Building Stone

Minerals Safeguarding DPD Evidence Report

November 2016
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The geological background of building stone

The Cornish peninsula is underlain by a variety of rocks including slate and granite, which contribute to the special character of the county's landscape and coastal scenery. Natural stone is the traditional building material of Britain and the built environment is perhaps the most visible aspect of our cultural heritage. The geological diversity of this country has meant that the variety of the rock types used is probably unmatched anywhere else in the world. The production and usage of stone peaked in the late 19th century and finally fell into serious decline in the 1960’s. This decline could be attributed to changes in construction methods and imports.

However greater emphasis is now being placed on the restoration and conservation of older buildings using sympathetic materials such as locally sourced stone. Sustainability considerations has meant there is greater demand for local stone for new buildings and townscape schemes and this is encouraged in the Cornwall Council Sustainable Building Guide: Retrofitting existing buildings http://www.cornwall.gov.uk/default.aspx?page=21590.

Cornwall Council, being mindful of this, had commissioned a study to map the location of “heritage quarries” (disused local quarries that could be brought back into use) throughout Cornwall to enable local stone that was used in the past to be used in the future to safeguard and protect Cornwall’s unique historic environment, for further information see The evidence report ‘The Building Stones of Cornwall Identification of Heritage Quarries’ and further discussion about future supply for heritage purposes see the Heritage Quarries section of this report.

The geology of Cornwall is very varied, with both igneous (e.g. granite, elvan, dolerite) and altered sedimentary rocks (shale/slate and sandstone-locally known as killas) combined with extrusive volcanic rocks (basalt). All apart from the granite have been metamorphosed (changed by heat and pressure) to a greater or lesser extent. At the Lizard there are a collection of rocks unusual to the British Isles caused by an ancient ocean floor having been obducted (thrust up) to the surface.

There are several rock types present in Cornwall which have been used for building stone; these are explained in detail below.

**Igneous Rock: Granite**

Granite is the most extensive igneous rock in Cornwall and occurs in four large intrusions or ‘plutons’ at Land’s End, Carnmenellis, St Austell and Bodmin Moor. In addition there are a number of smaller outcrops at Godolphin, St Michael’s Mount, Carn Marth, Carn Brea, St Agnes, Cligga Head, Castle-an-dinas, Belowda, Kit Hill, Hingston Down and Gunnislake. Typically the granite areas form the higher ground of Cornwall. The granites also give rise to the dramatic coastal cliffs, notably Land’s End.

There is considerable variation in the appearance of granite from one location to another, from fine-grained types to coarse-grained granites with individual feldspar crystals exceeding 10cm in length.

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1 Based on information contained in BGS Mineral Resource Information for Development Plans (BGS, 1997) and Geology and Minerals Resources of Cornwall (Scrivener, R C, 2006)

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Other types of granite occur in dykes or veins of fine-grained rock which are mainly pale grey or cream colour. These are known as ‘elvans’ and have been used in the past as building material.

Granites have provided an attractive source of dimension stone and their historical importance as a building material is reflected by the large numbers of disused quarries. In the 19th and 20th Centuries granite was in demand for construction (civic, institutional and commercial buildings) and export. Indeed Cornish building stone has been used for prestigious project such as Tower Bridge in London. Smaller quarries provided local building material (and roadstone).

**Basic Igneous Rock: Basalt, Dolerite, Gabbro and Picrite (known as Greenstones)**

Basic igneous rocks such as basalt, dolerite, gabbro and picrite occur within the Devonian and Lower Carboniferous slate and sandstone. These are known as collectively as greenstones and they tend to be harder than their slate hosts so they form landscape features such as Nare Head and Clicker Tor (near Menheniot).

Many gabbro outcrops occur on the Lizard reflected in the many disused quarries showing the widespread use of the stone for building materials. There is considerable variation in lithology and technical properties between these basic igneous rocks.

**Serpentine**

Serpentine occurs on the Lizard peninsula and on a very restricted scale in East Cornwall. It is highly coloured and soft and is used for ornamental purposes. However, it has been used in the past as a building material and there are examples of its use across the Lizard. In the east of Cornwall polyphant stone (serpentinised picrite) has been worked since Norman times as an ornamental stone. Although currently only very minor quantities are produced.

**Sandstone and shale**

In Cornwall there are considerable volumes of sandstone particularly in the north and east of the County. These comprise alternating folded beds of shale and hard sandstone, as occur in the late Carboniferous Crackington Formation and the late Devonian Portscatho Formation. In some cases sandstone is the dominant lithology in thick or massive beds, these are evident in parts of the Late Carboniferous Bude Formation of north Cornwall and also parts of the early Devonian Staddon Grit.

Sandstones vary in thickness, lateral persistence, grain size and strength. Fine or medium grained sandstone is known as ‘greywacke’, as at the time of sedimentation some silt and clay acted as a fine matrix.

Despite extensive resources, limited amounts of sandstone are produced in Cornwall, perhaps reflecting the cost of working the resource. A few small quarries extract sandstone for building materials alongside their main aggregate extraction.
**Slate**

Slates underlie much of Cornwall and are commonly interbedded with coarser-grained siltstone and sandstone. They are also known by the old miners’ term as ‘killas’ in some areas.

The slates in Cornwall are variable in nature and colour ranging from dark to light grey with green and red hues. Brown iron oxide staining is common, these are rustic slates.

Slates which can be split are used for roofing but their occurrence is more restricted. These tend to occur within extensive masses of less perfectly cleared material which accounts for the large waste material produced.

The County is an important source of roofing slate, including Delabole slate noted for its distinctive slivery grey colour. Elsewhere operations are small-scale mainly producing rustic slate, commonly used for paving, cladding, walling and fireplaces.

**Current production methods and reserves of building stone**

Figure 1 Building Stone Production 2001 - 2015 shows building stone production since 2001.

**Figure 1 Building Stone Production 2001 - 2015**

![Building Stone Production (2001 - 2015)](image)

Building stone is produced from some 8 operational quarries producing solely granite, slate and gritstone for building materials and 7 quarries that produce building stone alongside their primary aggregate production.
A number of sites in Cornwall have planning permission although they are currently inactive but could be brought back into production if necessary. Table 1 Status of permitted building stone extraction sites in Cornwall provides further details about the status of individual sites.

Table 1 Status of permitted building stone extraction sites in Cornwall

<table>
<thead>
<tr>
<th>Site</th>
<th>Location</th>
<th>Status</th>
<th>Mineral type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bearah Tor Quarry</td>
<td>Minions</td>
<td>Active (currently working)</td>
<td>Granite</td>
</tr>
<tr>
<td>Burnthouse Quarry</td>
<td>Mabe</td>
<td>Lapsed</td>
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</tr>
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<td>Granite</td>
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<tr>
<td>De Lank Quarry</td>
<td>St Breward</td>
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<td>Delabole Quarry</td>
<td>Delabole</td>
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<td>Eathorne Quarry</td>
<td>Constantine</td>
<td>Dormant</td>
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<td>Kennack Sands</td>
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<td>Serpentine</td>
</tr>
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<td>Hantergantick Quarry</td>
<td>St Breward</td>
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<td>Helsbury Quarry</td>
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<td>Sladesbridge</td>
<td>Dormant</td>
<td>Slate/Dolerite</td>
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<td>Lambest Quarry</td>
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<td>Lantoom Quarry</td>
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<td>Site</td>
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<td>Status</td>
<td>Mineral type</td>
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<td>Active (not currently working)</td>
<td>Slate</td>
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<td>Helston</td>
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<td>Granite</td>
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<td>Trebarwith Slate Quarry</td>
<td>Delabole</td>
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<td>Slate</td>
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<td>Trecarne Quarry</td>
<td>Delabole</td>
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<td>Slate</td>
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<td>Tredinnick Quarry</td>
<td>St Issey</td>
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<td>Tregunnon Quarry</td>
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<td>Constantine</td>
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<td>Longdowns</td>
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<td>Tubbs Mill Quarry</td>
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<td>Tynes Quarry</td>
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<td>Slate</td>
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<tr>
<td>Westwood Quarry</td>
<td>Doublebois</td>
<td>Active (not currently working)</td>
<td>Slate</td>
</tr>
</tbody>
</table>

'Figure 2 Geology, currently worked and other permitted building stone sites’ shows all the permitted building stone sites in Cornwall
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As minerals can only be worked where they are found some of the permitted building stone quarries lie within designated areas, such as Area of Outstanding Natural Beauty (AONB); some 540 hectares of mineral workings (aggregate, building stone, china clay and metals) are found within the AONB.

**Markets, transport and use of building stone**

Building stone production in Cornwall mainly serves local needs for construction, waling and roofing but there have been some exports to other areas in the UK and some quarries have produced stone for prestigious constructions e.g. De Lank granite for the “seed” sculpture at the Eden Project, the Tower Bridge in London and the European Parliament building in Brussels.

With the acceptance of climate change the whole life carbon footprint of buildings is more relevant today than in previous decades. Therefore the use of local stone, both in repair and for new build, has become a more viable option although the initial cost may be more expensive than imported stones.

**Government planning policy and guidance for building stone**

**National Planning Policy Framework**

In March 2012 the Government published the National Planning Policy Framework (NPPF), which replaced existing national planning policy. This includes a section on minerals and makes specific reference to the sustainable use of important minerals and also to defining Mineral Safeguarding Areas for minerals of national and local importance, including kaolin.

The NPPF requires local planning authorities to include policies for local and nationally important mineral resources and to safeguard those resources. Great weight should be given to the benefits of mineral extraction including to the economy. The NPPF is accompanied by a technical guidance document which provides guidance on the implementation of policies contained in the NPPF. This mainly relates to amenity issues, dust, noise, stability and restoration.

**Cornwall Local Policy Development for Building Stone**

**Cornwall Minerals Local Plan**

The Cornwall Minerals Local Plan (CMLP) adopted in 1997 contains planning policies for the development of building stone quarries and related development. The primary aim of the CMLP is to ensure the stable and long term production of the Cornish mining and quarrying industry. Chapter 12 is dedicated to building stone and slate and sets out a policy relating to the
re-use of dormant or disused building stone quarries for heritage purposes. The policies within this document have been ‘saved’ until the adoption of the Local Plan

**Emerging Cornwall Local Plan**

Minerals planning policy is being prepared for inclusion in the Cornwall local Plan. A specific Minerals Safeguarding DPD will also be prepared following adoption of the Local Plan: Strategic Policies.

Policy 17 aims to maintain a sufficient supply of indigenous minerals to achieve sustainable and economic growth, whilst encouraging the use of recycled and secondary materials. Proposed Policy 18 seeks the identification of safeguarding areas for mineral resources, as well as for key mineral infrastructure through a Minerals Safeguarding DPD.

A number of policies in the 1997 Minerals Local Plan will continue to form part of the development plan when the Local Plan is adopted, although they will then be reviewed as part of the emerging Minerals Safeguarding DPD.

**Projected demand and future supply for building stone**

Encouragement of local distinctiveness is increasing; this will require the use of local stone. However, cheap imports and expensive local alternatives threaten the use of local stone, especially in the current economic climate. The need for new buildings to comply with certain sustainability criteria may also impact upon the use of local stone as will the implementation of new hard landscape, particularly in areas of historic importance or regeneration areas such as Hayle and Camborne, Redruth and Pool. In addition, the conservation and restoration of historic buildings will also require local stone. However, predicting the tonnage of any particular stone needed in the future is very difficult due to variability of the market, existing viable levels of reserve and achievable outputs.

**Building Stone Reserves**

The Council has undertaken a survey of local building stone and slate producers to ascertain reserves and annual sales of different types of building stone and slate. However, responses were limited and often reserve information was not available. As it is important to gauge the level of reserves a methodology has been applied to calculate estimated reserves at permitted (excluding dormant sites) building stone quarries:

\[
\text{Estimated reserves} = \frac{\text{Number of remaining permitted years}}{3} \times \text{Average annual production (3 consecutive years production)}
\]

Applying this methodology to those sites where reserve information is not available and adding reserves data where it is available, the *estimated reserves* for building stone in Cornwall is 43.2 million tonnes. It is worth

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noting that this estimate includes different grade, quality and types of building stone material.

Given that the average annual production of building stone is just over 28,000, the estimated reserves are sufficient to last in excess of 1,000 years. It is therefore likely that future demand can be sourced from existing permitted sites, unless there is demand for a particular type of material not available at currently permitted sites.

**Heritage Quarries**

In 2006 a study was commissioned by the Council to identify quarries in Cornwall which are or may become important for architectural and heritage purposes. The study identified quarries, recently operated and disused quarries, including those linked to stone used in culturally important buildings, structures and settlements, by analysing information about Listed Buildings, and information from the “Buildings of England: Cornwall” (Pevsner, 1951). A methodology was developed to assess each quarry’s potential as a source of stone for heritage purposes, this involved examining the characteristics of the stone, planning status and which significant buildings had used the stone in order to ascertain a ‘heritage value’. The Cornwall Minerals Safeguarding Development Plan Document has identified a total of 28 Heritage Quarries for safeguarding and these include elvan, dolerite, granite, slate and serpentine quarries. All these sites contain stone of a limited distribution and either do not have extant planning permission for extraction or are classified as ‘dormant’ under the Environment Act 1995. This study has been updated and is available as a evidence paper ‘The Building Stones of Cornwall Identification of Heritage Quarries’.

**Strategic Stone Study**

During 2009 English Heritage commenced a study to identify sustainable stone resources for building and conservation purposes and to provide evidence of their importance. English Heritage, BGS and local geologists worked together to collate a catalogue of local building stones, their uses and identified significant buildings and villages and their stone sources. English Heritage’s strategic stone study built upon the work undertaken by the mineral planning authority in 2006. A Strategic Stone Study mapping program is available at http://maps.bgs.ac.uk/BuildingStone/default.aspx, this will be updated when further information is available, and may prove more useful in the future as it currently contains limited information for Cornwall. The Building Stone Atlas for Cornwall (and the Isles of Scilly) has been updated and a revised version was published in August 2011, this can be viewed at http://www.bgs.ac.uk/mineralsuk/mines/stones/eh_project.html.
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