City of Edinburgh

O.S. 1:50000 Sheet 66 Edinburgh B.G.S. 1:50000 Sheet 32E Edinburgh B.G.S. 1:25000 Edinburgh Special Sheet Route: (Map 4)

Two short itineraries illustrating features of geological interest near the city centre are described. Together with walking distance and approximate duration they are:

A The Dean Time: 1½ hours Walking distance: 2 km

B The Castle Hill Time: 3½ hours Walking distance: 2 km

(Map 4)

A short note is also appended on the Royal Museum of Scotland.

Excursion A — The Dean

The excursion starts at Stockbridge [NT 246 746] reached by Lothian Region Transport bus from the city centre.

Between Drumsheugh and Stockbridge the Water of Leith has cut its course through the sandstones and shales of the Granton Sandstones, which belong to the Lower Oil-Shale Group. The valley exposes what is virtually a strike section of the beds which here dip westwards and occupy the west limb of the St. Andrew's Square Anticline which is an expression within the city of the Pentland Anticline. This anticline is followed to the west by the Granton–Wardie Syncline.

1. St. Bernard's Well: Granton sandstones, quartz-dolerite dyke

Proceed to St. Bernard's Well (Figure 9) by way of Saunders Street, which follows the Water of Leith upstream from the bridge at Stockbridge, and the footpath by the waterside when the Dean Park is reached. St. Bernard's Well was a sulphurous medicinal well whose waters were prized for many years, as the classic 18th century well-house shows. In the river bank opposite the well, a quartz-dolerite dyke is exposed cutting shales and flaggy sandstones of the Granton Sandstones. The dyke is about 1 m in thickness and trends west-north-westwards. (Figure 9)

Skirt the well by the waterside, and follow the path up-stream for 25 m where a current-bedded sandstone with good ripple-marks is well seen dipping westwards.

2. St. George's Well: sandstones, dyke

Return to St. Bernard's Well, mount the steps to the main pathway and, turning right, follow the path upstream for 200 m when, in the river under a small building, St. George's Well, to the right of the path, another quartz-dolerite dyke cutting a bed of sandstone is exposed. This dyke is some 3 m in thickness and its trend is parallel to the St. Bernard's Well dyke.

A poor coal occurs in the river bed some 105 m above the second dyke and some 30 m downstream from the Dean Bridge. Unfortunately access to this coal is not possible.

3. The Dean Bridge: shales in Granton Sandstones

Follow the path upstream for a further 30 m when on the left-hand side, in the cliff below the Dean Bridge, occurs a fine exposure of shales with ironstone nodules and sandstone above, It is possible to collect from the shales at this exposure where, in addition to plant, entomostracan and fish remains, *Naiadites obesus* (R. Eth. jnr.) has been obtained.

4. Miller Row: Granton Sandstones/Wardie Shales junction

Passing under the Dean Bridge reach the ornamental mill-wheels in Miller Row. Here the Water of Leith occupies a westerly loop of its course and the shales and sandstones of the Granton Beds, which were seen at the last exposure to be dipping westwards at some ISO, plunge into the river bed and are succeeded on the opposite cliff, under the church building, by 55 m of bituminous shales. From fossil evidence obtained further along the strike at Drumsheugh, it is known that these bituminous shales belong to the succeeding Wardie Shales.

5. Dean Gorge: post-glacial cut

From this viewpoint in Miller Row the post-glacial cut of the Dean gorge is well seen. Upstream from Belford Bridge the Water of Leith occupies a valley filled with deep boulder-clay which presumably represents its pre-glacial course. At Stockbridge the river meanders over the late-glacial Raised Beach deposits. At the Dean, however, the valley is steep-sided and cut in rock with no boulder-clay filling. It is probable that in post-glacial times the river was deflected from its original course by the resistant dolerite sills at Belford Bridge, causing the river, heavy with glacial melt-water and rejuvenated by the rising land level, to cut the spectacular gorge of Dean.

Follow Miller Row to the small bridge and, turning left, ascend Bell's Brae to Queensferry Road which leads to the West End of Princes Street.

Excursion B—The Castle Hill

Walking Time/Distance: The Castle Hill 3.5 hours 2 km

The Excursion starts at the Half-Moon Battery [NT 252 735] in the Castle. A Lothian Region Transport bus from Waverley Bridge goes up the Mound. Turn off at Johnston Terrace and go to the Lawnmarket.

1. Within the Castle Walls: crag-and-tail, plug/Carboniferous junction

The Castle Hill and the Royal Mile form a classic example of crag-and-tail featuring. The ice sheet moved from the west and impinged on the western face of the basaltic plug on which the Castle is built. Ice was deflected towards the north and excavated the valley now occupied by Princes Street Gardens and the railway line leading to Waverley Station. Ice which was deflected to the south excavated the valley now occupied by the Grassmarket and the Cowgate. The 'tail' composed by sediments protected by the 'crag' and overlying drift, forms the gentle slope or the Royal Mile leading from the Castle to the Palace of Holyrood House. These features are well seen from the vantage points of the Half-Moon Battery and the Fore Well Battery.

The Fore Well, situated at the northern end of the Half-Moon Battery, marks the position of the junction of the basaltic plug with the lower Carboniferous sediments which lie to the east. The basalt may be seen at the summit of the Castle Hill between the National War Memorial and the Half-Moon Battery, which is itself built on sediments (see below). Descend by the steps adjoining Argyll's Tower and turning right pass through the Portcullis gate. Some 10 m short of the Inner Barrier the northern part of the eastern junction may be seen in the right-hand gutter of the roadway. Here the basalt and greenish-grey Carboniferous marl are exposed close together, the marl having been hardened by contact with the basalt. Continue down the roadway and on reaching the souvenir shop opposite the guardhouse look at the cliff behind it towards the Half-Moon Battery when it is possible to see the sediments upon which the Battery is built. They lie between the junction with the basaltic plug, and the Castle Fault to the east, and consist of greenish marly shales dipping very steeply inwards towards the basalt. This dip was beneficial in accumulating water for the Fore Well.

2. Johnston Terrace [NT 251 734]: plug/Carboniferous sediments junction, Castle Fault

Leaving the Castle cross the Esplanade and descend the stairs to the right at Castle Wynd North. On reaching Johnston Terrace turn right and proceed downhill for 200 m. Above the grassy slope to the right, in the corner formed by the Half-Moon Battery and the Old Palace, the southern part of the eastern junction is well seen. It is vertical and the Castle Fault lies just to the east. The dip of the sediments near the junction is steep but the sandstones under the esplanade, which are to the east of the Castle Fault, are dipping gently away from the plug. Continuing down Johnston Terrace the

margin of the basalt rises as a steep cliff. The basalt which composes it is microporphyritic and of Dalmeny type. In thin-section it shows small altered olivines and augites embedded in a mesh of felspar crystals with microlithic augite and magnetite granules. The natural appearance of the basalt in the cliff above Johnston Terrace, and in the cliff overlooking Princes Street Gardens on the north side of the plug, has been somewhat altered by grouting and rock-bolting to stabilise the cliff face.

3. West Princes Street Gardens: plug/Carboniferous sediments junction, glacial striae

Follow the base of the Castle Rock by entering West Princes Street Gardens by the Gate on the right 20 m short of the bridge carrying Johnston Terrace over King's Stables Road. On the left of the footpath is the valley excavated by ice whose easterly movement has been arrested by the west face of the Castle Rock. Use has been made of this valley as a site for the Car Park entered from Castle Terrace. On the right of the footpath the western junction of the plug with the Carboniferous sediments may be followed. Where it is first seen the contact is with sandstone, then some 100 m to the north-west with sandstone and marl, and then another 30 m to the north with marly shales. Follow the footpath to the northern face of the Castle Rock where marginal chilling of the basalt is well displayed.

Glacial moulding may be seen at a height of some 5 m on the northern face of the plug where it most closely approaches the railway. Near the ruins of the Old Well House glacial striae occur with an approximately east-west orientation. Looking westwards from the Well House there is evidence in the plug of horizontal columnar jointing controlled by cooling against a vertical margin. These joints are radial in plan and, although best seen at this position, may be traced all round the outcrop of the plug.

The railway traverses the site of a post-glacial lake which occupied the ice-excavated valley between the Castle and Princes Street. Between A.D. 1450 and 1816 the site was occupied by a smaller artificial lake called the Nor' Loch.

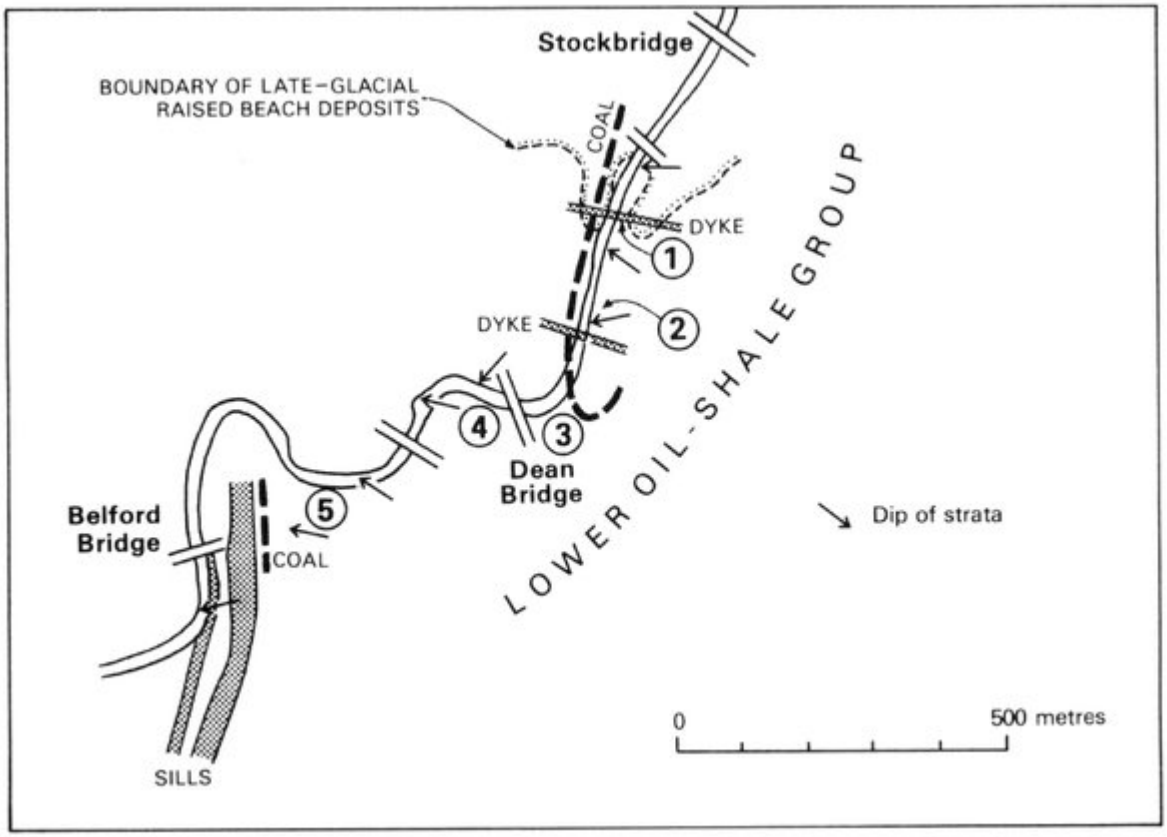
Access to Princes Street may be gained by way of one of the footbridges which span the railway.

The Royal Museum of Scotland [NT 258 733]

The Museum is situated in Chambers Street, which may be reached from Princes Street by way of the Mound and George IV Bridge or the East End and the Bridges. Opening hours are weekdays 1000 to 1700, Sundays 1400 to 1700.

The museum houses extensive geological collections, in particular Scottish minerals and Scottish fossils. In addition to displays of Scottish material there are exhibitions of a more general geological interest, to be seen in the Mineral Hall and the Evolution Exhibition.

References



(Map 4) Water of Leith valley.

(Figure 9) St Bernard's Well, by C. A. Hope from 'The Water of Leith', Jamieson 1984.