Newly exposed Carboniferous, and the aesthetics of developments in the Greystoke Gill, Penruddock and Pooley Bridge areas.

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New exposure

The Lake District fringe is seeing multiple development and urbanisation by way of new-build houses, many on green-field sites, and renovation of old buildings. In some cases, houses or bungalows are demolished to create new building plots which are in scarce supply.

One such plot is near Greystoke Gill where a new Huf-style house is being built on the site of a demolished bungalow.



Figure 1 Newly exposed sandstones at Greystoke Gill.

Bedrock has been newly exposed during excavation of the site. This new exposure is part of a reddish-purple sandy unit within the Alston Formation Carboniferous Limestone sequence. Sandstone beds are one to three feet in thickness and possibly shallow turbidites or deltaics. Thin interbeds of pale green or whitish sandstone are due to reducing conditions. There appear to be no macrofossils. The unit is capped by another thin limestone bed that forms a mostly grass-covered pavement on the terrace above. (Figure 1)

The older limestones of Penruddock and Motherby sit stratigraphically beneath this new exposure. Those units are rich in Productids, corals, bryozoa, and have few sandy intervals.

The limestones of Newbiggin and Flusco sit above the new exposure and sandy units are more common, as at the new Ullswater Heights holiday park which was built in an old quarry. The excellent exposures can be viewed from the panoramic new clubhouse bar and terrace that is open to the public.

The new exposure is typical of other sandy units that proliferate in the direction of Johnby, Skelton and Blencow. These units mark the gradual end of major Visean limestone deposition and the transition to Namurian, sand-rich lithologies of the Stainmore Formation sequence. Most of the Namurian is overstepped by Permian and Triassic units in our area, with only residual grabens near Carlisle and the Solway basin (proved by deep seismic and the West Newton borehole). The main Namurian sequences crop out extensively to the west of the Lake District, east of the Pennines and further south in the Peak District.

Aesthetics

The aforementioned developments across the area raise the interesting topic of geological aesthetics. Do the new developments harmonise with local geology? Is local stone used for construction? In the long term, will visual harmony and aesthetics be maintained? Some local case histories are worth investigating.

Pooley Bridge

The new bridge was installed during May 2020. The stainless steel structure design was selected from three options by a local poll. Arguments have since raged in the local press about whether the design is attractive, practical, fit-for-purpose, or will stand the test of time. A recent correspondent suggested another high flood level (inevitable of course) would push debris onto the bridge base. Time will tell.

From a geological perspective, the stonework appears to be a perfect ‘dog’s breakfast’. The bridge abutments are clad with yellow sandstone from Whitehaven. Adjacent walls are dark red Penrith sandstone. Protective boulders on the riverside are of Shap

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Figure 2 Close juxtaposition of allochthonous rocks at the new Pooley Bridge

adamellite/granite (Figure 2).

Why local Kirkstone slate was not used for cladding in large blocks is a pertinent question, or indeed why not local Ullswater volcanics? Another alternative might have been local Carboniferous Limestone that sits only 700 yards up the hill above Pooley Bridge. Alternatively, could the original bridge stonework that collapsed into the river (Figure 3) have been used? This would have formed a tangible connection with the original. Allegedly those pre-existing sandstone blocks are now in a Stainton landfill, although they may be re-used

In aesthetic terms, perhaps the bridge does not sit harmoniously with the local geology, therefore it may never look in keeping. In practical terms, it will not carry two-way traffic which is a major deficiency, and it remains to be seen how the design copes with a high water level (maximum recorded level almost nine feet in December 2015, top of normal range approx. three feet).

Flood damage is mostly caused by entrained debris – trees, vegetation and flotsam rather than the water *per se*. Debris backs up against bridges and culverts leading to high lateral stresses, effectively damming the water, then diversion of water laterally onto the flood plain or pushing over the bridges. This mechanism brought down many smaller Lake District bridges in 2005, 2009 and 2015 and it will most likely happen again, especially with the current vogue of planting more and more trees.

Tree planting in these local water catchments could be likened to loading the shotgun, as during high flow regimes, water goes in a straight line direct to the scene of the accident and carries everything in its wake. Artificial creation of meanders for flood control (as for example between Brothers water and Ullswater) is a pointless exercise. The first lesson of river geography for most schoolchildren describes channel shortcuts, abandoned meanders and ox-bow lakes. The presence of trees simply adds to the entrained debris load as the flood volume overwhelms



Figure 3. The original collapsed bridge and sandstone blocks, December 2015

every barrier and heads in a straight line for the nearest water body.

Nevertheless, geologically, the stonework of the new bridge raises questions about localism, about local materials, and about visual harmony and aesthetics.

Penruddock gabions

Gabions are wire baskets filled with rocks used to stabilised slopes, embankments and culverts. In this example a collapsed wall close to the church has been rebuilt and stabilised using gabions (Figure 4).The wall sits atop an attractive Carboniferous limestone outcrop that looks down on a small glacial overflow channel containing large erratic boulders. The wall itself is almost wholly of limestone – this was pleasing on the eye. However, the gabions have been filled with grey volcanic stone from outwith the area.



Figure 4. Penruddock gabions

The shape of the gabions clashes somewhat with the limestone outcrop, but the main clash comes from the material and colour of the introduced stone. Perhaps limestone would have been visually pleasing and more aesthetic. Perhaps also, a buttress construction against the high wall would have looked architecturally more in keeping. There are many examples locally of buttressed barn walls and the like.



Figure 5.Sandstone wall atop limestone outcrop, Penruddock

Also in Penruddock, just around the corner towards the A66, limestone bedrock is exposed beside a bungalow. The low wall on top of the limestone has been constructed using red sandstone (Figure 5). Again, there is visual disharmony with this clash of rock types, there is something alien about the wall. A limestone wall would have been aesthetically and geologically more in keeping.

As development continues apace across the area, it is incumbent on local geological societies to offer advice and get involved with planning applications. The attractive vernacular architecture of the area developed over a long period by using local materials in keeping with existing buildings and local geology. Any departure from this fundamental principle will diminish the long-term attractiveness and aesthetics of our local environment.