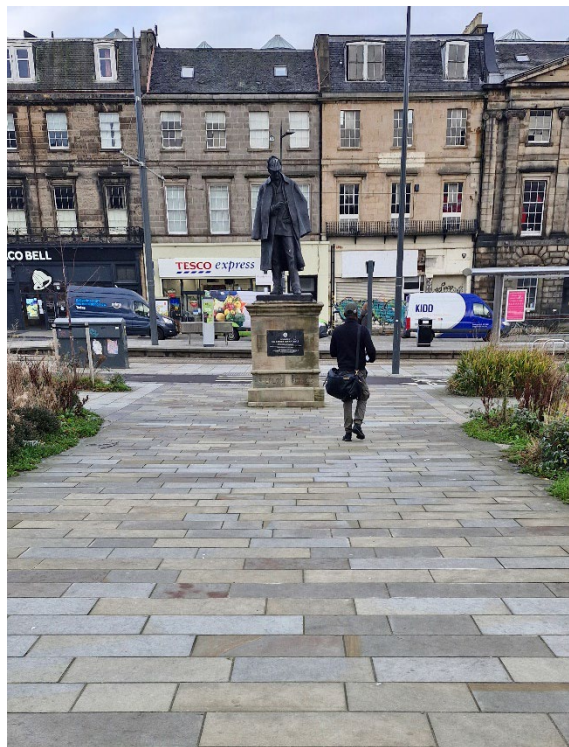




British
Geological
Survey

A review of sandstone paving in the Edinburgh New Town World Heritage Site

Decarbonisation and Resource Management programme
Commissioned Report CR/26/075



BRITISH GEOLOGICAL SURVEY

DECARBONISATION AND RESOURCE MANAGEMENT PROGRAMME
COMMISSIONED REPORT CR/26/075

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S F Parry, L J Albornoz-Parra, P A Everett

Editor

J Mankelow

BRITISH GEOLOGICAL SURVEY

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British Geological Survey offices

**Nicker Hill, Keyworth,
Nottingham NG12 5GG**

Tel 0115 936 3100

BGS Central Enquiries Desk

Tel 0115 936 3143

email enquiries@bgs.ac.uk

BGS Sales

Tel 0115 936 3241

email sales@bgs.ac.uk

**The Lyell Centre, Research Avenue South,
Edinburgh EH14 4AP**

Tel 0131 667 1000

email scotsales@bgs.ac.uk

**Natural History Museum, Cromwell Road,
London SW7 5BD**

Tel 020 7589 4090

Tel 020 7942 5344/45

email bgs london staff@bgs.ac.uk

**Cardiff University, Main Building, Park Place,
Cardiff CF10 3AT**

Tel 029 2167 4280

**Geological Survey of Northern Ireland, 7th Floor,
Adelaide House, 39-49 Adelaide Street, Belfast, BT2 8FD**

Tel 0289 038 8462

www2.bgs.ac.uk/gsni/

**Natural Environment Research Council, Polaris House,
North Star Avenue, Swindon SN2 1EU**

Tel 01793 411500

Fax 01793 411501

www.nerc.ac.uk

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Executive summary

This report presents the outcomes of a review of sandstone paving used within the public realm of the Edinburgh New Town World Heritage Site. As such, it serves as an update to the 2007 British Geological Survey report on the same subject. A shortlist of paving stones that warrant consideration for use in the delivery of streetscape schemes within the New Town going forward is provided, along with comments intended to ensure successful procurement of the preferred stone(s).

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1 Introduction

The New Town of Edinburgh (hereinafter ‘Edinburgh New Town’ or simply ‘the New Town’) has a renowned cultural significance owing to its designed urban architecture, and has been awarded World Heritage status as a result. Maintaining the distinctive character of the area demands consideration of not only the buildings, but also other aspects of the historic streetscape such as paving and, by extension, the natural stone used for this purpose. A consensus is therefore sought amongst City of Edinburgh Council (CEC), Edinburgh World Heritage (EWH) and Historic Environment Scotland (HES) – as key stakeholders – on the specification for the stone to be used for ongoing public realm streetscape works within the Edinburgh New Town.

Based on the recommendations made in a previous British Geological Survey (BGS) report (Hyslop & Hamilton, 2007), “*Scoutmoor <var. Scout Moor> sandstone*” has been formally adopted as the preferred material for paving purposes within the New Town. Accordingly, this stone has been used extensively across the World Heritage Site for much of the last two decades. As of late 2025, however, the ongoing availability of *Scoutmoor Sandstone* is in serious doubt as production has ceased at the source quarry in Lancashire (we understand it is considered ‘worked out’ for paving) and the site sold for aggregates production and landfill. Matters are compounded by the fact that Marshalls Plc, the ex-producer of *Scoutmoor Sandstone*, has effectively withdrawn from the UK natural paving stone market (i.e. the supply of UK-quarried natural paving stone). This has had the simultaneous effect of removing *Whitworth Sandstone* and *Appleton Sandstone* paving from the market. These particular stones are of broadly similar character to *Scoutmoor Sandstone*, and have in fact been supplied by Marshalls as components of ‘Scoutmoor Yorkstone’ mixtures (or ‘blends’) for a number of years now.

The need to identify a substitute for *Scoutmoor Sandstone* (in its own right, or as a ‘blend’) for use within the Edinburgh New Town has prompted CEC, EWH and HES to commission BGS to produce an independent and authoritative synthesis of the key facts about the paving stone types that are actively quarried in the UK and which could be considered as alternatives in the present circumstances. In addition to providing important background to CEC to inform their decision-making, and ultimately breaking the current impasse, this report is intended to serve as an update to the 2007 BGS report (op. cit.) and reference point when establishing paving stone procurement specifications going forwards.

The scope and objectives of this study are as follows:

- a) To undertake a brief visual and photographic survey of some 6–8 examples of street paving schemes within Edinburgh New Town, selected to demonstrate the variety of paving stones that have been employed in streetscape schemes delivered since c. 2007 (i.e. in the wake of the work of Hyslop & Hamilton, 2007).
- b) To characterise, as far as reasonably possible, the geological properties of the main stone types present in these example paving schemes, and summarise their origins in terms of source quarry, geographical region and/or bedrock geology (i.e. lithostratigraphy). These details will be presented alongside the corresponding information for the historic paving types of the Edinburgh New Town, as defined by Hyslop & Hamilton (2007).
- c) To present a synthesis of the photographic survey and characterisation work, including a simple review of each scheme in relation to desired design principles (as intimated by CEC, EWH and HES).

- d) To gather and present information about potentially favourable options for sourcing alternative UK-produced paving stones, briefly examining how their use would 'align' with the example existing paving schemes and their associated design principles, and exploring certain other criteria that may prove to be considerations in the procurement review (as indicated by CEC and EWH), such as security of supply.
- e) To offer any relevant advice on the wording of specifications relating to stone procurement longer term.

In order to satisfactorily address certain of these objectives it proved necessary to undertake a number of tasks not envisaged at the time of commissioning. These included direct engagement with, and the gathering of information from, Marshalls Plc, Tradstocks Ltd., Roy Geddes Bricks Ltd. and Denfind Stone Ltd., obtaining and petrographically examining example specimens of particular stones, and making a reconnaissance visit to Huncoat Quarry.

We note that in the context of this report, the term "paving" is used exclusively to refer to natural stone slabs intended for pedestrian pavements, and not for any other type of 'streetscape stone' that could arguably be considered paving, such as setts, kerbs, channels and steps.

2 Nomenclature applied in this report

The names assigned to paving stones, and indeed building stones more generally, are traditionally two-part, with the first part based on the source of the stone (whether this be either the quarry or geographical place, or the bedrock unit, of origin) and the second on the lithological type or a characteristic of that lithology. Names such as *Scoutmoor Sandstone*, *Angus Sandstone*, *Coal Measures Sandstone* and *Caithness Flagstone* are thus in common use amongst those in the industry. Nonetheless, the application and the written form of these names (in particular, the capitalization of the component parts) varies.

Another widely employed stone name, with particular relevance to paving stone, is 'Yorkstone'. This is an unfortunate term, however, that although having certain connotations has no sound geographical or geological basis. For example, the geographical source area of 'Yorkstone' is neither York nor is it limited to Yorkshire, and the bedrock source encompasses a number of lithostratigraphical units. Furthermore, whilst 'Yorkstone' was historically applied to thinly bedded, 'fine' sandstones originating from the stratigraphically highest levels of the Millstone Grit Group and portions of the overlying Pennine Coal Measures Group, the name over time has become attached to a broader range of Carboniferous sandstones originating from sites across central Northern and North West England. 'Yorkstone' should therefore be regarded as a trade name with an indefinite meaning, and treated with caution in terms of what it indicates about the character and provenance of any stone to which it has been applied.

In this report, the names applied to specific paving stones adhere to the established naming convention outlined above, but for consistency and clarity employ first letter capitals for each part of the name and are italicized throughout. As an example, *Whitworth Sandstone* refers to the paving sandstone originating from Whitworth Quarry in Lancashire (see also Section 3). The paving sandstone originating from Scoutmoor Quarry (a.k.a. Scout Moor Quarries) in Lancashire presents something of a complication owing to the fact that the name 'Scoutmoor Sandstone' has been used in connection with paving stone originating solely from Scoutmoor Quarry and also for paving stone mixtures ('blends') that include a greater or lesser proportion of stone from Scoutmoor Quarry. To remove any ambiguity, then, *Scoutmoor Sandstone (sensu stricto)* is the name used here for the paving sandstone originating entirely from Scoutmoor Quarry in Lancashire, while the name *Scoutmoor Sandstone (sensu lato)* (which can be regarded as synonymous with the 'Scoutmoor Yorkstone' name used over recent years by Marshalls Plc) refers to a paving stone 'blend' comprising sandstone from Scoutmoor Quarry in

Lancashire intermixed with greater or lesser amounts of *Whitworth Sandstone* and/or *Appleton Sandstone* (the latter originating from Appleton Quarry in West Yorkshire; see Section 3).

3 Significant paving stones in Edinburgh New Town

The investigations of Hyslop & Hamilton (2007) established that the most commonly used historical paving stone “by far” in the Edinburgh New Town, albeit surviving to only a limited extent, is *Hailes Sandstone*. This is a fine- or medium-grained, quartz-rich sandstone possessing irregular dark laminae. Although typically off-white to very pale orange in colour when fresh, a range of grey, orange-red and red-brown colours develop upon weathering which, in combination with the differential ‘wearing through’ of the laminae, give this stone a very distinctive visual appearance. Observations made as part of the present study, along the north side of Charlotte Square for example, corroborate the previous descriptions (see Hyslop & Hamilton, 2007). *Hailes Sandstone* was produced from Carboniferous strata assigned to the West Lothian Oil-Shale Formation at Hailes Quarry and nearby sites in south-western parts of Edinburgh.

Subordinate historical paving stones recognised by Hyslop & Hamilton (2007) were “Angus type sandstone (flagstone)”, “Craigleith type sandstone” and “Central Scotland type sandstone”. These paving stones were not observed during the present study, and the reader is therefore referred to Hyslop & Hamilton (2007) for further information on their respective characteristics and locations of use. We nonetheless provide details on *Angus Sandstone* (equivalent to the “Angus type sandstone (flagstone)” of Hyslop & Hamilton, 2007), as these will be relevant to later discussion. *Angus Sandstone* is a fine- to very fine-grained sandstone with a planar fabric created by variations in the grain size and the presence of concentrations of mica. The stone usually exhibits a pale greenish grey colour, but it can be reddish brown dependent on the iron oxide content. A number of varieties of *Angus Sandstone*, some of which were named eponymously, were produced in the past at locations across Angus, including Carmyllie, Pitairlie and Turin Hill. The source quarries principally worked strata assigned to the Dundee Flagstone Formation of Lower Devonian age.

Paving stones that have seen use within the Edinburgh New Town during recent times principally comprise varieties of fine-grained sandstone of Carboniferous age from Northern England. Chief amongst these is *Scoutmoor Sandstone (sensu stricto)*, its introduction following the study of Hyslop & Hamilton (2007) and resulting in the stone’s formal adoption as the preferred material for paving purposes in the New Town. Appreciable quantities of the broadly similar *Whitworth Sandstone* and *Appleton Sandstone* have also been laid during the last decade either in lieu of *Scoutmoor Sandstone (sensu stricto)* or as components of *Scoutmoor Sandstone (sensu lato)* ‘blends’. The reasons for this mixing or full substitution were rooted in the need for producer-supplier Marshalls Plc to meet the high demand for their ‘Scoutmoor Yorkstone’ product, whilst simultaneously contending with geological issues at the Scout Moor Quarries site in Lancashire.

Scoutmoor Sandstone (sensu stricto) is a predominantly very fine-grained sandstone with a variably pronounced cross-lamination. The individual laminae take the form of curvilinear dark seams. The stone has a pale, subtly bluish, grey base colour, but a yellowish cum ochreous discoloration (an expression of Liesegang banding) is often superimposed on this – in some cases, affecting areas equivalent to the bulk of an individual slab. A striking maroonish brown colour can also patchily develop upon weathering. It should also be noted that slabs affected by incipient weathering can appear subtly greenish (rather than bluish) grey, especially when wet. As indicated above, *Scoutmoor Sandstone (sensu stricto)* originates from the Scout Moor Quarries site, located c. 1.5 km to the east of the village of Edenfield in Lancashire. The bedrock source is known as the Upper Haslingden Flags, a part of the Rossendale Formation.

Table 1. Comparison of selected attributes of the paving stones discussed in this report. Quoted values were obtained from various sources, including Building Research Establishment (BRE) test reports, the freely available datasheets of individual stone suppliers and BGS' own data. Details of the testing methodologies are not always provided; it is assumed for the purposes of this report that the methodology used has been essentially the same in all cases and that the data are directly comparable. Nonetheless, the data presented here are for comparative purposes only, and should not be relied upon solely - the results of the most recent geotechnical testing should always be sought from the supplier ahead of specification. 'Not available' indicates that no source of the relevant information has been found. MPa = MegaPascals. Water absorbption is provided as % of weight. Permeability is based on a simple, non-quantitative assessment, and is categorised as very low, low, moderate, high or very high (expressed relative to a nominal 'average' permeability in building stone sandstones); the assessment is based on: (i) a water bead test; (ii) the proportion of pore space in the stone; (iii) a visual assessment of the degree to which pore spaces appear connected in thin section.

Stone	Base Colour	Variagation (e.g. colour banding)	Grain size	Bedding features	Quarry sources	Geological Unit (Age)	Permeability	Water absorption	Compressive Strength	Flexural Strength	Density	Slip resistance (Dry-Wet)	Comments
<i>Hailes Sandstone</i>	Off-white to pale grey with shades of other colours (e.g. orange)	A range of intense grey, orange-red and red-brown colours develop over time	Mostly fine sand-grade	Carries conspicuous irregular dark laminae	South-western parts of Edinburgh (e.g. Hailes)	Calders Member, West Lothian Oil-Shale Formation (Carboniferous)	Low	10.9% (1)	50.1 to 72.1 MPa (1)	Not available	2223 to 2304 kg/m ³ (1)	Not available	
<i>Angus Sandstone</i>	Pale greenish (to bluish) grey, with some beds showing red-brown or purplish colours	Generally subtle, with more brownish colours developing over time	Silt-grade to fine-sand grade	Moderately to well developed parallel bedding features; sometimes uniform	Angus (e.g. Pitairlie, Monikie)	Dundee Flagstone Formation (Devonian)	Very low	Not available	78-95 MPa (2)	11.9 MPa (3)	2400 kg/m ³ (3)	83-76 (3)	Quoted value for Flexural Strength is the lowest expected value (LEV).
<i>Scoutmoor Sandstone (sensu stricto)</i>	Pale, subtly bluish, grey, but can look slightly greenish at the onset of weathering (especially when wet)	Ochreous Liesegang banding commonplace, affecting 30-40% (est.) of the stone on average; maroonish brown colours can also develop	Very-fine-sand-grade	Possesses a variably pronounced cross-lamination, which is somewhat irregular	Scout Moor Quarries, Edenfield, Lancashire	Upper Haslingden Flags, Rossendale Formation (Carboniferous)	Very low to low	2.3% (4)	186 MPa (4)	17.5 - 25.7 MPa (4)	2464 kg/m ³ (4)	70 (4)	This description applies to <i>Scoutmoor Sandstone sensu stricto</i> and the quoted test data are those of BRE (2000). It is noted that in some online resources, including technical data sheets produced by Marshalls Natural Stone over recent years, ambiguity surrounds the source of the 'Scoutmoor Sandstone' tested; data derived from the testing of <i>Scoutmoor Sandstone sensu stricto</i> ± <i>Whitworth Sandstone</i> ± <i>Appleton Sandstone</i> may be represented on such data sheets.
<i>Whitworth Sandstone</i>	Pale, subtly greenish or bluish, grey	Ochreous Liesegang banding can be developed, but only weakly so and generally affecting no more than 10-20% (est.) of the stone	Very-fine-sand-grade	Carries conspicuous dark cross laminae	Whitworth Quarry, Whitworth, Lancashire	Upper Haslingden Flags, Rossendale Formation (Carboniferous)	Very low	3.5% (5)	102 MPa (5)	12.19 MPa (5)	2522 kg/m ³ (5)	90-87 (sawn surface) (5)	The greenish aspect to the base colour tends to become more apparent when the stone is viewed alongside distinctly bluish grey colours such as those typically exhibited by <i>Scoutmoor Sandstone sensu stricto</i> . The quoted values are taken from a technical data sheet provided by 'Arbour Landscape Solutions', but this is evidently based on a Marshalls Natural Stone-produced document; note also that the words "Scoutmoor Yorkstone" appear on the data sheet in question. Data derived from testing of <i>Scoutmoor Sandstone sensu stricto</i> ± <i>Whitworth Sandstone</i> ± <i>Appleton Sandstone</i> may be represented. LEV for Flexural Strength is quoted at 11.49 Mpa.
<i>Appleton Sandstone (pre-2022 production)</i>	Pale, subtly bluish, grey but can appear slightly brownish or fawn at the onset of weathering	Ochreous Liesegang banding commonplace, which can be intensely developed and similar to <i>Scoutmoor Sandstone (sensu stricto)</i> ; maroonish brown colours can also develop	Very-fine-sand-grade	Possesses a variably pronounced cross-lamination	Appleton Quarries, Shepley, West Yorkshire	Greenmoor Rock, Pennine Lower Coal Measures Formation (Carboniferous)	Very low to low	2.9% (4)	143.2 MPa (4)	12.6–18.3 MPa (4)	2384 kg/m ³ (4)	73 (4)	The quoted test data are those of BRE (2000).
<i>Appleton Sandstone (post-2022 production)</i>	Pale brownish grey	The base colour patchily or uniformly intensifies, becoming distinctly brownish; ochreous Liesegang banding does not appear to develop, however	Very-fine-sand-grade to fine-sand-grade	Carries variably prominent, brown, planar and cross laminae	Appleton Quarry, Shepley, West Yorkshire	Grenoside Sandstone, Pennine Lower Coal Measures Formation (Carboniferous)	Low to locally moderate	Not available	Not available	9.9–15.15 MPa (6)	2432 kg/m ³ (6)	Not available	Note that this sandstone is worked from the SE corner of the Appleton Quarry site and from a different series of beds to those that were the source of <i>Appleton Sandstone</i> produced prior to c. 2022 (see above).
<i>Caithness Flagstone ('typical variant')</i>	Dark Grey	Can develop a lighter grey or subtly yellowish cum brownish surface colouration	Silt-grade and finer	Parallel bedding and lamination	Various sites in northern Caithness	Spital Flagstone Formation (Devonian)	Very low	0.2% (7)	150 MPa (8)	35.0 MPa (7)	2680 kg/m ³ (7)	88-55 (7)	LEV for Flexural Strength is quoted at 26.9 Mpa.
<i>Caithness Flagstone ('buff mix')</i>	Brownish or orangish grey and dark grey	The base colour can patchily or uniformly intensify	Silt-grade and finer	Parallel bedding and lamination	Various sites in northern Caithness	Spital Flagstone Formation (Devonian)	Very low	0.2% (7)	150 MPa (8)	35.0 MPa (7)	2680 kg/m ³ (7)	88-55 (7)	Note that the brownish and orangish colours are spatially limited to one or more laminae at or close to the bedding plane surfaces. As such, breaching of the coloured layer (for example through footfall-related 'erosion') results in the exposure of stone displaying the typical dark grey base colour. LEV for Flexural Strength is quoted at 26.9 Mpa.
<i>Huncoat Sandstone</i>	Pale bluish to greenish grey (9)	Liesegang banding is only weakly developed, serving to impart shades of yellow and brown to a variable percentage of the surface area of each individual slab (9)	Essentially very-fine-sand-grade	Carries variably conspicuous irregular dark laminae	Rakehead Quarry, Accrington, Lancashire	Pennine Lower Coal Measures Formation	Very low	1.4% (10)	185 MPa (10)	17.5 MPa (10)	2150 kg/m3 (10)	85-74 (sawn surface) (10)	The base colour of this stone appears to vary somewhat, presumably reflecting the subtle development of other colours in response to the onset of weathering. LEV for Flexural Strength is quoted at 15.6 Mpa.

Sources of technical data:

- (1)
- Building Stones of Edinburgh (2nd Edition). 1999. Edinburgh Geological Society. Edinburgh, 235 pp.
- (2)
- Everett, P.A. *et al.* 2011. An historical and petrological assessment of Pitairlie Quarry, Angus. British Geological Survey, Open Report OR/11/009. 31 pp.
- (3)
- Denfind Stone - The Paving Collection: https://denfindstone.co.uk/wp-content/uploads/2026/05/The-Paving-Collection_-_Digital.pdf
- (4)
- British Research Establishment (BRE) test data generated in 2000; see BRE British Stones Glossary: <https://bregroup.com/stones-glossary>
- (5)
- Arbour Landscape Solutions datasheet for 'Whitworth Grey': <https://www.arbourlandscapesolutions.co.uk/uploads/productbrochure.pdf>
- (6)
- Marshalls Natural Stone - Blockstone Collection: https://media.marshalls.co.uk/image/upload/v1549625225/39582_Block_Stone_Square_Brochurev12_Full_Final.pdf
- (7)
- A&D Sutherland Ltd. Declaration of Performance: https://caithnessflagstone.uk/wp-content/uploads/2023/03/UK-CA-DECLARATION-OF-PERFORMANCE_Online-Version.pdf
- (8)
- A&D Sutherland Ltd. website (based on BRE test data): <https://caithnessflagstone.uk/index.php/bre-report-full-spec/>
- (9)
- Based on the examination of a test panel seen at the yard of supplier Tradstocks.
- (10)
- Sandberg Report 79661/G/A ('Testing of Huncoat'), June 2025.
- Any other data obtained from observations and testing of BGS' own samples.

Whitworth Sandstone is a predominantly very fine-grained sandstone with a conspicuously, albeit non-uniformly, developed cross-lamination. The individual laminae again take the form of curvilinear dark seams. Excepting the dark laminae, the stone is mostly a pale, subtly greenish or bluish, grey colour. A yellowish cum pale orange discoloration (an expression of Liesegang banding) can be developed, but this is notably less intense and areally less extensive than in *Scoutmoor Sandstone (sensu stricto)*. *Whitworth Sandstone* originates from Whitworth Quarry, located c. 2 km to the north-west of the village of Whitworth, itself located immediately to the north of Rochdale, in Lancashire. The bedrock source is the Upper Haslingden Flags sub-division of the Rossendale Formation.

Appleton Sandstone is a very fine-grained sandstone with a variably prominent cross-lamination expressed by curvilinear dark seams. Its appearance in general tends to be reminiscent of *Scoutmoor Sandstone (sensu stricto)*, such that the two stones can be difficult to distinguish in hand specimen. This has implications for distinguishing these two stones when seen 'in-service' as paving slabs. *Appleton Sandstone* originates from Appleton Quarry, located immediately south of the village of Shepley in West Yorkshire. The bedrock source is known as the Greenmoor Rock, a part of the Pennine Lower Coal Measures Formation. It should be noted that the characteristics of *Appleton Sandstone* as described were maintained up until around 2022 only, at which point extraction operations at Appleton Quarry switched fully to the south-east corner of the site. The beds worked in this part of the quarry belong to the Grenoside Sandstone (another part of the Pennine Lower Coal Measures Formation) and yield a stone of different character to those of the Greenmoor Rock previously worked.

Hyslop & Hamilton (2007) also recognised *Caithness Flagstone* amongst the recent paving of the Edinburgh New Town. The presence of this stone was confirmed during the present study, either in its own right or as a subsidiary component of schemes (e.g. the Picardy Place–Leith Walk 'island') largely comprising one or more of the Carboniferous sandstones described above. The stone itself is a typically dark grey lithology with a well-developed planar fabric defined by alterations of parallel laminae composed of varying proportions of silt-grade siliciclastic grains and both silicate and carbonate mud. The bedding planes, along which the stone is split, often exhibit a raised patternation reflecting the development of syneresis cracks at the time of deposition. Some bedding plane surfaces can also display a yellowish cum brownish coloration. *Caithness Flagstone* is named eponymously after its source area in northern Caithness, where it is worked from strata assigned to the Middle Devonian Spital Flagstone Formation.

A summary of the characteristics of these paving stones and their respective sources is provided in Table 1, together with salient physical properties data for each. Images of the stones as seen both 'in-service' and as reference specimens can be found in Appendix 1.

4 Review of recent paving schemes

A survey of the paving stones present at ten localities across Edinburgh New Town was carried out by Dr Stephen Parry and Luis Albornoz-Parra (BGS) during a series of site visits made between the 9th and 12th of December 2025 (inclusive). The weather at the time was mixed, and included spells of both cool, dry conditions ± winter sunshine and heavy rain. The paving stones were thus seen under a variety of lighting conditions and in a range of states spanning dry to fully saturated. To mitigate against the effects of any bias this could potentially introduce to the observations, and in cases where it was felt there was benefit to the overall study, certain localities were visited more than once.

Amongst the ten localities surveyed, six (localities 2, 3, 5 and 8–10; see Table 2) were selected from a list of recent sandstone paving schemes provided by CEC, with the remaining four (localities 1, 4, 6 and 7) chosen by BGS on the basis of their individual merits in the context of

the study. A full record of the observations made at each locality is provided in Appendix 2, and the key findings and conclusions summarised below:

- Remnant areas of *Hailes Sandstone* paving are still present within Edinburgh New Town, such as along north side of Charlotte Square (Locality 1). The distinctive visual characteristics of this stone, as described previously by Hyslop & Hamilton (2007), are confirmed (see Section 3).
- *Scoutmoor Sandstone (sensu stricto)* now features widely across the New Town (e.g. localities 2, 5, 6 and 10) and would appear to be the predominant extant paving stone. Its use can be regarded as successful, especially in terms of the 'aesthetic' it creates and its ability to sympathetically match the visual character of *Hailes Sandstone*. Its adoption as the preferred material for paving purposes in the New Town is, in our view, entirely justified.
- In general, slabs of *Scoutmoor Sandstone (sensu stricto)* can readily be distinguished from slabs of *Whitworth Sandstone* based on their macroscopic appearance. The 'lively' and extensive colouration typical of *Scoutmoor Sandstone (sensu stricto)* is seemingly never shown by *Whitworth Sandstone*, which in contrast displays only 'muted' colouration (ochreous Liesegang banding is only weakly developed, for example). In addition, dark laminae tend to be more conspicuously developed in *Whitworth Sandstone* relative to *Scoutmoor Sandstone (sensu stricto)*. It must be recognised, however, that there is some overlap in the visual characteristics of these two stones, and distinguishing the two with confidence becomes problematic (e.g. Locality 8) when essentially bluish grey slabs with weakly developed Liesegang banding and moderately prominent dark laminae are encountered.
- Distinguishing slabs of *Scoutmoor Sandstone (sensu stricto)* from slabs of *Appleton Sandstone* (specifically, the 'traditional' form of this stone supplied up until c. 2022) based on their macroscopic appearance cannot be done with confidence. These two paving stones, in their typical guises, can be regarded as essentially indistinguishable. Accordingly, *Appleton Sandstone* (if recognisable as such) is considered distinguishable from *Whitworth Sandstone*, notwithstanding the potential for some degree of visual overlap.
- The bulk of the *Appleton Sandstone* that has been used within the New Town is inferably the 'traditional' pre-c. 2022 form of the stone (i.e. derived from the Greenmoor Rock outcrop of the main part of Appleton Quarry). *Appleton Sandstone* in its post-c. 2022 guise (i.e. derived from the Grenoside Sandstone outcrop of the south-eastern extension of Appleton Quarry) has not been identified with confidence, although potential candidate slabs were observed within the 'Island area' forming part of Locality 10 (Picardy Place). Knowledge of when exactly the paving stone used for 'Island area' (which does differ in character from the other constituent parts of Locality 10; see Appendix 2) was delivered to site may give clues as to which form of *Appleton Sandstone* is actually present.
- Overall, it proved possible to verify the 'make-up' of the paving – whether involving single stone types or 'blends' – employed in the schemes drawn to our attention by CEC (Table 2). The exception was the junction of Melville Street and Walker Street (a.k.a. Melville Crescent; Locality 9), where we understand a 'blend' of *Whitworth Sandstone* and *Appleton Sandstone* was laid. Whilst *Whitworth Sandstone* is undoubtedly present at this locality, and predominates, the identity of the second ('blended') sandstone is uncertain. The visual characteristics of each and every 'blended' stone slab cannot be regarded as typical of those of *Appleton Sandstone*, either in its 'traditional' pre-c. 2022 form or its post-c. 2022 form, and we suspect that it is another sandstone type. We note also that the *Whitworth Sandstone* and the 'blended' sandstone appear to perform very differently in response to saturation due to heavy rain; the 'blended' sandstone is evidently substantially more porous and permeable than the *Whitworth Sandstone*.

- Notwithstanding the issues outlined in connection with Locality 9, blending of *Scoutmoor Sandstone (sensu stricto)* and pre-c. 2022 *Appleton Sandstone* can be regarded as successful set against the benchmark aesthetic of *Hailes Sandstone*. *Whitworth Sandstone* – whilst overlapping with *Scoutmoor Sandstone (sensu stricto)*, and indeed pre-c. 2022 *Appleton Sandstone*, in terms of appearance – is not considered to ‘blend’ sufficiently well, and its use in significant quantities as part of a ‘blend’ results in both a ‘muted’ visual appearance and a discernible departure from the desired aesthetic.

Table 2. Summary of the paving stones BGS understands were used in connection with specific schemes included in this study (information provided by CEC).

BGS locality number	Scheme name	Extent	Paving stone(s)* used
2	Leith Street	Whole Street	Scoutmoor
3	Elder Street	Whole Street	Scoutmoor/Appleton/Whitworth mix
5	St Stephen Street	Whole Street	Scoutmoor
8	Elm Row	Whole Street	Scoutmoor/Appleton/Whitworth mix
9	Melville Street	Walker Street Junction	Appleton/Whitworth
10	Picardy Place	Broughton Street to Union Street	Scoutmoor/Appleton/Whitworth mix

* Stone names have been shortened simply to aid accommodation of the text in the table. “Scoutmoor”, for example, means *Scoutmoor Sandstone*.

5 Future sourcing of paving stone – options and considerations

The current situation in which CEC and EWH find themselves has been precipitated by a combination of supply problems surrounding ‘Scoutmoor Yorkstone’ and the withdrawal of Marshalls Plc from the UK (i.e. UK-sourced) natural paving stone market. *Scoutmoor Sandstone (sensu stricto)* and *Scoutmoor Sandstone (sensu lato)* are thus no longer available, and there is little realistic prospect of this changing. In the case of Scoutmoor Quarry (Scout Moor Quarries), the site is considered to be ‘worked out’ for paving stone owing to geological issues, and it has been sold for aggregates production and landfill. At Whitworth Quarry, meanwhile, site ownership complexities combined with planning constraints (which limit the output of quarried block available for further processing, such as for cutting into paving slabs) have resulted in the site being mothballed; this impasse is unlikely to be resolved in the short- to medium-term. Appleton Quarry remains operational and has an expected lifespan of some six years, but operations are now focused on the Grenoside Sandstone outcrop occurring in the south-eastern part of the site; the sandstone exposed and worked here differs significantly in character from the Greenmoor Rock sandstone that was worked up until c. 2022 elsewhere in the quarry (see Table 1). As a result, *Appleton Sandstone* similar to *Scoutmoor Sandstone (sensu lato)* in appearance and other properties is unlikely to be available again from Appleton Quarry. The reality is that the Carboniferous sandstones on which CEC and EWH have been reliant over the last two decades are now unobtainable and alternative paving stones will have to be considered for use in connection with public realm streetscape works within Edinburgh New Town going forward.

It is important to recognise that there are no Carboniferous 'Yorkstone' sandstones in active production within the UK that offer a close match for *Scoutmoor Sandstone (sensu stricto)* in all respects, and in visual character especially. Accordingly, a level of compromise will be necessary with respect to the choice of a paving stone(s) for use going forward. Set against this backdrop, we now discuss and explore the relative merits of several candidate stones, paying particular attention to CEC's desired design principles – the emphasis being placed on:

- (1) mirroring the aesthetic of *Hailes Sandstone* and, by extension, *Scoutmoor Sandstone (sensu stricto)*.
- (2) security of supply.

The following three stones warrant consideration in the circumstances, and we treat each in turn:

- *Huncoat Sandstone*
- *Angus Sandstone*
- *Caithness Flagstone*

It should be noted that *Appleton Sandstone* in its post-c. 2022 (i.e. Grenoside Sandstone-derived) guise has been excluded from this shortlist as it is felt that this stone falls short of offering the desired aesthetic and its other intrinsic characteristics are sufficiently different to those of *Scoutmoor Sandstone (sensu lato)* that its inclusion cannot be justified; the projected lifespan for the Appleton Quarry extension of only six years is also a concern.

Huncoat Sandstone

This is a paving stone that has only recently been brought to market. Its availability stems from a desire to commercially reinvigorate Huncoat Quarry, located to the east of Accrington in Lancashire, following changes to Ibstock Brick's production network.

Huncoat Sandstone is produced from sandstone beds of Carboniferous age, which are assigned to the Pennine Lower Coal Measures Formation. As such, it offers the closest geological match for *Scoutmoor Sandstone (sensu stricto)* amongst the three candidate stones. Its physical properties are also comparable (see Table 1).

The macroscopic colour characteristics of *Huncoat Sandstone* are 'muted' relative to *Scoutmoor Sandstone (sensu stricto)* and can be regarded as essentially comparable to those of *Whitworth Sandstone*. Whilst as yet unproven, we consider it unlikely that appreciable changes in colour (such as an 'enhancement' of the Liesegang banding) will occur 'in-service' in response to weathering. The medium to long term performance characteristics of *Huncoat Sandstone* are equally unproven at the present time.

Preliminary investigations made by BGS as part of this study have revealed that substantial quantities of quarried *Huncoat Sandstone* block are available for processing into paving stone. As of February 2026, quarrying is in progress to augment the existing stockpile of block. Guarantees would certainly need to be sought, but it would appear that *Huncoat Sandstone* could viably meet the short-term supply needs of CEC, at least. Longer term supply security is less certain as this would be predicated on an extension to the existing quarry. We understand that planning permission for this is actively being pursued.

Angus Sandstone

Angus Sandstone is recognised as one of the historic paving stones of Edinburgh New Town (see Section 3), and on this basis alone its effective re-introduction may be regarded as an attractive option.

The physical properties of *Angus Sandstone* differ from the Carboniferous 'Yorkstone' varieties considered in this report (see Table 1), but these differences do not give cause for immediate concern and it remains the case that *Angus Sandstone* has a historical pedigree as paving stone.

Whilst the macroscopic colour presented by *Angus Sandstone* is often seen as 'muted', this is arguably a misrepresentation. In this respect, CEC and EWH may wish to visit the Broughty Ferry seafront and examine the *Angus Sandstone* paving recently installed here as part of the Broughty Ferry Flood Defence Project. A relatively 'lively' colour palette is on display (an indication of which is provided by the relevant image included in Appendix 1), which may be deemed an acceptable match for the coloration exhibited by *Hailes Sandstone* and *Scoutmoor Sandstone (sensu stricto)*.

Whilst assurances would need to be sought, we understand that the sole active supplier of *Angus Sandstone* has reserves (estimated at around 50 years) capable of meeting the medium- to long-term paving needs of CEC, within existing planning constraints.

Use of *Angus Sandstone* would benefit the Scottish economy and in its presence in a high-profile location such as Edinburgh New Town would serve to promote the use of Scottish stone.

Caithness Flagstone

Caithness Flagstone does not have a historical association with Edinburgh New Town, but features extensively across the Old Town. Its possible future use 'on scale' as part of streetscape schemes within the New Town could variously be regarded as beneficial in that it harmonizes the paved surfaces of Edinburgh or detrimental in that it (arguably) dilutes the character of the New Town.

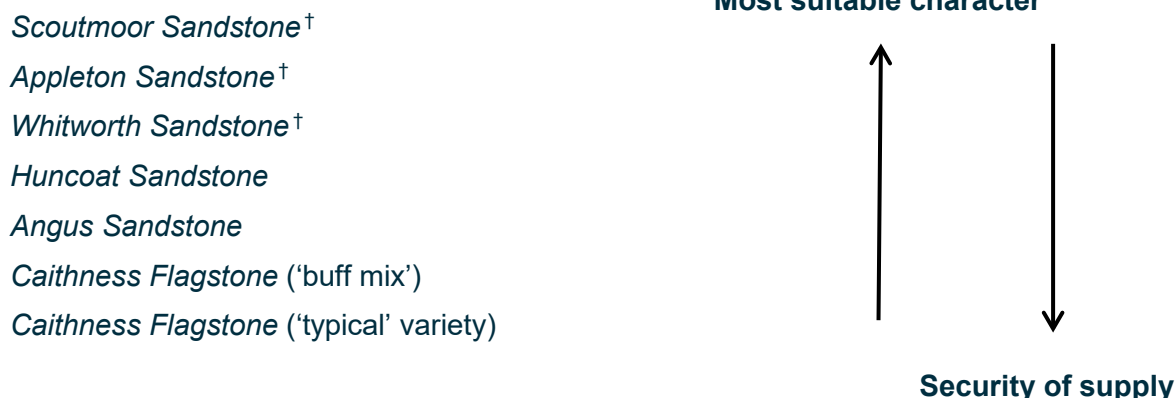
Caithness Flagstone has a well-established pedigree as a paving stone, and continues to see widespread use across Scotland (and indeed the UK) as part of streetscape and other paving schemes.

The macroscopic colour of 'typical' *Caithness Flagstone* contrasts markedly with *Scoutmoor Sandstone (sensu stricto)*. However, the brownish and orangish grey colours displayed – as expressions of a more general variegation – by the 'buff mix' (see Table 1 and Appendix 1) could be regarded as approaching the desired aesthetic. It remains the case that such brownish and orangish colours are spatially limited to one or more laminae at or close to the bedding plane surfaces, and breaching of the coloured layer (for example through footfall-related 'erosion') will result in the exposure of stone displaying the typical dark grey base colour; this is easily verifiable by viewing the *Caithness Flagstone* paving within certain heavily trodden parts of the Old Town.

We understand that existing reserves of *Caithness Flagstone* are easily capable of meeting the medium- to long-term paving needs of CEC.

Use of *Caithness Flagstone* would benefit the Scottish economy and in its presence in a high-profile location such as Edinburgh New Town would serve to promote the use of Scottish stone.

The suitability and 'security of supply' of *Huncoat Sandstone*, *Angus Sandstone* and *Caithness Flagstone* relative to the components of 'Scoutmoor Yorkstone' are summarised in the following diagram:



[†] Stone is outright unavailable or unavailable in a suitable form.

6 Comments on successful procurement

Market circumstances and CEC's ongoing need for paving stone to deliver public realm streetscape works within Edinburgh New Town will necessitate a procurement exercise. A robust specification will be essential to this process at the initial stone selection stage and should ultimately form the basis of the contractual arrangements put in place between CEC and the supplier of the paving stone(s) of choice. The overarching aim must be to ensure a successful outcome for each project that employs natural paving stone.

The need for robust stone specifications has recently been highlighted by issues surrounding the buff coloured sandstone used as part of the Hawick Flood Protection Scheme in the Scottish Borders (Everett and Albornoz-Parra, 2025). In this particular case, a 'non-compliant' stone was substituted for the sandstone that the specification wording should have ensured was used. A further possible example is provided by the Melville Street locality (Locality 9) included as part of this study, which bears witness to what is arguably an undesirable outcome that could potentially have been avoided through the inclusion and/or exclusion of particular words in the specification.

Much of what is contained in any future paving stone specification for the New Town is likely to be governed by the desired design principles of CEC, and rooted in the strategy that has seen the use of *Scoutmoor Sandstone* across the New Town over the past two decades. Adherence to numerical parameters, for measurable physical properties of the stone, will clearly be central to the contents of the specification. Beyond this, however, explicit wording and specific demands would be highly desirable to ensure that the paving stone delivered to site and laid fully meets expectations. We make several recommendations in this respect:

The geological identity and source of the paving stone to be supplied should be beyond doubt – Trade/supplier names and monikers, including 'Yorkstone', whether in common use in the industry or not, should be omitted. The stone to be supplied should be defined in well-understood geological nomenclature and its source stated in terms of both a geographical location (quarry name, address, National Grid Reference) and bedrock unit of origin; details of the source bed(s) should be included, if appropriate. The input of a qualified geologist with the relevant expertise would be beneficial when devising the specification text.

Mixing ('blending') of stones from multiple sources should be prohibited – The practice of stone mixing ('blending'), as has been practised by Marshalls Plc over recent years with their 'Scoutmoor Yorkstone' product, should be explicitly prohibited to minimise the potential for

uncertainty over the source the stone(s). If, however, it is deemed desirable to permit some sourcing flexibility to meet supply volumes and deadlines, for example, then appropriate caveats should be included in the specification (and formalised in any contract of supply).

The operator of the supplying quarry should be dealt with directly – Direct engagement with the operator of the source quarry is considered preferable to arrangements made through, managed by and/or otherwise involving third party suppliers. This should maximise security of supply.

A logical next step for CEC, in consultation with EWH and HES, would be to establish a robust stone specification that takes account of the recommendations above and the envisaged paving stone usage across the New Town over the coming years, and then engage in a procurement exercise, inviting tenders from stone suppliers across the UK. The goal of this process should be the determination of a new ‘approved material’ or range of ‘approved materials’ for use in the delivery of streetscape schemes going forward. Thereafter, it would be beneficial to ensure that supply contracts and design go hand-in-hand for each individual scheme.

7 Conclusions

- A survey of the extant paving stone across Edinburgh New Town, focusing on streetscape schemes delivered during the last two decades, suggests that *Scoutmoor Sandstone (sensu stricto)* predominates. The widespread use of this stone – following its formal adoption in c. 2007 as the preferred material for paving purposes within the New Town – can be regarded as successful, especially in terms of the ‘aesthetic’ it creates and its ability to sympathetically match the visual character of *Hailes Sandstone* (the most commonly used historical paving stone). Appreciable quantities of the broadly similar *Whitworth Sandstone* and *Appleton Sandstone* have also been laid during the last decade, in particular, either in lieu of *Scoutmoor Sandstone (sensu stricto)* or as components of ‘Scoutmoor Yorkstone’ ‘blends’. This, too, can be regarded as mostly successful, although the significant use of *Whitworth Sandstone* does result in a departure from the benchmark aesthetic of *Hailes Sandstone*.
- Market conditions are such that the three Carboniferous sandstones on which CEC have been reliant since c. 2007 (see preceding point) are now unobtainable and alternative paving stones will have to be considered for use in connection with public realm streetscape works within the New Town going forward. It is important to recognise that there no Carboniferous ‘Yorkstone’ sandstones in active production within the UK that offer a close match for *Scoutmoor Sandstone (sensu stricto)* in all respects, and in visual character especially. A level of compromise will thus be necessary with respect to the choice of a paving stone(s) for future use.
- In the current market circumstances, and with the highest significance attached to CEC’s desired principles of (i) mirroring the aesthetic of *Hailes Sandstone* and, by extension, *Scoutmoor Sandstone (sensu stricto)* and (ii) security of supply, three stones warrant consideration. These are *Huncoat Sandstone*, *Angus Sandstone* and *Caithness Flagstone*. The relative merits of these stones have been assessed, and this assessment should serve as the basis for further evaluation by CEC, in consultation with EWH and HES.
- A logical next step for CEC would be to establish a robust stone specification, taking account of envisaged paving stone usage across the New Town over the coming years, and then engage in a procurement exercise, inviting tenders from stone suppliers across the UK. The goal of this process should be the determination of a new ‘approved material’ or range of ‘approved materials’ for use in the delivery of streetscape schemes going forward.

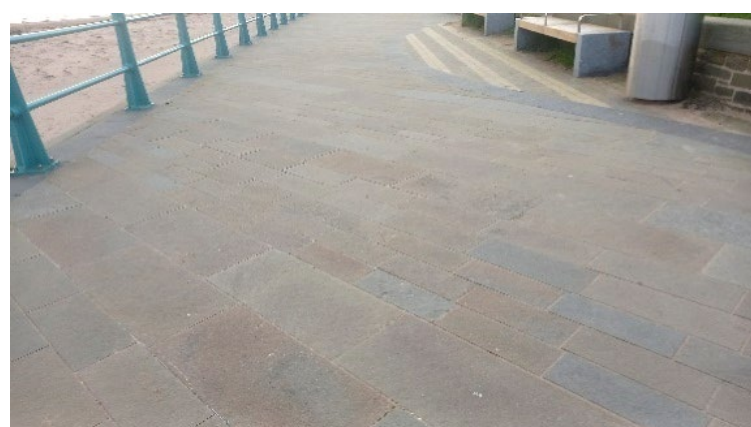
Appendix 1 Stone descriptions

The following descriptions and images are based on observations made on both BGS-held reference specimens of the stones and 'in-service' slabs. The provenance of the reference specimens relied upon is known to a high degree of certainty.



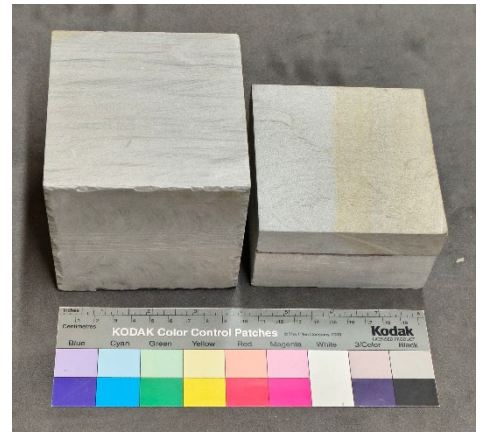
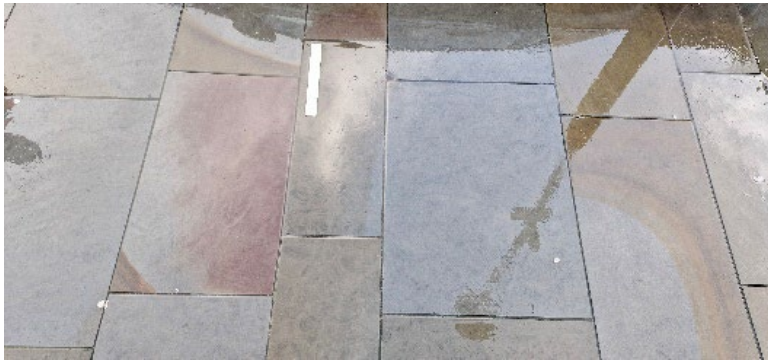
Hailes Sandstone

Off-white to pale grey with shades of other colours, for example orange, when fresh (see image of reference specimen). A range of bluish grey, orange-red and red-brown colours develop upon weathering (see image of 'in-service' slabs). The conspicuous cross-laminae that are present in the stone intersect with the 'dressed' (trodden) surfaces in such a way that they create a complex swirling pattern. The laminae weather differentially over time, introducing unevenness to the surface.



Angus Sandstone

Usually exhibits a pale greenish (to bluish) grey colour, with some beds showing reddish brown, or even purplish, colours (dictated by the iron oxide content); weathering produces duller shades of the same colours. The stone possesses a strong planar fabric. The image above (to left) shows the Broughty Ferry seafront and an area of *Angus Sandstone* paving installed as part of the Broughty Ferry Flood Defence Project.



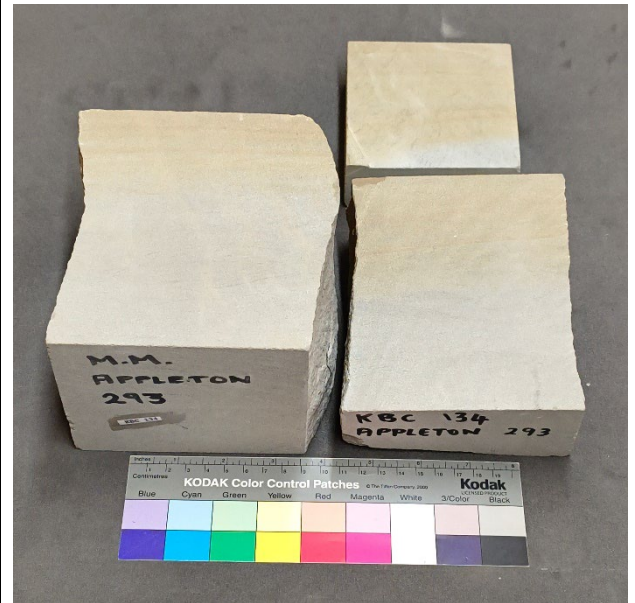
Scoutmoor Sandstone (sensu stricto)

Typically pale, subtly bluish, grey when fresh (see image of reference specimens), but a yellowish cum ochreous coloration (an expression of Liesegang banding) develops upon weathering; striking maroonish brown colours can also emerge. This 'superimposed' coloration affects an estimated 30–40% of an individual slab's surface area on average, but this figure can be significantly higher. *Whitworth Sandstone* has a notably 'muted' coloration by comparison (typified by the two slabs of uniform appearance in the image of 'in-service' paving above). Dark cross-laminae are variably pronounced.



Whitworth Sandstone

Typically displays a pale subtly greenish or bluish grey colour, with prominent dark cross-laminae that give rise to a complex 'swirling' patternation. Ochreous Liesegang banding can be developed, but only weakly so and it affects no more than 10–20% (est.) of an individual slab's surface area.



Appleton Sandstone (pre-2022 production)

Typically pale, subtly bluish, grey in colour, but can appear slightly brownish or fawn at the onset of weathering. Yellowish or ochreous Liesegang banding is commonplace, which can be intensely developed and similar to that of *Scoutmoor Sandstone (sensu stricto)*; maroonish brown colours can also develop. A variably prominent cross-lamination is expressed by curvilinear dark seams. The slab seen centrally in the image of 'in-service' paving above is considered to be *Appleton Sandstone*, but some uncertainty surrounds this identification and the more general discrimination of pre-2022 *Appleton Sandstone* from *Scoutmoor Sandstone (sensu stricto)*.



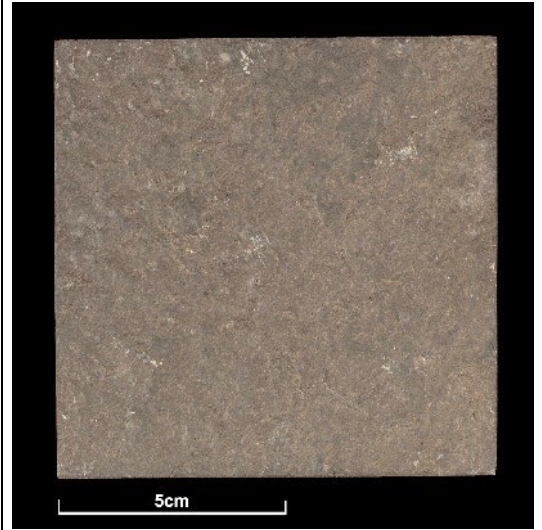
Appleton Sandstone (post-2022 production)

Exhibits a pale brownish grey colour (as seen above left), which patchily or uniformly intensifies during weathering, becoming distinctly brownish (as seen above right); ochreous Liesegang banding does not appear to develop, however. Carries variably prominent, brown, planar and cross laminae, which give rise to a locally conspicuous, brown, patternation on surfaces cut parallel or approximately parallel to the bedding. This stone has not yet been identified with certainty 'in-service' as paving slabs.



Huncoat Sandstone

Exhibits a pale bluish to greenish grey base colour, on which is superimposed shades of yellow and brown associated with the weak development of Liesegang banding. A variably prominent cross-lamination is expressed by curvilinear dark seams.



Caithness Flagstone ('typical variant')

Mostly exhibits a dark grey, almost black, colour, with lighter grey or subtly yellowish cum brownish colours developing on some slab surfaces. The bedding planes, along which the stone is split, often exhibit a raised pattern reflecting the development of syneresis cracks at the time deposition. Fossil fish fragments are occasionally preserved.



Caithness Flagstone ('buff mix')

The fundamental characteristics are those of the 'typical' Caithness Flagstone variant, and slabs of dark grey stone are still present. Intermixed with these, however, are slabs with a variably intense brownish or orangish grey colour reflecting the presence of iron oxides in the laminae at or close to the bedding plane surfaces (along which the stone is split). Breaching of the coloured layer (for example through footfall-related 'erosion') results in the exposure of stone displaying the typical dark grey base colour.

Appendix 2 Record of survey observations

Provided here is a record of the observations made as part of the survey of paving schemes undertaken by BGS during December 2025. Ten localities are covered, six of which were selected from a list of recent sandstone paving schemes provided by CEC, with the remaining four chosen by BGS on the basis of their individual merits in the context of the broader study.

For each locality, the paving stone types recognised are indicated. In cases where the stone(s) identified differ(s) from what CEC have informed us was to be laid (see Table 2 in Section 4), comments are provided accordingly.

We note that it is not possible to visually distinguish *Scoutmoor Sandstone (sensu stricto)* from *Appleton Sandstone* (at least the stone supplied as such up until c. 2022) with any degree of confidence. Thus, for those localities where we understand that either one or both of these stones was employed, we have not introduced any speculation as to whether either stone could in fact be the other; for example, if we have been informed that a scheme employed *Scoutmoor Sandstone (sensu stricto)* and *Appleton Sandstone*, we have assumed that this is correct, rather than suggest that only *Scoutmoor Sandstone (sensu stricto)* or only *Appleton Sandstone* is present.

Locality 1: Charlotte Square

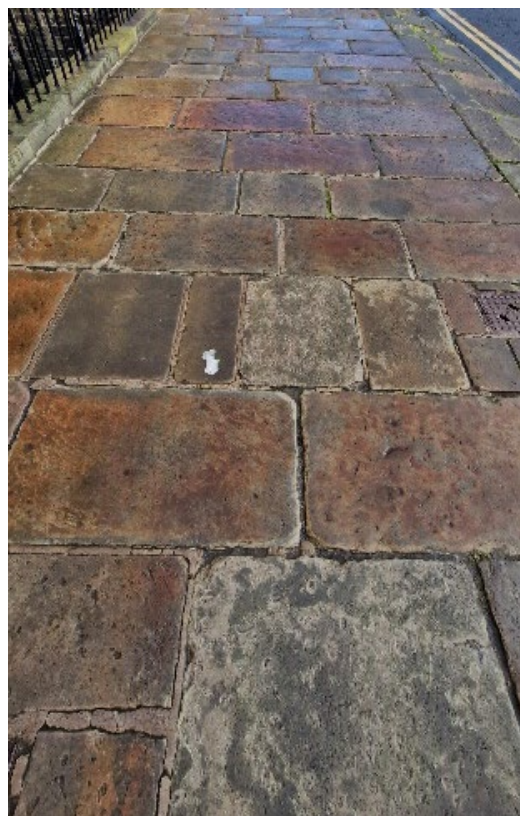
Scope of observations: Pavement along north side of Charlotte Square, including section outside main entrance to Bute House.

Stone types recognised: 1) *Hailes Sandstone*, which predominates and is the 'original' paving; 2) several other stone types, including sandstone of probable Indian origin, which feature sporadically as insert/replacement slabs.

Form and laying pattern: Naturally riven slabs; apparently random distribution of sizes, typically ranging from 40 x 40 cm to 100 x 55 cm.



Above: Typical examples of *Hailes Sandstone* slabs observed at Locality 1, as seen wet; 30 cm ruler for scale.



Above left: Stretch of *Hailes Sandstone* paving (as seen wet) present along the north side of Charlotte Square, illustrating the range of colours shown by this stone. **Above right:** Two rows of paving slabs located immediately outside the entrance to Bute House. Slabs of both *Hailes Sandstone* and a sandstone of probable Indian origin are present here; the latter are conspicuous owing to their colour and the distinctly different surface finish of the slabs.

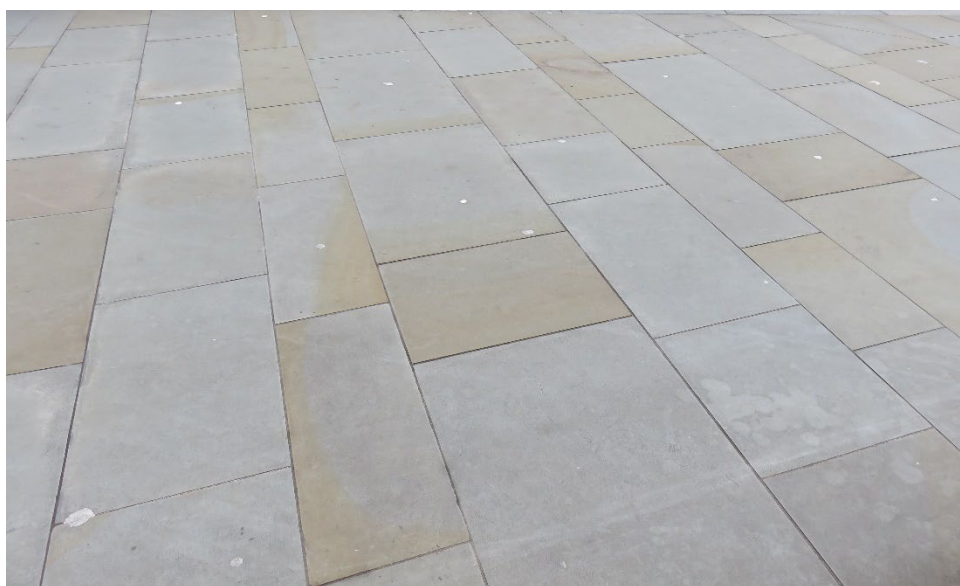
Locality 2: Leith Street

Scope of observations: Areas of pavement extending along the south-east side of Leith Street between Waterloo Place and Greenside Row, and along the north-west side of Leith Street between Waterloo Place and Little King Street.

Stone types recognised: *Scoutmoor Sandstone (sensu stricto)*.

Note that other stone types can be found in association with the entrances of specific private properties/developments located along the south-east side of Leith Street.

Form and laying pattern: Sawn slabs; mix of standard widths (30, 45, 60 cm) with random lengths, and typically arranged in a repeating '30–45–60' pattern. A small area comprising more weathered, apparently older (in terms of installation age), slabs is present immediately north of the building known as 'The Cube' – within this area, the individual slabs are consistently 60 cm wide and 80 cm in length, although a few examples measure 60 x 60 cm.



Above: Images illustrating the visual characteristics of the *Scoutmoor Sandstone (sensu stricto)* slabs present along the south-east side of Leith Street and also the laying pattern.



Above: Image showing an area of paving located immediately north of 'The Cube', on the south-east side of Leith Street. The interface between a small area comprising more weathered, apparently older (in terms of installation age), *Scoutmoor Sandstone (sensu stricto)* slabs and the typical, recently laid, *Scoutmoor Sandstone (sensu stricto)* paving of Locality 2 is well displayed. Weathering has picked out the irregular cross-lamination in the 'older' slabs, and as such their appearance is tending towards that of the historic *Hailes Sandstone* slabs of the New Town (not seen here). Tape measure (set at 30 cm) for scale.

Locality 3: Elder Street

Scope of observations: Pavement extending along the eastern side of Elder Street between St James Square and junction with St James Place.

Stone types recognised: *Scoutmoor Sandstone (sensu stricto)* and/or *Appleton Sandstone*.

Note that although the paving stone used for this scheme is understood to have been a “Scoutmoor/Appleton/Whitworth mix”, no stone displaying the characteristics of *Whitworth Sandstone* was observed amongst the in situ paving.

Form and laying pattern: Sawn slabs; mix of standard widths (30, 45, 60 cm) with random lengths, and commonly arranged in a repeating ‘30–45–60’ pattern.



Above: Images, taken looking approximately north, showing the general characteristics of the sandstone paving seen at Locality 3. Note that other stone types have been used in this area (as kerbs, for example) and nearby, but these are beyond the scope of the present study.



Above: Image illustrating the repeating ‘30–45–60’ pattern of the sandstone paving at Locality 3.

Locality 4: St James Place

Scope of observations: Pavement extending along both sides of St James Place between the junctions with Elder Street/Elder Street East and Cathedral Lane.

Stone types recognised: *Scoutmoor Sandstone (sensu stricto)* and/or *Appleton Sandstone*.

Form and laying pattern: Sawn slabs; the character of the pavement on the southern side of the street appears to be a continuation of that observed at Locality 3 (Elder Street) i.e. a mix of standard widths (30, 45, 60 cm) with random lengths, and commonly arranged in a repeating '30–45–60' pattern; the northern side of the street is different, however, and comprises a mix of non-standard and standard widths (15, 20, 30 and 40 cm) with random lengths, laid seemingly randomly.



Above: Images, taken looking approximately east, showing the general characteristics and laying pattern of the sandstone paving seen on the north side of St James Place. Note that another stone type has been used for the kerbs (beyond the scope of the present study). Note also the slab dimensions and laying pattern are different on the south side of St James Place, and reminiscent of what is seen at Locality 3.

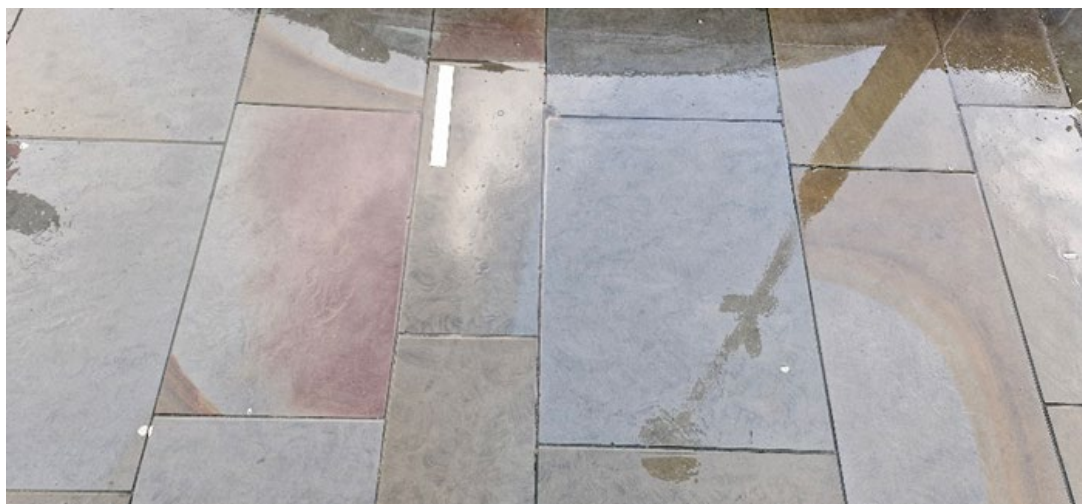
Locality 5: St. Stephen Street

Scope of observations: Pavement on north and south sides of St Stephen Street between the junctions with North West Circus Place and Clarence Street.

Stone types recognised: *Scoutmoor Sandstone (sensu stricto)*.

Note that very localised repairs have been carried out on the north side of the street using a sandstone of probable Indian origin.

Shaping and laying pattern: Sawn slabs; mix of standard widths (30, 45, 60 cm) with random lengths, and commonly arranged in a repeating '30–45–60' pattern.



Above: Image showing the general characteristics (when wet) and laying pattern of the sandstone paving seen at Locality 5; 30 cm ruler for scale.



Above: Image showing a damaged section of the sandstone paving at Locality 5 (seen dry); 30 cm ruler for scale.

Locality 6: National Gallery (lower level terrace)

Scope of observations: Area of paved terrace located immediately east of the National Gallery and providing access to the building from East Princes Street Gardens.

Stone types recognised: *Scoutmoor Sandstone (sensu stricto) ± Appleton Sandstone.*

Form and laying pattern: Sawn slabs; typically a mix of standard widths (30, 45, 60 cm) with random lengths, although a panel located directly in front of entrance/exit point comprises atypically large slabs that are consistently 90 cm wide and in random lengths of up to 1.38 m.



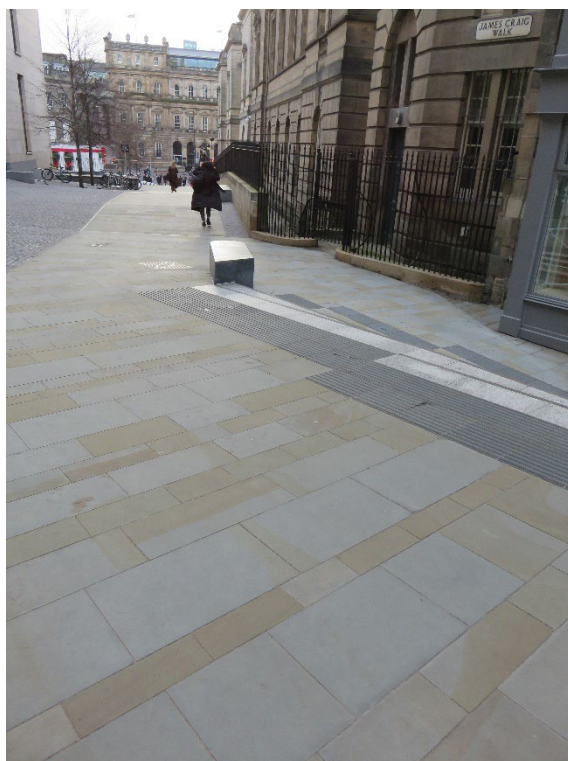
Above: Images illustrating the general characteristics and laying pattern of the sandstone paving at Locality 6. Both images show, in different levels of detail, the interface between the panel of atypically large slabs that is present directly in front of entrance/exit point (see LHS of images) and the enclosing area of standard width slabs (see RHS of images) that spatially dominates Locality 6.

Locality 7: St James Quarter (Leith Street entrance area)

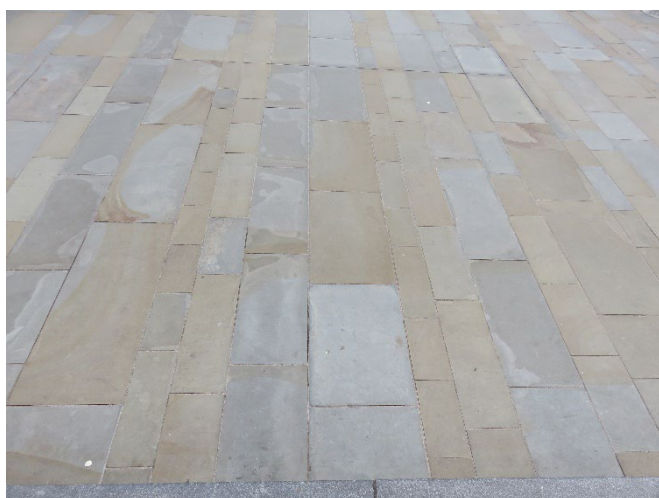
Scope of observations: Paved area providing access to St James Quarter from Leith Street, together with the slabbed pavement of James Craig Walk extending between Leith Street and St James Square.

Stone types recognised: *Scoutmoor Sandstone (sensu stricto) ± Appleton Sandstone.*

Form and laying pattern: Sawn slabs; a notable mixture of non-standard and standard widths (10, 20, 30 and 40 cm) with random lengths, although larger standard width slabs become more commonplace as James Craig Walk is followed northwards; no recognisable laying pattern.



Above left: Image, taken looking approximately south-east, showing the general characteristics of the sandstone paving present at the Leith Street entrance to St James Quarter. **Above right:** Image, taken looking approximately south, showing the sandstone paving of James Craig Walk, as seen in the vicinity of St James Square. Note that other stone types, beyond the scope of this study, have been used for kerbs, steps and other stone elements in these areas.



Above: Image showing sandstone paving observed at Locality 3 in greater detail. Note the make-up of the paving in non-standard and standard width slabs of 10, 20, 30 and 40 cm.

Locality 8: Elm Row

Scope of observations: Stretch of pavement fronting Elm Row and extending between the Montgomery Street and Leopold Place (London Road) junctions. Locality continues to the south-west of London Road, represented by the pavement fronting Baxter's Place, and continuing as far as Greenside Lane.

Stone types recognised: *Scoutmoor Sandstone (sensu stricto) ± Appleton Sandstone, Whitworth Sandstone*. The 'muted' colouration of the stone forming the Elm Row pavement itself suggests a high proportion of *Whitworth Sandstone* is present. In contrast, the more 'lively' colouration shown by the stone forming the Baxter's Place pavement suggests a greater presence of *Scoutmoor Sandstone (sensu stricto) ± Appleton Sandstone*.

Form and laying pattern: Sawn slabs; a mix of standard widths (30, 45, 60 cm) with random lengths, arranged in no particular order; sett-like blocks used for the roadway that runs parallel to Elm Row have dimensions of 20.5 x 10.5 cm.



Above: Image, taken looking north-east, showing the general characteristics of the sandstone paving present at the north-east end of Elm Row. The sett-like blocks used for the roadway are also visible. Note that the slabs in this particular area are already showing signs of damage, related – at least in part – to loading by vehicular traffic.



Above: Image showing the characteristics of the sandstone paving present at the north-east end of Elm Row in greater detail; 30 cm ruler for scale.



Above: Image showing an area of sandstone slabs (seen damp) forming the pavement at the Blenheim Place/London Road–Leith Walk junction. The slabs are variously 30, 45 and 60 cm wide. The discernibly higher proportion here of slabs showing more 'lively' coloration (something which becomes more pronounced as the pavement is followed south-westwards and Blaxter's Place is reached) is consistent with a greater presence of *Scoutmoor Sandstone (sensu stricto)* ± *Appleton Sandstone*.

Locality 9: Melville Street (Melville Crescent)

Scope of observations: Areas of pavement, including the central island on which the statue of Robert Viscount Melville sits, at junction between Walker Street and Melville Street.

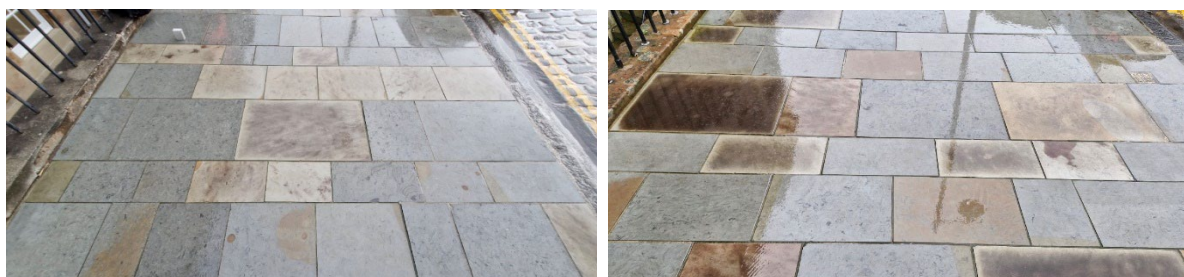
Stone types recognised: 1) *Whitworth Sandstone*; 2) an unidentified sandstone that is essentially light greyish buff in colour, but exhibits Liesegang banding to some extent and is commonly affected by variably extensive patches of brownish 'staining' (pronounced when wet).

We have been informed by CEC that the stone slabs used in this area comprise a 'blend' of *Appleton Sandstone* and *Whitworth Sandstone*. Whilst we are satisfied that *Whitworth Sandstone* is indeed represented amongst the paving, the characteristics of the second constituent stone cannot readily be reconciled with those of *Appleton Sandstone* in either its 'traditional' pre-c. 2022 form or its post-c. 2022 form.

Form and laying pattern: Sawn slabs; mix of standard widths (30, 45, 60 cm) with random lengths, and typically arranged in a repeating '30–45–60' pattern.



Above: Image showing the sandstone paving present at the south-eastern limit of Locality 9, when dry. The general characteristics of the paving and the laying pattern can be seen. Note the patchwork effect created by the 'blending' of two sandstone types of significantly different appearance. The identity of the essentially light greyish buff sandstone is unknown – the observed characteristics of this stone cannot readily be reconciled with those of *Appleton Sandstone*.



Above: Images showing two separate sections of the sandstone paving associated with Locality 9, when wet. The contrasting appearance of the two paving stones employed is even more marked when they are wet. Note also the very pronounced brownish 'staining' (cause uncertain) that affects some of slabs of the essentially light greyish buff sandstone of unknown identity.



Above: Image showing a typical slab of the *Whitworth Sandstone* observed at Locality 9, when dry. The base colour of the stone, conspicuous dark cross laminae (creating a striking swirling patternation on the exposed surfaces) and limited development of Liesegang banding are all consistent with *Whitworth Sandstone*. Slabs of this stone appear to dry rapidly once wet.



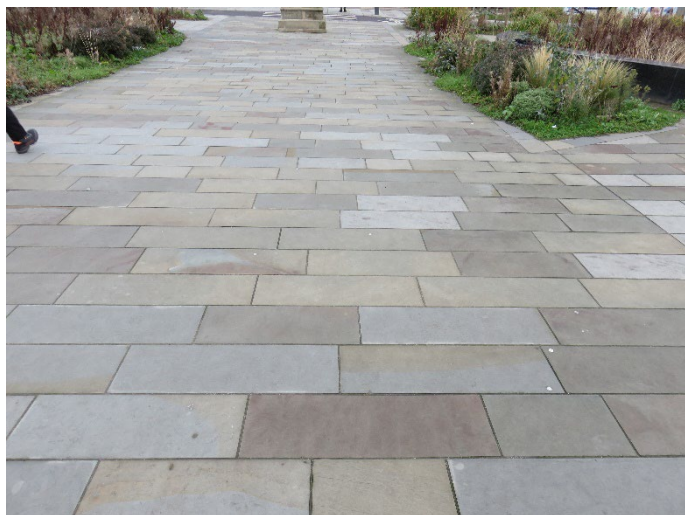
Above: Image showing two typical slabs of the essentially light greyish buff sandstone of unknown identity, when dry. The dark brown discolouration that is extensively developed within the slab seen to the right is more patchily developed in many of the slabs of this type. These slabs in general evidently hold water for a relatively prolonged period of time once wet (cf. the *Whitworth Sandstone*).

Locality 10: Picardy Place

Scope of observations: Areas of pavement associated with the triangular island on which the statue of Sherlock Holmes sits together with the stretches of pavement fronting Picardy Place itself (running between Broughton Street and Union Place) and Union Place (extending as far as the junction with Union Street).

Stone types recognised: *Scoutmoor Sandstone (sensu stricto)* ± *Appleton Sandstone*, *Whitworth Sandstone*; *Caithness Flagstone* is also present. Island area: NNW–SSE oriented strip is a seemingly random mixture of *Scoutmoor Sandstone (sensu stricto)* ± *Appleton Sandstone* and *Whitworth Sandstone*; peripheral areas are predominantly of *Scoutmoor Sandstone (sensu stricto)* ± *Appleton Sandstone*; borders and cross-cutting ‘ribs’ of *Caithness Flagstone*. Picardy Place/Union Place: *Scoutmoor Sandstone (sensu stricto)* ± *Appleton Sandstone* >> *Whitworth Sandstone*.

Form and laying pattern: Sawn slabs. Island area: NNW–SSE oriented strip of sandstone paving leading to statue comprises 30 cm wide slabs in random lengths, with c. 30 cm single slab-wide border of *Caithness Flagstone*; peripheral areas comprise 30, 45 and 60 cm wide slabs in random lengths, with area-specific usage of 45 + 60 cm wide and 30 cm wide slabs, and single slab-wide (c. 30 cm) ‘ribs’ of *Caithness Flagstone*. Picardy Place/Union Place: a mix of standard widths (30, 45, 60 cm) with random lengths, and typically arranged in a repeating ‘30–45–60’ pattern.



Above: Image, looking approximately north, showing the overall character of the NNW–SSE oriented strip of sandstone paving forming part of Locality 10’s ‘Island’. *Scoutmoor Sandstone (sensu stricto)* and/or *Appleton Sandstone* and *Whitworth Sandstone* are believed to be represented here.



Above: Image, looking approximately west, showing the overall character of a section of paving located towards the north-eastern corner of Locality 10’s ‘Island’. *Scoutmoor Sandstone (sensu stricto)* and/or *Appleton Sandstone* and *Whitworth Sandstone* are believed to be represented here. Note also the single slab-wide (c. 30 cm) ‘rib’ of *Caithness Flagstone*.



Above: Image showing an area of Locality 10's 'Island' in greater detail. The slabs with distinctly 'muted' colouration seen here are *Whitworth Sandstone*. The single slab-wide border (seen top left) is *Caithness Flagstone*.



Above: Image, taken looking north-east, showing an area of the pavement located on the south-western corner of Union Street. Note the generally 'lively' colouration shown by the paving stone here, which is considered to be predominantly *Scoutmoor Sandstone (sensu stricto)* and/or *Appleton Sandstone* (pre-c. 2022 form). Stone with this appearance is prevalent within the stretches of pavement fronting Picardy Place itself (running between Broughton Street and Union Place) and Union Place (extending as far as the junction with seen in this image).

References

The British Geological Survey holds most of the references listed and copies may be obtained via the library service subject to copyright legislation (contact libuser@bgs.ac.uk for details). The library catalogue is available at <https://ukrinerc.on.worldcat.org/discovery>

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