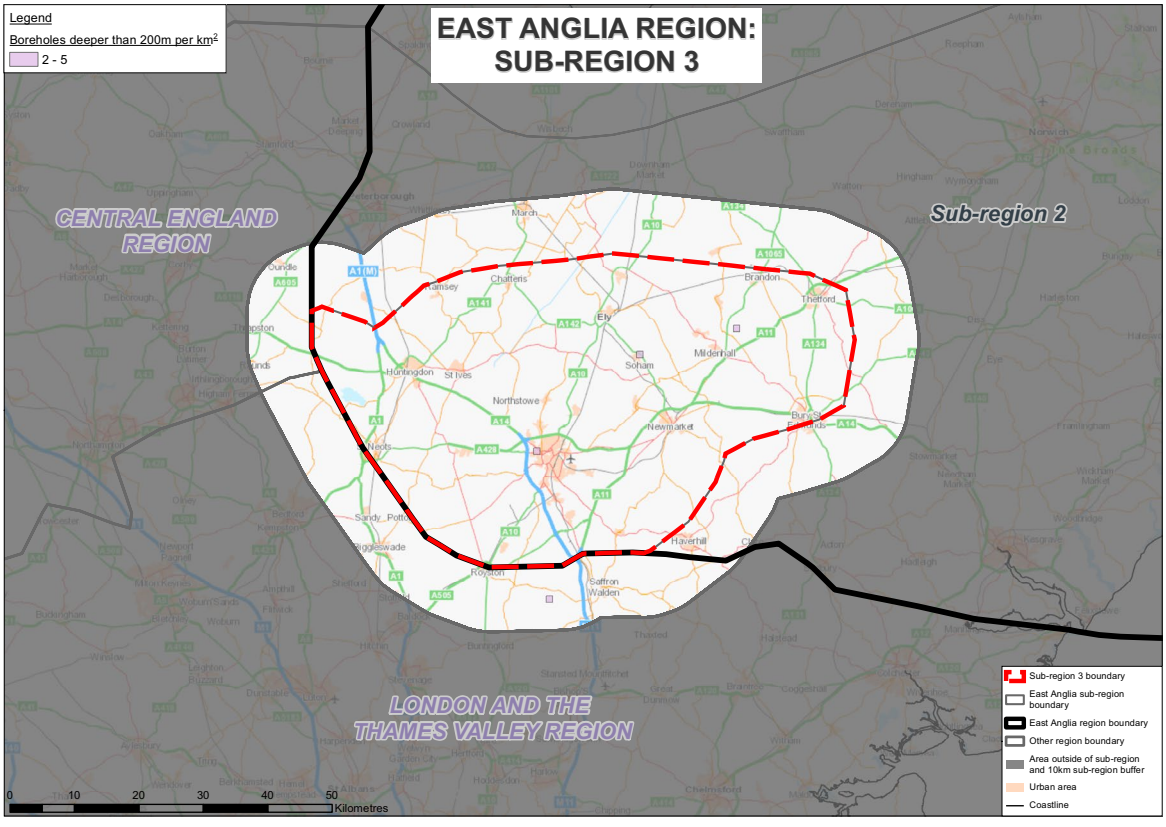


Figure 2 Areas in the East Anglia subregion 3 with concentrations of deep exploration boreholes.



Glossary

Aquifers

Aquifers are rocks that contain freshwater in pores and/or fractures and whose porosity and permeability are sufficiently high to make the extraction of groundwater possible.

Principal aquifers

An aquifer classified by the Environment Agency as: “rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage.” They represent the most important aquifers in terms of water supply or base flow.

Sedimentary

A type of rock resulting from the consolidation of material that has accumulated in layers to form gravel, sandstone, mudstone and limestone. The layers may be built up by movement from erosion (e.g. by rivers, the sea or wind) or by chemical precipitation. Generally, the material that accumulates has originated from the weathering of other rocks. Sedimentary rocks constitute one of the three main classes of rocks identified by geologists, the others being igneous and metamorphic.

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