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# Water of Leith, Stockbridge geological walk

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Local Geodiversity Site

Lothian and Borders GeoConservation

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## Figures

(Figure 1) Map of localities.

(Front cover)

## How to get there

Stockbridge lies north-west of the centre of Edinburgh and can be reached easily on foot or by public transport.

By bus: Buses 24, 29 and 42 run through Stockbridge from Princes Street. Turn left before the bridge and walk along Saunders Street (signed St Bernard's Well) to reach Locality 1.

By car: Not recommended as parking is limited although onstreet parking may be available at weekends. On foot: The Dean Bridge (Locality 5) is a 5–10 minute walk from the West End of Princes Street. From there, take the footpath running parallel to the Water of Leith to reach the start of the walk.

The interior of St Bernard's Well can only be viewed on Open Days (usually Sundays in August) or by arrangement with the Dean Village Association.

## Acknowledgements

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This and other excursions in the Edinburgh area feature in the book: McAdam AD & Clarkson ENK (1996) [Lothian Geology](#): An Excursion Guide Scottish Academic Press, ISBN 0-7073-0385-0

## Industry and the Water of Leith

The Water of Leith at Stockbridge, 1825, looking North From Grant J, c. 1888, Old & New Edinburgh. Cassell Industry is dependent on a source of power. Prior to the development of steam power which brought about the Industrial Revolution of the early 19th century, running water was often harnessed to provide that power. Where the Water of Leith flows over sandy or gravelly plains (eg as it approaches the shore in Leith) it is wide and the flow is slow, but in the steep gorges such as at Stockbridge, Craiglockhart and Colinton Dells the river is fast-flowing and ideally sited to turning water-wheels to power mills. Over 70 mills were established along the length of the river, manufacturing paper, cloth, snuff and flour.

The utility of the river was enhanced by artificially diverting the flow into channels called mill-lades which allowed power to be taken to more distant locations. At Stockbridge the mill-lade ran in a wooden duct for much of its length, raised on

posts. It can be seen to the right of the path in the engraving above. The mill-lade delivered power to the flour-mills at Canonmills as well as to the Stockbridge and Greenland mills. In March 1881 the lade was temporarily blocked by a major landslip at Randolph Cliff (Locality 4 overleaf ).

## **Introduction to the geology of the Water of Leith**

The Water of Leith is Edinburgh's principal river. From its source high in the Pentland Hills, it runs for 24 miles along a northerly course to the Firth of Forth. The valley through which it flows was formed very recently in the Earth's 4.6 billion year history, as a drainage channel for the vast amounts of meltwater which flowed from the Pentland Hills as the ice sheets began to thaw at the end of the last Ice Age, between 11,000 and 14,000 years ago.

The course of the river valley that formed was determined by the underlying rock. Where it was loose and sandy or gravelly, the valley is shallow but where it cut through harder rocks, the destructive power of the meltwater, laden with ice and rock fragments, carved steep-sided rocky gorges. The Water of Leith flows through one of these steep gorges between Stockbridge and Dean Village, as it passes through the Granton Sandstones and Wardie Shales. These rocks were deposited during the Carboniferous period (359–299 million years ago) when Scotland lay close to the Equator.

This walk demonstrates some of the important geological features on this section of the river, where the channel created by the water has provided one of the few opportunities to view an exposure of Edinburgh's bedrock.

For more information on the geology of the Water of Leith, see the Lothian and Borders GeoConservation leaflet *The Geology of the Water of Leith*. From McAdam & Stone, 1997, *East Lothian and the Borders: A landscape fashioned by geology* SNH/BGS

The bedrock underlying much of Edinburgh was laid down in the Carboniferous period between 359 and 299 million years ago. At that time, Scotland was situated close to the Equator and had a warm, humid tropical climate. During this time the sea level rose and fell repeatedly and as a result the land has been alternately submerged under the sea or formed beaches, river deltas, coastal swamps and shallow lagoons. Each of these has given rise to characteristic rocks. The diagram shows the typical rock types found in a Carboniferous sedimentary sequence, although not all may be present at any given location. At Stockbridge there are well-developed sandstones and oil-shale but limestone is not seen here. Coal is present in the riverbed between St George's Well and the Dean Bridge but it is of poor quality. It is not accessible. Superficial deposits of clay and gravel, laid down in more recent times, have softened the landscape and underlie the gardens on both sides of this section of the Water of Leith.

## **Sills and dykes**

A dyke is a band of hard igneous rock which is formed when hot liquid magma is forced upwards through a crack in the existing rock of the Earth's crust but solidifies before it reaches the surface. When the softer overlying strata are eroded away, the dyke is left exposed as seen at Locality 3. A sill is similar but is formed when magma is squeezed (or "intruded") between the strata of the sedimentary rock. There is a sill some 200 metres upstream from Locality 6, where it raises the height of the river-bed above the weir.

## **Hugh Miller and Stockbridge**

The renowned Scottish geologist Hugh Miller (1802–1856) is commemorated in the names of Hugh Miller Place and Hugh Miller Cottage in the 19th century development known as the Stockbridge Colonies, about 500 metres north of Locality 1 (overleaf ). The Colonies were built by the Edinburgh Co-operative Building Company (ECBC) Ltd, which was founded in 1861 by a group of building tradesmen who had been banned from their work through an industrial dispute. The work of the ECBC was inspired by increasing concerns about the poor state of urban housing, under the influence of the housing campaigner the Reverend James Begg, who was a close friend of Hugh Miller.

## **Geological walk**

### **Locality 1 Mackenzie Bridge [NT 24522 74360]**

The walk begins at Mackenzie Bridge, once known as St Bernard's Bridge, on the margin of the raised beach which was the former shoreline about 14,000 years ago. It is now about 30 metres above sea level, showing how far the sea-level has fallen and the land has rebounded as it was freed from the weight of the ice sheet (isostatic uplift). Descend the steps to look at the bridge, which was built in 1824. It is constructed of sandstone although the source of the stone is not known. Its appearance suggests that it may be from Craigleith Quarry. The steps were a later addition, in 1887. Note severe weathering on the coat of arms of the City of Edinburgh. At the right of the bridge (looking downstream) note the blocked-off arch showing the position of the mill-lade (an artificial stream) which supplied water to power several mills, not only along the Water of Leith but also as far away as Canonmills.

### **Locality 2 St Bernard's Well [NT 24452 74249]**

Walk upstream along the path on the eastern (lefthand) bank of the river. Ahead is a stone building surmounted by a Doric-style temple, St Bernard's Well, which was a popular source of medicinal waters from the late 18th century. The wellhouse is built of sandstone from the nearby Craigleith Quarry. Some of the stones show masons' marks, especially near the entrance. Note the small chimney (facing the river) which ventilated a fireplace for warming the waters in winter! The statue of Hygieia is made of Coade Stone, an artificial ceramic material developed by Eleanor Coade (1733–1821). The statue has been much damaged and restored over the years. Look directly across the river from St Bernard's Well. The more northerly of two quartz dolerite dykes may be visible in the opposite bank as a patch of darker rock, flush with the bank. In James Hutton's time it must have been easier to see as both dykes are described in his book "Theory of the Earth" (1795), and it is shown in the engraving overleaf (1825), but it appeared to have been largely destroyed during the construction of the sewer pipe (1864) which runs along the course of the river at this point. The two dykes were formed by solidification of hot liquid magma (see Sills & Dykes overleaf), which was eroded by ice and water leaving the harder rock as distinctive dark-coloured ridges. The spring which supplies the well may be the result of water permeating through the porous surrounding rock and coming to the surface when it reaches to relatively impermeable quartz dolerite. Beyond the well-house, note the Carboniferous sandstone bedrock exposed in the riverbed, the beds dipping to the West. A few metres upstream, the surface of the current-bedded sandstone shows clear ripple markings.

### **Locality 3 St George's Well [NT 24407 74117]**

Continue walking upstream along the path, which runs along the course of the former mill-lade. On the right-hand side, approximately 75 metres beyond St Bernard's Well, is another well-house, St George's Well. This was also a medicinal spring but it has been disused since the 1940s. Like St Bernard's Well, it also sits above a quartz dolerite dyke. Here the dyke can be clearly seen in the river bed and on the bank. The bank is steep here and it is not recommended to try and descend to the dyke. About 50 metres beyond St George's Well, the river-bed is cut by a poor quality coal seam, the Wardie Coal.

### **Locality 4 Randolph Cliff [NT 24365 73973]**

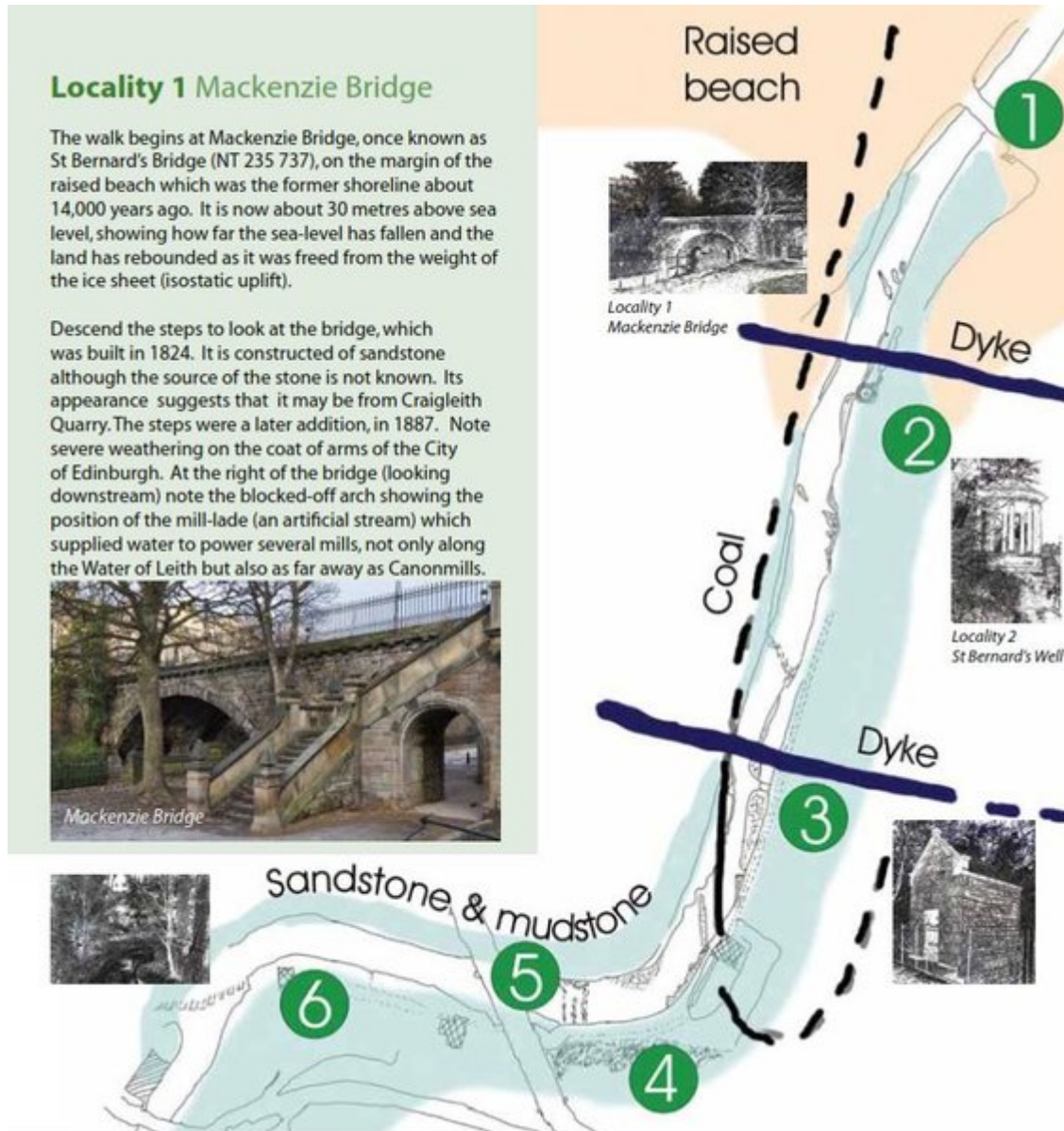
Approaching the Dean Bridge, look at the steep rocky escarpment to the left of the path. Here are gently dipping beds of Granton Sandstone underlying beds of dark crumbly mudstone (including some oil-shale), part of the Wardie Shales. It is possible to find plant and occasional fish fossils amongst the loose material at the foot of the cliff.

### **Locality 5 Dean Bridge [NT 24284 74006]**

The Dean Bridge was designed by Thomas Telford and opened in 1832. It is built from Craigleith Sandstone and the bridge pillars are hollow to allow access for maintenance. It carries the main Queensferry Road at a height of 32 metres above the Water of Leith, and the four arches span a total distance of 136 metres across the valley. Note the prominent bedding planes in many of the stones, and the small pits or depressions showing where hooks were attached to lift the stones into place during building works. A metal bracket on the corner of the southernmost bridge pillar appears to be a remnant of a Victorian gaslight, with a groove in the stone below it which held the gas-pipe.

## Locality 6 Miller Row [NT 24189 73996]

The Water of Leith played an important role in Edinburgh's industrial heritage, providing power to more than 70 mills along its length in the late 18th and early 19th centuries. Several flour mills were located along this section of the river but all have now been demolished with the exception of the West Mill which has been converted to residential use. Traces of the wall of Greenland Mill can be seen in the grassed area between Localities 3 and 4 (shown as hatched area on map). On the site of Lindsay's Mill, just beyond the Dean Bridge, three millstones have been erected in an ornamental setting. They are believed to be of orthoquartzite imported from Caen in France. Beyond the millstones, turn sharp left to ascend the steep Bell's Brae to the main Queensferry Road or cross the bridge to the right and explore the picturesque Dean Village.



Map of localities.

# Water of Leith



Stockbridge



Geological Walk



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*Front cover.*