Excursion 1 Stirling: building stones

Rosalind Garton and Andrew McMillan

Purpose: To examine natural stone used in historic buildings in the centre of Stirling; to illustrate the geology and landscape from key viewpoints.

Logistics: This half-day walk starts at the railway station [NS 7980 9358], on Goosecroft Road between Kerse Road and Seaforth Place. Car parking and toilets are available at the station, the nearby Thistle Centre and the Castle.

As this excursion is in a busy city centre, care must be taken when walking and looking at buildings, and only parts of the route are pedestrianised. Saturdays are very congested.

Maps: OS 1:50,000 Sheet 57 Stirling & the Trossachs;

OS 1:25,000 Sheet 366 Stirling & Ochil Hills West; BGS 1:50,000 Sheet 39W Stirling; locality map (Figure 1.1).

The Royal Burgh of Stirling was historically the gateway to the Highlands. Dominating the local landscape are the Ochil, Touch and Gargunnock hills, which rise abruptly from the flat ancient sea bed of the Carse of Stirling, across which meanders the River Forth (Francis *et al*., 1970). For centuries the carse, with its treacherous peat bogs more than 3 m deep in places, formed a natural barrier to movement north and south. Travellers had to use the bridge at Stirling, for the bogs extended to the base of the prominent crags. Stirling Castle is situated on a crag that was plucked bare on its western side by an ice sheet. The medieval old town developed down from the castle along the more gently inclined eastward-sloping tail, but subsequently much of it was demolished after the mid-nineteenth century. Some of the remaining buildings, like the house of Bruce of Auchenbowie (1520), show how the older stone buildings were largely constructed of rubble consisting of rounded glacial boulders and hard kernels of local dolerite, although some were of local Carboniferous sandstone.

From 1780 onwards the wealthier families in the burgh began to build houses in lower parts of the town, especially in Melville and Pitt terraces and Allan Park. Sometimes these houses were constructed of squared whinstone (quartz-dolerite), which considering its hardness would have been expensive to shape. It came from the many old quarries around the old town. The dolerite face opposite the front of the old High School on Academy Road was probably such a quarry. Other houses used sandstone from quarries in Carboniferous strata to the south of the town (Dinham & Haldane, 1932), such as Denovan [NS 8185 8405] and Thornydyke [NS 8209 8455] to the north of Denny, Polmaise [NS 8365 8915] and Cat Craig [NS 8070 8968] near Bannockburn. With the arrival of the railways in 1848, other stones were brought in, the most prominent being the bright-red Permian desert sandstone from Dumfriesshire.

Locality 1.1 [NS 7978 9355] Stirling Railway Station

Completed by the Caledonian Railway Company in 1914 of sandstone from Blaxter Quarry in Northumberland [NY 932 900], it is one of the loveliest surviving Scottish railway stations and presents a cleaned façade to the street with crowstep gables and crenulations. The stone is a buff micaceous sandstone showing good examples of cross-bedding.

Localities 1.2 [NS 7966 9356] and 1.3 Royal Bank of Scotland and Post Office

Proceed up Station Road and turn right into Murray Place (by the Arcade and the Baptist church). On the right, nos 80 and 82 (Locality 1.2) are of iron oxide-speckled sandstone from the Upper Limestone Formation at Polmaise Quarry [NS 8365 8915]. The buildings were formerly the premises of the National Bank, now the Royal Bank of Scotland. Next door at no. 84 is the town's main Post Office (Locality 1.3), opened in 1895 and built of sandstone from Blackcraig (by Plean House, [NS 8248 8638]) and Dunmore [NS 8384 8860] quarries. Note the fine carving of the head of Queen Victoria and the letters 'V. R.' over the north door. Note some thin, black carbonaceous partings; mica flakes are also obvious. Pink

granite pediments may be seen opposite the Post Office building at the corner with Friars Street [NS 7962 9361].

Locality 1.4 Sentinel Chambers

Cross Maxwell Place and proceed northwards along Barnton Street. Opposite Maxwell Place is a building in red sandstone with two large 'S's in the stonework of the first floor. This was the Sentinel Chambers building, the offices of one of Stirling's three rival newspapers (the *Journal*, the *Sentinel* and the *Stirling Observer*). It was built in 1927 of Permian sandstone from Locharbriggs Quarry [NX 990 810] in Dumfriesshire, following the destruction by fire of the old building the previous year. The new building was the first business premises in Stirling to have an electric lift, and appears to have been built with the prestige of the newspaper in mind.

Locality 1.5 Sentinel Chambers to Princes Street

The buildings between the Sentinel Chambers and Princes Street to the north are of sandstone from Polmaise Quarry. This quarry was worked intermittently between the 1860s and 1910, and was re-opened for a time in the 1930s. Note the building on the corner, no. 10 Barnton Street opposite the Sentinel Chambers, is of orbicular granite at pavement level, with brown and black, 5cm-diameter orbs of zoned feldspar.

Locality 1.6 Nos 77 and 79 Murray Place

Cross Barnton Street and walk south back to Murray Place. Feued in 1842, the street was named after William Murray of Polmaise who had been instrumental in its development. By the early nineteenth century the main route up through the town to Stirling Bridge had become too steep and narrow for contemporary traffic, and Murray Place subsequently became the commercial hub of the town. At Friars Street, note nos 77 and 79 Murray Place, at present the Oxfam Shop. Formerly the Commercial Bank and opened in 1872, it is probably built of stone from Raploch Quarry [NS 7860 9420] to the north of the castle – a coarse-grained sandstone containing quartz pebbles up to 6 mm across. The lowest course of this building is faced with polished gabbro.

Locality 1.7 Thistle Street–Murray Place corner

Walking south along Murray Place to the corner with Thistle Street. Note the polished blue-black syenite ('larvikite' from Oslo Fjord) slabs with thumbnail-sized crystals of blue iridescent alkali feldspar at [NS 7972 9342].

Locality 1.8 Former Bank of Scotland

It is worth pausing to admire the former bank building on the corner of Murray Place and King Street. The building was opened in 1862 as the premises of the Stirling Tract Enterprise, the hub of a large mail-order business, which sold religious books. The undertaking was so successful that it put considerable strain on Stirling Post Office at the time. Faced with polished gabbro at ground-floor level, the building is of sandstone from Polmaise Quarry, with a grand sculpted façade at the first-floor level, including fine carvings of bunches of grapes around pillars (Plate 1.1). Opposite, note the two standing stones made of Caithness flagstone (Middle Devonian).

Locality 1.9 No. 24 King Street

Turn right up King Street, noting the dolerite setts in the road, and the deep dolerite kerbstones, a feature of many old Scottish streets. No. 24 King Street, previously the Bank of Scotland, is of very badly weathered sandstone from the now filled-in Thornydyke Quarry [NS 8209 8455]. The sandstone displays good cross-bedding. At nos 8–10, the Golden Lion, note the snecking, small squared stones used in a rubble wall to fill spaces between stones of different height. This building is of dolerite, with sandstone window framings and door columns.

Locality 1.10 No. 61 King Street

Cross the road to the red sandstone building on the corner of King Street and Corn Exchange Road [NS 7956 9342]. This was formerly the Clydesdale Bank and was completed in 1901. The lower courses are faced with coarse-grained red granite with fine-grained xenoliths up to 7.5cm across, while the building itself is constructed of Permian sandstone from

Locharbriggs and Closeburn [NX 892 910] quarries in Dumfriesshire. The sandstone shows the well-developed aeolian (wind dune) cross-bedding highlighted by pinstripe lamination (marked variation in grain size between adjacent laminae). Note the carved faces and other decorations above the windows on each floor and the Clydesdale horse with unicorn's horns that caps the whole (Plate 1.2). The building opposite the Clydesdale Bank is faced with green serpentinite.

Locality 1.11 Public Library

Go left into Corn Exchange Road to the public library on the left. Financed by the Carnegie Fund, its foundation stone was laid by Mrs Andrew Carnegie in 1902. A light-grey slightly micaceous sandstone from Blackcraig Quarry was used for this building. Dominated by a turreted corner tower, the lower courses are of rock-faced dolerite, while the upper floors are rock-faced sandstone. Sandstone ashlar (shaped cut stone) was used around the windows.

Locality 1.12 Municipal Buildings

Opposite the public library are the Stirling District Council Municipal Buildings, opened in 1918 and constructed from Northumbrian Carboniferous sandstone from Blackpasture [NY 931 699] and Blaxter quarries. The kerbstones outside the building are of porphyritic granite from Shap [NY 555 083], Cumbria. A competition-winning design, money ran out, the First World War intervened and it was never finished. It is still a very confident example of Scottish Edwardian architecture.

Locality 1.13 Statue of Sir Henry Campbell-Bannerman

To the SW of the Municipal Buildings is a statue of Sir Henry Campbell-Bannerman, Member of Parliament for the Stirling burghs from 1868 to 1908. The statue was unveiled by his successor as Prime Minister, Herbert Henry Asquith. The pedestal is of Shap granite and has good examples of albite twinning in the euhedral (well shaped crystal faces) feldspar phenocrysts. Looking into the courtyard behind the Municipal Buildings the face of one of the old dolerite quarries may be seen, but is now overgrown. At the Back Walk, just SE of the statue, on the town wall of dolerite blocks (Plate 1.3) founded on top of a dolerite outcrop, a plaque indicates that it was rebuilt in 1547 during the infancy of Mary, Queen of Scots in case of an attack by the English army.

Locality 1.14 Allan Park

At the foot of the Back Walk, cross Dumbarton Road and enter Allan Park. The Georgian houses are made of blonde Carboniferous sandstone from Thornydyke Quarry. Note the subsidence in the middle of the terrace on the east side. Dolerite is used in the gable ends and in the old coach houses.

Localites 1.15 and 1.16 No. 23 Spittal Street; Messrs Lawson Ltd.

Retrace your steps along Corn Exchange Road and turn left up Spittal Street. No. 23 (Locality 1.15), now Stirling District Court, is built of sandstone from the Auchenheath Quarries [NS 880 445], Lanarkshire, in the Upper Limestone Formation, with spalling at the base. Formerly the local police station, it was built in 1931. The red sandstone building opposite (Locality 1.16) was originally the furnishings department of Messrs Lawsons Ltd, the Trades Clothing and Furnishing House, and was built in 1902 of Permian sandstone from Gatelawbridge Quarry [NX 902 965] in Dumfriesshire. Messrs Lawsons aimed 'to cater for the personal and household requirements of the industrial classes', and in its day ran a thriving business, as demonstrated by the use of a stone exotic to the area (on the frontages only — the sides of the building are of local sandstone). The building is now harled, apart from windows, pediment, etc.

Locality 1.17 Forth Valley Health Board

The premises of the Forth Valley Health Board [NS 7946 9356] at no. 33, started life as the headquarters of the Commercial Bank which, judging by the elaborate neoclassical frontage of the building, was thriving at the time of the building's construction in 1827. It was built of sandstone from the Lanarkshire quarries of Auchenheath [e.g. NS 805 449]. There have been many additions to the building since that time.

Locality 1.18 Stirling Highland Hotel (the Old High School)

The first part of the fine Old High School of Stirling to be encountered on this excursion is the Maclaren wing, next door to the Health Board offices and which was added to the school in 1889. Note the green-domed revolving observatory above, gifted by Sir Henry Campbell-Bannerman, and the elaborate carvings around the gateway including, appropriately, the signs of the zodiac (Plate 1.4). The lower courses of the wing are of the coarse-grained Raploch sandstone, with dolerite and sandstone being used for the upper floors. Turn left into Academy Road where the main part of the school can be seen in its full Gothic splendour and with a sculpture of children by Handyside Ritchie above the main entrance to the courtyard. It is entirely built of well-dressed dolerite with sandstone being used around the windows and doors. The south wing at the far end of the road (the 'New Primary High School') is built of Polmaise sandstone in the lower courses. The walls of the upper floors are composed of dolerite and Polmaise sandstone, the sandstone blocks being stugged or pecked, an appearance which has been achieved with the use of a pick or pointed tool. It is worth pausing to look at the southern wall of the school on the Back Walk, to see the plaque in memory of Robert Spittal, local philanthropist, tailor to James IV and 'Donor Of The Hospital In The Burgh For Relief Of Decayed Tradesmen'. The nearby Youth Hostel was formerly a church, and is made of dolerite and sandstone (possibly Raploch); the pineapple fountain (Ebenezer Erskine) is of badly weathered golden yellow sandstone.

Locality 1.19 Nos 39 to 41 St John Street

Walk back to Spittal Street and turn left, proceeding up the hill on St John Street. Nos 39–41, just before the Church of the Holy Rude, is the house of Bruce of Auchenbowie, which may date from 1520. It is a very good example of an early stone building in Stirling, being made of rubble comprising assorted sizes and shapes of sandstone and dolerite boulders. Opposite the Old Town Jail, the sandstone building has a fine Caithness flagstone pavement outside [NS 7930 9367].

Locality 1.20 Church of the Holy Rude

The church is built of a mélange of different stones. The bluish sandstone, used in much of the nave and for the tower, may be from Ballengeich Quarry [NS 7900 9435]. It is cross-bedded and shows ripple laminations, as do the internal pillars. The exact location of this quarry is unrecorded, but it probably lay between Stirling Castle and the Gowan Hills, beneath the dolerite sill and excavated in Limestone Coal Formation rocks.

Locality 1.21 Mar's Wark

Going north from the church, pause at Mar's Wark, the ruins of a splendid Renaissance palace begun as the town residence of the Earl of Mar, hereditary Keeper of Stirling Castle. It is built of a colourful mixture of different sandstones, with some spectacular convolute bedding in many of the fine-grained, brown sandstone blocks. Ballengeich sandstone was used in the building, but many other kinds were also used. It is said that some of its stone was acquired from the nearby Cambuskenneth Abbey [NS 8085 9396], just to the east of Stirling. Look back now at the roof of the Church of the Holy Rude. At the eastern end large flagstones have been used, contrasting with the small, thin slates on the rest of the roof.

Locality 1.22 [NS 7910 9400] Stirling Castle Esplanade viewpoint

Continue north to the castle esplanade. The castle was built in many different stages of different stones, including rocks from Ballengeich, Cat Craig and Longannet [NS 9500 8567] quarries. The esplanade is a superb vantage point to see the geology of the Forth valley, and to understand the relationship between geology and scenery. From the esplanade, looking westwards up the Forth valley, the distant Grampian Highlands can be seen. The prominent mountains on the horizon are all composed of 600 million year-old metasedimentary rocks belonging to the Southern Highland Group of the Dalradian Supergroup. Situated on part of the overturned limb of the huge recumbent structure known as the Tay Nappe, Ben Lomond is formed of relatively flat-lying cleaved wacke sandstones, pelitic (mudstone) rocks and metavolcaniclastic 'green beds' of the Ben Ledi Grit Formation. Other mountains composed of rocks of this formation, including Ben Venue, Ben Ledi, Stuc a' Chroin and Ben Vorlich, lie within the down-turned hinge-zone of the Tay Nappe. The core of the nappe includes rocks of the Aberfoyle Slate Formation. The Highland Boundary Fault that extends through the southern end of Loch Lomond, behind the Menteith Hills, through Callander to Stonehaven on the east coast, divides the Grampian Highland metamorphic rocks from the younger sedimentary and volcanic rocks of the Midland Valley. Immediately south of the Highland Boundary Fault the Menteith Hills are composed of steeply dipping conglomerates and sandstones of Early Devonian age (410 million years old).

Rocks of Early Devonian age underlie all the ground between the Menteith and Ochil hills. Looking north from the esplanade, the Ochil Hills with Dumyat at the SW end consist of a sequence of lavas and volcaniclastic sedimentary rocks (Ochil Volcanic Formation). Westwards, towards Dunblane and beyond, the volcanic rocks pass up into a sequence of sedimentary strata including fluvial sandstones and finer grained sedimentary rocks laid down in lakes and extensive alluvial plains. The West Ochil Fault separates the volcanic sequence exposed in the Ochil Hills from younger coal-bearing Carboniferous rocks underlying the flat valley floors of the Forth and Devon. The fault effectively forms the spectacular scarp face of the Ochils, through the south side of Stirling University campus, and eastwards past Menstrie, Alva and Dollar. The fault has had the effect of downthrowing the Carboniferous strata to the south by a maximum of about 3000 m at Tillicoultry.

Most of the Carboniferous rocks in the vicinity of Stirling are hidden by a thick succession of Late Devensian and Holocene marine and estuarine sediments formed at various stages following deglaciation of the Forth valley about 13,500 years ago (Figure 5.2). These sediments infill a glacially overdeepened depression that locally is greater than 180 m deep. The principal upstanding hills in the valley floor are composed of rock types that were more resistant to glacial erosion. The main one is quartz-dolerite that in the Stirling district forms a transgressive sill, intruded during late Carboniferous times into Carboniferous sedimentary rocks and displaced locally by faulting and stepping. The Midland Valley Sill-complex extends under Stirling, Falkirk, West Lothian and Fife. Prominent is the Castle Rock, a crag-and-tail shaped by the action of eastward-moving ice which plucked bare the western faces and deposited debris to the east. The brown-ochre weathering and blocky jointing of the dolerite can be easily seen. To the north, Abbey Craig with the Wallace Monument (built in 1869) is also part of the sill, displaced slightly to the east by a small fault.

Locality 1.23 [NS 7910 9380] View from Ladies' Rock

From Ladies' Rock, in the cemetery to the south of the esplanade, a fine view is afforded of the south side of the Forth valley. The prominent trap featuring of the Touch and Gargunnock hills highlights successive lava flows with weathered tops, the lavas having been poured out on the ancient landscape in Early Carboniferous times (about 335 million years ago). These are part of the Clyde Plateau Volcanic Formation, locally up to 1000 m thick, which extends westwards to the Campsie Fells and Renfrew-shire Hills. In the middle distance, Craigforth, a prominent hill above the general level of the valley floor, is also of Early Carboniferous lava.

In the foreground, a cliff (partly obscured by trees) is a former coastline, and forms the northern edge of the King's Park. It is composed of quartzdolerite, and was last touched by the sea during Holocene times (6000 to 5500 years ago), when local sea level was approximately 15–16 m above OD. At this time prominences such as Craigforth and Hill of Drip (Lower

Devonian sandstone) were islands. The Carse Clays, intertidal mudflat deposits, were also laid down over a wide area extending at least 24 km westwards from Stirling to Aberfoyle, burying pre-existing surface peat deposits (termed the

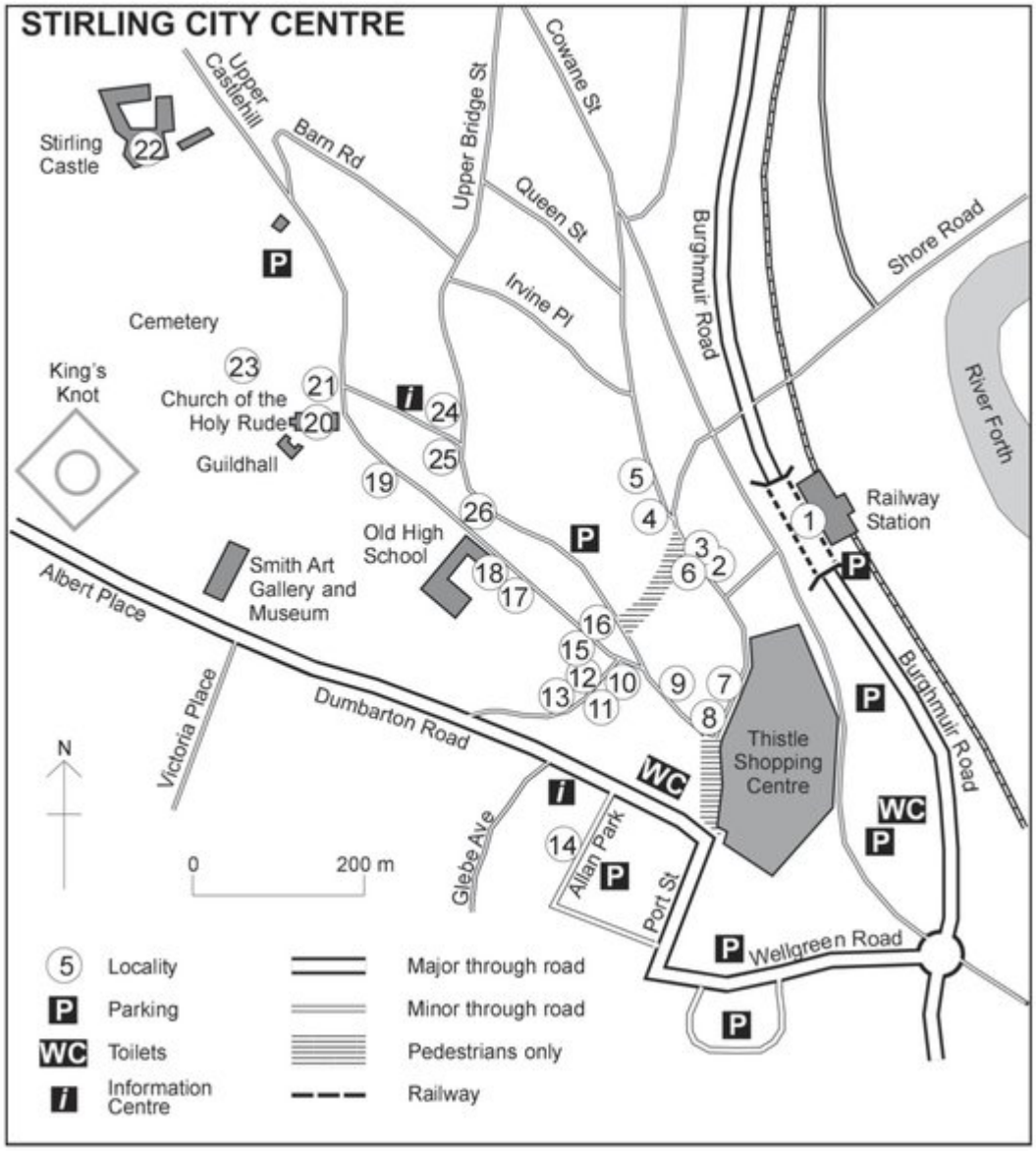
Sub-carse Peat). The King's Park and much of south Stirling are underlain by Late Devensian sediments. These were laid down as a terminal moraine by deltaic and other marine or glaciofluvial processes during deglaciation, about 15,000 years ago (Figure 5.2). Both the Holocene and Late Devensian estuarine sediments and erosional beach and terrace features have been left high and dry as continuing isostatic uplift of the Earth's crust has taken place in response to the unloading of the Scottish ice sheet.

Much of the Carse of Stirling was covered by peat following the lowering of sea level about 5000 years ago, but with extensive clearance by man for agriculture in the nineteenth century, the only remaining large expanses of moss occur at East Flanders, West Flanders and Gartrenich. Looking SE, the flagstaff at the Borestone site at Bannockburn is clearly visible. It is on top of a small drumlin, a hill composed of glacial till, the streamlined form produced as the last ice sheet moved across the land.

Localities 1.24, 1.25 and 1.26 Nos 2–10 Broad Street, nos 17–25 Broad Street and Baker Street

Return to the town centre down Broad Street. Nos 2–10 and 17–25 are burgh properties built in 1932 and partly faced with Auchenheath sandstone, a micaceous white and pale brown rock. The seventeenth-century Norrie's House, nos 14–16, was built using quarried stone, possibly from Raploch [NS 7860 9420], an old quarry in coarse-grained sandstone of the Lower Limestone Formation to the north of the castle. This is believed to have been the Craigforth Quarry referred to as an 'old quarrie' in 1707. Turn right into Bow Street and continue down Baker Street. The houses beyond Spittal's House (Locality 1.26) are built of dolerite rubble with some sandstone. Note also the common use of dolerite rubble on the side of the house by Dalgleish Court with sandstone ashlar on the street frontage, and the fine example of dolerite and sandstone building in the Boys' Brigade headquarters at the foot of the close. Turn left into Friars Street and hence to Murray Place and return to Stirling Railway Station.

References



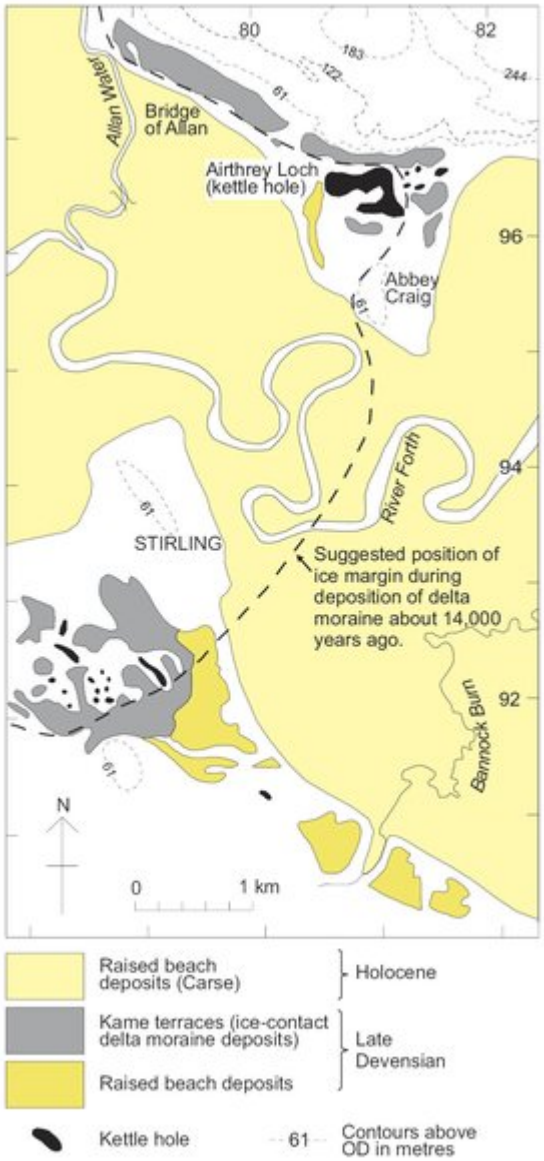
(Figure 1.1) Stirling city centre locality map.

(Plate 1.1) Locality 1.8. Corner of Murray Place and King Street, former Bank of Scotland; Upper Limestone Formation sandstone from Polmaise Quarry.

(Plate 1.2) Locality 1.10. 61 King Street, former Clydesdale Bank; red Permian sandstone from Locharbriggs.

(Plate 1.3) Locality 1.13. City wall at Back Walk in blocks of local quartz-dolerite. Bedrock of same quartz-dolerite seen at pavement level.

(Plate 1.4) Locality 1.18. Stirling Highland Hotel – the Old High School; Lower Limestone Formation sandstone from Raploch Quarry.



(Figure 5.2) Quaternary geological map of the Bridge of Allan– Stirling area.