Watch Hill Formation and Intrusions, Cockermouth

Leader: Phil Davies 4 August 2021

Watch Hill, known locally as The Hay, lies on an elongated ridge that runs roughly eastwards from the edge of Cockermouth to become Setmurthy Common. For this evening excursion the group assembled near Cockermouth School and followed the bridleway up the hill.

Along the way there were opportunities to take in excellent distant views. The view south into the Lake District along the Vale of Lorton traverses Skiddaw Group Sedimentary strata (both north and south of the Causey Pike Fault) to the Borrowdale Volcanics in the Buttermere area. To the north, beyond the strip of Carboniferous age Cockermouth Lavas (not discernible from this location) lies a broad sweep of limestone country evident in the quarrying at Moota and Clints Crags (with limestone pavement) near Blindcrake.

Closer by, Watch Hill is separated from Slate Fell to the south by the valley along which runs both the Cockermouth to Embleton Road and Bitter Beck. The latter gives its name to the Bitter Beck Formation that underlies the Watch Hill Formation. The Bitter Beck Formation is the oldest formation exposed in the Lake District: being dominated by mudrocks it doesn't form particularly good exposures. However it can be examined in river banks at Cockermouth. Published BGS mapping (1:50,000 Sheet 23) shows the Bitter Beck Formation as being thrust over the younger Kirk Stile Formation. The Watch Hill Thrust is mapped as lying in the valley of Bitter Beck and extending eastwards into the Northern Fells north of Skiddaw. It was possible to discern at least one (quarried) diorite intrusion in the northern side of Slate Fell.

The first summit of Watch Hill (NY 14739 31789) is notable for a good exposure of one of the diorite masses that lie within the Skiddaw Group strata between Bassenthwaite and Cockermouth. (Figure 1) Columnar jointing is clearly evident, albeit imperfectly developed. This occurrence appears to be a bedding-parallel sill: the steep southerly dip of the columns would be compatible with the predominantly NNW bedding dip of most of the Watch Hill Formation.

Most of the outcrops visible on Watch Hill are at small quarried pits (often for the purpose of extracting diorite (for example at NY 15508 31864, NY 15523 31860 and NY 15626 31865) that are dotted along and around the ridge. Laminated turbidite sandstones and siltstones of the Watch Hill formation can be examined here and there. While at some locations these tie up well (and over tens of metres) with the bedding orientation shown on BGS mapping (around 35 degrees towards the NNW), pronounced slump folding is also displayed. These 'soft sediment' structures predate the tectonic phenomena that gave rise to the overall 35-degree tilt to the mass of strata. Over a distance of a few metres these apparently localised structures show disharmonic folding (argillaceous beds squeezed thicker at fold axes) and 'pinch and swell' effects (Figure 2). Setting aside one location with vertical bedding, it was considered that the beds probably remain 'younging upwards'.



Figure 1 Watch Hill diorite columnar jointing NY 14700 31700

The group returned to Cockermouth to complete the excursion in just over two hours. The leader noted that there remains scope for further geological exploration here in a more extended trip. For example less accessible diorite exposures are present in the south facing flanks of the hill. A large but weathered diorite exposure is present beside the Setmurthy Plantation forestry road along the northern flank together with remarkably consistently dipping Watch Hill strata in roadside cuttings.



Figure 2 NY 15500 31824 examining slump folding.