

Cumberland Geological Society Excursion 28 September 2024

The author wishes to preface this document by noting that he is not an expert on any of these topics.

Introduction

Dan Mackenzie published “Some remarks on the development of sedimentary basins”ⁱ in 1978. It is one of the most cited papers on sedimentary basins and describes a common model for the formation of many sedimentary basins in response to crustal extension. The model has been applied by many authors in relation to the history of the Carboniferous Northumberland-Solway Basin. Characteristics of this model include fault controlled rapid early subsidence, often accompanied by volcanism, followed by widespread slower regional thermal subsidence.

Sedimentary basins which subsequently experience compressional forces and crustal shortening undergo structural deformation in a characteristic style called basin inversion, e.g. as described by Dewey in 1989 “Kinematics and dynamics of basin inversion”ⁱⁱ

Finally, after all this has happened, sedimentary basins may be covered by post-deformation sediments.

The detailed history of the Carboniferous Northumberland-Solway Basin is excellently described in the BGS sub-surface memoir “The structure and evolution of the Northumberland-Solway Basin and adjacent areas” (Chadwick et al 1995)ⁱⁱⁱ. The frontispiece diagram shows events across the basin (<https://resources.bgs.ac.uk/memoir-images/images/P1000155.jpg>).

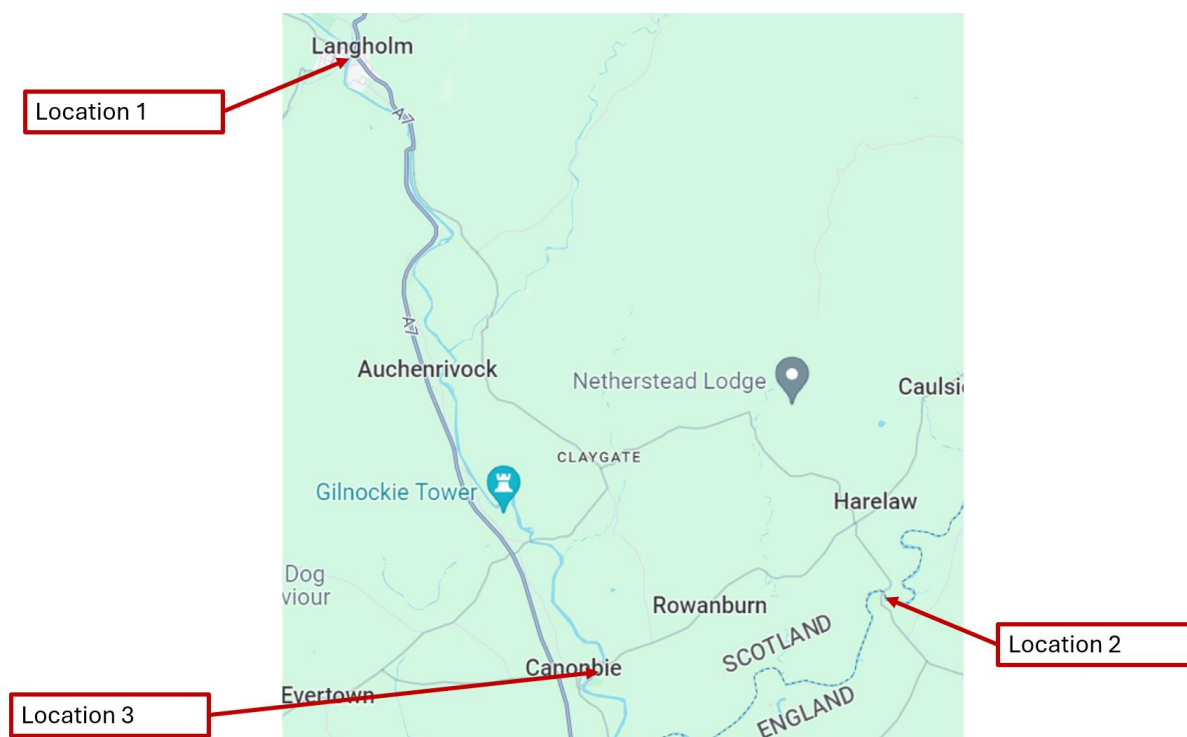
A summary relevant to this trip is shown below

When	Basin phase	Geology	Tectonism	Locality
Permian-Triassic	Post-basin landscape	Dune-bedded sandstones	Post basin deposits	Canonbie
Late Carboniferous- Early Permian	Basin ‘death’	Folds and faults	Basin inversion, compressional folds and faults	Penton
Late Carboniferous	Basin development	Sandstone	Slow regional subsidence	Canonbie
Mid-Carboniferous	Basin development	Yoredale cycles	Slow regional subsidence overprinted with glacial-drive sea level change	Penton
Early Carboniferous	Basin ‘birth’	Basalt lavas	Extensional folds and faults, rifting and volcanism	Langholm
Silurian	Pre-basin landscape	Greywackes	Basement Rocks	Langholm

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This excursion is based on the BGS publication “Geology in South West Scotland” Edited P. Stone, 1996, and is an abbreviated version of Excursion 1 - Langholm and Canonbie.^{iv} We will be visiting locations 3, 4 and 6 from this excursion guide. There are full geology notes for the locations in this guide, available free online, which are not reproduced here.

Itinerary map



Logistics

10.00 to 10.30 Location 1: Charles Street Car Park, Langholm, Grid reference NY 362 844, Postcode DG13 0AA

Langholm is on the A7 north of Carlisle, just over an hour's drive from Keswick. From Keswick take the A66 east towards Penrith, join the M6 heading north at junction 40. Exit the M6 at junction 44 and take the A7 north towards Longtown. Stay on the A7 past Longtown until you reach Langholm. Just after the narrow single lane section in the town centre bear left and then turn left to reach the Charles Street car park.

Refreshments and toilets are available in Langholm town centre where there is also free short term disk parking. Pelosi's Corner café is recommended for early arrivals or those wanting a late breakfast.

We will **assemble in Charles Street Car Park at 10.30** for the 2 mile loop walk to Skipper's Bridge (there is no safe parking for a group of cars at Skipper's Bridge, and the riverside walk is pleasant).

At Skipper's Bridge we will look at exposures of the Silurian greywacke basement, presumed to extend under the Northumberland-Solway Basin, the basin margin fault and early Carboniferous Birrenswark lavas from the extension-rifting phase – the birth of the basin.

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We aim to return to Charles Street Car Park by 12.30 for the short drive to Penton Bridge.

12.30 to 12.50 drive to Penton Bridge.

From Charles Street Car Park follow the one way system round to rejoin the A7 turning right to head south. At the traffic lights at Skippers Bridge turn left on the B6318 towards Penton. Follow the B6318 taking care to turn left at Claygate and then left and right at Harelaw where the road descends to the Liddel Water. There is parking for 3-4 cars in the layby on the left before the bridge, and for several more cars on the roadside on the right past the bridge.

Location 2: Penton Bridge, Grid Reference NY 432 774, Postcode CA6 5QU.

12.50 to 15.50 we will explore this scenic geological SSSI to look at the Carboniferous Yoredale cycles, with fossiliferous limestones, mudstones, siltstones, sandstones and coals. We will also explore the basin inversion fold and faults visible here. We will have lunch en route. We return to the cars at 15.50 for the short drive to Canonbie.

15.50 to 16.00 drive to Canonbie.

We return on the B6318 to Harelaw where we turn left on the B6357. We pass through Rowanburn, with its visible coal mining history. On entering Canonbie we turn **left at the signal-controlled bridge before** crossing the River Esk signposted Canonbie churchyard. Follow this road towards the church, turning right at the cemetery where there is parking for several cars. If this parking area is full there is more parking on the other side of the bridge in Canonbie at the village hall.

Location 3: Canonbie Church, Grid Reference NY 394 763, Postcode DG14 0RA.

16:00 to 17:00 we walk past 'Dead Neuk', scene of a tragic ferry accident in 1696 when 28 church-goers were drowned in a flood, and along the riverside. On the far bank we can see Permian desert sandstones, the post-basin deposits.

We continue along the river bank to a small bluff where there is an exposure of late Carboniferous red-beds (the Canonbie Bridge sandstone). These are described in a relatively recent BGS report "The stratigraphy and sedimentology of Upper Carboniferous Warwickshire Group red-bed facies in the Canonbie area of SW Scotland" Jones and Holliday 2006.^v These rocks are "probably typical of what covered most of northern England prior to late Carboniferous folding and uplift"^{vi} according to the British Regional Geology guide to Northern England, so represent the final deposits in the Northumberland-Solway Basin.

ⁱ [https://doi.org/10.1016/0012-821X\(78\)90071-7](https://doi.org/10.1016/0012-821X(78)90071-7)

ⁱⁱ <https://doi.org/10.1144/gsl.sp.1989.044.01.20>

ⁱⁱⁱ <https://webapps.bgs.ac.uk/Memoirs/docs/B06816.html>

^{iv} https://earthwise.bgs.ac.uk/index.php/Geology_in_south-west_Scotland:_an_excursion_guide.

^v <https://nora.nerc.ac.uk/id/eprint/7191/1/1R06043.pdf>

^{vi} https://earthwise.bgs.ac.uk/index.php/Warwickshire_Group,_Carboniferous,_Northern_England