East Antrim U3A geology group report – Carnlough 19th July 2022

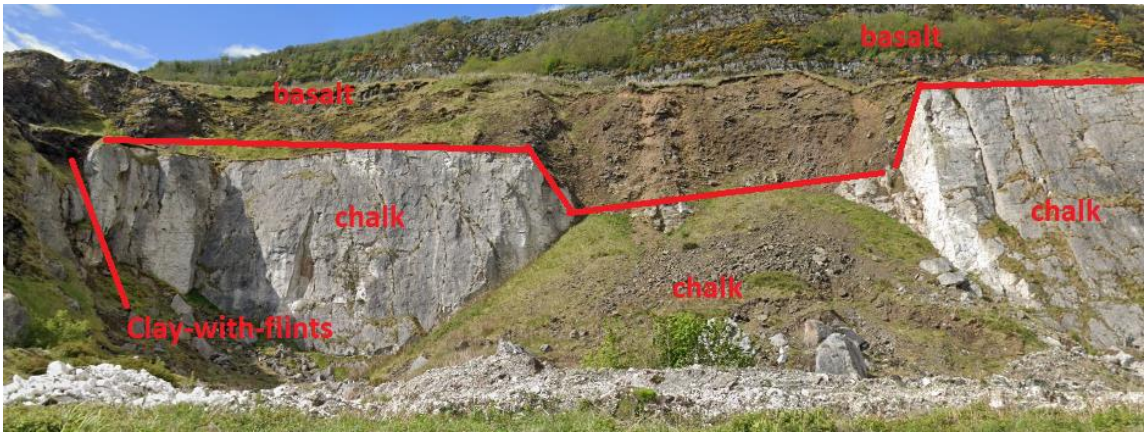
Ian Enlander group convenor

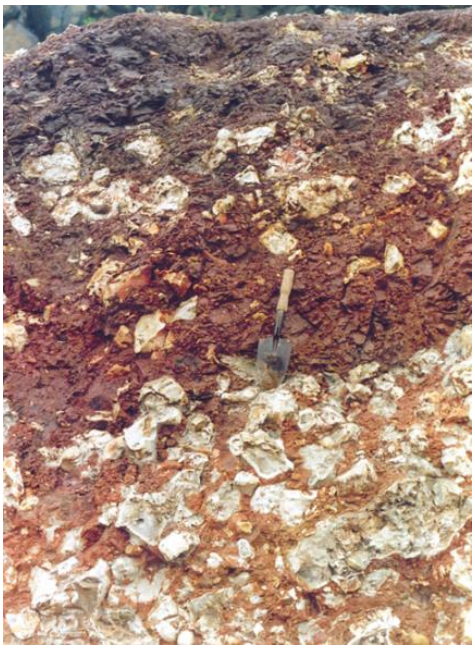
7 members of the East Antrim U3A Geology Group were joined by folk from the North Down and Ards U3A to enjoy yet another sunny day to look at aspect of the geology and industrial heritage of the Carnlough area.

Clay-with-flint deposits

Our first stop allowed us to look at the rocks exposed by quarrying and a recent landslip near Whitebay car park, south of Glenarm. This offers excellent sections through the chalk and overlying basalt, but also shows some of the interesting features of the pre-basalt chalk surface together with our first view of the enigmatic clay-with-flints deposit. This occurs at various places between the top of the chalk and below the first basalt unit around the Antrim coast.

We know that the chalk (Ulster White Limestone) formed in a marine environment from around 90 – 80 million years ago. Around 80 million years ago the limestone was uplifted, becoming dry land. As is the case today, exposed limestones are subject to the slow but relentless effect of chemical weathering as rainfall (a weak acid) gradually dissolves the calcium carbonate which makes up bulk of the limestone. Weathering is uneven and can become concentrated due to an uneven land surface. Such karst landscape eventually are characterised by most water movement happening below the surface as streams dissolve out sinkholes and voids formed underground result in collapse features (dolines) on the surface. The range of features found in these Cretaceous limestones match well those found in modern karst landscapes e.g. around the Marble Arch Caves in Fermanagh.





The irregular land surface seen at Whitebay is due to this dissolution process with a sizeable doline exposed by quarrying and more recent land slippage. The doline has been subsequently infilled by the first lava flows when these were erupted across the land surface some 65 million years ago.

The clay-with-flints is widespread in its distribution between the chalk and basalt. It is variable in thickness and can be entirely absent. As the name indicates it is made up of clay (typically red) and flints (of variable sizes).

So where did the flint come from? Well that one is straightforward. As the upper layers of chalk were dissolved away, the flints (which are pure silica and insoluble) were left behind. Indeed the pre-basalt land surface would have been dominated by deposits of flint. While the thickness of chalk dissolved varies considerably by location, up to 40m is known to be 'missing' in some areas.

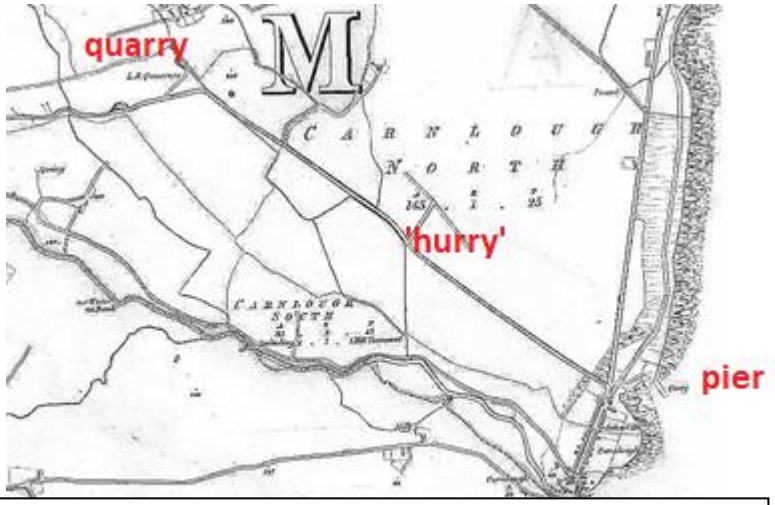
And what about the clay? Well that's when the problems start. Previously it was thought that the clay was also an insoluble residue left behind as the chalk was weathered. However simple maths shows that there is not enough clay in the chalk to account for the volumes we see in the clay-with-flint deposits. When the clays were analysed, it was shown that their geochemical signature matched that of the volcanic rocks associated with the start of the eruptive series which culminated in the formation of the basalt series. Early explosive eruptions generated huge volumes of volcanic ash which flowed down the volcanic slopes (these early volcanoes were either subsequently eroded away or are buried under the main basalt plateau – we certainly cannot see any trace of them today) or contributed to mudflows (such volcanic eruptions typically generate huge thunderstorms leading to flash floods). The ash flows must have quickly encountered the flints, adding to the volume of material on the move. As the flows subsided and slowed, a mix of the ash (soon to be weathered to clay materials) and flint were deposited

in hollows or wherever the flows stopped. With the onset of the more typical fissure eruptions, lavas (cooling to basalt) soon capped the clay-with-flints and chalk, protecting them from erosion.

We had another opportunity to see the clay-with-flint deposit near Cranny Falls, Carnlough.

Carnlough quarries and industrial heritage

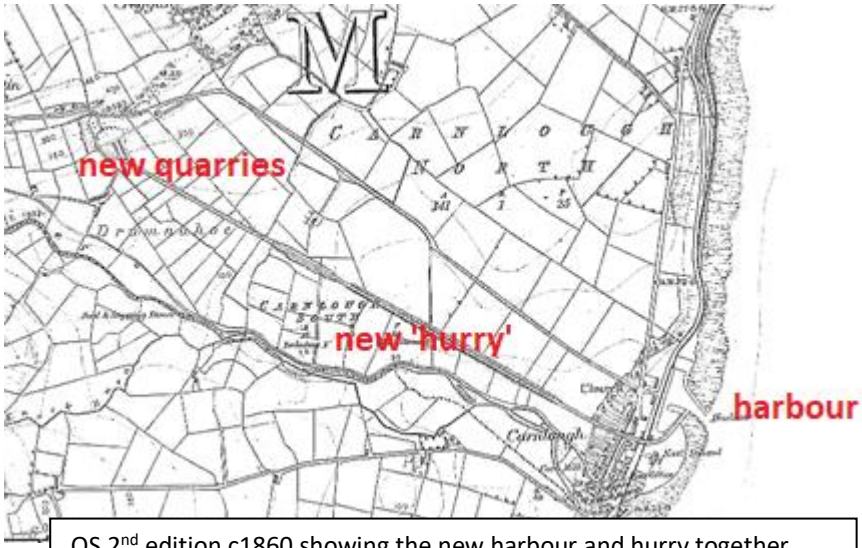
Limestone quarrying and processing is what made Carnlough. As early as the 1830's a small 'hurry' (inclined plane used to bring stone, possibly on sledges, part of the way to the pier, the journey being completed by carts) led from the first quarry above the village to a pier. Around this time, the profitability of quarrying was evident from the success at Glenarm. Limestone was quarried and shipped in various forms to Scotland but it was thought that Carnlough offered a better setting for a purpose built harbour offering deeper water, allowing ships to be loaded directly from land thus cutting out the time consuming and costly use of 'lighters' or barges to move material to ships at anchor offshore. The material was shipped to Scotland (south-west Scotland has limited limestone) where the ships offloaded limestone and took on a cargo of coal – much in demand in Ireland.



OS 1st edition c1830 showing the original quarry and 'hurry' linking it to the small pier which lay to the north of the larger harbour

The major landowners in the Carnlough area, the Marquis and the Marchioness of Londonderry, also owned major coal mines in Co Durham which supported the iron smelters in Cleveland. With the relative proximity of Carnlough to the Clyde-side iron industry, they recognised a major business opportunity. The limestone was used for a range of purposes including as a flux in the new iron smelters of Clydeside (adding flux helps the smelting process and draws out impurities).

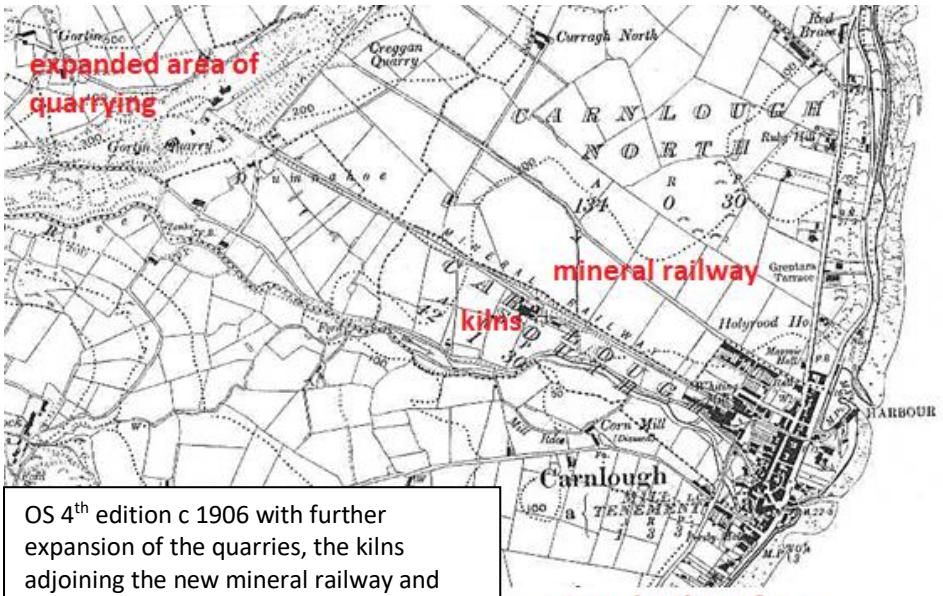
Additional uses included production of agricultural lime via a set of large kilns (now demolished), then taking the lime as a further raw material fed to the nearby whiting mill (generating a fine grade chalk for use as a filler in whitewash, paint and putty and possibly also to bulk out flour). It was also important for production of mortar and cement.



OS 2nd edition c1860 showing the new harbour and hurry together with the expanded scale of quarrying.

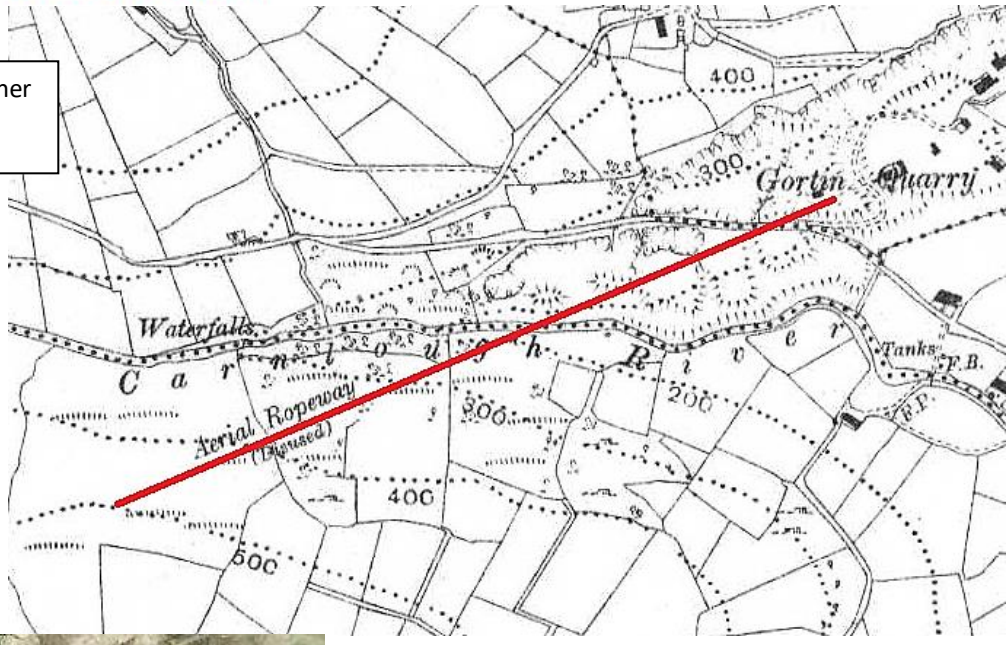
A comprehensive account of the development of the harbour can be found at https://antrimhistory.net/carnlough-harbour-development-scheme-18541864-by-jimmy-irvine.
The project commenced in 1853 but experienced a range of problems including solid rock at the harbour entrance, dredging required to deepen the harbour basin to counter the build-up of sand and collapsing harbour walls amongst others. The counter-balanced rail system for bringing limestone and products to the harbour also gave problems and still required material to be carted to the harbour until 1856 when the system was perfected. A second mineral railway also brought limestone products to the harbour area, this from the quarry at Tulloughter. The importance of 'burnt lime' to the schemes profitability was early recognised and by 1857 industrial scale kilns had been constructed beside the main 'hurry' coming from the quarries. The development of the overall scheme can be followed through use of the various Ordnance Survey maps of the area.

A new extractive industry came to Carnlough in 1902. Surveys had shown that the peat above Carnlough (in the townlands of Harphall and Aghalum) was particularly rich in ammonia. A scheme to process this peat was devised, with the final product being ammonium sulphate, a very important fertiliser. Peat was cut and delivered to the 'head' of an aerial



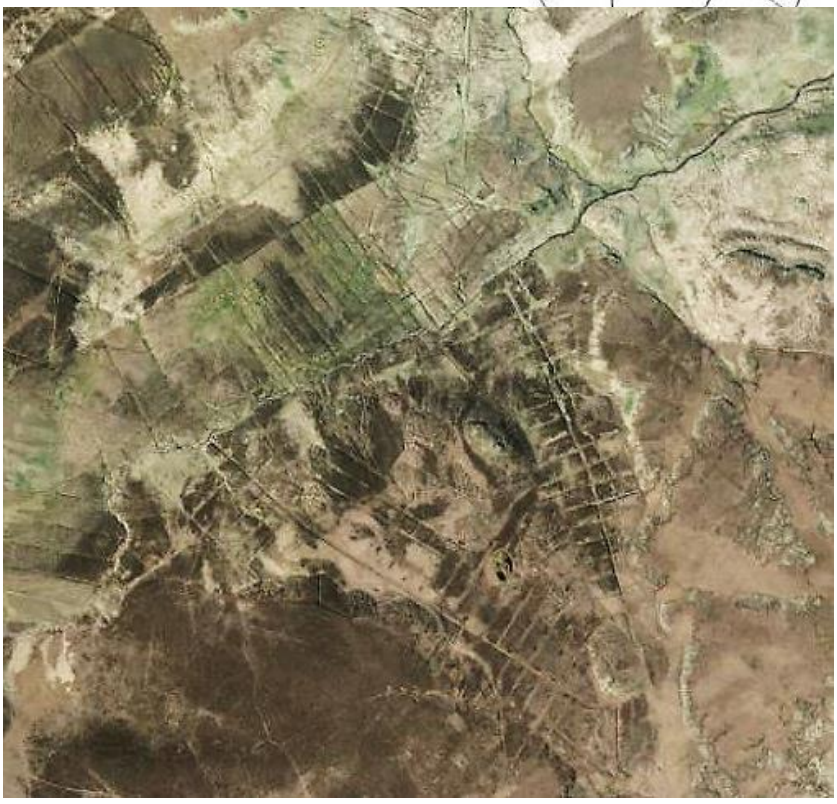
OS 4th edition c 1906 with further expansion of the quarries, the kilns adjoining the new mineral railway and the additional mineral railway linking the Tullyoughter quarry with the harbour

ropeway by a small railway network. Here it was loaded into suspended buckets and delivered to the lower station, close to the start of the mineral railway, which presumably took the finished fertiliser to the harbour for export. Over 200 people were employed making this a very important input into the local economy. The scheme was relatively short-lived, closing due to a reduction in quality (ammonium content) of the source peat in around 1908. Again the maps help in telling the story, while modern aerial photographs identify the scale of the former peat cutting and even show the buildings associated with the upper station



OS 4th edition showing extent of quarries together with aerial ropeway bringing peat to the Low Station for manufacturing ammonia sulphate

The story of the Carnlough sulphate of ammonia industry can be found at https://antrimhistory.net/the-sulphate-of-ammonia-co-ltd-carnlough-by-linda-mcneill while some additional information and a picture of the remaining building near the head station, can be found at http://www.hidden-gems.eu/antrim-carnloughpeatdiggers.pdf.

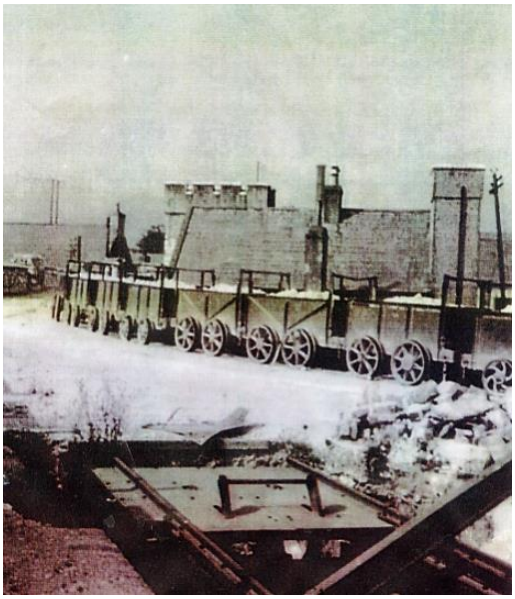


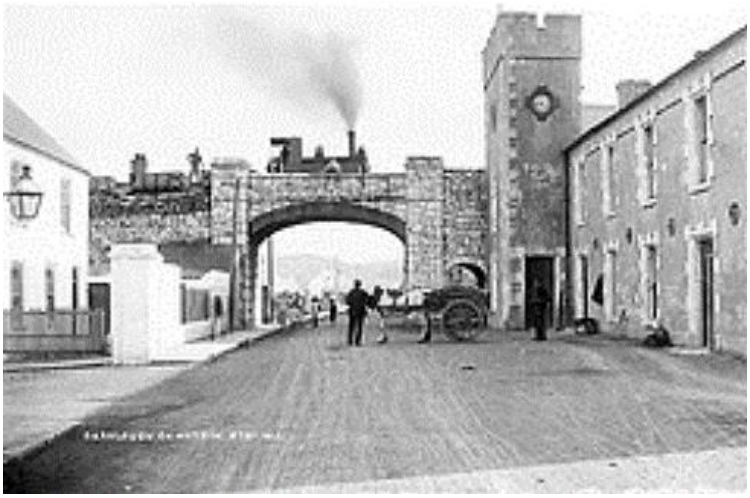
Recent aerial photo of the peat works showing layout of former lines used to transport cut peat to the aerial ropeway – steam engines hauled wagons. The mechanism driving the aerial ropeway is not clear but presumably relied on a combination of gravity and some powered mechanism at the lower station

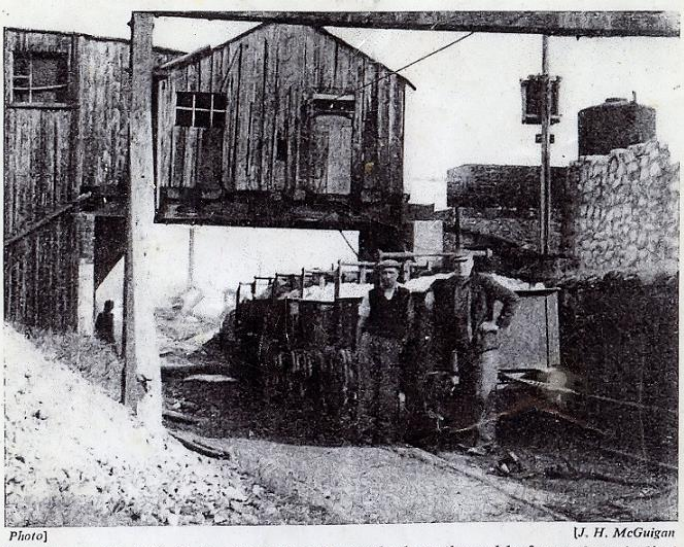
Recent aerial photo coverage showing foundations of the uprights of aerial ropeway

Early 1905 saw construction of a dining room and huts for sleeping at the High Station – remains shown left. An office, staff house and the processing plant were built at the Low Station. The aerial runway was supported on 24 trestles.

There are many contemporary photographs of the working harbour, together with quarry and mineral railway. No images are known of the sulphate of ammonia peat works or the associated aerial ropeway.







Photo] *[J. H. McGuigan*

Trucks on the 4 ft. 8½ in.-gauge track attached to the cable from the winding engine. The cable passes overhead to an idling drum before returning to ground level

An exhibition space has been developed in the village which tells the story of Carnlough and its rich industrial heritage – details at https://discovernorthernireland.com/things-to-do/the-heritage-hub-at-carnlough-town-hall-p731211

Reproduction of an old photograph showing the locomotive '' Otter '' at work about fifty years ago