

Teacher notes – Finding the right rocks for storing carbon dioxide deep underground.

Reservoirs and seals

Generally in storing carbon dioxide, we are looking for a reservoir-seal pair. This is a pair of formations that have the following characteristics:

- There should be a reservoir rock such as sandstone. In sandstone there are tiny spaces (pores) between the grains which mean that the CO₂ can be stored in the rock (good porosity). Also, these pore spaces are connected, so that the CO₂ can move through the rock (permeability).
- A sealing rock, such as shale or mudstone, has low permeability and low porosity and prevents the CO₂ from moving through the rock. Because CO₂ is buoyant, it will try to move upwards, so the sealing rock needs to be above the reservoir rock.

Wireline log traces

Wireline logs have several traces. In this exercise we concentrate on the gamma log (also referred to as EHGR on the log), which is a record of the measurement of naturally-occurring radioactivity. Shales and mudstones generally contain radioactive materials, particularly potassium, and give a high gamma ray reading, where as in general, sandstones have low gamma ray readings.

However, there are some times when the log readings are not quite so neat – for instance if the sandstone contains feldspar.

What are the other traces on the log?

They are the SP – the spontaneous (electrical) potential, caused by charge separation in clay or other minerals, BS - bit size (the drilling bit) and HCAL, which measures the actual diameter of the drilled well hole.

Using the activity:

In part A, Trace A is a sandstone with a shale underneath, which is a reversal of the type of configuration we would be looking for. So Trace A would not indicate good storage.

Trace B is a shale with a sandstone underneath which would be a good configuration. Trace B would indicate good storage.

Trace C is of sandstone with small sections of shale or sands with high natural radioactivity. To determine which, other logs can be used as well as correlation with the cuttings (bits of rock that come out during drilling). So Trace C may be good storage but further information is needed.

In part B, The correct answer is B.

A is B reversed, and has the sandstone showing as a shale or mudstone. C has the Pember mudstone as a sandstone and D has the Timboon sandstone as a shale.