Historic England

Cumbria

Building Stones of England

The Building Stones of England

England's rich architectural heritage owes much to the great variety of stones used in buildings and other structures. The building stones commonly reflect the local geology, imparting local distinctiveness to historic towns, villages and rural landscapes.

Historic England and the British Geological Survey (BGS), working with local geologists and historic buildings experts, have compiled the Building Stones Database for England to identify important building stones, where they came from and potential alternative sources for repairs and new construction.

Drawing on this research, plus BGS publications and fieldwork, guides like this one have been produced for each English county. The guides are aimed at mineral planners, building conservation advisers, architects and surveyors, and those assessing townscapes and countryside character. The guides will also be of interest if you want to find out more about local buildings, natural history, and landscapes.

This guide is based on original research and text by Graham Lott and Stephen Parry (British Geological Survey).

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Front cover: Cottages, Ambleside. Westmorland Slate. © AM Stock 2 / Alamy Stock Photo.

How to Use this Guide

Each guide describes the local building stones in their geological timescale order, starting with the oldest layers through to the youngest. The guide ends with examples of other notable building stones from other parts of England and further afield.

Geological time periods, groups, formations and building stones

Each building stone is listed under the relevant geological timescale, group and formation. A formation may be divided into members and where relevant these are referenced in individual building stone sections.

Middle Jurassic
↑ geological time period

Inferior Oolite Group, Lincolnshire Limestone Formation
↑ geological group ↑ geological formation

Lincolnshire Limestone
↑ building stone (alternative or local name)

Bedrock geology map and stratigraphic table

To help you with the geology of the area, there is a bedrock geology map and a stratigraphic table which shows the layers of rocks and the associated building stones in this geological timescale, group, formation order.

Page numbers for each building stone are included in the stratigraphic table for ease of reference. The page numbers are inverted to correspond with the geological age order.

Contents list

If you click on the page number for a building stone in the Contents list, you will go straight to the relevant section in the guide.

Building stone sources and building examples

A companion spreadsheet to this guide provides:

- More examples of buildings. Information is included on building type, date, architectural style, building stone source, and listed/ scheduled status
- A list of known (active and ceased) building stone sources such as quarries, mines, pits and delphs
- Additional information on building stones including lithology, grain size, sedimentary structures, key identification features, and notes on failure/weathering, and use.

The Building Stone GIS map allows you to search the Building Stones Database for England for:

- A building stone type in an area
- Details on individual mapped buildings or stone sources
- Potential sources of building stone sources within a given proximity of a stone building or area
- Buildings or stone sources in individual mineral planning authority area.

Further Reading, Online Resources and Contacts

The guide includes geological and building stone references for the area. A separate guide is provided on general Further Reading, Online Resources and Contacts.

Glossary

The guides include many geological terms. A separate Glossary explaining these terms is provided to be used alongside the guides.

The guides use the BGS lexicon of named rock units.

Mineral and local planning authorities

This guide covers the mineral planning authority areas of Cumbria County Council, the Lake District National Park and part of the Yorkshire Dales National Park; and the local planning authority areas of the City of Carlisle, Allerdale, Eden, Copeland, South Lakeland, Barrow-in-Furness and the two national parks.

Contents

1 Introduction

Cumbria boasts not only some of England's most attractive and unspoilt scenery, but it also represents an area of highly varied geology. The various rock types present have been used extensively to construct its unique assemblage of vernacular stone buildings. In some cases, they have also been exported to markets much further afield, both national and international.

Given the wealth and range of lithologies present, it is not surprising that stone-built structures dating back to prehistoric times are found within Cumbria. These include the Late Neolithic to Early Bronze Age 'Long Meg and her Daughters' stone circle, comprising, respectively, a silica-cemented red Penrith Sandstone monolith and in excess of 50 large igneous erratics. The Romans' organisation of quarrying of stone and building approach from the 2nd century is evident in the remains of their many forts and other buildings. Examples are found at Hardknott, comprising various igneous building stones from the Borrowdale Volcanic Group; Ravenglass, where the bath house is of red St Bees Sandstone; and Bewcastle, where there is Carboniferous limestone and sandstone, the blocks of which were reused in the 11th century for the castle on the same site. By far the most impressive of all the Roman remains in Cumbria, however, is Hadrian's Wall, constructed to protect the northernmost limits of the Roman Empire. It was built, in large part, of local stone types, which are as varied as the geology of the formations that it crosses.

After the departure of the Romans in the 4th century there followed a long period during which there appears to have been little significant use of building stone, except for the re-use of material from earlier Roman structures. However, it is evident from the decoratively carved Anglo-Saxon stone crosses found, for example, at Bewcastle and Kirkby Stephen (both Carboniferous sandstone) and also at Great Urswick (red St Bees Sandstone) that the skills associated with the selection, quarrying and carving of stone lived on in Cumbria during the Dark Ages. A return to using stone for large-scale building projects awaited the arrival of the Norman barons in the late 11th century. The local stone resources were employed to great advantage at this time in the construction of defensive castles, such as those at Carlisle and Brough.

Subsequently, many of the area's churches were established, and these were built primarily of locally quarried stone.

During medieval times, the remoteness of much of Cumbria attracted monastic communities, which made extensive use of the locally available

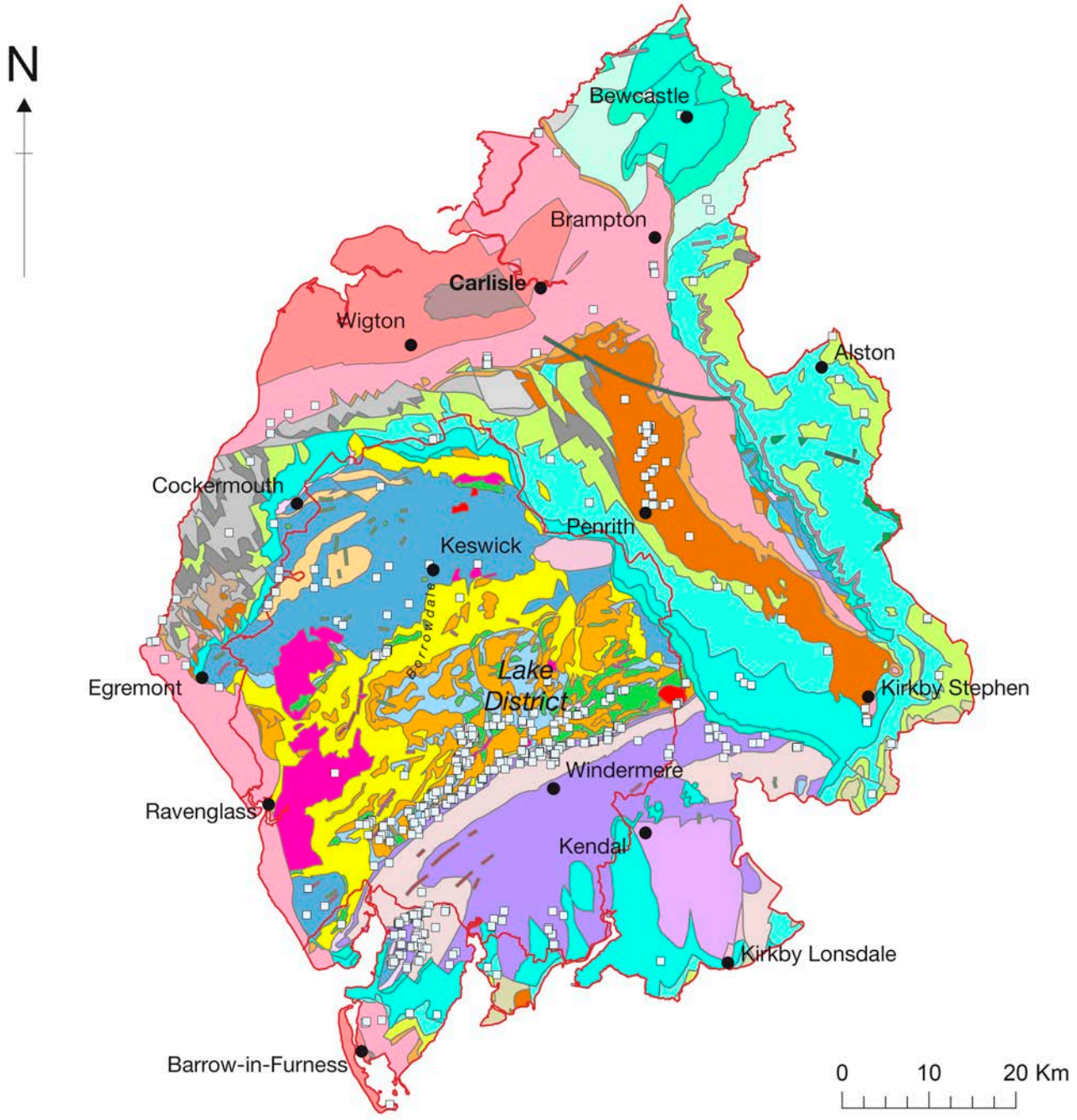
Figure 1: View along the Roman wall at Hardknott. Various igneous building stones.

stone types in the construction of their abbeys and priories. Remnants of these often-substantial buildings survived the Dissolution of the Monasteries in the 16th century, and were left either as ruins (now much visited) or were in part revitalised as parish churches. Examples include Barrow-in-Furness (red Triassic Sherwood Sandstone), Lanercost (grey Carboniferous sandstone and red St Bees Sandstone) and Cartmel (grey Carboniferous sandstone from the Alston Formation).

Cumbria's late medieval defensive towers and castles reflect the turbulent nature of these times. Examples include Appleby-in-Westmorland (local Carboniferous sandstone), Brough (variegated Carboniferous sandstone, in part reused, and red Permian Penrith Sandstone) and Carlisle (red Lazonby, red St Bees and grey Kirklinton Sandstones). These structures were later joined by a wide range of smaller fortified tower houses (Peel, or Pele, houses), such as at Clifton (pink Carboniferous sandstone) and Dalton-in-Furness (pale grey Carboniferous limestone and red-brown Sherwood Sandstone). From the 17th century, and on into the 19th century, more peaceful times saw the construction or remodelling of some of Cumbria's best-known and now most-visited stately homes, including Lowther Castle (Carboniferous sandstone) and Naworth Castle (grey Carboniferous and red Triassic sandstones).

The last of Cumbria's major stone-building projects were undertaken by 19th-century Victorian architect-builders, including leading lights of this period such as William Butterfield, George Gilbert Scott, Augustus Pugin, Ewan Christian, Anthony Salvin and Alfred Waterhouse, whose work is seen across the county. These architects, in large measure, oversaw the construction or reconstruction of many of the churches, great houses and other buildings that typify the Lakeland stone architecture seen today in Ambleside, Bowness-on-Windermere, Keswick and Troutbeck, for example.

Bedrock Geology Map



Key

Building stone sources

Sedimentary rocks

Lias Group — mudstone, siltstone, limestone and sandstone

Triassic Rocks — mudstone, siltstone and sandstone

Triassic Rocks — sandstone and conglomerate, interbedded

Permian Rocks — mudstone, siltstone and sandstone

Permian Rocks — sandstone and conglomerate, interbedded

Warwickshire Group — siltstone and sandstone with subordinate mudstone

Pennine Upper Coal Measures Formation — mudstone, siltstone, sandstone, coal

Pennine Middle Coal Measures Formation — mudstone, siltstone, sandstone, coal

Pennine Lower Coal Measures Formation — mudstone, siltstone, sandstone, coal

Millstone Grit Group — mudstone, siltstone and sandstone

Yoredale Group — limestone, mudstone and subordinate sandstone, interbedded

Yoredale Group — limestone with subordinate sandstone and mudstone

Yoredale Group — limestone, sandstone, siltstone and mudstone

Bowland High Group and Craven Group — mudstone, siltstone and sandstone

Border Group — sandstone with subordinate mudstone and limestone

Dinantian Rocks — limestone with subordinate sandstone and mudstone

Dinantian Rocks — sandstone, limestone and mudstone

Inverclyde Group — sandstone, siltstone and mudstone

Upper Devonian Rocks — sandstone and conglomerate, interbedded

Silurian Rocks — sandstone and conglomerate, interbedded (meta-sediments)

Wenlock Rocks — sandstone and conglomerate, interbedded (meta-sediments)

Silurian Rocks — mudstone, siltstone and sandstone (meta-sediments)

Ashgill Rocks — mudstone, siltstone and sandstone (meta-sediments)

Caradoc Rocks — mudstone, siltstone and sandstone (meta-sediments)

Ordovician Rocks — sandstone and conglomerate, interbedded (meta-sediments)

Ordovician Rocks — mudstone, siltstone and sandstone (meta-sediments)

Extrusive igneous rocks

Unnamed extrusive rocks, Carboniferous — mafic lavas and tuffs

Unnamed extrusive rocks, Ordovician — felsic lavas and tuffs

Unnamed extrusive rocks, Ordovician — mafic lavas and tuffs

Intrusive igneous rocks

Unnamed igneous intrusion, Palaeogene — mafic igneous rock

Unnamed igneous intrusion, Carboniferous to Permian — mafic igneous rock

Unnamed igneous intrusion, Carboniferous to Permian — dolerite and tholeiitic basalt

Unnamed igneous intrusion, Late Silurian to Early Devonian — felsic rock

Unnamed igneous intrusion, Ordovician to Silurian — felsic rock

Unnamed igneous intrusion, Ordovician to Silurian — mafic igneous rock

Stratigraphic Table

Geological timescale	Group	Formation	Building Stone	Page
Quaternary	various	various	Tufa Boulders, cobbles, fieldstones	26 23
Triassic	Sherwood Sandstone Group	St Bees Sandstone Formation	Sherwood Sandstone, St Bees Sandstone, Kirklinton Sandstone	21
		Kirklinton Sandstone Formation		
Permian	Appleby Group	Penrith Sandstone Formation	Penrith Sandstone, Plumpton Red Sandstone	19
		Brockram Formation	Brockram Breccia	18
Carboniferous	Warwickshire Group	Whitehaven Sandstone Formation	Whitehaven Sandstone	18
	Pennine Coal Measures Group	Pennine Middle Coal Measures Formation	Main Band, Bannock Band, Ten Quarters Rock, Countess Sandstone	17
		Pennine Lower Coal Measures Formation	Harrington Four Foot Rock, Six Quarters Rock	17
	Yoredale Group	various formerly assigned to the 'Calciferous Sandstone Series'	Yoredale Group sandstones, Orebank Sandstone, Hensingham Grit	16
	Great Scar Limestone Group	various including the Urswick Limestone Formation, Dalton Formation	Great Scar Limestone, Urswick Limestone, Dalton Limestone	14
Devonian	various igneous intrusions	Shap Pluton	Shap Granite	13
		Skiddaw Pluton	Skiddaw Granite	13
		minor igneous intrusions	Lamprophyre Dyke Rock	13
Silurian	Kendal Group	Kirkby Moor Formation	Kirkby Moor Formation Sandstone	12
		Bannisdale Formation	Bannisdale Formation Sandstone	12
	Coniston Group	Gawthwaite Formation	Gawthwaite Formation Sandstone	12
	Tranearth Group	Wray Castle Formation	Burlington Slate Kirkby Slate	12 12
	Stockdale Group	Skelgill Formation, Browgill Formation, Brathay Formation	Brathay Slate	12
	Dent Group	Ashgill Formation		
Ordovician	various igneous intrusions	Ennerdale Intrusion	Ennerdale Granite	11
		Eskdale Intrusion	Broad Oak Granodiorite, Eskdale Granite	11
	Borrowdale Volcanic Group	various including Seathwaite Fell Sandstone Formation, Eagle Crag Sandstone Member, Birker Fell Andesite Group	Lakeland Slate, Cumberland Slate, Westmorland Slate, Seathwaite Slate, Honister Slate	8
		Threlkeld Intrusion	Threlkeld Granite	7
	Skiddaw Group	various	Skiddaw Slate	7

Building stones in geological order from the oldest through to the youngest layers.

2 Local Building Stones

The geological history of Cumbria is complex and as yet not fully understood. Modern stratigraphical reappraisals have resulted in both interpretational changes and significant revisions to the nomenclature applied to the area's rock successions. An up-to-date account of the geology of Cumbria is provided in the 5th edition of the British Geological Survey's Regional Guide to Northern England (2010).

The oldest rocks occurring within Cumbria crop out in the Lakeland Fells around Borrowdale and are well exposed on the high peaks of Skiddaw, Scafell Pike and Great Gable. These rocks, comprising a thick, deformed and faulted sequence dominated by metamorphosed mudstones, siltstones and volcaniclastic rocks (the Cumbrian slates), form a Lower Palaeozoic (Siluro-Ordovician) 'core' to the area. This is intruded by a variety of igneous rocks, including granites and diorites. Surrounding the mountainous core, which typifies the scenery of the Lake District National Park, are lower-lying areas underlain by younger sedimentary rocks. These include the thick Carboniferous successions of Alston, Kirkby Stephen and the Cumberland (or Whitehaven) Coalfield, and the deep Permo-Triassic basins of the Vale of Eden, Carlisle and Barrow-in-Furness.

Much of Cumbria's present-day topography is a reflection of the climatic instability that has characterised the past 2.5 million years. During Pleistocene times, glaciers episodically radiated outwards from the central 'highlands', deeply eroding these parts and mantling the valley floors and adjacent areas with thick blankets of unconsolidated till and fluvio-glacial sediments. In the west, this thick succession extends to the coastal plain and beyond, while to the east it drapes the Permo-Triassic rocks of the Eden Valley.

Local quarrying of stone in Cumbria dates back to Roman times, as is widely evident from its use in Roman buildings and structures across the area. However, the quarrying of building stone as an industry came relatively late in Cumbria, due to the varied and often extreme topography of the county. Prior to the mid-19th century, only a few quarry operators with ready access to a suitable means of transportation, principally the sea, were able to move their commodities any great distance. Some Cumbrian roofing slate producers, for example, were regularly shipping their products to London and the south of England by the 17th century, while the coastal quarries around St Bees (working red Triassic sandstone) were exporting building stone to the United States, Australia and Scotland during the first half of the 19th century. Further growth of the Cumbrian stone quarrying industry had

to wait for the development of the local road and rail networks in the 19th and 20th centuries, which enabled access to wider national markets.

Ordovician

Skiddaw Group, various formations

Skiddaw Slate

The Skiddaw Group consists primarily of dark-coloured slates, more specifically, metamorphosed siltstones and mudstones with sporadic beds of greywacke. These have been widely used as a vernacular building stone, often in crudely dressed rubblestone form. Finely cleaved lithologies capable of serving as good quality roofing slate are not generally present, however. The largest town located on the outcrop is Keswick, which is very much characterised by its distinctive stone buildings. Keswick expanded considerably during the 19th century, and the new buildings were constructed of a wide range of stone types 'imported' from other areas of Cumbria (suggesting indifference to the local Skiddaw Group slates). It is, consequently, a town that has some of the most interesting, varied and colourful Victorian stone architecture in Cumbria. Polychromatic fabrics are commonplace and make the town one of the more interesting and challenging building stone trails in Cumbria.

Borrowdale Volcanic Group, Threlkeld Intrusion, various including Seathwaite Fell Sandstone Formation, Eagle Crag Sandstone Member, Birker Fell Andesite Group

The Borrowdale Volcanic Group comprises a substantial thickness of sub-aqueously deposited volcanic sediments (tuffs, coarse-grained volcaniclastic sandstones and agglomerates), with abundant interbedded sequences of lava flows and sills. These rocks crop out most impressively in and around the high peaks of the Lake District National Park at, for example, Scafell Pike and Great Gable. Both the mapping and correlation of the Borrowdale Volcanic Group rocks across the area have always been problematic, due to the lack of stratigraphically useful marker horizons within the succession.

Threlkeld Granite

This body of porphyritic grey microgranite (the Threlkeld Intrusion) forms a series of outcrops to the south of Threlkeld. The granite was used locally to a limited extent in farm buildings and for quoins. It is also seen in Keswick, most notably in the Roman Catholic Church of Our Lady of the Lakes and St Charles. The large areal extent of the modern Threlkeld Quarry (located to the south-east of Birkett Mire) is the result of its 19th-century production activities, when it supplied stone for the construction of nearby Thirlmere reservoir and ballast for the developing local railway networks.

Lakeland Slate, Cumberland Slate, Westmorland Slate, Seathwaite Slate, Honister Slate

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The tectonic deformation of the Borrowdale Volcanic Group strata during the Lower Devonian imprinted a cleavage that is particularly well developed in the finer grained volcaniclastic horizons. It is these strongly cleaved rocks, which occur at several different stratigraphic levels, that are one of the principal sources of the renowned blue, grey and green Lakeland roofing slates. The slate beds are still quarried in large surface workings, or are mined along deep adits that follow the target slate bands.

Historically, the major slate quarrying areas lay in and around Ambleside, Skelwith Bridge, Little Langdale, Elterwater, Grasmere, Coniston and Honister. At the Honister Slate Mine, located towards the eastern end of the Honister Pass, production of the eponymously named olive-green roofing slates continues today by traditional means. In addition to the Honister operations (where the Eagle Crag Sandstone Formation is worked), current slate quarrying activities within the Borrowdale Volcanic Group are concentrated in the Coniston, Tilberthwaite and Elterwater areas (all working the Seathwaite Fell Sandstone Formation).

Figure 2: Elterwater Slate Quarry, Great Langdale. Seathwaite Fell Sandstone Formation.

The cleaved lithologies, in general, have been employed for vernacular building purposes, both as roofing and as a walling material. Indeed, there is evidence of the use of Borrowdale Volcanic Group rocks as rubblestone walling dating back to at least Roman times (for example, at Hardknott Fort). Whereas the stone used for walling tended to come from the coarser grained, more poorly sorted and imperfectly cleaved beds, the highest quality roofing slates originated from the fine-grained and finely cleaved tuff bands. These could be split along their natural cleavage to produce large heavy slabs of uniform colour and thickness. It was common practice to lay the roofing slates in diminishing courses from eaves to ridge.

Initially, the roofing slates could only be supplied to the local market, but as transportation networks developed, they became much sought-after in the construction of higher status buildings across the rest of England and in parts of Scotland. Slates from the quarries located near Troutbeck Park had reached London (for example, Chelsea Hospital and Kensington Palace) and other southern markets by the mid-17th century. They were transported first by pack animals and carts, then by boats along local river courses, and finally by sea.

The vernacular cottages and farms of the Borrowdale Volcanic Group outcrop area are characterised by coursed and uncoursed slate rubblestone wall fabrics, which sometimes incorporate other more tractable stone types, such as Carboniferous sandstones and limestones, as window lintels, mouldings and door surrounds. At Elterwater, the rubblestone cottages feature massive irregularly shaped window lintels and quoins of the local green slate. These old highly distinctive vernacular building styles were subsequently copied in the architecture of the rapidly expanding Victorian resort towns, including Windermere, Troutbeck, Ambleside, Skelwith Bridge and Keswick.

Figure 3: Former police station and adjoining Magistrates Court, Keswick. Borrowdale Volcanic Group slate and Permo-Triassic sandstone.

Figure 4: Bridge House, Ambleside. Borrowdale Volcanic Group rubblestone, including vesicular andesite.

Figure 5: Cottage on Chapel Hill, Ambleside. Borrowdale Volcanic Group slate.

Various igneous intrusions, Eskdale Intrusion, Ennerdale Intrusion

Broad Oak Granodiorite, Eskdale Granite

The grey Broad Oak Granodiorite has been both quarried and gathered (in the form of fieldstones) around Waberthwaite for use as a building stone and, occasionally, as an ornamental stone. The large quarry to the west of Broad Oak itself is not in regular production at present, but limited amounts of stone can be supplied to meet specific requirements.

This sizeable Eskdale Intrusion is dominated by medium to coarse-grained granite and granodiorite. It crops out in the Eskdale Fell, Muncaster Fell and Waberthwaite areas. The complex was the source of the pale pink microgranite used to build the Victorian mansion house known as Muncaster Castle (the stone was likely produced at Beckfoot Quarry) and various line-side buildings erected by the Whitehaven and Furness Junction Railway, such as the station at Millom.

Figure 6: Railway station, Millom. Eskdale Granite blocks with dressings and bands of red-brown Sherwood Sandstone.

Ennerdale Granite

The Ennerdale Intrusion crops out to the north and south of Ennerdale Water, covering an area of some 50km^2. It comprises variably porphyritic (crystalline), granophyric (angular quartz and alkali feldspar intergrowths) granite and microgranite, with zones of diorite, dolerite and hybridised rocks. The pink and grey-green granitic rock used for the Church of St James (and some of the farm buildings) at Buttermere is believed to originate from this intrusive body.

Silurian

The strata of Upper Ordovician (Ashgill) and Silurian age is a very thick (about 4.5km) succession of shallow to deep-water lithologies, which are in part volcaniclastic and often strongly modified by tectonic processes. As a result, the rocks tend not to be particularly suitable as a general purpose building stone. A total of five groups are recognised within the succession as a whole: the Dent, Stockdale, Tranearth, Coniston and Kendal Groups.

Stockdale and Traneath Groups, Skelgill, Browgill Formation, Brathay Formation, Wray Castle Formation

Brathay Slate, Kirby Slate, Burlington Slate

Strongly cleaved, hemipelagic, silty mudstones dominate the Tranearth Group. The traditional source of blue-grey Burlington Slate, it has provided very substantial quantities of roofing slate not only for Cumbria, but also for areas further afield. Indeed, from the 17th century, Brathay Slate was exported by boat to London and elsewhere in the south of England via Lake Windermere and the River Leven. The slate quarries were located to the north of Lake Windermere, near Troutbeck and around Applethwaite Common. The Wray Castle Formation (sitting at the top of the Tranearth Group) is still worked for slate at Kirkby Quarry, near Kirkby-in-Furness, but evidence of far more extensive former quarrying operations is seen nearby, notably in the vicinity of the Burlington quarries, which were principally concentrated between Wall End and Gawthwaite Moor.

Coniston and Kendal Groups, Gawthaite Formation, Bannisdale Formation, Kirby Moor Formation

Gawthwaite Formation Sandstone, Bannisdale Sandstone, Kirby Moor Formation Sandstone

Both the Coniston and Kendal Group successions are represented by thick accumulations of deep-water turbiditic sandstone and hemipelagic mudstone. The sandstone-dominated beds of the Gawthwaite Formation (Coniston Group) were worked at Eccle Riggs Quarry near Broughton-in-Furness and also along the strike to the north-east near Torver. At stratigraphically higher levels, the Bannisdale Formation (Kendal Group) comprises metamorphosed fine-grained sandstones, banded siltstones and nodule-bearing mudstones. These slates were used locally as a vernacular building material across their outcrop area in southern Cumbria, although few definite building stone-producing quarries have been identified. The succession of fine-grained sandstones (several hundred metres thick) that comprises the Kirkby Moor Formation (at the very top of the Kendal Group) has been worked extensively for roadstone, and possibly also for building stone, at the Roan Edge and Holmescales quarries to the east and south-east, respectively, of Kendal.

Devonian

Various igneous intrusions

Lamprophyre Dyke Rock

A compositionally varied range of minor igneous intrusions, including occasional dykes of lamprophyre rocks, locally intrude the Siluro-Ordovician rocks across Cumbria for example, in the Cross Fell, Cautley and Cleator areas. Boulders originating from these minor intrusions are occasionally seen in nearby rubblestone field boundary walls and older farm buildings.

Skiddaw Granite

Sporadically exposed within the valleys of the Skiddaw Forest area, the Skiddaw Pluton is a small (less than 3km^2) intrusive body of grey-brown, medium-crystalline, variably porphyritic biotite-granite. It has, in the past, been quarried to a limited extent for building purposes.

Shap Granite

The coarsely crystalline, pink and occasionally grey granite (strictly biotite-monzogranite) of the Shap Pluton is characterised by large, pink, K-feldspar megacrysts. The quarrying and exploitation of Shap Granite as a decorative stone began in the early 19th century, and it is still worked to order today and exported around the UK as polished ornamental stone. Only rarely is the granite seen locally in the exposed rubblestone fabrics of older cottages and farm buildings; it was not generally quarried and dressed as a blockstone. Polished Shap Granite headstones and monuments are a fairly common occurrence in Victorian and Edwardian graveyards across the country.

Figure 7: Shap Granite.

Carboniferous

The major tectonic reorganisation that commenced during late Devonian times saw the relative uplift of the Cumbrian area and the development of a series of depositional basins across northern England. The Carboniferous succession of Cumbria consequently rests with marked unconformity upon, and oversteps onto or is faulted against, the earlier Palaeozoic successions.

The outcrops of Carboniferous strata lie along the present-day eastern border of Cumbria, stretching from the vicinity of Bewcastle in the north to Mallerstang Common in the south. They then continue north-west along the western side of the Vale of Eden, from Kirkby Stephen to near Caldbeck, and then swing west to the coast at Whitehaven. Isolated fault-bounded outliers of Carboniferous rocks also occur along the southern coastal fringes of Cumbria, extending from Kirkby Lonsdale in the east to Barrow-in-Furness in the west. The succession in general is subdivided into the Ravenstonedale, Great Scar Limestone, Yoredale and Pennine Coal Measures groups, and building stone has been quarried extensively from each of these units. Individual quarries, however, have tended to supply only their surrounding areas with stone.

Great Scar Limestone Group, various formations including Urswick Limestone Formation, Dalton Formation

Dalton Limestone, Urswick Limestone, Great Scar Limestone

The Urswick Limestone Formation crops out in southern Cumbria around Great Urswick, Baycliff, Stainton with Adgarley, and Newton. It largely comprises pale grey, coarse-grained, bioclastic limestones, which commonly feature in buildings in and around the aforementioned locations. The nodular limestone beds of the Urswick Limestone Formation are currently worked for building and decorative stone at Baycliff Haggs Quarry, to the west of Baycliff.

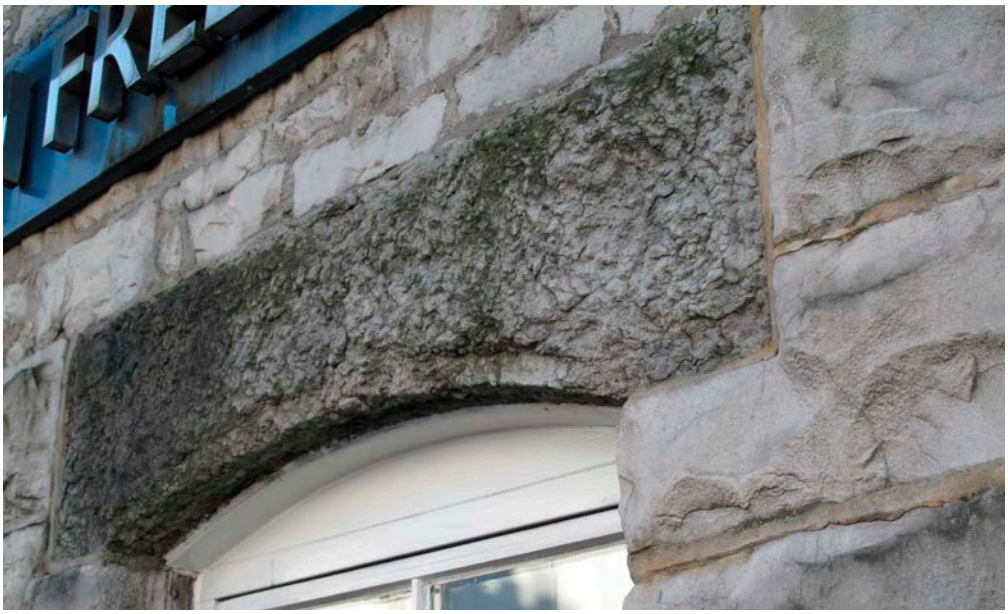

Figure 8: Shearman House, Kendal. Urswick Limestone.

Great Scar Limestone Group encircles the mountainous Lower Palaeozoic 'core' of the Lake District on its northern, eastern and southern sides. Exposures of grey limestones extend sporadically from Egremont (through Cleator Moor, Frizington and Rowrah) to Lamplugh. In general, though, the significant buildings in these areas are of red St Bees Sandstone or local limestone rubble, occasionally with Carboniferous sandstone dressings. Isolated limestone exposures were quarried near Hensingham and also at Dean, Pardshaw, Eaglesfield, Brigham, Bridekirk, Tallentire, Plumbland and Bothel. To the north-east of Cockermouth, the Great Scar Limestone outcrop adopts an east–west trend and continues from Whitrigg to Uldale (where whitewashed cottages are common) and on to Whelpo. At Caldbeck, the outcrop changes direction once more, turning south-eastwards towards Haltcliff Bridge. It then continues to Hutton Roof, Penruddock, Stainton, Hardendale, Crosby Ravensworth and Crosby Garrett (where the viaduct carrying the Settle to Carlisle railway is of local Great Scar Limestone), before ultimately reaching Kirkby Stephen and Ravenstonedale. In the older buildings of Kirkby Stephen, Great Scar Limestone is used extensively as a building stone, often in conjunction with locally sourced red sandstone and breccia rubble; the window and door mouldings are commonly of sawn Penrith Sandstone.

In southern Cumbria, fault-bounded outcrops of Great Scar Limestone are found between Kendal and Levens. This same limestone is also present around Heversham, Milton, Milnthorpe (Laburnum House), Arnside (Arnside Tower), Burton-in-Kendal (walling of the Church of St James), Kirkby

Figure 9: Smardale Viaduct, near Crosby Garrett. Great Scar Limestone.

Lonsdale, Grange-over-Sands, Ulverston and Dalton-in-Furness. The local limestone has been widely employed both as ashlar and rubblestone in and around these settlements. In the case of some buildings, such as Witherslack Hall School and Dalton Castle, the grey limestone stonework has been enlivened with red-brown Sherwood Sandstone dressings.

The local Great Scar Limestones are well displayed in a wide range of buildings in Kendal. The fabrics of the houses and business premises here, whether they be of ashlar or rubblestone, are dominated by hard, creamy grey-coloured, variably fossiliferous Dalton Formation limestone. This contrasts markedly with the distinctive, rather darker fabrics that arise from the use of the nodular, pseudo-brecciated, bioturbated Urswick Formation limestones. These latter limestones were often sawn for use as window and door mouldings.

Yoredale Group, various formations

Yoredale Group sandstones, Orebank Sandstone, Hensingham Grit

Yoredale Group sandstone crops out in northern and south-western parts of Cumbria. Although limestones predominate, the group includes a number of beds of slightly calcareous, medium to coarse-grained, grey and pinkish-grey sandstone (formerly assigned to the Calciferous Sandstone Series). These sandstones were locally important sources of building, and occasionally roofing, stone. Examples of villages and buildings in which the sandstones (and to a lesser extent the limestones) feature prominently as rubblestone and occasionally ashlar include Dacre (and nearby Dalemain House), Greystoke, Yanwath Hall, Alston and Brough. The Yoredale Group sandstones are also seen in the older houses of Appleby-in-Westmorland and Penrith, where they contrast strongly with the dark red Penrith Sandstone fabrics. At the former lead mining community of Garrigill, the older houses are similarly constructed of coursed Yoredale Group sandstone (albeit yellow-brown here) and have flagstone roofs. However, a long terrace of former miners' cottages is constructed of sandstone and limestone blocks, with distinctive decorative string courses of dark grey limestone.

Figure 10: Former miners' cottages, Garrigill. Yoredale Group sandstone and limestone.

The other sandstones in the group include Orebank Sandstone and Hensignham Grit. Both were quarried near Cockermouth. These sandstones were used for a number of nearby buildings and also feature extensively in the fabric of Cockermouth Castle. The siting of the castle on the River Derwent aided access to the quarries at Brigham and Eaglesfield, although it is believed that some of the castle's sandstone was recycled from the nearby Roman fort of Papcastle (Derventio). Further quarried outcrops of the Hensingham Grit occur to the south-west (for example, around Dean, Distington and Whitehaven), and this area was indeed a locally important building stone source.

In the far south of Cumbria around Holker, a small outcrop of calcareous mudstones and sandstones currently assigned to the Yoredale Group Alston Formation is present. The grey, siliceous sandstone beds were quarried during the medieval period to build the priory at nearby Cartmel.

Figure 11: Terraced cottages, Appleby-in-Westmorland. Yoredale Group and Permo-Triassic sandstones. Caesar's Tower. Local Carboniferous sandstone.

Pennine Coal Measures Group, Pennine Lower Coal Measures Formation, Pennine Middle Coal Measures Formation

Six Quarters Rock, Harrington Four Foot Rock, Countess Sandstone, Ten Quarters Rock, Bannock Band, Main Band

The strata of the Cumberland (or Whitehaven) Coalfield, which are assigned to the Pennine Coal Measures Group, form a broad curved outcrop in the north and north-west of the county, running from near Cleator to Southwaite. The Coal Measures succession, in general, comprises an interbedded sequence of carbonaceous mudstones, siltstones and sandstones, with local developments of coal. These last were worked from at least the 16th century and encouraged settlement across the outcrop area, particularly during

the late 18th and 19th centuries. This population influx resulted in a major phase of building and saw the local Coal Measures Sandstones being put to common use. The principal sandstone units, including the Harrington Four Foot and Six Quarters Rocks of the Pennine Lower Coal Measures Formation and the Main Band, the Bannock Band, the Ten Quarters Rock and the Countess Sandstone of the Pennine Middle Coal Measures Formation, were locally quarried. Together with imported red Permo-Triassic sandstones, they were used to construct the numerous terraced houses, places of worship and business premises required by the expanding coalfield communities.

Warwickshire Group, Whitehaven Sandstone Formation

Whitehaven Sandstone

This formation comprises more than 300m of red to purple-brown, cross-bedded sandstones and variegated mudstones and siltstones. These rocks crop out near the coast at Whitehaven and further inland to the east, being seen in both natural exposures and the many small quarries that are found over much of the central part of the Cumberland Coalfield. Where readily accessible, Whitehaven Sandstone was worked and used extensively as a local building stone, most notably in Whitehaven itself and in the nearby settlements.

Permian

Appleby Group, Brockram Formation, Penrith Sandstone Formation

The Permian strata of Cumbria occupy a series of fault-bounded basins formed in response to regional east–west crustal extension. These sandstone-dominated rocks variably include, at their base, the alluvial fan and flash-flood breccias (calcareous cemented stone fragments) that represent the Brockram (literally ‘broken rock’) facies. Both the Brockram Breccias and the aeolian sandstones of the Penrith Sandstone Formation have been widely used as building stone close to where they crop out. The local red Permian sandstones are notably conspicuous in the Vale of Eden. Elsewhere, they have been commonly used both as ashlar blocks and as window and door framings/mouldings. In more recent times, these sandstones have been exported further afield to the likes of Glasgow and Edinburgh.

Brockram Breccia

The distinctive Brockram facies comprises coarse-grained, matrix-supported breccias that contain abundant angular clasts, ranging from small pebble to cobble size. The clast lithologies are varied and include dolerite, quartzite and Carboniferous limestone. They reflect the pre-Permian rocks of the Vale of Eden, indicating a local provenance. The rock matrix can be mud-rich, silty and/or sandy. Examples of the use of Brockram Breccia as a walling stone can be seen in a number of the buildings in the centre of Kirkby Stephen.

Figure 12: Wall detail, Kirkby Stephen. Brockram Breccia.

Plumpton Red Sandstone, Penrith Sandstone

The Brockram Breccias pass laterally into the dark red, cross-bedded, aeolian sandstones of the Penrith Sandstone Formation. These medium to coarse-grained sandstones were widely used for building purposes across the whole of their outcrop, and were also exported to markets further afield. In general, the sandstones tend to be weakly cemented and soft, but some beds are well cemented by silica. The harder sandstones were intensively worked in the past at Lazonby Fell: for example, where numerous old quarries are still visible in the landscape. In addition to the Lazonby and Lazonby Fell stones produced in this particular area, the Penrith Formation sandstones had a number of other trade names in the past, including Plumpton Red and the more generic Penrith Sandstone.

Penrith Sandstone features prominently in towns, villages and isolated (farm)houses located on or close to its outcrop. It has been used for many of the substantial buildings in Penrith itself, including the castle. Appleby-in-Westmorland, meanwhile, boasts a fine display of both dark red Penrith Sandstone and pinkish-buff Carboniferous calciferous sandstone fabrics along its main street (Boroughgate). There are numerous examples of older villages constructed almost entirely of locally quarried red Permian sandstone, including Renwick, Melmerby and Kirkoswald. At Great Salkeld, a thinly bedded horizon occurring within the surrounding Penrith Sandstone has been widely used as roofing material. The large, thick and heavy sandstone slabs can be seen on the roofs of cottages, the Church of St Cuthbert and nearby farm buildings, and they are quite unique to the area.

Figure 13: 30 Boroughgate, Appleby-in-Westmorland. Penrith Sandstone.

Figure 14: Church of St Cuthbert, Great Salkeld. Penrith Sandstone including roof.

Figure 15: Houses and other buildings, Great Salkeld. Penrith Sandstone including roof slabs.

Triassic

Sherwood Sandstone Group, Kirklinton Sandstone Formation, St Bees Sandstone Formation

Kirklinton Sandstone, St Bees Sandstone, Sherwood Sandstone

The Penrith Sandstone Formation Triassic sandstone formations. The lowermost unit of the Sherwood Sandstone Group is dominated by fine to medium-grained, reddish-brown but occasionally greenish-grey or variegated sandstones. These are conformably overlain by the fine to medium-grained, red (although locally white), strongly cross-bedded sandstones of the Kirklinton Sandstone Formation. The curved outcrop of Triassic strata in Cumbria runs almost uninterrupted from Kirkby Stephen to Maryport, continuing onwards to Barrow-in-Furness along the coastal strip to the south of Whitehaven. Quarrying of these sandstones has taken place widely, locally on a prolific scale, and they represent a major Cumbrian building stone resource.

The St Bees Sandstone and Kirklinton Sandstone are not easily distinguished when seen in isolation within buildings, but the Sherwood sandstones, generally, have been widely quarried and used extensively as a building stone across their entire outcrop area since at least medieval times. By the late 19th century, very large commercial quarrying operations had been established near St Bees in order to meet the demands of a growing local and national market. Buildings of this period, particularly churches and commercial premises, were commonly constructed of this red sandstone (in either ashlar or rubblestone form), which is ubiquitous in the larger villages and towns located along and near the outcrop (for example, at Aspatria, Dalston, St Bees, Egremont, Haile, Seascale, Drigg and Barrow-in-Furness). In the north-east of the county, to the east of Carlisle, the Sherwood Sandstone was quarried and used for building around Wetheral and Hayton (in the latter case since Roman times).

A contemporary description of the Sandwith and Birkhams quarries (near St Bees Head) from the end of the 19th century refers to operations extending for about ‘three quarters of a mile along the coast, with a vertical face of 300–350ft’.

The sandstones here are horizontally bedded, with individual beds averaging 1.5 to 2m in thickness, but reaching over 3m on occasions. The widely spaced natural joints allowed blocks of considerable size to be obtained. A direct rail connection to Whitehaven Docks served to facilitate export of the quarried stone, not only to cities across the UK but also to North American markets.

The medieval abbey ruins at Barrow-in-Furness provide arguably the best example of large-scale use of Sherwood Sandstone in Cumbria. The stone for the abbey is believed to have been produced at the quaintly named Vale of Nightshade quarries located just to the north of the site. Several hundred

years later, during the late 19th century, Sherwood Sandstone ashlar was again put to impressive use in Barrow, this time in the form of the massive town hall building. The supplying quarries were those at nearby Hawcoat.

Sherwood Sandstone is still actively worked in several quarries near St Bees (namely the Birkhams, Bank End and Grange quarries). It has seen use in many UK buildings during recent times, such as Liverpool Cathedral, and has also been exported overseas in connection with both new-build and conservation projects. One example of the latter is the restoration of New York's early Brownstone buildings in Albany.

Figure 16: Furness Town Hall, Barrow-in-Furness. Sherwood Sandstone.

Figure 17: Furness Abbey, Barrow-in-Furness. Sherwood Sandstone.

Quaternary

Various groups, various formations

Boulders, cobbles, fieldstones

Rounded boulders and/or cobbles feature prominently in a number of the walls and cottages found within the low-lying coastal areas of Cumbria, most notably in the settlements overlooking the Solway Firth (for example, at Port Carlisle, Bowness-on-Solway, Newton Arlosh and Kirkbampton). Having been reworked from the thick Quaternary boulder clay deposits that mantle large swathes of both the Irish Sea floor and adjacent coastal plain, they were subsequently deposited along the shoreline by storm activity. The cobbles and boulders themselves are lithologically varied and represent both relatively local and distal sources. They were gathered and sorted, then carted inland before being split, dressed and/or trimmed ahead of use. Occasionally, the boulders and cobbles were used 'in the round', which necessitated the in-building of levelling courses comprising slabs of thinly bedded or cleavedrocks.

Figure 18: Dwelling in Brough. Fieldstones and/or stream boulders.

Away from the coast, rounded boulders and cobbles have locally been put to similar use. Indeed, there are some good examples of early farm buildings featuring boulders and cobbles obtained from nearby Quaternary fluvial deposits. At Brough, some of the farm buildings and cottages boast fieldstones (lithologically varied field clearance debris), used both in their natural rounded state and in squared and coursed form. Buildings built wholly or in part of rounded fieldstones or stream boulders are also seen in Soulby, Thornthwaite and Broughton-in-Furness.

A far more common practice in the rugged highland core of the Lake District, however, was to use angular rubblestone gathered and/or 'quarried' from surface outcrops. There are numerous farm buildings constructed of 'slate' rubble, which often have conspicuously large slate quoins and lintels. Many of these buildings also have roofs of local slates, generally laid in diminishing courses. Specific examples include farm buildings at Troutbeck, Boon Crag (near Coniston), High Oxen Fell and Loweswater. Other non-agricultural buildings of this type include Coniston (Old) Hall and Hawkshead Courthouse. In some cases, the windows and doors of such buildings are framed with better quality, sawn slabs of Lower Palaeozoic slates, Carboniferous sandstones and limestones, and red Permo-Triassic sandstones.

Figure 19: Cottage, Port Carlisle. Rounded boulders and cobbles.

Figure 20: Farm building. Slate rubble, squared boulders and crudely dressed fieldstones.

Figure 21: Hawkshead Old Courthouse, Ambleside. Borrowdale Volcanic Group rubblestone and boulders and Permo-Triassic sandstone.

Tufa

Isolated blocks of white, highly porous, calcareous tufa appear sporadically in some wall fabrics, such as Brough Castle. However, this particular building stone is not commonly encountered across Cumbria, suggesting that it was never available in any great quantity.

Figure 22: Brough Castle keep, Brough. Porous calcareous tufa.

3 Examples of Reused and Imported Building Stones

Reused stones

Natural stone, particularly dressed natural stone, is a valuable commodity. Stone reuse effectively defrays the initial financial outlay associated with quarrying and dressing blocks, making this a very cost-effective practice, especially for new-build projects such as isolated farmhouses or churches. Some of the best examples of stone reuse in Cumbria are the buildings that are constructed, partly or wholly, of materials cannibalised from old Roman structures. The most substantial and best-known Roman structure in Cumbria is Hadrian's Wall. This fortification, now a World Heritage Site, defined the then northern frontier of the Roman Empire in Britain. The Cumbrian section of Hadrian's Wall extends from the milecastle at Birdoswald to the coastal fort at Bowness-on-Solway. In the east, the 'wall' was constructed of local stone, but close to the Solway estuary only the turrets of the milecastle forts were of stone, the wall itself was largely of turf. Hadrian's Wall crosses a range of geological units, many of which were exploited to provide stone for its construction. Roman quarry faces with contemporary carved inscriptions are found in the Triassic Sherwood Sandstone exposed alongside the River Gelt near Hayton.

At Birdoswald, meanwhile, enough remains of the fort there to show that the highly skilled Roman masons were working the grey Carboniferous sandstones (Yoredale Group) exposed nearby. Physical evidence of many of the Roman quarries, however, has been lost as a result of later urban development, for example at Carlisle.

There are numerous examples of buildings located close to the line of Hadrian's Wall that make use of blocks that once formed part of either the wall itself or its associated milecastles and forts. Specific examples include the Church of St Michael at Burgh by Sands, constructed of Carboniferous stone taken from the wall and nearby Aballava fort; Drumburgh Castle, in part a 13th-century Peel tower, built from a mix of squared and little-dressed blocks of red Permian sandstone; and Lanercost Priory, constructed from a mixture of red St Bees Sandstone and grey Carboniferous sandstone robbed from the wall, plus supplementary material newly quarried from the original Roman sources.

Figure 22: Lanercost Priory, Lanercost. Red St Bees Sandstone and grey Carboniferous sandstone.

Imported stones

With the exception of the highly distinctive Shap Granite, igneous lithologies and marbles amenable to polishing and use thereafter as a decorative stone are a comparative rarity in the Cumbrian geology. Victorian architects, in particular, overcame this problem by 'importing' a range of polishable stones for decorative work. The Church of St Stephen at Kirkby Stephen, for example, has an ornate pulpit constructed of polished Shap Granite and a variety of colourful Italian marbles and alabaster. Shap Granite also features (as columns) in the Church of St Augustine of Canterbury at Alston, in addition to dark fossiliferous Frosterley Marble (a Carboniferous limestone from County Durham). William Butterfield's 19th-century font within the Church of SS Mary and Bega at St Bees is a massive carved block of veined, grey-brown limestone from Devon, while the alabaster reredos within the Church of St Mary at Ambleside possibly originates from Chellaston in Derbyshire.

4 Further Reading

The Further Reading, Online Resources and Contacts guide provides general references on:

- Geology, building stones and mineral planning
- Historic building conservation, architecture and landscape.

There is also a separate glossary of geological terms.

Cumbria references

Brambles, G 2001 'The building stones of Kendal: An excursion 05.08.01'. *Proceedings of the Westmorland Geological Society*, **29**, 33–4

Brunskill, R W 1978 *Vernacular Architecture of the Lake Counties: A Field Handbook*. London: Faber & Faber

Cramp, R and Bailey, Y R N 1988 *Corpus of Anglo-Saxon Sculpture: Cumberland, Westmorland and Lancashire North-of-the-sands, Vol 2*. Oxford: Oxford University Press

Cameron, A 1996 *Slate from Coniston: A History of the Coniston Slate Industry*. Cumbria Amenity Trust Mining History Society

David, R 1987 'The slate quarrying industry in Westmorland (Part I): The valleys of Troutbeck, Kentmere and Longsleddale'. *Transactions of the Cumberland and Westmorland Antiquarian and Archaeological Society*, **87**, 215–35

David, R and Brambles, G W 1991 'The slate quarrying industry in Westmorland (Part II). A field survey of selected sites in Troutbeck and Longsleddale'. *Transactions of the Cumberland and Westmorland Antiquarian and Archaeological Society*, **91**, 213–27

Geddes, R S 1975 *Burlington Blue-Grey: A History of the Slate Quarries, Kirkby-in-Furness*. Richard Stanley Geddes

Johnson, G A L 1997 *Geology of Hadrian's Wall (Geologists' Association Guides No. 59)*. London: Geologists' Association

McCarthy, Y M R, Summerson, H R T and Annis, R G 1990 'Carlisle Castle: A survey and documentary history'. *English Heritage Archaeological Report*, **18**

Mitchell, M 2001 'The building stones of Cartmel and its priory: An excursion 23.06.01'. *Proceedings of the Westmorland Geological Society*, **29**, 26–7

Moseley, F (ed) 1978 *The Geology of the Lake District*. Yorkshire Geological Society

Tyson, B 1984 'The Troutbeck Park slate quarries: Their management and markets, 1753–1760'. *Transactions of the Cumberland and Westmorland Antiquarian and Archaeological Society*, **84**, 167–90

Tyson, B 1998 'Transportation and the supply of construction materials: An aspect of traditional building management'. V*ernacular Architecture*, **29**, 63–81

Scobie, J 'An investigation into the quarrying industry in Sedbergh, Garsdale and Dent.', *Sedbergh Historian*

British Geological Survey publications

Athurton, R S and Wadge, A J 1981 *Geology of the Country Around Penrith: Memoir for 1:50 000 Geological Sheet 24*. Memoirs of the Geological Survey of Great Britain (England and Wales). London: HMSO

Aveline, W T, Hughes, T M and Tiddeman, R H 1872 *The Geology of the Neighbourhood of Kirkby Lonsdale and Kendal (Quarter-sheet 98 SE)*. Memoirs of the Geological Survey of England and Wales. London: HMSO

Aveline, W T and Hughes, T M 1888 *The Geology of the Country Around Kendal, lune*

Bowness and Tebay (Explanation of Quarter-sheet 98 NE). Memoirs of the Geological Survey of England and Wales. London: HMSO

Burgess, I C and Holliday, D W 1979 *Geology of the Country Around Brough-under-Stainmore: Memoir for 1:50 000 Geological Sheet 31 and Parts of Sheets 25 and 30*. Memoirs of the Geological Survey of Great Britain (England and Wales). London: HMSO

Dakyns, J R, Tiddeman, R H, Russell, R, Clough, C T and Strahan, A 1891 *The Geology of the Country Around Mallerstang, with parts of Wensleydale, Swaledale and Arkendale (Sheet 97 NW)*. Memoirs of the Geological Survey of England and Wales. London: HMSO

Dakyns, J R, Tiddeman, R H and Goodchild, J G 1897 *The Geology of the Country Between Appleby, Ullswater and Haweswater (Sheet 102 SW)*. Memoirs of the Geological Survey of England and Wales. London: HMSO

Dixon, E E L, Maden, J, Trotter, F M, Hollingworth, S E and Tonks, L H 1926 *The Geology of the Carlisle, Longtown and Silloth District (Explanation of Sheets 11, 16 and 17)*. Memoirs of the Geological Survey of England and Wales. London: HMSO

Eastwood, T, Dixon, E E L, Hollingworth, S E and Smith, B 1931. *The Geology of the Whitehaven and Workington District (Explanation of Sheet 28)*. Memoirs of the Geological Survey of Great Britain (England and Wales). London: HMSO

Rose, W C C and Dunham, K C 1977 *Geology and Hematite Deposits of South Cumbria. Economic Memoir for 1:50 000 Geological Sheet 58 and Southern Part of Sheet 48*. Memoirs of the Geological Survey of Great Britain (England and Wales). London: HMSO

Stone, P, Millward, D, Young, B, Merritt, J W, Clarke, S M, McCormac, M and Lawrence, D J D 2010 British Regional Geology: Northern England (Fifth edition).Keyworth, Nottingham: British Geological Survey

Trotter, F M and Hollingworth, S E 1932 *The Geology of the Brampton District (Explanation of Sheet 18)*. Memoirs of the Geological Survey of Great Britain (England and Wales). London: HMSO

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Figures

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