



# Development potential for building stone resources in Scotland

Decarbonisation and Resource Management Programme Open Report OR/24/020



#### DECARBONISATION AND RESOURCE MANAGEMENT PROGRAMME OPEN REPORT OR/24/020

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#### Keywords

Building stone; resources; quarry; quarrying industry; development; Scotland; sandstone; flagstone; roofing slate; granite.

#### Front cover

Map of part of Scotland, showing the locations of building stone quarries and areas where building stones with development potential crop out.

#### Bibliographical reference

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Maps and diagrams in this book use topography based on Ordnance Survey mapping.

# Development potential for building stone resources in Scotland

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## Foreword

In Scotland during the late 18th and throughout the 19th centuries, a vast industry supplied building stone for a range of building, paving and roofing purposes, serving markets in Scotland, the wider UK, and in countries located further afield. This industry has since seen a precipitous decline, and nowadays only a limited quantity of the stone that is used in Scotland is sourced from 'indigenous' quarries.

Increasing the number and range of indigenous Scottish building stones on the market would make additional stone types available for the repair and conservation of historically important buildings and structures, as well as facilitating new-build and streetscape projects that are in keeping with the character of the local (vernacular) stone-built heritage.

This report presents the results of a study that was carried out to shortlist the building stones and quarries in Scotland that can be considered most historically significant, to review UK market conditions for stone materials, and to suggest which resources may have the greatest potential for renewed production of building stone. It contains a series of three factsheets, covering "sandstone and flagstone", "igneous and metamorphic rock" and "roofing slate" respectively, which were prepared to highlight the key outcomes of the project.

This work is intended to provide background context that can be used by policy makers and potential investors to identify opportunities for growth, and to better inform both local planning policy-making and business cases for investment in indigenous building stone production enterprises.

The project was commissioned by Historic Environment Scotland (HES) and the study has been conducted by the BGS Building Stones Team.

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# 1 Introduction

This report presents the outcomes of a project designed to gather and furnish baseline information that illustrates the geological and geographical context, historic significance, and development potential of Scotland's building stone resources.

As the most widespread traditional building material used throughout Scotland, natural stone makes an invaluable contribution to the historic environment. The stone industry today is a fraction of its former size and faces considerable competition from imported stone (Gillespie and Tracey 2016). Successful, long-term conservation of existing natural stone structures, as well as new-build in keeping with the character of the local built environment, depends on there being a reliable supply of suitable indigenous natural stone.

In addition to generating positive outcomes for the historic environment, increasing the number and range of indigenous building stones on the market would also bring a range of economic, social, cultural and environmental benefits to Scotland, including the creation of new jobs, preservation of important skills, and reduced  $CO_2$  emissions compared to imported stone.

The primary purpose of this work is to assist policy makers and potential investors in identifying opportunities for growth, and to better inform both local planning policy-making and business cases for investment in indigenous building stone production enterprises.

The project has produced:

- 1) a dataset of contextual information on the historic significance and development potential of Scotland's different building stones and their quarry sources.
- 2) a synthesis of relevant UK building stone production, import and export statistics.
- 3) a series of three factsheets (covering "sandstone and flagstone", "igneous and metamorphic rock" and "roofing slate" respectively) that present information and maps showing the geographical distribution of the building stones and quarries in Scotland that have been identified as having the greatest development potential.

The principal output of this project is the factsheets, which are included within this report. The report is intended to complement and provide context for the factsheets. It should be noted that the factsheets have been designed so as to be suitable for printing and displaying as standalone 'posters', which could be exhibited at conferences and networking events, for example, to draw attention to these issues.

Section 2 of this report describes how the dataset of contextual information was produced and then used as the basis for selecting the most historically significant building stones and potentially prospective quarries (i.e. those that may have development potential) for inclusion in the factsheets. A synthesis of the UK building stone production and import and export statistics from which some of the information on the factsheets has been drawn is presented in Section 3. The factsheets themselves are reproduced (at A1 page size) in Section 4, and a summary of the main outcomes and conclusions of the project is provided in Section 5.

Extracts of relevant data on the building stones and quarries that were selected for inclusion on the factsheets are provided in Appendix 1, to allow the reader to further investigate specifics of the building stones and quarries that are highlighted as having the greatest development potential.

# 2 Rating the historic significance and development potential of building stone resources

The first stage of this project consisted of an investigation that was carried out in order to:

- establish which of the traditional building stones of Scotland can be considered most historically significant
- identify where these building stones are actively quarried
- suggest which disused quarries in Scotland may have the greatest prospect of commercial success were they to be brought back into production today.

The Building Stone Database for Scotland (BSDS) was the central dataset for this investigation. The BSDS, which was co-funded and developed by Historic Environment Scotland (HES) and the British Geological Survey (BGS), aims to define and describe all of the building stones of Scotland, and provide details of associated quarries, built sites and reference samples.

According to the definition used by the BSDS, 198 different Scottish building stones are recognised. The BSDS has defined building stones according to the geological unit from which they have been sourced; for example, the building stones Locharbriggs Sandstone and Aberdeen Granite are sourced from the geological units Locharbriggs Sandstone Formation and Aberdeen Granite Pluton, respectively. Unless there is evidence that a geological unit has been quarried for building stone, a building stone name is not assigned to it. This definition is linked to the BGS Digital Geological Map of Great Britain, which allows the areas where each of these stones crop out to be mapped across the country.

The BSDS contains records for 3721 building stone quarries. This is based on documentary evidence that these quarries supplied building stone in the past. There are undoubtedly many (perhaps thousands) more quarry sites in Scotland where stone would also have been extracted and used for building purposes, but for which we do not hold any clear evidence that this was in fact the case.

The BSDS groups spatially adjacent quarries that extracted the same stone into a quarry "cluster". The large number of quarries in some parts of the country has led to the concept of a quarry 'supercluster' being introduced, which refers to a spatial grouping of clusters that produced the same building stone. For the purposes of this study, all the quarries within a cluster or supercluster are treated as a single quarry site, to allow for simple representation at the nationwide scale.

The investigation consisted of a desktop-based data gathering exercise whereby quarry records in the BSDS were attributed with new information about their scale, resource accessibility and setting to produce a dataset (see Appendix 1) that was then used as the basis for selecting and assembling the information presented in the factsheets (Section 4). To gather this data, current and historic Ordnance Survey maps, satellite photography, information from the BSDS and the BGS Database of Mines and Quarries (BritPits) were reviewed.

The investigation focused on 80 of the 198 building stones defined in the BSDS. The remaining 118 building stones were excluded from the investigation on the basis that they have each been quarried at a small number of locations (<10) and were supplied to a local area only; such stones were thus deemed to be of relatively low significance.

The data gathering exercise involved the following process:

- Each building stone quarry associated with the selected 80 building stones was assigned a number of 'points' based on its apparent maximum size. Larger quarries were assigned more points, and smaller quarries fewer. For each building stone, the number of points assigned to all of the building stone quarries that have worked it were then added together.
- To produce a broad indication of the "scale" of historic quarrying for each building stone, these were ranked and classified into four groups, based on the total number of points

assigned to each. The 20 building stones with the most points were assigned a "scale" score of 4 (the top score), the 20 stones with the next most points a score of 3, and so on. To minimise wasted effort, quarries that produced the building stone "Caithness Flagstone" were not assigned points: there are over 700 Caithness Flagstone quarries, and as such it can be safely assumed that by any measure, the scale to which Caithness Flagstone has been quarried will exceed that of any other Scottish Building Stone by a considerable margin. As such, Caithness Flagstone was automatically assigned the top score (4) for "scale".

- Each building stone was then assigned a score based on its maximum historical geographic "reach". This is based on information held in the BSDS. Stones that were transported and used internationally were assigned the highest score of 4, whereas those that are thought to have been primarily used only in the local area where they were produced were assigned the lowest score of 1.
- A "historic significance" score was then produced for each stone by adding together the two scores for "scale" and "reach". This is intended to recognise that the extent to which a stone has been quarried as well as how widely it was used historically both reflect the historic significance and pedigree of the material, and this approach to defining "historic significance" attempts to give both these factors equal weight.
- Building stones with a historic significance score of 5 or above were selected for inclusion in the factsheets. This resulted in 22 building stones being included in the "sandstone and flagstone" factsheet, 12 on the "igneous and metamorphic rock" factsheet and 3 on the "roofing slate" factsheet.
- Further details on resource accessibility at each quarry were captured. This included information about quarry "status" (for example, whether it is currently actively worked, disused, overgrown, flooded or built over) and "setting" (simple definitions of the current land use at the site, along with any relevant information on whether it falls within a designated or otherwise environmentally or culturally protected, or sensitive, area). This information was then used to comment on which disused quarries could be considered potentially prospective for renewed extraction. Caithness Flagstone quarries were again excluded from this part of the data gathering exercise: as several of these quarries actively produce substantial volumes of building stone, renewed extraction at any disused Caithness Flagstone quarry is deemed less likely to be worthwhile as this would face considerable market competition from the currently active quarries.

Summary tables of the information derived by this investigation are presented on each factsheet. These include brief comments about whether any of the disused quarries for each building stone could be considered "potentially prospective".

Disused quarries are identified as being potentially prospective if they satisfy all of the following criteria: 1) they appear to remain accessible (i.e. they are not infilled, flooded, built over or heavily overgrown); 2) as far as we are aware, they are not located within environmentally or culturally protected or sensitive areas; 3) they are not situated within highly developed land (such as built-up urban areas); 4) the building stone worked at the site is identified as having high historic significance (i.e. assigned a historic significance score of 5 or greater); and 5) renewed production of building stone at any of these sites is unlikely to face substantial competition from any currently active quarry located in Scotland (or elsewhere in the UK) that extracts either the same or a very similar stone.

Maps showing the locations of active quarries and potentially prospective disused quarries, and the areas where each of these of the selected building stones crop out were prepared, and these are included in the factsheets (Section 4). Further details about the dataset along with accompanying notes that describe how each of the attributes detailed above were derived are provided in Appendix 1.

# 3 UK building stone production, import and export statistics

A range of publicly available UK building stone production and trade statistics were reviewed and compiled, to provide information on the current market conditions within which UK building stone producers operate. Key facts and figures drawn from this review are presented on the factsheets; this section of the report describes how that information was derived.

#### 3.1 SOURCES OF INFORMATION

The following sources of information<sup>1</sup> were reviewed:

- The UK Manufacturers' Sales by Product survey (PRODCOM), published by the UK Office for National Statistics, which provides information on UK production of a range of building stone products.
- The UK Department for Business and Trade's monthly Bulletin of Building Materials and Components (BBMC) statistics, which is relied upon as the source of UK roofing slate production statistics, since PRODCOM does not include roofing slate statistics. BBMC slate production statistics encompass production within Great Britain only. However, other reliable sources of information (BGS Directory of Mines and Quarries 2020, Agg-Net website) indicate that there are no quarries actively producing roofing slate in Northern Ireland, so this data is taken to be representative of the United Kingdom as a whole.
- UK Overseas Trade Statistics (OTS) tables, published by HM Revenue and Customs, which provide information on UK imports and exports for a range of building stone products.
- The publication "Mineral extraction in Great Britain", published by the former UK Department for Communities and Local Government. This presents the results of the Annual Minerals Raised Inquiry (AMRI), which report UK building stone production at a regional level. The most recent AMRI results are for the year 2014.
- The UK Minerals Yearbook (Bide et al. 2022). This publication largely relies on PRODCOM data as its primary source of information on UK building stone production.

With the exception of the AMRI, these sources all publish UK-wide statistics and none include any information on the production or flow of commodities within and between each of the UK's constituent nations (Scotland, England, Wales and Northern Ireland).

#### 3.2 CURRENT UK BUILDING STONE PRODUCTION AND TRADE

Following an initial review of the sources of information detailed above, relevant production, import and export statistics were extracted from PRODCOM, BBMC and OTS data tables. These data were then used as the basis for deriving all further facts and figures on building stone production and trade presented in this study. The AMRI and UK Minerals Yearbook were not used as the basis for further investigation, for the following reasons:

- Although the AMRI is the only reviewed source that provides Scotland-specific data, the
  most recent statistics date from 2014. As such, these do not necessarily provide an upto-date picture of current economic conditions. Additionally, we note that a review of
  Scottish building stone production that was based on AMRI data for 2012 and 2013 has
  already been published in a previous BGS report (Gillespie and Tracey 2016), to which
  the reader is referred.
- The UK Minerals Yearbook (Bide et. al. 2022) estimates total UK building stone production to fluctuate between ~900,000 and 1,200,000 tonnes annually. This data

<sup>&</sup>lt;sup>1</sup> See the references section at the end of this report for further details on these sources of information.

series is understood to be based on estimates that have been informed by an aggregation of total production figures for all building stone product types reported by PRODCOM. A notable limitation of this PRODCOM data is that many figures are suppressed (left blank in published statistics), which is frequently done to avoid disclosure of confidential data. This is a common situation for commodities that are produced on a limited scale, and/or by only a few suppliers. The UK Minerals Yearbook data do not evidence any significant upward or downward trend in annual UK-wide building stone production over the last 10 years. It is possible, however, that changes in the type of building stone produced, as well as smaller fluctuations in total building stone production could have occurred without being apparent in these estimated statistics. In any case, rather than using the Yearbook contents directly, this investigation has instead sought to independently make interpretations, based on the same primary sources of information that the Yearbook has used.

PRODCOM and OTS statistics are reported for a range of product categories, each of which is assigned a commodity code and an extended definition. In the synthesis of these statistics that follows, building stone product types have been described using the five terms "sandstone", "paving", granite", "roofing slate" and "other stone" for simplicity. The PRODCOM and OTS categories that were selected as the basis for producing a data series for each of these simplified product types are listed and identified using the corresponding commodity codes for each in Table 1, alongside the most recent annual production and trade statistics derived for each product type. In some cases, several of these categories were grouped together and summed to derive a data series for the product type. This is further explained below, with reference to the respective category codes and definitions in the source datasets:

- **"Sandstone"** UK production statistics are based on PRODCOM code 08111250; trade statistics on OTS code 25162000. These codes refer to the same set of products, corresponding to sandstone monumental and building stone, excluding that which already has the characteristics of setts, kerbstones and flagstones.
- "Paving stone" UK production statistics are based on PRODCOM code 23701210; trade statistics on OTS code 68010000. These codes refer to the same set of products, corresponding to setts, kerbstones and flagstones produced of any type of natural stone, excluding slate.
- "Granite" UK production statistics are based on PRODCOM code 08111236; trade statistics are based on a grouping of OTS codes 25161200 and 68022300. The descriptions of the codes included in this grouping correspond to granite block, which has been cut into a square or rectangular shape, excluding that which already has the characteristics of setts, kerbstones and flagstones. Data reported under several other commodity codes that include the word 'granite' in their definition have been excluded from those selected for this product type, on the basis that these categories are judged not to be representative of granite used for general architectural purposes, and are instead thought to encompass either more crudely fashioned block such as armour stone, or highly-processed granite supplied for use as kitchen worktops, gravestones, and other decorative purposes. For any of the commodity codes that refer to "granite", it is unclear whether this can be taken to mean only granite in the geological sense, or if this could also encompass other types of igneous and/or metamorphic rocks, which can also commonly be referred to as "granite" within the stone trading sector.
- "Roofing slate" PRODCOM categories do not distinguish between roofing/walling slate and other worked slate items of similar dimensions, so UK production statistics for this product type are instead taken from a separate source (BBMC: see Table 7a within downloadable spreadsheets). Trade statistics are based on OTS code 68030010; the description of this code corresponds to worked roofing and walling slate.
- "Other stone" the UK production and trade statistics included for this product type are based on a grouping of all the remaining PRODCOM (for production) and OTS (for trade) product categories which include the terms "monumental or building stone" in their definition, but which were not otherwise selected to be included within the data series

derived for any of the product types above. This includes numerous codes, which are listed in full in Table 1.

Table 1. Summary of data sources and recent production, import and export statistics for each stone product type, as derived by this investigation. For each product type, 'annualised' figures in terms of physical quantities (in tonnes) and monetary values (in pounds sterling) are quoted for the most recent calendar year for which these are reported for all flow types. As such, figures for sandstone are for 2022, figures for paving stone and granite are for 2021, and those for roofing slate are for 2019.

Product type	Production			Trade						
	Tonnes	Value	Source	Import		Export		Source		
			(PRODCOM code, where relevant)	Tonnes	Value	Tonnes	Value	(OTS code)		
Sandstone	750,000*	£21M	08111250	260,000	£92M	700	£0.36M	25162000		
Paving stone	-	£67M	23701210	370,000	£120M	4,600	£2.1M	68010000		
Granite	6,103,482*	£6.1M	08111236	36,000	£23M	1700	£0.72M	25161200, 68022300		
Roofing slate	12,000	-	BBMC, Table 7a	140,000	£66M	6,300	£4.2M	68030010		
Other stone	300,000	£440M	08111233, 08111260, 08111290, 23701100, 23701230, 23701260, 23701270	4.8M	£340M	12,000	£14M	25151100, 25151200, 25152000, 25161100, 25169000, 68021000, 68022100, 68022900, 68029100, 68029200, 68029310, 68029390, 68029910, 68029990, 68030090		

\* these figures for physical quantities are reproduced as they appear in PRODCOM but are deemed to be unreliable, on the basis that they appear to be unreasonably high (particularly when compared to the corresponding monetary values in both cases). It is possible that these reflect estimates and/or may encompass other stone products that are not considered to be 'building stone' in the context of this investigation.

The groupings of stone types used for the factsheets (i.e. "sandstone and flagstone", "igneous and metamorphic rocks" and "roofing slate" – see Section 4 of this report) are based on the geological character of the stone materials. This is out of necessity and somewhat different to the groupings of product types (i.e. "sandstone", "paving stone", "granite", "roofing slate") used for the synthesis of building stone production and trade statistics. Ideally, a direct correspondence could be drawn between these two groupings. However, this is not fully possible given the nature of the available geological and statistical information. One of the main reasons for this is that one stone type can be used for more than one type of product, and furthermore one product type can be made from more than one type of stone. For example:

- the category used for the product type 'paving stone' include setts, kerbstones and flagstones, which can be produced from different geological materials and therefore different building stone types (granite and sandstone/flagstone, for instance).
- the categories used for the product type 'granite' exclude granite used for setts and other paving purposes; this means it is impossible to derive a figure for 'granite' setts and paving production using the statistical data, because this is not distinguished within a paving stone category.

It is also important to note that:

- the PRODCOM statistics are based on survey data and are therefore reliant on accurate reporting and a sufficiently high response rate to generate representative data.
- a high proportion of figures are suppressed for some categories where response data is minimal or where there are few manufacturers, to protect their confidentiality.

- to the best of the authors' knowledge, no "slate" in the geological sense is currently (as of June 2024) produced in Scotland, although stone roofing slabs may be sourced from active flagstone quarries.
- as statistics for any types of igneous and metamorphic stone products (other than granite) are not reported as separate categories, it can only be assumed that these would probably sell within a similar price range as granite.

These limitations mean that the available sources of information are somewhat imperfect for providing a complete understanding of the market conditions into which any indigenous Scottish building stone enterprise would be operating. Nonetheless, these statistics still provide many useful insights into the state of the UK building stone market, and how this has changed since the previous review by Gillespie and Tracey (2016).

#### 3.3 RECENT TRENDS IN UK BUILDING STONE PRODUCTION AND TRADE

The UK imports considerably more building stone than it produces (and/or exports). This trade imbalance has significantly widened over recent years. Building stone exports have remained minimal and relatively constant in scale, whilst building stone imports, in terms of both physical quantity (mass) and monetary value, have increased almost every year: growing by 47% in terms of mass and by 71% in terms of value since 2015 (Figure 1 and Figure 2). These graphs are based on the trade figures for the five stone product types (including "other stone") defined in Table 1 added together.

Graphs showing the mass (Figure 3) and value (Figure 4) of the four stone product types "sandstone", "paving stone", "granite", "roofing slate" imported to the UK over the same time period are also presented below, for the purposes of comparing trends in UK imports for these specific stone product types. Data for "other stone" is not included on these charts or any others that follow. The nature of the geological characteristics and end-uses for the product categories grouped together as "other stone" are uncertain, so the corresponding information is not as useful as that of the other four product types for allowing the more specific market conditions that would be relevant to any stone production enterprise within Scotland to be better understood.

Despite the large growth in the quantity of building stone products being imported, these are becoming considerably more expensive at the same time. The average import price (in  $\pounds/t$ ) for 'sandstone', 'paving stone', 'granite' and 'roofing slate' has increased significantly over the period 2015–2022, and particularly since 2020, far outstripping the rate of inflation (Figure 5).



Figure 1. Total UK building stone trade by mass.



Figure 2. Total UK building stone trade by monetary value.



Figure 3. Mass of UK building stone imports by product type.



50

0

2015

Slate

2016

2017

Sandstone



2018

Year

2019

2020

Granite

2021

2022

Paving



Figure 5. The variation in average import prices of building stone products from 2015–2022, compared with inflation.

#### 3.4 BENCHMARK PRICE RANGES FOR BUILDING STONE SALES

It has not been possible to derive reliable pricing information in pounds sterling per tonne (£/t) for building stone products produced and sold in the UK, due to the high proportions of suppressed figures in the PRODCOM dataset, along with the absence of robust figures for UK building stone production in any other publicly available source of information.

However, OTS trade data are comparatively more comprehensive, and have been used to establish representative price ranges for different stone products imported into and exported from the UK (Table 2). The ranges are based on the highest and lowest average price recorded for the most recent six-year period for which they are reported (2017–2022). Each of the categories used in the OTS dataset themselves encompass a wide range of products, and the published statistics report the average price for all product types included in the category. It is therefore highly likely that the figures, especially those based on smaller quantities, may be skewed even to the point of being anomalous toward higher prices in years where a greater proportion of more valuable, potentially more highly processed products were counted, and may also likewise be skewed toward lower prices in years where a greater proportion of less valuable, more simply processed products were counted. If so, these statistics may not actually be comparing "like-with-like" across each year. With this in mind, we have used the highest and lowest prices within the last six-year period to arrive at the broad benchmark price ranges quoted below. Using this range is intended to encompass some of the inherent uncertainty, in contrast to an average price over several years, or a single recent figure, both of which may be unreliable indicators.

Taking all of this into account, and acknowledging the fact that many of the export price ranges are commonly based on very limited quantities (in some cases, hundreds of tonnes only), the equivalent prices per tonne evidently fluctuate considerably, and are unlikely to be truly representative as a result. However, import statistics are generally not supressed, and are based on larger quantities, so these can be considered comparatively reliable. Accordingly, the import price ranges listed in Table 2 have been quoted on the factsheets to serve as a useful initial reference point for exploring the business opportunity that would exist for indigenous building stones if they can successfully compete with imported stone.

Table 2. Price ranges for different stone product types imported into and exported from the UK. These figures are based on OTS data, rounded to the nearest £10. Import price ranges are based on the lowest and highest average price of each product type over the period 2017–2022 (see data series in Figure 5). Export price ranges are based on the equivalent data.

Product type		Import price ranges (£/tonne)	Export price ranges (£/tonne)		
Sandsto	one	210 – 360	350 – 940		
Paving	stone	200 – 390	250 – 790		
Granite		320 – 630	190 – 1110		
	Sawn	660 – 780	540 – 1820		
	Cropped	280 – 530	160 – 1730		
Roofing	slate	440 – 590	670 – 1040		

## 4 Factsheets

The three factsheets (covering "sandstone and flagstone", "igneous and metamorphic rock" and "roofing slate", respectively) are presented on the following pages.

When the factsheets are read using Adobe pdf software (e.g. Adobe Reader, Adobe Acrobat)<sup>2</sup>, the reader can make use of two 'interactive' functions:

- By hovering the mouse cursor over the name of a building stone in the factsheet table this will show its extent on the map
- By left-clicking on the name of a building stone in the factsheet table, this will activate a hyperlink that will open the page for that building stone in the Building Stone Database for Scotland web portal, within the user's default web browser

<sup>&</sup>lt;sup>2</sup> If viewed using other software, e.g. within your browser, these interactive elements may not display or function as intended

# **Development potential for building stone resources in Scotland:** Sandstone and flagstone

Natural stone has been used as a building material since the Today, just a handful of active building stone quarries remain. early days of human habitation in Scotland and is still in fashion for modern architecture. It has been used to create most of the important civic buildings in the country, and much of the UK, and as a result, imported stone now swamps the UK Scotland's traditional housing stock - notably the tenements market. This can be said to erode the individual character that characterise our major cities and towns.

Most of the stone used in traditional Scottish buildings was sourced locally. The great diversity of Scotland's geology means that the 'local stone' typically changes over small distances, so the character of stone structures varies considerably from place to place, reflecting the bedrock beneath. In some cases, large quarries previously supplied the stone used to build certain parts of towns and cities, further enhancing the distinctiveness and 'sense of place' that characterises many settlements and areas across the country.

During the late 18<sup>th</sup> and throughout the 19<sup>th</sup> centuries, tens of thousands of people in Scotland were employed in many hundreds of building stone quarries, producing stone that was used to construct hundreds of thousands of stone buildings in Scotland and beyond.

Since the early 20<sup>th</sup> century, building stone quarrying and production in Scotland has seen a precipitous decline, making way for modern construction materials such as concrete, brick and steel.

Nowadays, it is possible to import stone from as far afield as India and China, often at cheaper prices than stone quarried in and sense of place that indigenous stone has imparted to our historic environment, and the decreasing availability of appropriate stone for repair work places our surviving historic buildings at increased risk. Furthermore, while stone is a naturally low carbon building material (especially compared to concrete, for example), its embodied carbon increases significantly when it is transported large distances.

Increasing the number and range of indigenous Scottish building stones on the market would make additional stone types available for the repair and conservation of historically important buildings and structures, as well as facilitating new build and streetscape projects that are in keeping with the character of the local vernacular or stonebuilt heritage. In addition to these positive outcomes for the historic environment, this would also bring a range of economic, social, cultural and environmental benefits to Scotland, including the creation of new jobs, the preservation of important skills, and reduced  $CO_2$  emissions.





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#### What this factsheet shows

This factsheet is one of a series of three (covering "sandstone and flagstone", "igneous and metamorphic rock" and "roofing slate", respectively). These present the results of an investigation that was carried out to shortlist the building stones and guarries in Scotland that can be considered most historically significant, and to suggest which disused quarries may have the greatest prospect of commercial success were they to be brought back into production today.

To achieve this, a "historic significance" score was assigned to each of The locations of active and potentially prospective disused quarries, and the the (c. 200) building stones defined in the Building Stone Database for areas where each of the selected building stones are found, are displayed Scotland (BSDS).<sup>1</sup> Stones with the highest scores were selected to feature on the accompanying maps.

in the factsheets. The "historic significance" score is the sum of two other scores, one for the maximum historical geographic "reach" of the stone, and another for the "scale" to which the stone has been worked in the past, in terms of the number and size of historic quarries.

40 kilometres

Summary tables of this information, which include brief comments about whether any disused quarries could be considered potentially prospective for renewed extraction of each building stone, are provided on this factsheet.

Devonian flagstones and sandstones Carboniferous (generally 'buff') sandstones												
Building stone	Typical end uses	Reach	Scale	Historic *** significance	Active quarries	Potentially prospective quarries		Building stone	Typical end uses	Reach	Scale	Historic ** significance
Caithness Flagstone	Masonry, Paving slabs, Roofing	4	4	8	Regular supply (3): Spittal, Lieurary, Banniskirk Limited supply (4): Achscrabster, Bower, Achavrole, Skitten	None identified - renewed extraction of this stone at any disused quarry would face very strong market competition from Spittal, Lieurary and Banniskirk quarries.		Gullane Sandstone	Masonry, Paving slabs	4	3	7
Dundee Flagstone	Masonry, Paving slabs, Roofing	4	4	8	Regular supply (1): Pitairlie Limited supply (1): Scotston	None identified - renewed extraction of this stone at any disused quarry would face strong market competition from Pitairlie quarry.		Upper Limestone	Masonry	2	4	6
Stromness Flagstone	Masonry, Paving slabs, Roofing	1	4	5	Limited supply (5): Hill of Heddle, Banks, Gairsty, Clestrain, Cursiter	None identified - several active quarries, which in general produce crushed rock aggregate, are thought to also produce a limited quantity of building stone. There is probably scope for increased building stone production at these quarries.						
Scone Sandstone	Masonry	1	4	5	None	4 disused quarry sites are identified as potentially prospective.		Limestone Coal Formation Sandstone	Masonry	2	4	6
Raddery Sandstone	Masonry	2	3	5	Limited supply (1): Balaldie	13 disused quarry sites are identified as potentially prospective. Although Balaldie quarry is thought to produce a limited quantity of building stone, unless quarrying operations are expanded in scale, this would probably not present strong market competition for renewed extraction of the same stone		Scottish Middle Coal Measures Sandstone	Masonry	2	4	6
Permian/Triassic 're	d' sandstor	es				at any disused quarry.		Scottish Lower Coal Measures Sandstone	Masonry	2	4	6

Potentially prospective quarries

None identified - renewed extraction of this stone at any disused

guarry would face very strong market competition from Corsehill

Potentially prospective quarries

6 disused quarry sites are identified as potentially prospective

#### Building stone Active quarries eqular supply (4 orsehill, St Bees Sandstone

Other sandstones

Stratheden and

Building stone

					Birkhams, Grange	Cove, Birkhams and Grange quarries.
Mauchline Sandstone	Masonry	4	3	7	None	None identified - renewed extraction of this stone at any disused quarry would face strong market competition from several building stone quarries in Scotland and England that actively produce very similar Permian/Triassic 'red' sandstones from other bedrock units.
Locharbriggs Sandstone	Masonry	4	3	7	Regular supply (1): Locharbriggs	None identified - renewed extraction of this stone at any disused quarry would face very strong market competition from Locharbriggs quarry.
Corncockle Sandstone	Masonry	3	3	6	Regular supply (1): Corncockle	None identified - renewed extraction of this stone at any disused quarry would face very strong market competition from Corncockle quarry.
Thornhill Sandstone	Masonry	3	2	5	None	None identified - renewed extraction of this stone at any disused quarry would face strong market competition from several building stone quarries in Scotland and England that actively produce very similar Permian/Triassic 'red' sandstones from other bedrock units.

Active quarries

None

Gullane Sandstone	ullane Sandstone Masonry, Paving slabs				None	1 disused q prospective
Upper Limestone Formation Sandstone	Masonry	2	4	6	Regular supply (1): Drumhead	3 disused q potentially produces a volumes of comparativ alongside th Formation S consider th other (disus strong mark
Limestone Coal Formation Sandstone	Masonry	2	4	6	None	4 disused q prospective
Scottish Middle Coal Measures Sandstone	Masonry	2	4	6	None	18 disused prospective
Scottish Lower Coal Measures Sandstone	Masonry	2	4	6	None	9 disused q prospective
Hopetoun Sandstone	Masonry	-2	4	6	None	1 disused q prospective
Calders Sandstone	Masonry, Paving slabs	2	4	6	None	1 disused q prospective
Passage Sandstone	Masonry	1	4	5	None	10 disused prospective
Scottish Upper Coal Measures Sandstone	Masonry	1	4	5	None	5 disused q prospective
Ballagan Sandstone	Masonry	2	3	5	Regular supply (1): Swinton	None identi any disusec competitior
Sandy Craig Sandstone	Masonry	2	2	5	Limited supply (1): Cullalo	13 disused prospective produced a understand Unless qua probably no renewed ex disused qua

nverclyde Sandstone Reach: a score based on the maximum historical geographic reach of the building stone; international (4) national (3), regional (2) or local (1). \*\* Scale: a score (1-4 from smallest to greatest) used to compare the extent to which building stones have been quarried. \*\*\* Historic significance: a score based on adding the 'Reach' and 'Scale' scores for each stone together. This aims to recognise that both the extent to which a stone has been quarried and how widely it has been used reflect the historical significance and pedigree of the material.

Further information about how the contents of the above tables were derived is documented in the report that accompanies (and contains) this factsheet. https://nora.nerc.ac.uk/id/eprint/537904

#### Active quarries that regularly supply building stone

These quarries produce significant volumes of building stone annually which is sold on the commercial stone market. The focus of quarrying operations at these sites is directed towards building stone production.

Active quarries that may produce only a limited supply of building stone These quarries are active, or intermittently active, but they either do not regularly produce any building stone, or may only produce limited volumes. This includes, for example, crushed rock guarries, mothballed sites, and others as such small guarries that primarily supply only a local area and do not trade widely on the commercial market. All of these quarries are thought to possess, or have until recently possessed, planning permission for stone extraction.

#### Disused, potentially prospective quarries

The investigation carried out to produce these factsheets identified these guarries as being potentially prospective for renewed building stone production. The reasons for their selection are summarised in the information tables in this factsheet above, and are further documented in the report that accompanies (and contains) this factsheet.

#### Potentially prospective quarries

Active guarries

uarry site is identified as potentially

uarry sites are identified as being prospective. Although Drumhead quarry a regular supply of building stone, the stone produced are thought to be ely small. Taking this into account he great extent to which Upper Limestor Sandstone has been used historically, we nat renewed extraction of this stone at any sed) quarry would probably not face very ket competition from Drumhead quarry. uarry sites are identified as potentially

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tified - renewed extraction of this stone at ed quarry would face very strong market on from Swinton quarry

I quarry sites are identified as potentially e. Although Cullalo quarry until recently regular supply of building stone, we I that this quarry is currently mothballed rrying at Cullalo is revived, this would ot present any market competition for traction of the same stone at any





Sandstone is one of the most prevalent stone types used for buildings in Scotland, particularly in the larger towns and cities of the Central Belt. An advantage of sandstone as a building material is that it can be relatively easy to extract, shape and tool, thus making it a popular material for building facades as well as elaborately carved, 'moulded' masonry and sculpture.

Although stone is commonly thought of as being solid and impervious, sandstone is normally porous i.e. there are spaces between the grains which are sometimes open. It is often possible for water to enter these pores, for example from rainfall. In many cases, this will do no harm to the stone, but in certain circumstances damage can occur, for example if the water cannot escape and reacts with vulnerable minerals in the sandstone, or if the stone is attacked by chemicals or pollutants. This means that, compared to many other stone types, sandstone is prone to decay as it weathers, and selecting a replacement stone with similar weathering properties to the original is important for ensuring successful and long-lasting repairs.

Some kinds of layered sedimentary rocks, known as flagstones, have a tendency to split into large, strong, tabular slabs, which are particularly well suited for paving. These are commonly produced from sandstone, siltstone, or mudstone, with lower permeability.

Development potential for Scottish sandstone and flagstone

Increased supply of Scottish sandstone and/or flagstone can be brought about in four ways:

- Increased building stone production at active quarries that already produce a regular supply of building stone
- Increased or renewed building stone production at active quarries that already produce a limited quantity of building stone, and/or where extraction currently focuses on other products (e.g. crushed rock), or at quarries that are currently mothballed
- Re-opening disused quarries that have development potential
- Opening new quarries in locations which have not previously been worked

Although all of these would have societal benefits, they will ultimately only succeed if they prove to be commercially feasible. This will depend on operational and start-up costs as well as the price that can be achieved for the end product(s).



Published statistics<sup>2</sup> suggest that the total market for sandstone masonry products in the UK was worth c. £112 million in 2022. Imports account for c. 82% of this market. The market for paving products was worth c. £180 million in 2021 (data for 2022 are not available). This figure includes sandstone/ flagstone paving, although the statistics group paving products of all rock types (including granite kerbs and setts, for example) into one category. Based on the same import statistics, price ranges of between £210 and £360 per tonne for sandstone blocks, and £200 - £390 per tonne for paving stone appear to be reasonable reference price points, although we note exported paving products achieved £790 per tonne on average in 2022.

Significantly, the price for imported sandstone products has increased substantially since 2020, far outstripping inflation. As a result, although the value of the market has continued to grow into 2022, the total quantity of imported sandstone has shrunk. This suggests that the business opportunity for Scottish sandstones to successfully compete with imported stone could be growing.



Bibliographic reference: Everett, P A and Shaw, I R. 2024. Development potential of building stone resources in Scotland. Nottingham, UK, British Geological Survey (CR/24/020). https://nora.nerc.ac.uk/id/ eprint/537904

Further details about the investigation that was carried out to produce and select the information presented on this factsheet are documented in report OR/24/020, which accompanies and contains this factsheet. This investigation has been limited to quarry sites that are known to have produced building stone in the past, according to BGS records. Development potential may also exist at other sites, including quarries that are not known to have produced building stone in the past, or which have only ever focused on other products (such as crushed rock aggregate). The inclusion of any quarry or building stone does not constitute a guarantee with respect to either the performance characteristics or the aesthetic appeal of the recoverable material.

The information and maps on this factsheet are intended for general consideration of building stone supply issues and not as a detailed source of information on specific sites. The information and maps should not be used to determine individual planning applications or in taking other decisions on the acquisition or use of a particular piece of land, although they may give useful background information which sets a specific proposal within context.

#### Footnotes

<sup>1</sup> Building Stone Database for Scotland web portal. https://webservices.bgs.ac.uk/buildingstone

<sup>2</sup> UK Office for National Statistics (UK manufacturers' sales by products survey [PRODCOM]), and UK import and export statistics published by HM Revenue and Customs (UK Overseas Trade Statistics [OTS])

# **Development potential for building stone resources in Scotland:** Igneous and metamorphic rock

Natural stone has been used as a building material since the early days of handful of active building stone quarries remain. Nowadays, it is possible human habitation in Scotland and is still in fashion for modern architecture. It has been used to create most of the important civic buildings in the country, and much of Scotland's traditional housing stock - notably the tenements that characterise our major cities and towns.

Most of the stone used in traditional Scottish buildings was sourced locally. The great diversity of Scotland's geology means that the 'local stone' typically changes over small distances, so the character of stone structures varies considerably from place to place, reflecting the bedrock beneath. In some cases, large quarries previously supplied the stone used to build certain parts of towns and cities, further enhancing the distinctiveness and Increasing the number and range of indigenous Scottish building stones 'sense of place' that characterises many settlements and areas across the country.

During the late 18<sup>th</sup> and throughout the 19<sup>th</sup> centuries, tens of thousands of people in Scotland were employed in many hundreds of building stone quarries, producing stone that was used to construct hundreds of thousands of stone buildings in Scotland and beyond.

Since the early 20<sup>th</sup> century, building stone quarrying and production in Scotland has seen a precipitous decline, making way for modern construction materials such as concrete, brick and steel. Today, just a

to import stone from as far afield as India and China, often at cheaper prices than stone quarried in the UK, and as a result, imported stone now swamps the UK market. This can be said to erode the individual character and sense of place that indigenous stone has imparted to our historic environment, and the decreasing availability of appropriate stone for repair work places our surviving historic buildings at increased risk. Furthermore, while stone is a naturally low carbon building material (especially compared to concrete, for example), its embodied carbon increases significantly when it is transported large distances.

on the market would make additional stone types available for the repair and conservation of historically important buildings and structures, as well as facilitating new build and streetscape projects that are in keeping with the character of the local vernacular or stone-built heritage. In addition to these positive outcomes for the historic environment, this would also bring a range of economic, social, cultural and environmental benefits to Scotland, including the creation of new jobs, the preservation of important skills, and reduced  $CO_2$  emissions.

▲ Dunduff

🔈 Bogary

•





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•						
Building stone	Typical end uses	Reach	Scale	Historic *** significance	Active quarries	Potentially prospective quarries
Peterhead Granite	Masonry	4	4	8	Limited supply (2): Stirling Hill, Longhaven	Two active quarries (Stirling Hill and Longhaven), currently extract Peterhead Granite, but these focu- on production of crushed rock aggregate. There may be scope for building stone production at thes quarries, and if so, they can be considered to have the foremost potential for renewed production of Peterhead Granite. 2 disused quarry sites are also identified as potentially prospective, though this potential is somewhat diminished by the existence of the Stirling Hill and Longhaven quarries.
Corrennie Granite	Masonry	3	2	5	Limited supply (1): Corrennie	One active quarry (Corrennie), currently extracts Corrennie Granite, but the focus is on production of crushed rock aggregate. There may be scope for building stone production at Corrennie quarry and if so, this can be considered to have the foremost potential for renewed production of Corrennie Granite. 1 disused quarry site is also identified as potentially prospective, though this potential is somewhat limited in comparision to that of Corrennie quarry.
Ross of Mull Granite	Masonry	4	1	5	None	3 disused quarry sites are identified as potentially prospective.
'Grey' granites						
Building stone	Typical end uses	Reach	Scale	Historic *** significance	Active quarries	Potentially prospective quarries
Aberdeen Granite	Masonry, Kerbs and Setts	3	4	7	None	All of the disused quarry sites that formerly extracted this stone are nowadays infilled, flooded or built over, and as such, none are identified as potentially prospective.
Kirkmabreck Granite	Masonry	3	3	6	None	Although some of the disused quarry sites that formerly extracted this stone are accessible, they a located in a sensitive area, and as such, none are identified as potentially prospective.
Kemnay Granite	Masonry, Kerbs and Setts	3	3	6	Limited supply (2): Kemnay, Tom's Forest	Two active quarries (Kemnay and Tom's Forest), currently extract Kemnay Granite, but these focus on production of crushed rock aggregate. There may be scope for building stone production at these quarries, and if so, they can be considered to have the foremost potential for renewed production of this stone. All of the disused quarry sites that formerly extracted Kemnay Granite are nowadays substantially overgrown, and as such, none are identified as potentially prospective.
Dalbeattie Granite	Masonry, Kerbs and Setts	3	3	6	Limited supply (1): Craignair	One active quarry (Craignair), currently extracts Dalbeattie Granite, but the focus is on production of crushed rock aggregate. There may be scope for building stone production at this quarry, and it so, it can be considered to have the foremost potential for renewed production of this stone. All of the disused quarry sites that formerly extracted Dalbeattie Granite are nowadays substantially overgrown, and as such, none are identified as potentially prospective.
	Masonry,				Limited augubly (1):	One active quarry (Bonawe), currently extracts Cruachan Granite, but the focus is on production of crushed rock aggregate. There may be scope for building stone production at this quarry, and if sc

#### Active quarries that may produce only a limited sup of building stone

These quarries are active, or intermittently active, but they either do not regularly produce any building stone, or may only produce limited volumes. This includes, for example, crushed rock quarries, mothballed sites, and others as such small quarries that primarily supply only a local area and do not trade widely on the commercial market. All of these quarries are thought to possess, or have until recently possessed, planning permission for stone extraction.

#### Disused, potentially prospective quarries

The investigation carried out to produce these factsheets identified these quarries as being potentially prospective for renewed building stone production. The reasons for their selection are summarised in the information tables in this factsheet (see right), and are further documented in the report that accompanies (and contains) this factsheet

> 😒 Stirlinghill Longhaver

Other igneous and	metamorp	hic roc	ks			
Building stone	Typical end uses	Reach	Scale	Historic *** significance	Active quarries	Potentially prospective quarries
Scottish Mafite	Masonry, Kerbs and Setts	3	4	7	Limited supply (8): Boards, Craighouse Farm, Cruicks, Northfield, Riskend, Tam's Loup, Cairneyhill, Duntilland	Eight active quarries (Boards, Craighouse Farm, Cruicks, Northfield, Riskend, Tam's Loup, Cairneyhill and Duntilland) currently extract Scottish Mafite, but these focus on production of crushed rock aggregate. There may be scope for building stone production at these quarries, and if so, they can be considered to have the foremost potential for renewed production of Scottish Mafite. Scottish Mafite, marketed as 'Scottish Whin' by the company Tradstocks is available today, but this is thought to be derived from boulders and/or oversize aggregate quarry blocks. As a reliable long-term and scaleable reserve of 'Scottish Whin' is unlikely to exist, this will probably not present strong market competition for renewed quarrying of Scottish Mafite. 7 disused quarry sites are also identified as potentially prospective, though this potential is somewhat limited in comparision to that of the active aggregate quarries.
Furnace Porphyry	Masonry, Kerbs and Setts	3	3	6	Limited supply (1): Furnace	One active quarry (Furnace), currently extracts Furnace Porphyry, but the focus is on production of crushed rock aggregate. There may be scope for building stone production at Furnace quarry, and if so, this can be considered to have the foremost potential for renewed production of Furnace Porpyry. 1 disused quarry site is also identified as potentially prospective, though this potential is somewhat limited in comparision to that of Furnace quarry.
Scottish Felsite	Masonry	1	4	5	Limited supply (3): Balmullo, Bogary, Dunduff	Three active quarries (Balmullo, Bogary and Dunduff), currently extract Scottish Felsite, but these focus on production of crushed rock aggregate. There may be scope for building stone production at these quarries, and if so, they can be considered to have the foremost potential for renewed production of Scottish Felsite. 2 disused quarry sites are also identified as potentially prospective, though this potential is somewhat limited in comparision to that of the active aggregate quarries.
Southern Uplands Greywacke	Masonry, Paving flags, Roofing	1	4	5	None	12 disused quarry sites are identified as potentially prospective.

\* Reach: a score based on the maximum historical geographic reach of the building stone; international (4) national (3), regional (2) or local (1). \*\* Scale: a score (1-4 from smallest to greatest) used to compare the extent to which building stones have been quarried.

\*\*\* Historic significance: a score based on adding the 'Reach' and 'Scale' scores for each stone together. This aims to recognise that both the extent to which a stone has been quarried and how widely it has been used reflect the historical significance and pedigree of the material.

Further information about how the contents of the above tables were derived is documented in the report that accompanies (and contains) this

factsheet. https://nora.nerc.ac.uk/id/eprint/537904

Development potential for Scottish igneous and metamorphic rock quarry in Argyll, is thought to produce a regular supply of building stone. would require substantially more effort, and greater initial investment. Achnaba quarry is not included on the maps and tables in this factsheet, as the building stone it produces (Dalradian Metamafite) is not known to have been quarried at scale or had a wide geographical reach in the past, but nonetheless this quarry makes a valuable contribution to the supply of indigenous Scottish building stone today.

'Pink' granites

Although we are unaware of any other quarry that produces a regular supply of igneous or metamorphic building stone, limited quantities of igneous building stones are obtainable to a greater or lesser degree from various sources, including active guarries that focus on aggregate production. For example, Scottish Mafite is currently available on the building stone market, supplied by the company Tradstocks as 'Scottish Whin'. This stone is understood to be derived from blocks sourced from several different locations, including active aggregate quarries as well as boulders picked from various other places.

Given this situation, there is a high chance that reliable reserves of most of Scotland's igneous and metamorphic building stones do not exist (particularly over the medium- to long-term). If so, there may be little security of supply, and any demand for larger volumes of stone (e.g. for use in connection with streetscape projects) may go unsatisfied.

Granite from many countries, including Spain, Portugal, Italy, Finland, England, the U.S.A., South Africa, India and China, can now be obtained in Scotland. Much of it is provided as polished slab aimed at the decorative stone market, but granite that has been pre-formed into setts, kerbs and other paving units is also widely available.

Given the large number of active aggregate quarries in Scotland that already extract igneous and metamorphic rock, the most feasible approach for increasing supply of these indigenous building stones will be increased or renewed production of building stone at these quarries. Although the possibility of re-opening disused quarries that have development potential, or opening new quarries in locations which have



#### What this factsheet shows

This factsheet is one of a series of three (covering "sandstone and sum of two other scores, one for the maximum historical geographic flagstone", "igneous and metamorphic rock" and "roofing slate", carried out to shortlist the building stones and quarries in Scotland historic quarries. that can be considered most historically significant, and to suggest which disused quarries may have the greatest prospect of commercial success were they to be brought back into production today.

of the (c. 200) building stones defined in the Building Stone Database potentially prospective disused quarries, and the areas where each for Scotland (BSDS).<sup>1</sup> Stones with the highest scores were selected of the selected building stones are found, are displayed on the to feature in the factsheets. The "historic significance" score is the accompanying maps.

Present day, only one metamorphic rock quarry in Scotland, Achnaba not been previously worked may be considered worthwhile activities, by comparison, these activities

Although any such approach would have societal benefits, they will ultimately only succeed if they prove to be commercially feasible for quarry operators. This will depend on operational and start-up costs as well as the price that can be achieved for the end product(s).

disused quarry sites that formerly extracted Cruachan Granite are nowadays substantially

vergrown, and as such, none are identified as potentially prospective.



Granite import value 2016 2017 2018 2019 2015 2020 Actual import value \_\_\_\_\_ 2015 value adjusted for Inflation

Published statistics<sup>2</sup> suggest that the total market for granite building stone products in the UK was worth c. £29 million in 2022. Imports account for c. 81% of this market. Based on the same import statistics, price ranges of between £280 and £530 per tonne for cropped granite blocks, and £660 to £780 per tonne for sawn granite blocks appear to be reasonable reference points. It should be noted, however, that the size and degree of processing applied to granite products will result in a considerable price variance: smaller units such as setts that require comparatively minimal working will sell at a considerably lower price per tonne than larger blocks and those which have been highly processed, such as polished worktops, for example.

Statistics for other types of igneous and metamorphic stone products are not reported as separate categories in the published statistics. Though these will possibly have been included within a generic 'other' building stone category, the contribution each of these products makes towards the reported total for that category is not known. Based on the available information, therefor e, it can only be assumed that these would probably sell within a similar price range as granite.

The average price of imported granite products increased substantially in 2021 and, despite decreasing slightly in 2022, remains much higher than the average price prior to 2020, after accounting for inflation. As a result, the total quantity of imported granite has shrunk to less than half than the 2020 total, while the value of the market has only shrunk by 16%. If the import price of granite masonry products continues to increase, the business opportunity for Scottish igneous and metamorphic building stones to successfully compete with imported stone may grow still further.

"reach" of the stone, and another for the "scale" to which the stone respectively). These present the results of an investigation that was has been worked in the past, in terms of the number and size of

Summary tables of this information, which include brief comments about whether any disused guarries could be considered potentially prospective for renewed extraction of each building To achieve this, a "historic significance" score was assigned to each stone, are provided on this factsheet. The locations of active and



A Craighouse Farm



Various types of igneous and metamorphic rock have been used extensively as building, paving and decorative stone in Scotland. Crystalline igneous rocks, such as granite, porphyry, mafite and felsite form when molten rock (magma) solidifies, producing a mass of interlocking crystals with virtually no pore space in between. Metamorphic rocks are former igneous or sedimentary rocks that have been baked and/or compressed as they have experienced high temperature and pressure deep within Earth's crust, changing the original rock textures and mineral composition significantly.

Igneous and metamorphic rocks are typically very strong and impermeable. These properties influence how they are worked and used as a building stone. Although they can be challenging to extract and shape (when compared to sandstone and other types of sedimentary rock), they are generally very resilient to weathering, and can take a fine polish, making them look attractive and easy to keep clean. This makes them ideal for certain uses such as kerbstones and setts on heavily trafficked streets, as well as for monuments and decorative masonry, and in Scotland they have been quarried and transported long distances for these purposes.

Geologists use a wide range of terms to classify different types of igneous and metamorphic rocks, based on their mineral composition and how they have formed. In the building and decorative stone trade, however, it is common for essentially any type of coarse-grained igneous (and sometimes metamorphic) rock to be called 'granite'. Similarly, any type of hard, impervious, typically more finegrained, dark grey to black igneous or metamorphic rock (including, for example, mafite or greywacke) was traditionally known as 'whinstone' or 'whin', and this term is still commonly used.

Many large (typically several km across) bodies of granite, known as intrusions, form the bedrock in various different parts of Scotland. These have been quarried for building stone in numerous locations in the past, perhaps most famously in Aberdeen, the "granite city". These granite building stones display a range of appearance and mineral composition, but they can broadly be divided into 'pink' and 'grey' granites. Porphyry, another igneous rock with scattered, large crystals set in a fine matrix, has also been formed, quarried, and used in a similar way to granite.



Scottish Mafite and Scottish Felsite have predominantly been quarried from relatively small intrusions called dykes and sills. Mafite dykes and sills, in particular, which are distributed throughout the Central Belt of Scotland, have been quarried at numerous locations where the local bedrock is predominantly sedimentary. These quarries were valued as sources of igneous rock that was well suited for use as setts and kerbs, and many historic streets in Scottish cites were (and still are) paved with this stone type.



One greywacke building stone, Southern Uplands Greywacke, is a weakly metamorphosed sandstone that forms the bedrock across the majority of the Southern Uplands massif, which takes in the Scottish Borders and Dumfriesshire, as well as parts of Ayrshire and Lanarkshire. As it was a difficult stone to dress finely, Southern Uplands Greywacke was commonly employed as a rubble walling stone in these areas in conjunction with squared dressings (i.e. jambs, sills, lintols and quoins etc.) of sandstone imported from quarries located elsewhere in Central and Southern Scotland.



Bibliographic reference: Everett, P A and Shaw, I R. 2024. Development potential of building stone resources in Scotland. Nottingham, UK, British Geological Survey (CR/24/020). https://nora.nerc.ac.uk/id/eprint/537904

Further details about the investigation that was carried out to produce and select the information presented on this factsheet are documented in report OR/24/020, which accompanies and contains this factsheet. This investigation has been limited to quarry sites that are known to have produced building stone in the past, according to BGS records. Development potential may also exist at other sites, including quarries that are not known to have produced building stone in the past, or which have only ever focused on other products (such as crushed rock aggregate). The inclusion of any quarry or building stone does not constitute a guarantee with respect to either the performance characteristics or the aesthetic appeal of the recoverable material.

The information and maps on this factsheet are intended for general consideration of building stone supply issues and not as a detailed source of information on specific sites. The information and maps should not be used to determine individual planning applications or in taking other decisions on the acquisition or use of a particular piece of land, although they may give useful background information which sets a specific proposal within context.

#### Footnotes:

<sup>1</sup> Building Stone Database for Scotland web portal. https://webservices.bgs.ac.uk/buildingstone <sup>2</sup> UK Office for National Statistics (UK manufacturers' sales by products survey [PRODCOM]), and UK import and export statistics published by HM Revenue and Customs (UK Óverseas Trade Statistics [OTS],

# **Development potential for building stone resources in Scotland: Roofing slate**

Natural stone has been used as a building material since the early days of human habitation in Scotland and is still in fashion for modern architecture. It has been used to create most of the important civic buildings in the country, and much of Scotland's traditional housing stock - notably the tenements that characterise our major cities and towns.

Most of the stone used in traditional Scottish buildings was sourced locally. The great diversity of Scotland's geology means that the 'local stone' typically changes over small distances, so the character of stone structures varies considerably from place to place, reflecting the bedrock beneath. In some cases, large quarries previously supplied the stone used to build certain parts of towns and cities, further enhancing the distinctiveness and 'sense of place' that characterises many settlements and areas across the country.

During the late 18<sup>th</sup> and throughout the 19<sup>th</sup> centuries, tens of thousands of people in Scotland were employed in many hundreds of building stone quarries, producing stone that was used to construct hundreds of thousands of stone buildings in Scotland and beyond.

Since the early 20<sup>th</sup> century, building stone quarrying and production in Scotland has seen a precipitous decline, making way for modern construction materials such as concrete, brick and steel. Today, just a handful of active

building stone guarries remain. Nowadays, it is possible to import stone from as far afield as India and China, often at cheaper prices than stone guarried in the UK, and as a result, imported stone now swamps the UK market. This can be said to erode the individual character and sense of place that indigenous stone has imparted to our historic environment, and the decreasing availability of appropriate stone for repair work places our surviving historic buildings at increased risk. Furthermore, while stone is a naturally low carbon building material (especially compared to concrete, for example), its embodied carbon increases significantly when it is transported large distances.

Increasing the number and range of indigenous Scottish building stones on the market would make additional stone types available for the repair and conservation of historically important buildings and structures, as well as facilitating new build and streetscape projects that are in keeping with the character of the local vernacular or stone-built heritage. In addition to these positive outcomes for the historic environment, this would also bring a range of economic, social, cultural and environmental benefits to Scotland, including the creation of new jobs, the preservation of important skills, and reduced CO<sub>2</sub> emissions.



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Roofing slates						
Building stone	Typical end uses	Reach	Scale**	Historic *** significance	Active quarries	Potentially prospective quarries
West Highland Slate	Roofing	4	4	8	None	7 disused quarry sites are identified as potentially prospective.
Highland Border Slate	Roofing	2	4	6	None	16 disused quarry sites are identified as potentially prospective.
Macduff Slate	Roofing	2	4	6	None	9 disused quarry sites are identified as potentially prospective.

\* Reach: a score based on the maximum historical geographic reach of the building stone; international (4) national (3), regional (2) or local (1). \*\* Scale: a score (1-4 from smallest to greatest) used to compare the extent to which building stones have been quarried. \*\*\* Historic significance: a score based on adding the 'Reach' and 'Scale' scores for each stone together. This aims to recognise that both the extent to which a stone has been quarried and how widely it has been used reflect the historical significance and pedigree of the material. Further information about how the contents of the above tables were derived is documented in the report that accompanies (and contains) this

Disused, potentially prospective quarries

factsheet. https://nora.nerc.ac.uk/id/eprint/537904

The investigation carried out to produce these factsheets identified these quarries as being potentially prospective for renewed building stone production. The reasons for their selection are summarised in the information tables above, and are further documented in the report that accompanies (and contains) this factsheet.



Development potential for Scottish roofing slate

No roofing s late i s quarried commercially i n Scotland today, although roofing s late originating from m any countries, including England, W ales, Spain, Brazil, Argentina, the U.S.A., Canada, China and Italy can be readily obtained.

Most of these commercially available slates are too regular and 'clean' to be considered a good match for Scottish slates. Furthermore, they are usually sold as thinner tiles, none have the surface texture of typical Scottish slate tiles, and none are supplied in the range of sizes that would allow the 'diminishing courses' style of traditional Scottish roofs to be replicated. As a result, there is strong demand for re-cycled Scottish slate tiles if they remain in good condition after removal (for example from demolished buildings). In many cases, traditional Scottish slate roofs that require repair are completely renewed with an imported slate. Notably, unless Scottish slate can be obtained, effecting repairs to only part of a Scottish slate roof (by only replacing defective tiles, for example) will result in a marked aesthetic contrast between the repaired sections and the original, which many property owners would find undesirable.

Increased supply of indigenous roofing s late will therefore become increasingly critical for the effective preservation of the built heritage in Scotland, particularly as traditional buildings continue to age and require ongoing roof repairs. This can only be brought about in two ways, however: either by re-opening disused quarries that have development potential, or by opening new quarries in locations which have not been previously worked.

All three of the main Scottish roofing slates -West Highland Slate, Highland Border Slate and Macduff Slate - are metamorphic rocks that consisted originally of mud that was deposited on a sea floor c. 800-500 million years ago and was subsequently metamorphosed during the Caledonian Orogeny (c. 470 million years ago). Slate is impermeable and splits easily along cleavage planes - the result of a 'fabric' produced by the pressure of metamorphic processes. These properties allow thin, waterproof tiles to be easily produced, which are ideal for roofing.

The term slate is used widely to refer to both a type of rock and a roofing component, and as such can be confusing; for clarity, the term slate is used here to refer to the natural geological material, and the term tiles is used to refer to the roofing component. The main flagstone building stones found in Scotland (see the 'sandstone and flagstone' factsheet in this series) have also been used as roofing tiles, in the areas local to where they were quarried. These are sometimes called 'stone slates' to distinguish them from 'true' metamorphic roofing slates - the latter are considerably more common, and are found on buildings throughout all parts of Scotland.





Scottish slate tiles are traditionally nearly always laid in diminishing courses, with the larger sizes at the base, becoming smaller towards the top. This technique ensured that more of the slate from a quarry was used and thus reduced wastage. The rough and slightly irregular appearance gives the classic 'organic' appearance of a Scottish slate roof.



#### What this factsheet shows

This factsheet is one of a series of three (covering "sandstone and flagstone", "igneous and metamorphic rock" and "roofing slate", respectively). These present the results of an investigation that was carried out to shortlist the building stones and quarries in Scotland that can be considered most historically significant, and to suggest which disused quarries may have the greatest prospect of commercial success were they to be brought back into production today.

To achieve this, a "historic significance" score was assigned to each of the (c. 200) building stones defined in the Building Stone Database for Scotland (BSDS). Stones with the highest scores were selected to feature in the factsheets. The "historic significance" score is the sum of two other scores, one for the maximum historical geographic "reach" of the stone, and another for the "scale" to which the stone has been worked in the past, in terms of the number and size of historic quarries.

Summary tables of this information, which include brief comments about whether any disused quarries could be considered potentially prospective for renewed extraction of each building stone, are provided on this factsheet. The locations of active and potentially prospective disused quarries, and the areas where each of the selected building stones are found, are displayed on the accompanying maps.

Footnotes:





A West Highland slate tile

5 centimetres



5 centimetres

A Highland Border Slate tile with coloured banding known as ribboning

A Macduff Slate tile

An application for planning permission for renewed extraction of West Highland Slate at a quarry on the Isle of Luing (included amongst the quarry sites with potential prospectivity on this factsheet) has been recently submitted and is under consideration by the local authority at the time of writing. If this is approved, and a successful slate production enterprise results, this will make an invaluable contribution to addressing the supply issues faced by anyone who wishes to effect "like-for-like" repairs to traditional Scottish slate roofs. Nonetheless, renewed quarrying at this site alone is unlikely to ensure a reliable and adequate reserve of Scottish slate over the long term, and further development of Scottish roofing slate resources, including at other quarry sites, will be needed if the continued disappearance of traditional Scottish slate roofs is to be substantially addressed.

Although renewed production of indigenous slate would positively impact historical building conservation in Scotland, this will ultimately only succeed if it proves to be commercially feasible for quarry operators. This will depend on operational and start-up costs as well as the price that can be achieved for the end product(s).



Published statistics<sup>2</sup> suggest that the total market for roofing slate products in the UK was worth c. £70 million in 2019 (more recent data are not available). Imports account for c. 93% of this market, and all UK production is from guarries in England and Wales only. Based on the same import statistics, a price range of between £440 and £590 per tonne appears to be a reasonable reference point in order to compete with imported slate on price. It is noted, however, that some specifiers may favour indigenous slate over imported slate because it is the 'authentic choice' with respect to the historic built environment. This may allow indigenous slate to achieve a market premium.



The price of imported slate has risen significantly since 2015 and continues to increase at a rate much greater than inflation almost every year. The total amount of slate imported into the UK (in tonnes) has also risen by more than 50% since 2015. This suggests that the business opportunity for Scottish roofing slate products to successfully compete with imported stone could be growing, at the same time as demand for roofing slate products is markedly increasing.



Bibliographic reference: Everett, P A and Shaw, I R. 2024. Development potential of building stone resources in Scotland. Nottingham, UK, British Geological Survey (CR/24/020). https://nora.nerc.ac.uk/id/ eprint/537904

Further details about the investigation that was carried out to produce and select the information presented on this factsheet are documented in report OR/24/020, which accompanies and contains this factsheet. This investigation has been limited to guarry sites that are known to have produced building stone in the past, according to BGS records. Development potential may also exist at other sites, including quarries that are not known to have produced building stone in the past, or which have only ever focused on other products (such as crushed rock aggregate). The inclusion of any quarry or building stone does not constitute a quarantee with respect to either the performance characteristics or the aesthetic appeal of the recoverable material.

The information and maps on this factsheet are intended for general consideration of building stone supply issues and not as a detailed source of information on specific sites. The information and maps should not be used to determine individual planning applications or in taking other decisions on the acquisition or use of a particular piece of land, although they may give useful background information which sets a specific proposal within context.

<sup>1</sup> Building Stone Database for Scotland web portal. https://webservices.bgs.ac.uk/buildingstone <sup>2</sup> UK Office for National Statistics (UK manufacturers' sales by products survey [PRODCOM]), and UK import and export statistics published by HM Revenue and Customs (UK Overseas Trade Statistics [OTS

# 5 Discussion and conclusions

Increasing the supply and use of Scottish building stones can be brought about in four ways:

- increased building stone production at active quarries that already supply building stone.
- increased or renewed building stone production at other active quarries that produce a limited quantity of building stone, and/or where extraction currently focuses on other products (e.g. crushed rock), or at quarries that are currently mothballed.
- re-opening potentially prospective disused quarries that have development potential.
- opening new quarries in locations which have not been previously worked.

These activities are listed in order of increasing effort, particularly in terms of the start-up costs and planning process that would need to be followed for re-opening disused quarries or opening completely new quarries in locations that have not previously been worked.

Although the establishment of any new stone production enterprise in Scotland would be in the overall public interest, it will ultimately only succeed if it proves to be commercially feasible. This will depend on operational and start-up costs, as well as the price that can be achieved for the end-product(s). While this will need to be explored in detail in individual business case(s), the review of UK building stone production and import and export statistics (Section 3) has revealed some relevant market conditions and trends:

- As the majority of stone used in the UK is imported, imported stone clearly presents the most significant source of market competition for the Scottish stone industry as a whole.
- Building stone products being imported into the UK are becoming significantly more expensive. The average import price (in £/t) for 'sandstone', 'paving stone', 'granite' and 'roofing slate' has increased significantly over the period 2015–2022, and particularly since 2020, far outstripping the rate of inflation (Figure 5).
- The mass of sandstone, granite and paving imported into the UK decreased significantly in 2022, but the total value of these imports remained much more constant. This decrease has not been accompanied by an increase in indigenous production, which suggests that the price of imported stone is becoming prohibitive to construction projects and natural stone is therefore not being used, rather than the stone being sourced from elsewhere.
- Increasing import prices combined with low and fluctuating indigenous production leaves the Scottish (and UK) building stone market at risk of trending further towards erratic pricing and decreasing affordability. If this trend continues, it will become increasingly important to diversify sources of building stone supply (including stimulating indigenous supply) to ensure security of supply and avoid suppliers (importers) 'cornering the market'.
- UK exports of building stone products currently attract a higher price than imported stone across all examined product categories, and they are traded in comparatively small volumes, presumably by relatively small-scale producers. The higher prices may reflect a greater degree of processing being applied to the finished products, or an inherent ability of UK stone to attract a premium. If growth of the UK building stone industry could be stimulated sufficiently, 'economies of scale' could arise whereby suppliers could diversify their product range, sell profitably at a lower price, and therefore compete across wider sectors of the market.

Should the price of imported stone continue to increase, or remain relatively high, indigenous building stone production may be able to increasingly compete on price with imported material. Competing on price will always be an important factor. It is noted, however, that some specifiers may favour indigenous stone over imported stone because it can be considered an environmentally sustainable choice (primarily due to the lower embodied carbon related to transport) and because it is the 'authentic choice' with respect to the historic built environment. This may allow indigenous stone to achieve a market premium.

The majority of building stone quarried in Scotland today is sandstone and flagstone; any new sandstone or flagstone production enterprise in Scotland would face some competition from currently active quarries, but there remain some historically highly significant sandstone building stones (including several Carboniferous, generally buff, sandstones) that are currently not worked, and for which there are no closely similar currently available alternatives. This is a concern in relation to the availability of appropriate materials for effecting repairs to historic sandstone buildings. Set against this backdrop, we note that the price for imported sandstone products has increased substantially since 2020, far outstripping inflation. Seemingly as a result of this, and although the value of the market has continued to grow into 2022, the total quantity of imported sandstone has shrunk. This suggests that the business opportunity for Scottish sandstones to successfully compete with imported stone could be growing.

In contrast to sandstone and flagstone, only small quantities of igneous and metamorphic building stones are produced in Scotland. With the exception of the stone produced at Achnaba quarry, most of these stones are obtained from quarries which focus on production of crushed rock aggregate. Renewed production at any of these sites will face very little competition from any other quarry in Scotland. This, when considered along with the fact that these quarries are already operational and will hold planning permission for stone extraction, means that re-establishing building stone production may present a relatively easy opportunity to realise.

No roofing slate is guarried commercially in Scotland today, and so renewed production of Scottish slate could only be brought about by re-opening disused guarries that have development potential, or by opening new quarries in locations which have not been previously worked. This means that renewed slate production at any of these guarries would face essentially no competition from any other quarry in Scotland. Significant start-up costs will be unavoidable, however. The unique characteristics of Scottish slate mean that an equivalent product is not available, thus severely limiting the scope for "like-for-like" repairs to traditional Scottish slate roofs. An application for planning permission for renewed extraction of West Highland Slate at a quarry on the Isle of Luing (listed among the quarry sites with potential prospectivity on this factsheet) has been recently submitted and is under consideration by the local authority at the time of writing (June 2024). If this is approved, and a successful slate production enterprise results, this will make an invaluable contribution to addressing the supply issues faced by anyone wishing to effect "like-for-like" repairs to traditional Scottish slate roofs. Nonetheless, renewed quarrying at this site alone is unlikely to ensure a reliable and adequate reserve of Scottish slate over the long term, and further development of Scottish roofing slate resources, including at other guarry sites, will be needed if the continued disappearance of traditional Scottish slate roofs is to be substantially addressed. Promisingly, of all the product types considered in this report, the UK market for roofing slate appears to be the most buoyant: the quantity of roofing slate being imported has continued to increase alongside price, while the quantities of roofing slate being produced in the UK and exported from the UK have both decreased, suggesting sustained growth in demand for the material amidst falling indigenous production.

Supporting increased production at quarries that already actively supply building stone is also equally important for the success of Scotland's building stone industry. It should be borne in mind that one of the criteria used by this study was to identify disused quarries as potentially prospective only if no active quarry is currently producing the same (or a similar) building stone. The rationale behind this approach was that introducing competition between new and existing indigenous suppliers is unlikely to improve the present state of the industry.

A number of active building stone quarries in Scotland (including the Dunaverig, Spynie, Clashach, Avochie and Achnaba quarries) were not featured on the factsheets because the building stones that they produce are not known to have been quarried at scale or did not have a wide geographical reach in the past, and so they were not rated as being among the most historically significant according to the methodology used by this investigation. This reflects the focus of investigation on identifying where gaps in indigenous stone production may exist, rather than on detailing the scale and range of all current production. It is important to note, however, that these quarries do make a valuable contribution to the supply of indigenous Scottish building stone today. While imported stone clearly presents the most significant source of competition for the Scottish stone industry as a whole, any new indigenous stone production enterprise (whether re-opening a disused quarry or expanding stone production at an active site) will also face market competition from other Scottish producers, and those elsewhere in the UK. Within the scope of this project, it has not been possible to present new information on market scale, value, or sales prices for the existing Scottish (and UK) stone industry. The reader is referred to the BGS report *Scotland's building stone industry: a review* (Gillespie and Tracey 2016), which, as far as we are aware, provides the most recent review of this information. Given that both this and the most recent compilation of AMRI data are now around a decade old, conducting a survey of Scottish building stone market specifically, and thus informing individual business cases for indigenous building stone production enterprises.

# 6 Limitations

This investigation has been limited to quarry sites that are known to have produced building stone in the past, according to BGS records. Development potential may also exist at other sites, including quarries that are not known to have produced building stone in the past and those which have only ever focused on other products (such as crushed rock aggregate).

The inclusion of any quarry or building stone does not constitute a guarantee about either the performance characteristics or the aesthetic appeal of the recoverable material, or indeed the financial returns realisable on any investment.

The information and maps presented on the three factsheets are intended to assist with the general consideration of building stone supply issues and not serve as detailed sources of information on specific sites. The information and maps should not be used to determine individual planning applications or in taking other decisions relating to the acquisition or use of a particular piece of land, although they may give useful background information which sets a specific proposal within context.

Our assessment of "quarry scale", and the related rating of "historical significance" for different building stones that this feeds into, could be positively skewed towards building stone quarries that continued to extract aggregate (and therefore became larger) after ceasing building stone production. This is particularly relevant in relation to igneous and metamorphic building stones. This possible bias should not be detrimental to the overall investigation, however, the overarching goal of which has been to identify development potential; in this respect, highlighting building stones and/or quarries that have been worked more recently for aggregate ought to be relevant.

Due to the low level of detail, potential inconsistency and uncertainty surrounding the sources of information that were relied upon to produce the summary of UK building stone production and imports and exports presented in Section 3 of this report, some further market research would be required to better define reference prices that can inform the development actual business cases for individual stone production enterprises. These will need to take into account local market conditions and target product ranges, once established.

# Appendix 1 Data for selected building stones and quarries

This appendix contains tabulated extracts from the dataset that was used to derive the information presented on the three factsheets (see Section 4). These are intended to allow the reader to further investigate the specifics of the building stones and quarries identified as having the greatest development potential. The data tables that follow include hyperlinks to corresponding entries in the Building Stone Database for Scotland (BSDS) web portal, which can be accessed at: https://webservices.bgs.ac.uk/buildingstone

#### **BUILDING STONES DATA EXTRACT**

The following tables contain information about the 22 "sandstone and flagstone" building stones (Table 3), 12 "igneous and metamorphic rock" building stones (Table 4) and 3 "roofing slates" (Table 5) that are featured in the factsheets (Section 4). Accompanying notes for these tables are provided in the following sub-section of this appendix.

Table 3. Data extract for the 22 building stones included on the "sandstone and flagstone" factsheet (see Section 4.1). Clicking on the building stone name in the first column will activate a hyperlink to the corresponding entry for that building stone in the BSDS web portal.

Building stone	Group	Maximum Historical Geographic Reach	Reach Scale of score historic (1-4) quarrying (points)		Scale score (1-4)	Historic significance score (Scale + Reach)
Caithness Flagstone	Devonian flagstones	International	4	*	4	8
Dundee Flagstone	Devonian flagstones	International	4	1456	4	8
Stromness Flagstone	Devonian flagstones	Local	1	995	4	5
Scone Sandstone	Devonian sandstones	Local	1	296	4	5
Raddery Sandstone	Devonian sandstones	Regional	2	261	3	5
St Bees Sandstone	Permian/Triassic 'red' sandstones	International	4	252	3	7
Mauchline Sandstone	Permian/Triassic 'red' sandstones	International	4	234	3	7
Locharbriggs Sandstone	Permian/Triassic 'red' sandstones	International	4	230	3	7
Corncockle Sandstone	Permian/Triassic 'red' sandstones	National	3	177	3	6
Thornhill Sandstone	Permian/Triassic 'red' sandstones	National	3	75	2	5
Stratheden and Inverclyde Sandstone	Other sandstones	Regional	2	224	3	5
Gullane Sandstone	Carboniferous sandstones	International	4	279	3	7
Upper Limestone Formation Sandstone	Carboniferous sandstones	Regional	2	1580	4	6
Limestone Coal Formation Sandstone	Carboniferous sandstones	Regional	2	850	4	6
Scottish Middle Coal Measures Sandstone	Carboniferous sandstones	Regional	2	631	4	6
Scottish Lower Coal Measures Sandstone	Carboniferous sandstones	Regional	2	581	4	6
Hopetoun Sandstone	Carboniferous sandstones	Regional	2	335	4	6
Calders Sandstone	Carboniferous sandstones	Regional	2	285	4	6
Passage Sandstone	Carboniferous sandstones	Local	1	377	4	5
Scottish Upper Coal Measures Sandstone	Carboniferous sandstones	Local	1	285	4	5
Ballagan Sandstone	Carboniferous sandstones	Regional	2	239	3	5
Sandy Craig Sandstone	Carboniferous sandstones	Regional	2	183	3	5

\* quarries that produced the building stone "Caithness Flagstone" were not assigned points (see accompanying notes in the next subsection)

Table 4. Data extract for the 12 building stones included on the "igneous and metamorphic rock" factsheet (see Section 4.2). Clicking on the building stone name in the first column will activate a hyperlink to the corresponding entry for that building stone in the BSDS web portal.

Building stone	Group	Maximum Historical Geographic Reach	Reach score (1-4)	Scale of historic quarrying (points)	Scale score (1-4)	Historic significance score (Scale + Reach)
Peterhead Granite	'Pink' granites	International	4	379	4	8
Corrennie Granite	'Pink' granites	National	3	80	2	5
Ross of Mull Granite	'Pink' granites	International	4	32	1	5
Aberdeen Granite	'Grey' granites	National	3	503	4	7
Kirkmabreck Granite	'Grey' granites	National	3	99	3	6
Kemnay Granite	'Grey' granites	National	3	137	3	6
Dalbeattie Granite	'Grey' granites	National	3	246	3	6
Cruachan Granite	'Grey' granites	National	3	68	2	5
Scottish Mafite	Other igneous rocks	National	3	676	4	7
Furnace Porphyry	Other igneous rocks	National	3	216	3	6
Scottish Felsite	Other igneous rocks	Local	1	339	4	5
Southern Uplands Greywacke	Other metamorphic rocks	Local	1	395	4	5

Table 5. Data extract for the 3 building stones included on the "roofing slate" factsheet (see Section 4.3). Clicking on the building stone name in the first column will activate a hyperlink to the corresponding entry for that building stone in the BSDS web portal.

Building stone	Group	Maximum Historical Geographic Reach	Reach score (1-4)	Scale of historic quarrying (points)	Scale score (1-4)	Historic significance score (Scale + Reach)
West Highland Slate	Roofing slate	International	4	481	4	8
Highland Border Slate	Roofing slate	Regional	2	774	4	6
Macduff Slate	Roofing slate	Regional	2	382	4	6

#### ACCOMPANYING NOTES FOR BUILDING STONES DATA EXTRACT

Each item below relates to the corresponding column heading in Table 3, Table 4, and Table 5.

- <u>Building stone</u> the name of the building stone, as employed in the scheme for building stones used for the Building Stone Database for Scotland (BSDS).
- **<u>Group</u>** the name of the group into which the building stone has been placed for presentation in the factsheet information tables.
- <u>Maximum historical geographic reach</u> information based on whether the building stone has been used internationally, nationally, regionally or locally; in this case, whichever one of the four terms best expresses the maximum historical geographic reach is used (for example, the term "regional" would be assigned to a stone that has been used both regionally and locally). This information is drawn from the BSDS. It is noted that "historical" reach is taken to mean essentially prior to around 1950, and so in the context of supply to

traditional buildings. Certain building stones that are still actively quarried in Scotland are nowadays supplied further afield than they were traditionally, but their "modern" geographic reach is not taken into account here.

- <u>Reach score</u> each building stone was assigned a score of 1-4 based on its maximum historical geographic reach (see the preceding point). Stones with international reach were assigned a score of 4 (the top score), those with national reach were assigned a score of 3, those with regional reach were assigned a score of 2, and those with only local reach were assigned a score of 1.
- <u>Scale of historic quarrying</u> individual quarries in the BSDS were each assigned points based on their apparent maximum size. This was estimated via an inspection of historic and current Ordnance Survey maps, and modern satellite imagery. Points were assigned with reference to nominal approximate area ranges, as detailed below.

Points	Nominal approximate area (m²)	Example
1	<2000	Very small excavation that likely supplied only one or a handful of local structures (e.g. farm buildings).
5	2000 - 10,000	Small quarry that likely supplied several local structures.
15	10,000 - 25,000	Moderately sized quarry, that likely supplied numerous local buildings, such as throughout a small village or part of a town.
35	25,000 - 50,000	Moderately large quarry such as would have likely served as one of the principal sources of building stone for a large portion of a village or town, and potentially throughout a small region.
75	50,000 - 100,000	Large quarry such as would have likely served as one of the principal sources of building stone for a town, part of a city, and/or possibly throughout a large region.
150	>100,000	Very large quarry of significant industrial scale.

The total number of points that were assigned to all the quarries associated with each building stone were then added together to serve as a measure of the total scale of historic quarrying for each building stone (as presented Tables 1, 2 and 3).

Although this method is inherently somewhat imprecise, and does not take into account the depth (and therefore the volume) of quarry workings, it was intended to serve as a relatively straightforward approach for capturing relevant, available information that should be fit for the purpose of comparing the scale to which the different building stones of Scotland have been quarried, relative to one another.

To minimise wasted effort, the (over 700) quarries that produced the building stone "Caithness Flagstone" were not assigned points.

**Scale score** – this score was produced by ranking and classifying each of the 80 selected building stones into four equal groups, based on the total number of points assigned to each. The 20 building stones with the most points were assigned a "scale" score of 4 (the top score), while the 20 stones with the next most points were assigned a score of 3, and so on. Although points were not assigned for quarries of the building stone Caithness Flagstone, this stone was automatically placed at the top of the group with the most points, and was assigned the top "scale score" (4). As there are over 700 Caithness Flagstone quarries, it can be safely assumed that by any measure the scale to which

Caithness Flagstone has been quarried will exceed that of any other Building Stone by a considerable margin.

• <u>Historic significance score</u> – this score was simply produced by adding together the "Reach score" and the "Scale score". This approach is intended to recognise that the extent to which a stone has been quarried and how widely it was used historically both reflect the historic significance and pedigree of the material, and it attempts to give both these factors equal weight.

#### **QUARRIES DATA EXTRACT**

The tables on the following pages contain information about all of the currently active, and all of the (disused) potentially prospective quarry sites that have been identified and are shown on the factsheets (Section 4). The information is organised into three tables: Table 6 holds details of all the relevant quarry sites that appear on the "sandstone and flagstone" factsheet; Table 7 holds details of those that appear on the "igneous and metamorphic rock" factsheet and; Table 8 holds details of those that appear on the "roofing slate" factsheet. Accompanying notes for these tables are provided in the following sub-section of this appendix.

Table 6. Data extract for all of the active and potentially prospective quarry sites listed for the 22 building stones included on the "sandstone and flagstone" factsheet (see Section 4.1). Clicking on the name of the quarry site in the second column will activate a hyperlink to the corresponding entry for that site in the BSDS web portal.

Building stone	Name of quarry site	Easting	Northing	Status	Land designation	Setting
Caithness Flagstone	Banniskirk cluster	316966	957251	Active: regular supply	Partly protected	Not determined
Caithness Flagstone	Lieurary cluster	308015	962523	Active: regular supply	Undesignated	Not determined
Caithness Flagstone	Spittal cluster	317014	954110	Active: regular supply	Partly protected	Not determined
Caithness Flagstone	Bower quarry	319876	958807	Active: limited supply	Undesignated	Not determined
Caithness Flagstone	Achavrole cluster	309766	959418	Active: limited supply	Undesignated	Not determined
Caithness Flagstone	Achscrabster cluster	308284	963213	Active: limited supply	Undesignated	Not determined
Caithness Flagstone	Skitten cluster	331895	957134	Active: limited supply	Undesignated	Not determined
Dundee Flagstone	Pitairlie cluster	350029	737321	Active: regular supply	Undesignated	Farm land
Dundee Flagstone	Scotston cluster	334335	740998	Active: limited supply	Undesignated	Forestry
Stromness Flagstone	Banks quarry	343978	1030376	Active: limited supply	Undesignated	Open countryside
Stromness Flagstone	Clestrain cluster	330963	1006613	Active: limited supply	Undesignated	Open countryside
Stromness Flagstone	Cursiter cluster	337542	1012405	Active: limited supply	Undesignated	Farm land
Stromness Flagstone	Gairsty cluster	325700	1020544	Active: limited supply	Undesignated	Farm land
Stromness Flagstone	Hill of Heddle cluster	335402	1013087	Active: limited supply	Undesignated	Open countryside
Scone Sandstone	West Drums quarry	358705	757100	Disused, accessible	Undesignated	Open countryside
Scone Sandstone	Ardovie cluster	358586	757836	Disused, accessible	Undesignated	Open countryside
Scone Sandstone	Huntingtower cluster	307500	724732	Disused, accessible	Undesignated	Open countryside
Scone Sandstone	Littleton cluster	319720	745968	Disused, accessible	Undesignated	Open countryside
Raddery Sandstone	Balaldie quarry	287225	879300	Active: limited supply	Undesignated	Open countryside
Raddery Sandstone	Carlungam quarry	276498	884093	Disused, accessible	Undesignated	Coastal
Raddery Sandstone	Corrachie quarry	267935	854330	Disused, accessible	Undesignated	Open countryside
Raddery Sandstone	Drummond quarry	260410	864370	Disused, accessible	Undesignated	Coastal

Raddery Sandstone	Embo quarry	281755	893008	Disused, accessible	Undesignated	Coastal
Raddery Sandstone	Killen quarry	268131	858053	Disused, accessible	Undesignated	Open countryside
Raddery Sandstone	Kinkell quarry	254580	853240	Disused, accessible	Undesignated	Open countryside
Raddery Sandstone	Platcock quarry	272530	857270	Disused, accessible	Undesignated	Open countryside
Raddery Sandstone	Raddery quarry	270455	859055	Disused, accessible	Undesignated	Open countryside
Raddery Sandstone	Suddie quarry	265480	853995	Disused, accessible	Undesignated	Open countryside
Raddery Sandstone	Balvraid cluster	277471	895251	Disused, accessible	Undesignated	Open countryside, Forestry
Raddery Sandstone	Cullicudden cluster	264500	864825	Disused, accessible	Undesignated	Coastal
Raddery Sandstone	Tain cluster	275039	881324	Disused, accessible	Undesignated	Open countryside, Forestry
Raddery Sandstone	Tarradale cluster	255285	849828	Disused, accessible	Undesignated	Open countryside
St Bees Sandstone	Corsehill cluster	320518	569983	Active: regular supply	Undesignated	Farm land
St Bees Sandstone	Cove cluster	325682	571010	Active: regular supply	Undesignated	Farm land
Locharbriggs Sandstone	Locharbriggs cluster	299146	580726	Active: regular supply	Partly protected	Farm land
Corncockle Sandstone	Corncockle cluster	308672	587048	Active: regular supply	Undesignated	Farm land, Forestry
Stratheden and Inverclyde Sandstone	Harelaw quarry	388250	657159	Disused, accessible	Undesignated	Farm land
Stratheden and Inverclyde Sandstone	Ulston Moor quarry	367820	620670	Disused, accessible	Undesignated	Open countryside
Stratheden and Inverclyde Sandstone	Denholmhill White cluster	357178	617115	Disused, accessible	Undesignated	Open countryside
Stratheden and Inverclyde Sandstone	Glenlomond cluster	317135	704991	Disused, accessible	Undesignated	Open countryside
Stratheden and Inverclyde Sandstone	Lantonhill Quarries cluster	362263	620473	Disused, accessible	Undesignated	Open countryside
Stratheden and Inverclyde Sandstone	Ploughlands cluster	363362	630753	Disused, accessible	Undesignated	Open countryside
Gullane Sandstone	Granton cluster	322055	677302	Disused, accessible	Undesignated	Coastal
Upper Limestone Formation Sandstone	Drumhead cluster	281849	683969	Active: regular supply	Undesignated	Open countryside
Upper Limestone Formation Sandstone	Catcraig quarry	283357	647265	Disused, accessible	Undesignated	Open countryside
Upper Limestone Formation Sandstone	Netherwood cluster	276725	677960	Disused, accessible	Undesignated	Farm land
Upper Limestone Formation Sandstone	Threepwood cluster	281473	648170	Disused, accessible	Undesignated	Open countryside
Limestone Coal Formation Sandstone	Creepies quarry	230920	650150	Disused, accessible	Undesignated	Open countryside
Limestone Coal Formation Sandstone	Kittlyknowe quarry	317110	655580	Disused, accessible	Undesignated	Open countryside

Limestone Coal Formation Sandstone	Quarrelburn cluster	226207	642643	Disused, accessible	Undesignated	Farm land
Limestone Coal Formation Sandstone	Todhills cluster	231233	650936	Disused, accessible	Undesignated	Open countryside
Scottish Middle Coal Measures Sandstone	Colenan quarry	234865	632915	Disused, accessible	Undesignated	Open countryside
Scottish Middle Coal Measures Sandstone	Corraith quarry	236575	632075	Disused, accessible	Undesignated	Open countryside
Scottish Middle Coal Measures Sandstone	Craigrie quarry	290365	691660	Disused, accessible	Undesignated	Open countryside
Scottish Middle Coal Measures Sandstone	Devon quarry	289850	695960	Disused, accessible	Undesignated	Open countryside
Scottish Middle Coal Measures Sandstone	Knockentibber quarry	240090	639375	Disused, accessible	Undesignated	Open countryside
Scottish Middle Coal Measures Sandstone	Laigh Logan quarry	254995	625125	Disused, accessible	Undesignated	Open countryside
Scottish Middle Coal Measures Sandstone	North Logan quarry	254760	625750	Disused, accessible	Undesignated	Open countryside
Scottish Middle Coal Measures Sandstone	Ravenscraig quarry	278177	657594	Disused, accessible	Undesignated	Open countryside
Scottish Middle Coal Measures Sandstone	Westfield quarry	290185	691645	Disused, accessible	Undesignated	Open countryside
Scottish Middle Coal Measures Sandstone	Woodhill quarry	240525	639535	Disused, accessible	Undesignated	Open countryside
Scottish Middle Coal Measures Sandstone	Auchinlea supercluster	281030	659185	Disused, accessible	Undesignated	Open countryside, Forestry
Scottish Middle Coal Measures Sandstone	Bankhead cluster	290067	696055	Disused, accessible	Undesignated	Open countryside
Scottish Middle Coal Measures Sandstone	Bellside cluster	281021	658504	Disused, accessible	Undesignated	Open countryside
Scottish Middle Coal Measures Sandstone	Gartness cluster	278682	663193	Disused, accessible	Undesignated	Open countryside
Scottish Middle Coal Measures Sandstone	Greenhill cluster	240302	639404	Disused, accessible	Undesignated	Open countryside
Scottish Middle Coal Measures Sandstone	Harviestoun Castle cluster	293837	697693	Disused, accessible	Undesignated	Open countryside
Scottish Middle Coal Measures Sandstone	Toryglen cluster	278708	662978	Disused, accessible	Undesignated	Open countryside
Scottish Middle Coal Measures Sandstone	Wemyss Den cluster	333815	697640	Disused, accessible	Undesignated	Forestry
Scottish Lower Coal Measures Sandstone	Balhearty quarry	293250	695900	Disused, accessible	Undesignated	Open countryside
Scottish Lower Coal Measures Sandstone	Coalpots quarry	291308	694833	Disused, accessible	Undesignated	Forestry
Scottish Lower Coal Measures Sandstone	Forrestburn quarry	288065	665445	Disused, accessible	Undesignated	Open countryside
Scottish Lower Coal Measures Sandstone	Foxcover Plantation quarry	232426	648471	Disused, accessible	Undesignated	Open countryside
Scottish Lower Coal Measures Sandstone	Old Sandyford quarry	280428	662065	Disused, accessible	Undesignated	Open countryside
Scottish Lower Coal Measures Sandstone	Barleydean/Parduvine cluster	329434	660765	Disused, accessible	Undesignated	Open countryside
Scottish Lower Coal Measures Sandstone	Braehead Fauldhouse cluster	292019	660522	Disused, accessible	Undesignated	Open countryside

Scottish Lower Coal Measures Sandstone	Overwood cluster	277071	645938	Disused, accessible	Undesignated	Open countryside
Scottish Lower Coal Measures Sandstone	Quarry Park Plantation cluster	330695	700981	Disused, accessible	Undesignated	Open countryside
Hopetoun Sandstone	Viewfield quarry	301515	656450	Disused, accessible	Undesignated	Open countryside
Calders Sandstone	Burn Craigs cluster	309133	676863	Disused, accessible	Undesignated	Forestry
Passage Sandstone	Castlecary Lime Works quarry	278605	677792	Disused, accessible	Undesignated	Open countryside
Passage Sandstone	Dalpatrick quarry	280670	649355	Disused, accessible	Undesignated	Open countryside
Passage Sandstone	Eggerton quarry	284990	631830	Disused, accessible	Undesignated	Forestry
Passage Sandstone	Gain quarry	273535	670425	Disused, accessible	Undesignated	Open countryside
Passage Sandstone	Levenseat quarry	294505	659235	Disused, accessible	Undesignated	Open countryside
Passage Sandstone	The Spats quarry	335283	702596	Disused, accessible	Undesignated	Open countryside
Passage Sandstone	Whitehill quarry	284840	688045	Disused, accessible	Undesignated	Farm land
Passage Sandstone	Blair cluster	296527	685862	Disused, accessible	Undesignated	Farm land
Passage Sandstone	Monkcastle cluster	229063	647365	Disused, accessible	Undesignated	Open countryside
Passage Sandstone	Sands cluster	294460	686369	Disused, accessible	Undesignated	Farm land
Scottish Upper Coal Measures Sandstone	Benston quarry	243934	624959	Disused, accessible	Undesignated	Open countryside
Scottish Upper Coal Measures Sandstone	Bredisholm quarry	270200	662475	Disused, accessible	Undesignated	Open countryside
Scottish Upper Coal Measures Sandstone	Cambusnethan quarry	278475	653670	Disused, accessible	Undesignated	Forestry
Scottish Upper Coal Measures Sandstone	Crawfordston quarry	241200	623249	Disused, accessible	Undesignated	Open countryside
Scottish Upper Coal Measures Sandstone	Montgarswood Flagstone quarry	253086	627473	Disused, accessible	Undesignated	Open countryside
Ballagan Sandstone	Swinton cluster	385354	648507	Active: regular supply	Undesignated	Farm land
Sandy Craig Sandstone	Cullalo cluster	318925	688207	Active: limited supply	Undesignated	Farm land
Sandy Craig Sandstone	Binnend quarry	324000	687140	Disused, accessible	Undesignated	Open countryside
Sandy Craig Sandstone	Kemback Wood quarry	342450	715693	Disused, accessible	Undesignated	Forestry
Sandy Craig Sandstone	Flisk cluster	343102	715776	Disused, accessible	Undesignated	Forestry
Sandy Craig Sandstone	Newbigging cluster	321018	686370	Disused, accessible	Undesignated	Farm land

Table 7. Data extract for all of the active and potentially prospective quarry sites listed for the 12 building stones included on the "igneous and metamorphic rock" factsheet (see Section 4.2). Clicking on the name of the quarry site in the second column will activate a hyperlink to the corresponding entry for that site in the BSDS web portal.

Building stone	Name of quarry site	Easting	Northing	Status	Land designation	Setting
Peterhead Granite	Longhaven cluster	411549	839094	Active: limited supply	Sensitive, partly protected	Coastal
Peterhead Granite	Stirling Hill cluster	412502	841251	Active: limited supply	Undesignated	Open countryside
Peterhead Granite	Cowsrieve quarry	408899	844387	Disused, accessible	Undesignated	Farm land
Peterhead Granite	Sandfordhill cluster	411630	841733	Disused, accessible	Undesignated	Open countryside
Corrennie Granite	Corrennie cluster	364105	811903	Active: limited supply	Undesignated	Open countryside, Forestry
Corrennie Granite	South Tillykerrie quarry	362227	812486	Disused, accessible	Undesignated	Open countryside
Ross of Mull Granite	Aridhglas quarry	132465	723030	Disused, accessible	Undesignated	Open countryside
Ross of Mull Granite	Erraid quarry	129787	720426	Disused, accessible	Undesignated	Open countryside
Ross of Mull Granite	Tormore cluster	130495	723970	Disused, accessible	Undesignated	Open countryside
Kemnay Granite	Tom's Forest quarry	376200	817000	Active: limited supply	Undesignated	Open countryside
Kemnay Granite	Kemnay cluster	373755	816968	Active: limited supply	Undesignated	Built up area, Farm Land
Dalbeattie Granite	Craignair cluster	281958	560689	Active: limited supply	Undesignated	Farm land, Forestry
Cruachan Granite	Bonawe cluster	201518	733460	Active: limited supply	Partly protected	Coastal
Scottish Mafite	Boards quarry	279185	685535	Active: limited supply	Undesignated	Open countryside
Scottish Mafite	Craighouse Farm quarry	360220	635705	Active: limited supply	Undesignated	Farm land
Scottish Mafite	Cruicks quarry	313075	681600	Active: limited supply	Sensitive	Built up area, Open countryside
Scottish Mafite	Northfield quarry	280000	685400	Active: limited supply	Undesignated	Open countryside
Scottish Mafite	Riskend quarry	272830	679225	Active: limited supply	Sensitive	Open countryside
Scottish Mafite	Tam's Loup quarry	288550	663930	Active: limited supply	Undesignated	Open countryside
Scottish Mafite	Cairneyhill cluster	284952	666373	Active: limited supply	Undesignated	Open countryside
Scottish Mafite	Duntilland cluster	284263	663568	Active: limited supply	Undesignated	Open countryside

Scottish Mafite	Beltmoss quarry	272125	679060	Disused, accessible	Undesignated	Open countryside
Scottish Mafite	Bowdenmoor quarry	353570	631830	Disused, accessible	Undesignated	Open countryside
Scottish Mafite	Forresthill quarry	285965	666675	Disused, accessible	Undesignated	Farm land
Scottish Mafite	Gatehouse quarry	287080	746025	Disused, accessible	Undesignated	Forestry
Scottish Mafite	Kinninmonth quarry	343012	712513	Disused, accessible	Undesignated	Farm land
Scottish Mafite	Old Lurdenlaw quarry	376550	631640	Disused, accessible	Undesignated	Farm land
Scottish Mafite	Ladeddie cluster	344308	713324	Disused, accessible	Undesignated	Farm land
Furnace Porphyry	Furnace cluster	202877	700140	Active: limited supply	Partly sensitive	Forestry, Coastal
Furnace Porphyry	Crarae quarry	199525	698195	Disused, accessible	Undesignated	Coastal
Scottish Felsite	Balmullo quarry	341800	721420	Active: limited supply	Undesignated	Farm land
Scottish Felsite	Bogary quarry	194720	623955	Active: limited supply	Undesignated	Open countryside
Scottish Felsite	Dunduff quarry	277900	641000	Active: limited supply	Undesignated	Farm land
Scottish Felsite	Bemersyde cluster	359528	634397	Disused, accessible	Undesignated	Open countryside, Farmland
Scottish Felsite	Cauldshiels Hill cluster	351610	631743	Disused, accessible	Undesignated	Farm land
Southern Uplands Greywacke	Barbeth quarry	201078	565483	Disused, accessible	Undesignated	Farm land
Southern Uplands Greywacke	Challoch Hill quarry	201365	563065	Disused, accessible	Undesignated	Farm land
Southern Uplands Greywacke	Edston quarry	322750	639650	Disused, accessible	Undesignated	Forestry
Southern Uplands Greywacke	Garpol quarry	306775	603000	Disused, accessible	Undesignated	Open countryside
Southern Uplands Greywacke	Horsburgh Castle quarry	328470	639090	Disused, accessible	Undesignated	Open countryside
Southern Uplands Greywacke	Sterniehall Plantation quarry	353115	644685	Disused, accessible	Undesignated	Farm land
Southern Uplands Greywacke	Windgate House quarry	301570	627275	Disused, accessible	Undesignated	Open countryside
Southern Uplands Greywacke	Balkelly cluster	211035	543008	Disused, accessible	Undesignated	Farm land
Southern Uplands Greywacke	Balshere cluster	211566	539357	Disused, accessible	Undesignated	Farm land
Southern Uplands Greywacke	Boondreigh Burn cluster	359241	651905	Disused, accessible	Undesignated	Open countryside
Southern Uplands Greywacke	Threapwood Bridge cluster	351863	644252	Disused, accessible	Undesignated	Forestry
Southern Uplands Greywacke	Woodheads Hill cluster	352290	645052	Disused, accessible	Undesignated	Farm land, Forestry

Table 8. Data extract for all of the active and potentially prospective quarry sites listed for the 3 building stones included on the "roofing slate" factsheet (see Section 4.3). Clicking on the name of the quarry site in the second column will activate a hyperlink to the corresponding entry for that site in the BSDS web portal.

Building stone	Name of quarry site	Easting	Northing	Status	Land designation	Setting
West Highland Slate	Creag Nam Meall Workings quarry	206607	764073	Disused, accessible	Undesignated	Forestry
West Highland Slate	Ballachulish Slate supercluster	208304	757761	Disused, accessible	Undesignated	Open countryside, Forestry
West Highland Slate	Luing supercluster	174196	710931	Disused, accessible	Undesignated	Coastal
West Highland Slate	Breine Phort cluster	175322	543008	Disused, accessible	Undesignated	Coastal
West Highland Slate	Coire Uainean Mor cluster	206742	539357	Disused, accessible	Undesignated	Open countryside
West Highland Slate	Easdale Island cluster	173708	651905	Disused, accessible	Undesignated	Coastal
West Highland Slate	Tarbert cluster	161340	644252	Disused, accessible	Undesignated	Coastal
Highland Border Slate	Aberuchill quarry	271600	719715	Disused, accessible	Undesignated	Open countryside
Highland Border Slate	Braincroft quarry	281130	723750	Disused, accessible	Undesignated	Open countryside
Highland Border Slate	Clynder quarry	224445	683595	Disused, accessible	Undesignated	Forestry
Highland Border Slate	Drummond quarry	270900	718800	Disused, accessible	Undesignated	Open countryside
Highland Border Slate	Dunie quarry	292370	730560	Disused, accessible	Undesignated	Open countryside
Highland Border Slate	Gadgers Hall quarry	309707	745598	Disused, accessible	Undesignated	Open countryside
Highland Border Slate	Inchmarnock Slate quarry	202690	659185	Disused, accessible	Undesignated	Coastal
Highland Border Slate	Lunanbank quarry	309149	745182	Disused, accessible	Undesignated	Open countryside
Highland Border Slate	Bute Slate supercluster	205698	667596	Disused, accessible	Undesignated	Open countryside, Coastal
Highland Border Slate	Botich cluster	292906	730949	Disused, accessible	Undesignated	Open countryside
Highland Border Slate	Craiglea cluster	294888	732250	Disused, accessible	Undesignated	Open countryside
Highland Border Slate	Glenshee cluster	298827	734504	Disused, accessible	Undesignated	Open countryside
Highland Border Slate	Lochranza cluster	196153	650342	Disused, accessible	Undesignated	Open countryside
Highland Border Slate	Newtyle cluster	304815	741435	Disused, accessible	Undesignated	Open countryside
Highland Border Slate	Obney Hill cluster	301550	737488	Disused, accessible	Undesignated	Open countryside

Highland Border Slate	Ruhumman cluster	297830	733797	Disused, accessible	Undesignated	Open countryside
Macduff Slate	Easter Mountbletton quarry	373113	861407	Disused, accessible	Undesignated	Farm land
Macduff Slate	Maryfield quarry	369860	836315	Disused, accessible	Undesignated	Farm land
Macduff Slate	Pitglassie quarry	368399	843619	Disused, accessible	Undesignated	Farm land
Macduff Slate	Haining cluster	354823	832804	Disused, accessible	Undesignated	Open countryside, Farmland
Macduff Slate	Hill of Foudland cluster	360345	833384	Disused, accessible	Undesignated	Forestry
Macduff Slate	Hill of Tillymorgan cluster	365382	834599	Disused, accessible	Undesignated	Open countryside
Macduff Slate	Kirkney cluster	350764	831593	Disused, accessible	Undesignated	Forestry
Macduff Slate	Logie Newton cluster	365965	838810	Disused, accessible	Undesignated	Open countryside
Macduff Slate	Muiryfield cluster	363861	851217	Disused, accessible	Undesignated	Open countryside

#### ACCOMPANYING NOTES FOR QUARRIES DATA EXTRACT

Each bulleted note below relates to the corresponding column heading in Table 6, Table 7, and Table 8.

- **<u>Building stone</u>** the name of the building stone extracted at the site, according to the scheme of building stones used for the BSDS.
- <u>Name of quarry site</u> the name of the quarry site, according to the BSDS. To allow for simple representation at the nationwide scale, all of the quarries in the BSDS that are grouped within a cluster or supercluster are treated as a single quarry site. This is reflected in the names presented in this column. The hyperlinks to the BSDS that are included for each row. Tables 6–8 can be used to obtain further information about the constituent quarries of each cluster and supercluster.
- <u>Status</u> the status of the quarry, in terms of resource accessibility. This was investigated by reviewing satellite images, current Ordnance Survey maps, and the BGS Database of Mines and Quarries (BritPits), as well as limited research of publicly available information. In each case, the quarry status is expressed using one of the terms from the list below:

Active (regular supply)	Most accessible
Active (limited supply)	Ť
Disused, accessible	
Disused, overgrown	
Flooded	
Infilled	Ι
Built over	Least accessible

Several of the quarry clusters and superclusters each comprise a number of individual quarries that vary in terms of accessibility. In these situations, the cluster or supercluster was assigned a status term that relates to the most accessible of these quarries. For example, a cluster that consists of one disused but accessible, one flooded, and two infilled quarries would be defined as "Disused, accessible" (because although significant parts of the quarry workings are flooded and infilled, it is still possible to access the stone resource in part of the site).

 <u>Land designation</u> – information about whether the quarry site is located within, or surrounded by, any environmentally or culturally protected or sensitive areas. The terms used and the corresponding criteria used to define them are listed below:

Undesignated	As far as we are aware, the quarry site is not affected by cultural or environmental protections
Culturally protected	The quarry site falls within a culturally protected area(s), including gardens and designed landscapes, battlefields, conservation areas and world heritage sites, as defined by Historic Environment Scotland – see https://portal.historicenvironment.scot/downloads
Environmentally protected	The quarry site falls within an area where it is understood that there are statutory environmental protections in place, including National Nature Reserves, Marine Protected Areas, Biogenetic Reserves, Special Areas of Conservation, European Diploma Areas, Special Protection Areas, Regional Parks, World Heritage Sites, SSSIs, RAMSAR, Nature Reserves, Marine Consultation Areas,

	and Biosphere Reserves, as defined by NatureScot – see https://opendata.nature.scot/
Sensitive	The quarry site falls within an area where it is understood that there are non-statutory environmental protections in place, including Geological Conservation Review sites and Country Parks, as defined by NatureScot – see https://opendata.nature.scot/
Partly protected / partly sensitive	These terms are used in situations where one or more of the constituent quarries within a quarry cluster or supercluster are classed as environmentally/culturally protected or sensitive, while the remainder are undesignated.

• <u>Setting</u> – the setting of the quarry, in terms of the character of the current land use at and/or surrounding the site. This was investigated by reviewing satellite images and current Ordnance Survey maps. In each case, the quarry setting is expressed using terms from the list below:

Built up area	
Farm land	
Forestry	
Open countryside	
Parkland	
Coastal	

In situations where a cluster or supercluster consists of individual quarries that are situated within different settings, multiple terms from this list are used, as appropriate.

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