East Antrim U3A geology group report – Brown's Bay, Islandmagee 6th September 2022
Part 1

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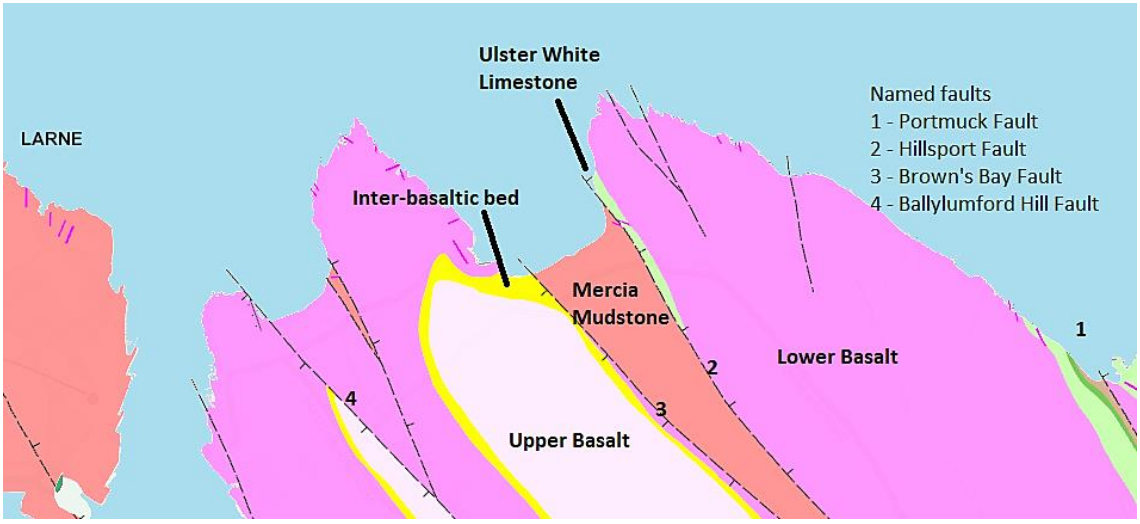
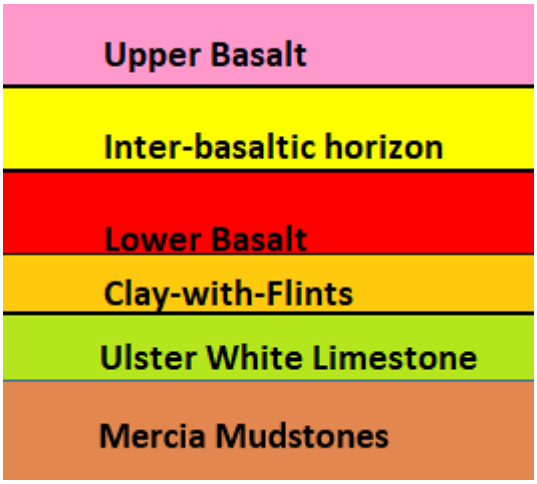
Links to all previous excursion reports can be found at https://eau3a.org.uk/geology/ (scroll down web page)

The plan. A small group of us gathered on a fine afternoon at Browns Bay. On the east side of the beach there is a good range of rock types and also one of the most easily and clearest examples of faulting. Rocks on the west side of the bay consist of one of the most accessible examples of the Inter-basaltic horizon, of considerable commercial/industrial importance as a source of iron and aluminium ores. The headland of Skernaghan Point on the east side of the bay, exhibits a fine example of a 'raised beach'. Finally, along the way we looked at modern beach and stream processes.

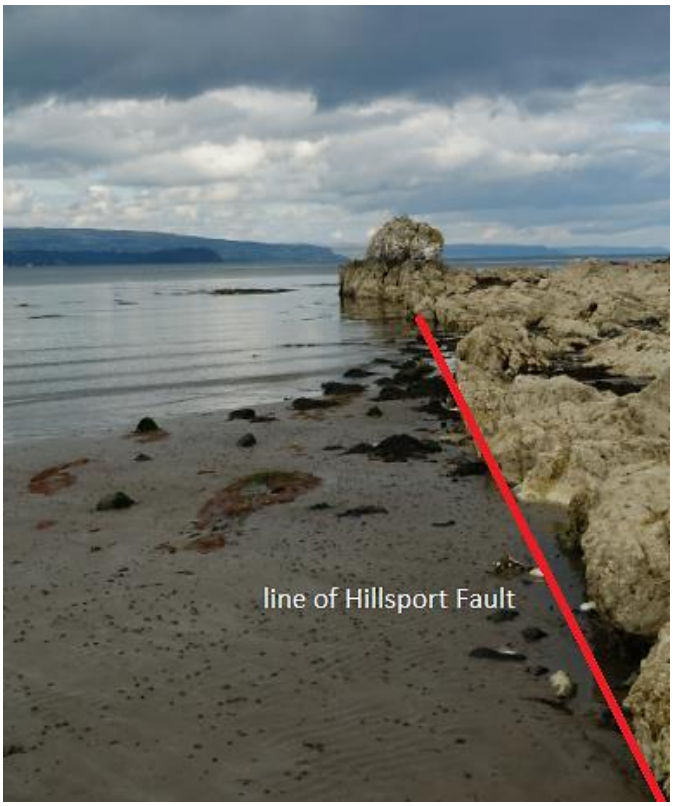


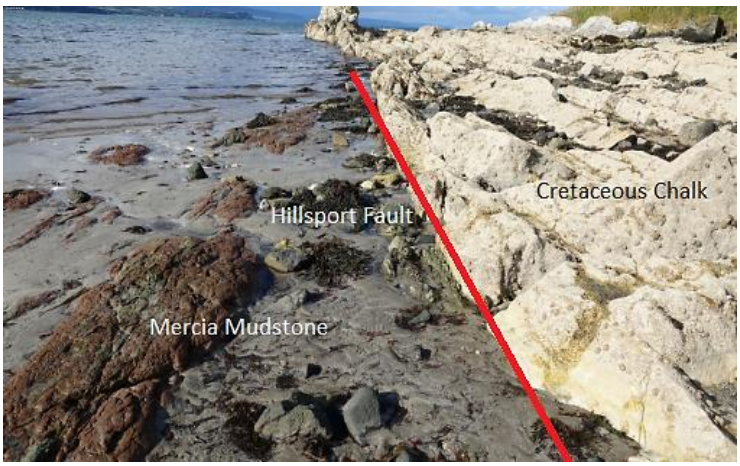
The solid geology of the area is shown in the map together with location and names of the main faults.

The low lying ground that forms Browns Bay and the valley to the south, is due to faults to the east (Hillsport Fault which runs the length of Islandmagee, continuing to the Hillsport area, south of The Gobbins) and to the west (Browns Bay Fault). Movement on these faults (principally vertical) has brought chalk (on the east side only) and basalts to the level of Mercia Mudstone – a displacement of many 10's meters. The basalt now forms the higher ground bordering Browns Bay. The rock sequence is shown on the right. Note the Upper Triassic (Penarth Group) and the Lower Jurassic rocks are not present in this area.



The Hillsport Fault is very clearly defined on the east side of the beach with a relatively thin series of the upper chalk present. The Triassic age Mercia Mudstone is mainly buried by the beach sand but can be seen if the sand cover has been stripped away by storm activity.





You can read about the story of the chalk at the Portmuck report (https://eau3a.org.uk/wp-content/uploads/Images/Interest-Groups/Geology/4.-Portmuck-excursion-10th-May-2022.pdf) while the flint was covered in the Glenoe report (https://eau3a.org.uk/wp-content/uploads/Images/Interest-Groups/Geology/Geology_Group_Glenoe_excursion.pdf). The intervening deposit of Clay-with-Flints can be seen at Browns Bay. This unit occurs between the chalk and the first flow of the Lower Basalts. It is a bit of a scramble to find so material that had been collected earlier was examined 'in the hand'. More information on the Clay-with-Flints is in the Carnlough report (https://eau3a.org.uk/wp-content/uploads/Images/Interest-Groups/Geology/6.-Carnlough-excursion-19th-July-2022.pdf).

Dating from a much later period, the last being some 6,000 year ago, periods of relatively high sea-levels have eroded a distinctive bench into the basalts at Skernaghan Point. Formed during our most recent period of glaciation, the story of fluctuating land and sea-levels result from a combination of the weight of ice on Ireland (generally thickest in north-east) depressing land levels, while sea-levels were also lowered due to the amount of water locked up in these enormous ice masses. As the ice melted, sea-levels began to rise while the reduction in the weight of ice allowed land levels to 'bounce back'. The rates of response to these changes differs, resulting in times when relative sea-level was higher than today. Time didn't permit examination of Skernaghan Point but you can walk the bench (a raised beach) and visualise which bits of land would have been under water and which would have formed off-shore islets and abandoned sea-cliffs.

Next on the agenda were the rocks on the west side of Browns Bay. Looking at the solid geology map above, the effect of the Browns Bay Fault can be see with basalts (west of the fault) being brought down to the level of the Mercia Mudstones (east of the fault). The fault has also 'brought down' some other rocks that are not found elsewhere on Islandmagee or the wider Larne – Carrickfergus area. Looking at our rock series diagram above we see 3 geological units that contain the word 'basalt'. The earliest of these is the Lower Basalts, formed by fissure eruptions spewing huge volumes of lava out over the land, building up layer by layer and dating from about 61 million years ago. There was a pause in these eruptions over most of the Co. Antrim area before they recommenced around 59 million years ago to produce the Upper Basalt series – a sliver of which survives in the Browns Bay area. So what happened during the extended period when no lavas erupted?

Red Inter-basaltic horizon – the laterites. Former iron ore mines near Ballynure

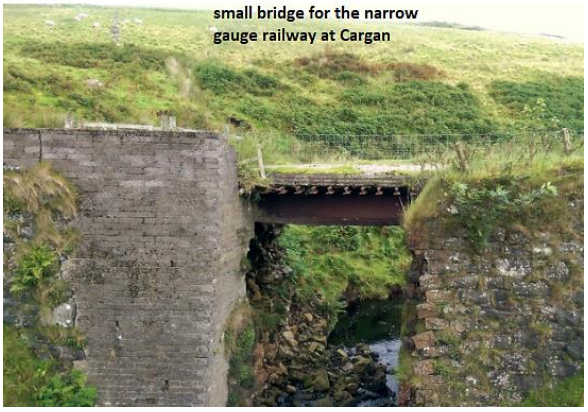
The climate at that time was warm and wet. The land surface would have consisted of the uppermost flows of the Lower Basalts. Over the period of this interruption in igneous activity, the Lower Basalt surface would have been exposed to weathering action. Minerals were broken down and altered and certain components in the rocks were subjected to movement (in solution) within the primitive soil profile. This mineral weathering and redistribution of certain components resulted in a relative enrichment of the uppermost part of this ancient soil in iron compounds typically in the form of the clay mineral kaolinite. Overall the orange-red soil, known as laterite, contain some 30% iron. Where the parent rocks were richer in silica (volcanic rocks and ash beds), the dominant clay mineral produced by weathering was gibbsite rich in aluminium. The aluminium-rich material is more restricted in distribution than the iron rich series. Laterite soils are found today in over large areas of the planets landmass within the tropical – humid climatic zones. Large areas of laterites were also formed in the past. They are derived from a range of parent rocks material, not just basalt.

While we now recognise that the Inter-basaltic horizon is the result of an extended period of weathering of the upper parts of the Lower Basalts, earlier geologists thought the 'red beds' were deposited as sediments in a series of huge lakes. Browns Bay was one of the sites used in the early 20th century to demonstrate that this wasn't the case. The red beds showed no layering (as you would expect in a series of lake sediments) and also the gradation in weathering from basalt to laterite could be seen clearly. Indeed the laterites often contain residual masses of partially or unweathered basalt – demonstrating that the basalt was the parent material from which the laterite was derived. Strictly speaking those sections which retain unweathered or partially weathered basalt is referred to as lithomarge; the term laterite being reserved for the upper sections where the basalt has been completely broken down. So the Inter-basaltic horizon is really a fossil soil developed in the upper part of the Lower Basalts.

In some areas the iron content was high enough to make the laterites economically important – the richest ore was found at the top of the laterite. It is known that some of the deposits were worked for aluminium (the latter ore is known as bauxite).

Over 700 adits (horizontal passages or drives driven into the laterite beds on hillsides to allow the ore to be extracted) are known throughout the Antrim 'iron fields' and a total of some 5 million tons were mined. The adits typically opened out into a series of side drives and where good quality ore was encountered, the mine opened up into stall and pillar sections where sufficient material was left to support the roof. Generally the mine roofs needed minimal support (the

roof was formed by the bottom of the first flow of the Upper Basalts) which helped with their commercial viability as bringing wood in would have added a significant cost. Larger mines would have used ore buggies on railway tracks to bring the ore and waste to the mine entrance – while most of the entrances have collapsed (where they are still present they have been gated for safety reasons) these are often easily spotted by flat lying ground on the hillside and steep sided waste piles.


small bridge for the narrow gauge railway at Cargan

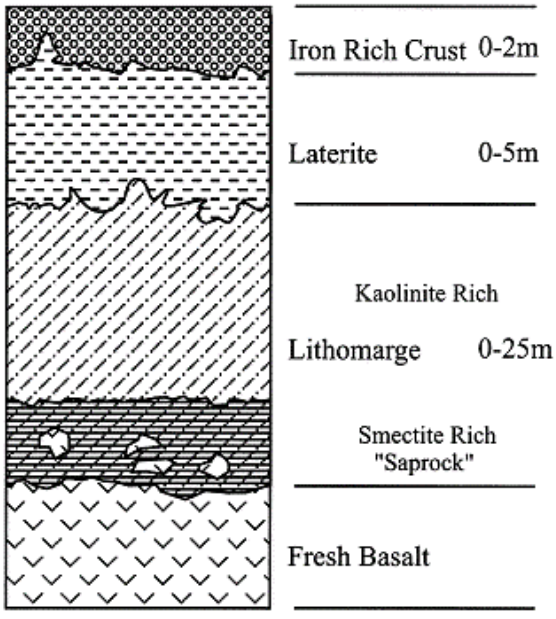
In the main mining districts a network of narrow gauge railways were constructed to bring the extracted ore to the main railway system notably from the Parkmore area (also serving the important mining districts at Glenravel, Cargan and Newtown Crommelin) to Ballymena. There was no refining/metal production in our area. The transport links were very important as all the extracted ore was shipped to iron and aluminium works in England and Scotland.

mine spoil heaps


bed of the railway near Cargan

Mining continued through to the 1920's – 1930's although many of the mines had closes earlier due to local factors such as flooding and the impact of faults and dykes leading to 'loss' of the main iron seams. Ultimately these relatively low grade ores could not compete with the huge high grade deposits then beginning to be exploited in Australia, America and Brazil. Bauxite production similarly ceased when important deposits in Australia, West Africa, Jamaica and South America came on stream.

There was a short-lived revival of bauxite production from Lyles Hill near Templepatrick and also at the Skerry mines. When overseas supplies could not be guaranteed during WW2, and need for aluminium was critical for aircraft production especially, these mines were reopened and some ¼ million tons of bauxite were mined.



The maps at the end show the distribution of mines from this almost forgotten but important industry.

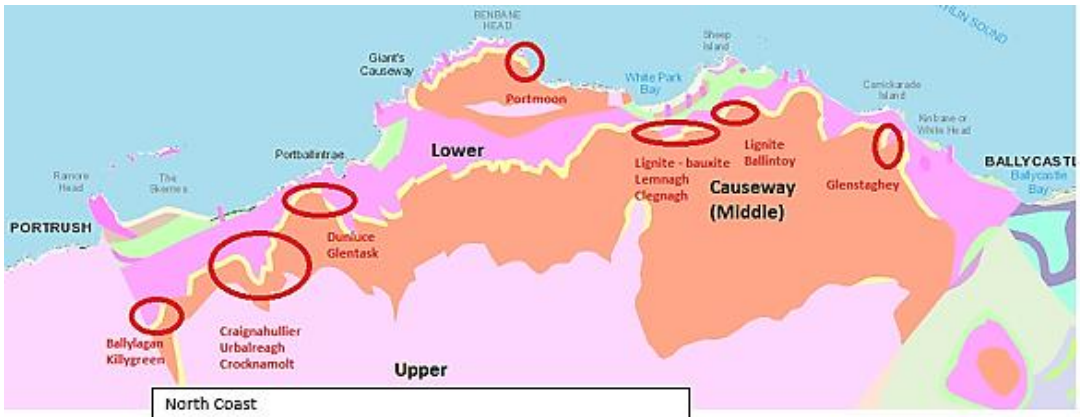
Adit or drive through the laterite. The shallow cross trenches would have held wooden sleepers that the rail track was laid on

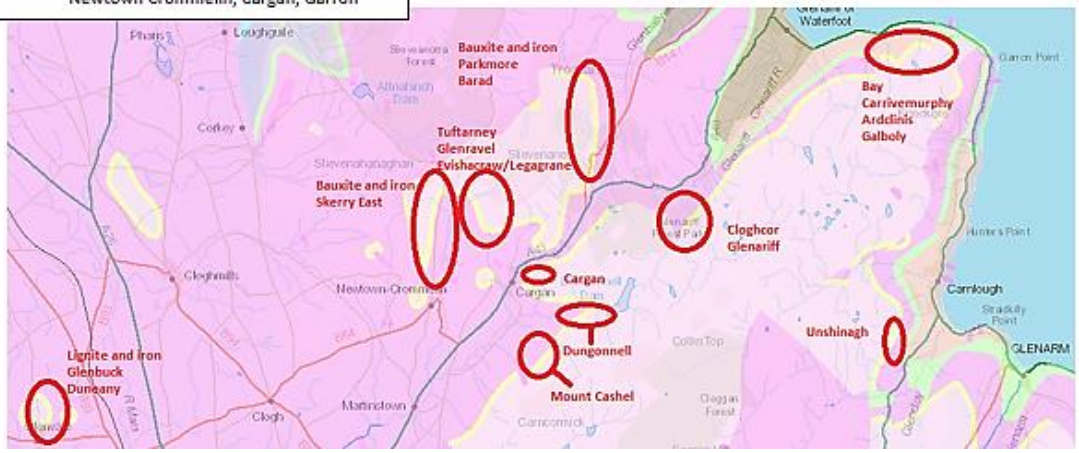
In a number of places, the laterites were exposed over laterally extensive areas allowing open pit techniques to be used. A site called Ballypalady near Templepatrick was worked in this manner. In addition to the iron ore, surface organic deposits were noted. These accumulated, probably in an ancient lake, and amongst the fine silts, plant material could be found. This, together with similar deposits at other sites, gave a picture of the vegetation present some 60 million years ago. A diverse range of conifers, flowering trees and ferns have been identified. An organic deposit at Craignahulliar, near Portrush, has yielded pollen identifiable as coming from Cedar, Spruce, Pine, Hazel and Alder.

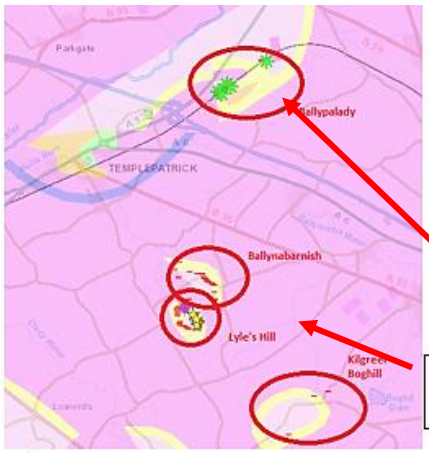
Again at Craignahulliar, together with a number of other sites, large volumes of organic matter accumulated in valley features or other depressions. The resultant brown coal or lignite was present in sufficient quantity to make extraction worthwhile. The lignite was sold locally.

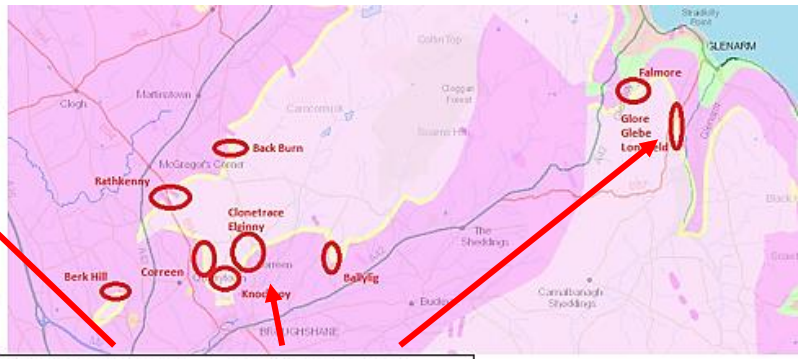
See end of the report for maps showing the distribution of the iron ore and bauxite mines together with maps showing the mineral railway network associated with the mining industry

Distribution of the main iron ore and bauxite mines



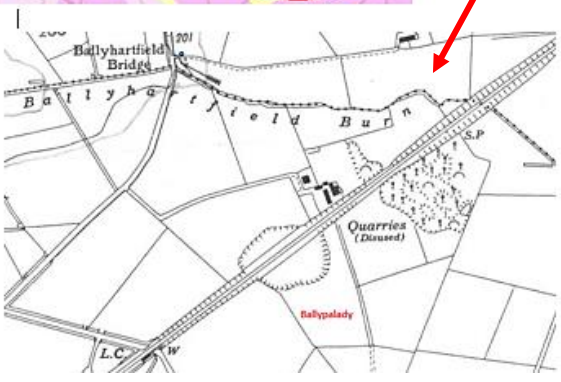


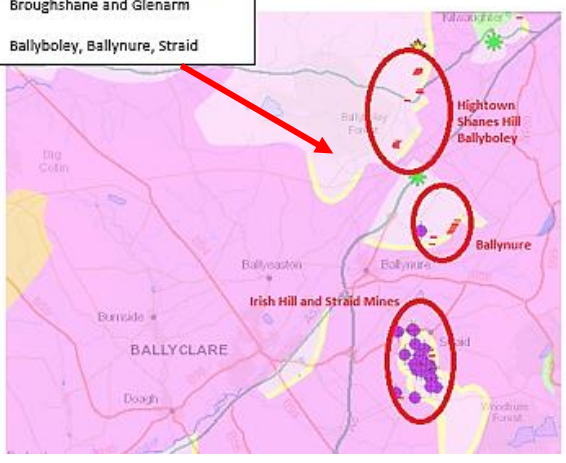




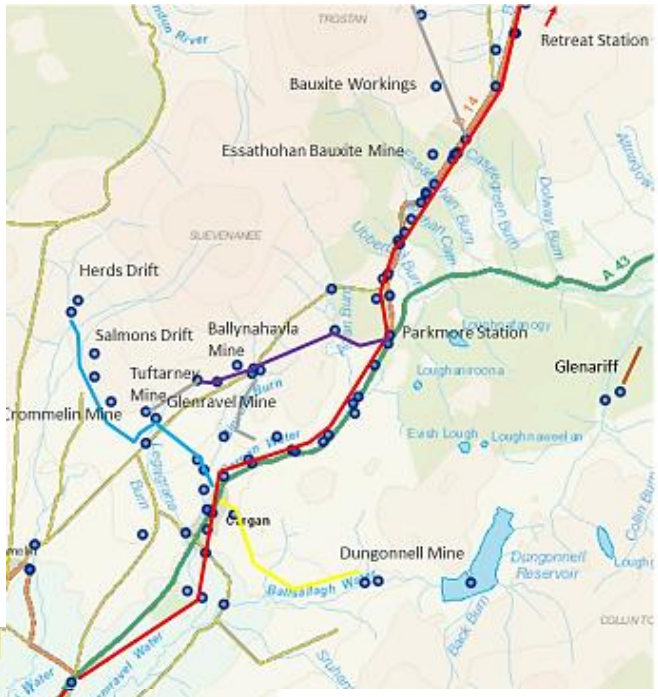
Lyles Hill and Ballypalady | Broughshane and Glenarm

Ballypalady details | Ballyboley, Ballynure, Straid





Retreat – Cargan – Martinstown – Ballymena Railway



Ballymena - Retreat Narrow Gauge Railway

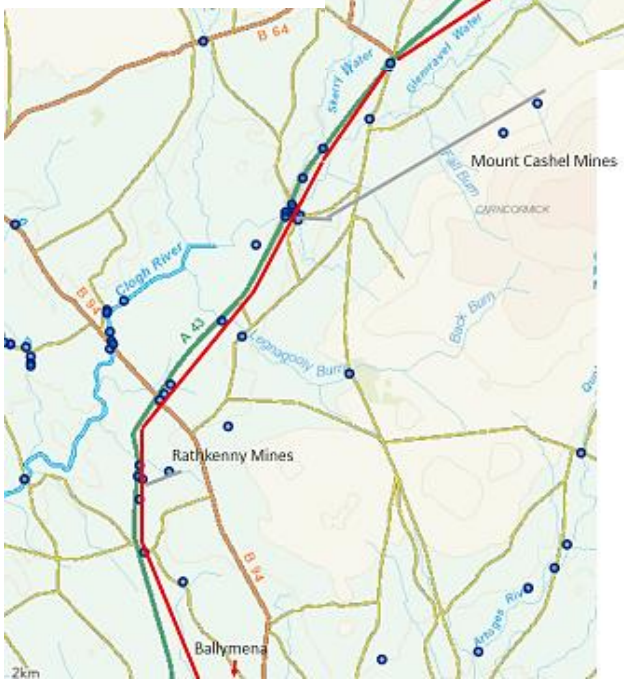
Cargan Siding

Crommelin Mineral Railway

Minor Mineral Railways

Parkmore Siding

Glenariff Mineral Railway

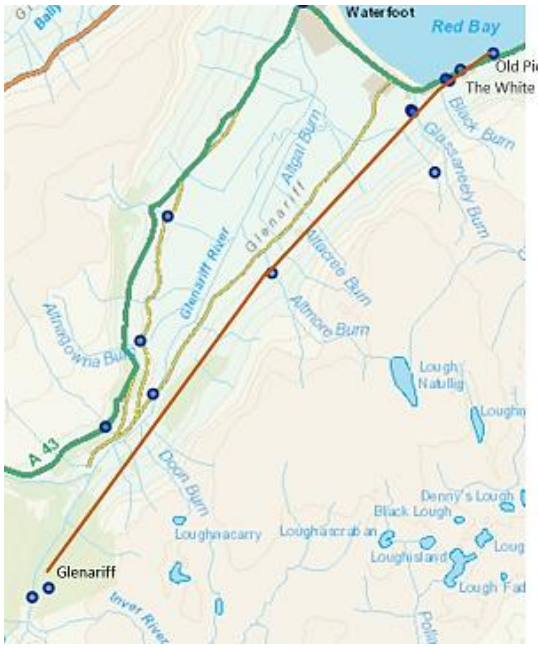


Minor Mineral Railways

Ballymena - Retreat Narrow Gauge Railway

Glenravel mines

Glenariff Mineral Railway



Glenariff Mineral Railway