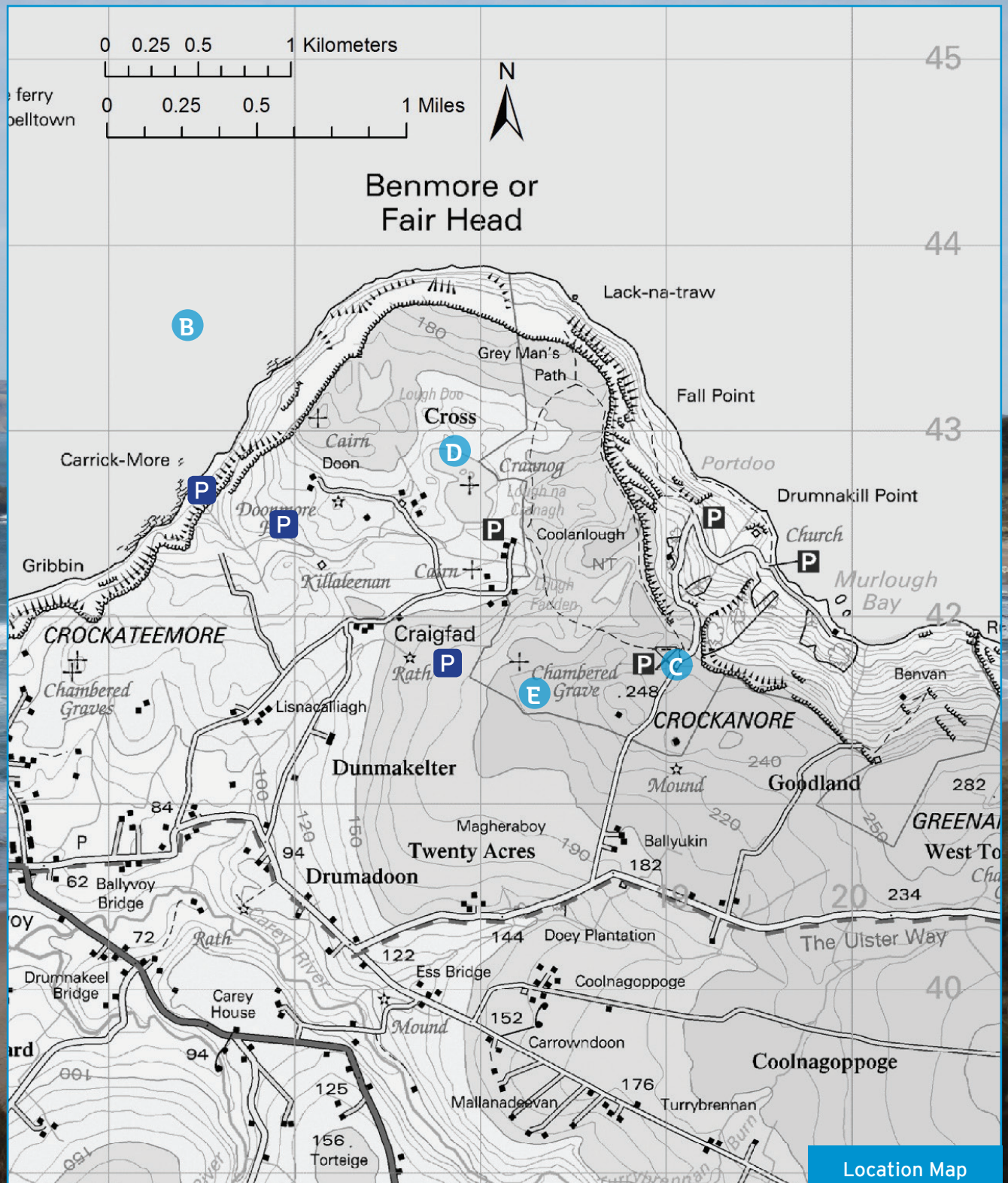


Fairhead in County Antrim, is a distinctive headland with vertical dolerite cliffs rising to 150m above sea level. The exposed cliffs at Fairhead are part of the Fairhead Sill, which is the thickest and most extensive of the Paleogene sills associated with volcanic activity along the north coast of Ireland. The sill forms a dominant headland, composed of columnar jointed dolerite which is approximately 60 million years old. The sill reaches a maximum of 85m depth and its upper surface dips and thins towards the south. There is evidence that the sill has transgressed through underlying Carboniferous, Triassic and Cretaceous rocks in the area. A visit to Fairhead is an excellent opportunity to explore the Paleogene geology of the north Antrim Coast, but when combined with a visit to Murlough Bay, becomes an excellent area in which to develop an understanding of geological processes and past environments from the Pre-Cambrian (approximately 600 million years ago) to the present day.





## Teacher's Notes

SUGGESTED STOPS	POINTS TO NOTE
Access:	<p>Access to Fairhead and Murlough Bay is by a series of small country roads. Car and minibus parking is available at Doonmore (prior arrangement with landowner), Coolanlough and Murlough Bay. None of the roads or car parks are suitable for large coaches. A series of waymarked walking trails connect Fairhead and Murlough Bay. Route maps are displayed on interpretive signage at Doonmore and Coolanlough.</p>
1	<p>The youngest rocks at Fairhead and Murlough Bay are those of the Fairhead Sill, which represents the thickest and most extensive Paleogene age sill in County Antrim. The sill forms the distinctive headland known as Benmore or Fairhead, and is composed of columnar jointed olivine rich dolerite, an igneous rock, some 60 million years old. The sill reaches a maximum of 85m depth and its upper surface dips and thins to the south. The sill has transgressed through the underlying Carboniferous, Triassic and Cretaceous rocks which are best seen in Murlough Bay.</p> <p>Dolerite is an igneous rock which cools below the Earth's surface, often in dykes or sills. Compared with the extensive basalts of the Antrim Plateau, dolerite has a coarser crystalline structure because the magma tends to cool more slowly than surface lavas which form the finer crystalline rock, basalt.</p> <p>A sill is an intrusive volcanic feature which squeezes through existing beds of country rock, exploiting points of weakness such as joints and faults. Here at Fairhead and Murlough, the evidence indicates that the dolerite sill has squeezed through layers of older Carboniferous, Triassic and Cretaceous rock.</p> <p>The best location to develop an appreciation of the scale and distinctive appearance of Fairhead Sill is from the Carrickmore Road outside Ballycastle (<a href="#">see point a</a> on map or <a href="#">Ballycastle Sheet</a>).</p>
2	<p>A series of walking trails connect Fairhead and Murlough Bay. Take any of these trails to the top of Fairhead (<a href="#">point b</a> on the map). Along the way there are a series of informative way marker posts which provide information about the built, natural and cultural heritage of the area. There are also a series of Drifting Apart way marker posts which explain how the geology of this area, connects to partner sites across northwest Europe, Canada and Russia.</p> <p>Once you reach the top of Fairhead, there are fantastic views of Rathlin Island, Inishowen, the Mull of Kintyre and the Scottish Islands; however, the main feature of interest at this location is the extensive boulder field located directly beneath the cliffs. This boulder field has been created from the failure of the exposed columnar dolerite formed as part of the Fairhead Sill. It is believed that a series of advancing and retreating glaciers throughout the Quaternary, would have removed any previous blocks of rock, therefore the boulder field seen today has most likely been created since the end of the last glaciation in this part of Ireland 13,500 years ago. It is known that block failures continue irregularly today, perhaps influenced by freeze-thaw action. Some of the blocks beneath the cliffs are larger than a double-decked bus!</p>
3	<p>The oldest rocks found in the area are of Precambrian age (approximately 600 million years old). They are found on the east side of Murlough Bay at Benvan (<a href="#">point c</a> on map). Access to this area is not encouraged due to the difficult nature of the terrain; however, it is useful to let students know of their existence as it helps to explain the complete geological history of the area. These rocks, originally sands and muds, were deposited on the floor of an ancient ocean known as the Iapetus. Later, during the Silurian period the rocks were deformed and metamorphosed during the Caledonian Orogenesis (a mountain building event), as the Iapetus Ocean closed.</p> <p><b>Did you know?</b></p> <p>That during the Cambrian, present day areas of Scotland, the north of Ireland, Greenland and North America were part of a continent known as Laurentia. Because of rifting a major new ocean, known as the Iapetus began to form between Laurentia and another large continent known as Gondwana. The sediments which were deposited on the continental margins of Iapetus Ocean are now exposed here at Murlough Bay, but can also be found at partner sites in Lochaber Aspiring Geopark, Marble Arch Caves Global Geopark, Geopark Shetland and the Humber Zone in Cadox Aspiring Geopark. You can visit some of these sites using the virtual reality tools on the Drifting Apart website.</p>



4	<p>Carboniferous age rocks (approximately 320 million years old) are exposed at the west side of Murlough Bay and continue beneath Fairhead Sill and along the Ballycastle Coastline (<a href="#">point d</a> on map). The rocks are mainly a mixture of sandstones, pebbles, conglomerates and coal. The Carboniferous rocks were mined for coal at Ballycastle and on Fairhead until the 1960s. Some of the best exposures of Carboniferous rock are located along the Carrickmore Road in Ballycastle, but there are some good exposures within Murlough Bay too.</p> <p><b>Did you know?</b></p> <p>That during the Carboniferous this part of Ireland was located at the edge of a landmass on or very near to the equator. During this period a number of continents were moving together to form the supercontinent known as Pangea. It is known that areas located at the edge of a landmass at this time were covered by a shallow tropical sea. This resulted in the deposition of fossil-rich limestone (best seen at the Marble Arch Caves Global Geopark). In this part of Ireland, it is known that over a period of approximately 20 million years' sea levels fell and delta and swamp conditions prevailed. Sediment continued to be transported from the eroding Caledonian-Appalachian Mountains (evidence for these mountains is seen at point c), forming sandstones and coals.</p>
5	<p>Triassic sandstones (approximately 205 million years old) are exposed along the cliffs at the top of the south slope of Murlough Bay (see <a href="#">point e</a> on map). These sandstones provide evidence of a desert environment towards the end of the Triassic.</p> <p><b>Did you know?</b></p> <p>Not long after Pangaea formed, it began to rift apart again. The first attempt at this was just under 300 million years ago when a rift began to form down the middle of what we now know as the North Sea, between Scotland and Norway. This rift failed and it only managed to form a depression or a basin before rifting ceased. Around 250 million years ago, more rifting began, this time along the eastern side of North America. At this time, this part of Ireland was in semi-arid latitudes, but this time north of the equator. In some areas, when the desert landscapes were flooded, they dried out and left thick salt deposits behind, whilst in others desert sandstones are found. There is evidence of Triassic rifting in Stonehammer Geopark and huge salt deposits located beneath Carrickfergus in Causeway Coast and Glens.</p>

