

# **Technical Paper M3 Building stone**

**Cornwall Council  
March 2013**

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# 1 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 19<sup>th</sup> 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: Retro-fitting 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 Minerals Technical Paper 6: The Building Stones of Cornwall: Identification of Heritage Quarries and further discussion about future supply for heritage purposes see section 6.2 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<sup>1</sup>.

## 1.1 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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<sup>1</sup> 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)

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 19<sup>th</sup> and 20<sup>th</sup> 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).

## **1.2 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.

## **1.3 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.

## **1.4 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 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.

## 1.5 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.

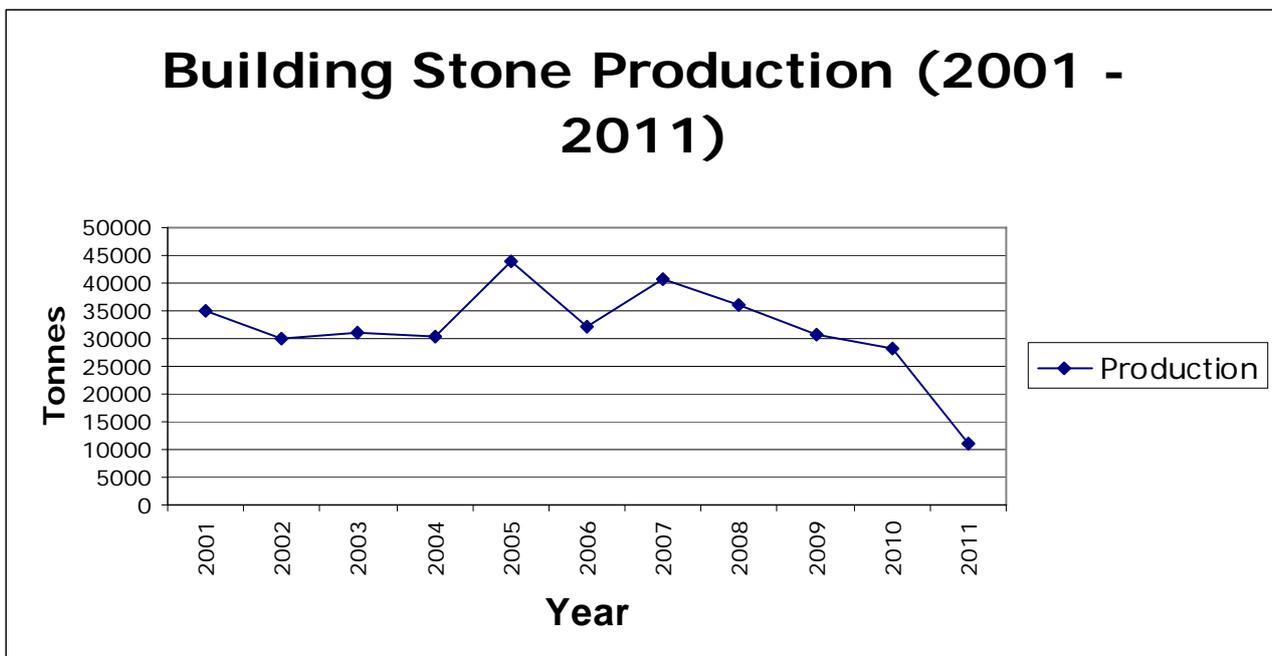
Slates which can be split are used for roofing but their occurrence is more restricted. These tend to occur within extensive masses of less perfectly cleared material which accounts for the large waste material produced.

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

## 2 Current production methods and reserves of building stone

Average annual production of building stone over the last 10 years in Cornwall is approximately 37,520 tonnes. Figure 2.1: Building Stone Production 2001 - 2011 shows building stone production since 2001. It can be seen that in recent years there has been a downward trend in production.

Figure 2.1: Building Stone Production 2001 - 2011



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 2.1 Status of permitted building stone extraction sites in Cornwall provides further details about the status of individual sites.

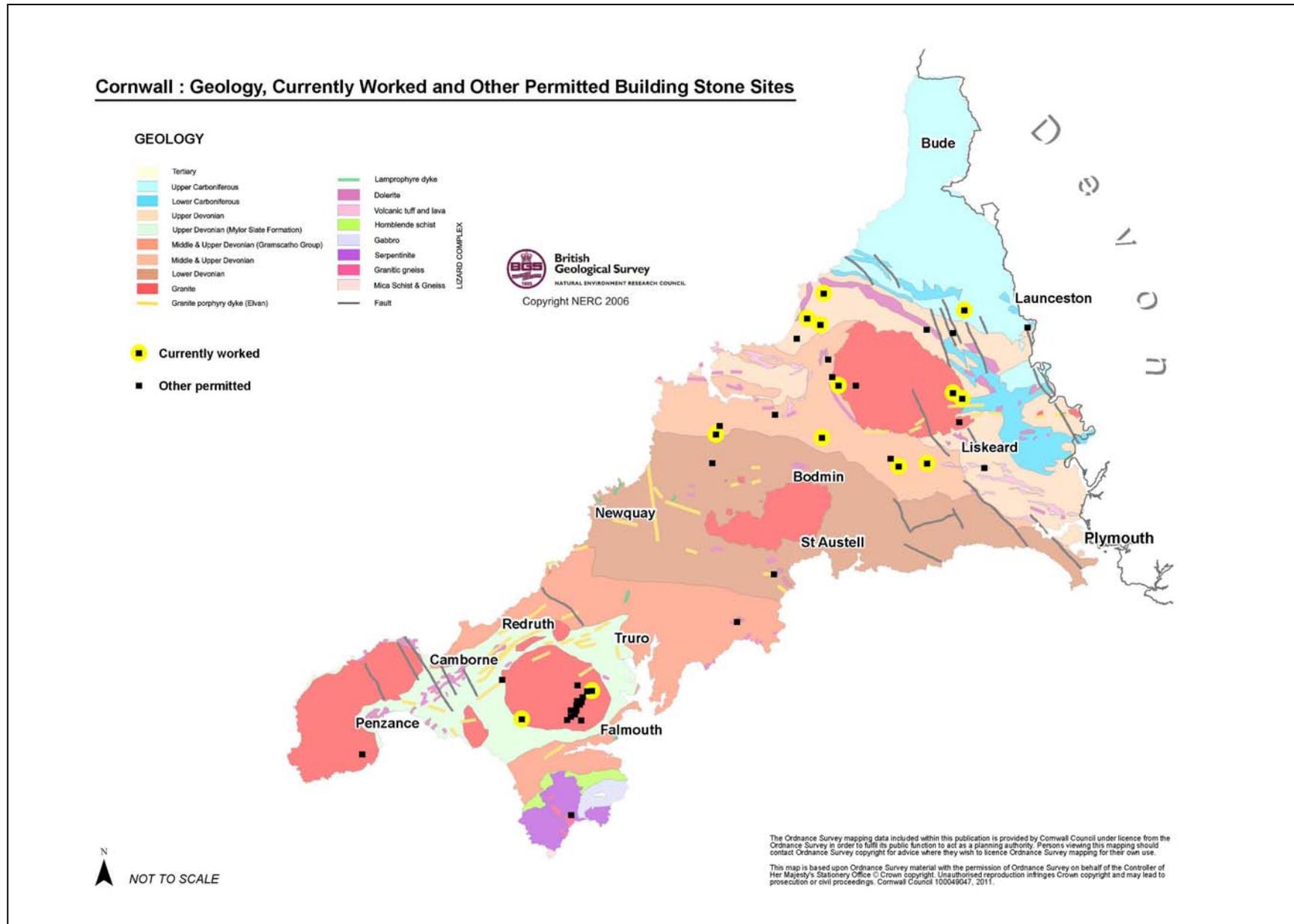
**Table 2.1 Status of permitted building stone extraction sites in Cornwall**

Site	Location	Status	Mineral type
Bearah Tor Quarry	Minions	Active (currently working)	Granite
Bosahan Quarry	Constantine	Active (not currently working)	Granite
Burnthouse Quarry	Mabe	Active (not currently working)	Granite
Callywith Quarry	Bodmin	Active (currently working)	Slate/shale
Caradon (Gonamena) Quarry	Caradon Hill	Active (currently working)	Granite
Carbilly Tor Quarry	Blisland	Dormant	Granite
Carzantic Quarry	Launceston	Dormant	Granite
Castallack Quarry	Lamorna	Dormant	Granite
Cheesewring Quarry	Minions	Dormant	Granite
Clowance Quarry	Praze-an-beeble	Dormant	Granite
De Lank Quarry	St Breward	Active (currently working)	Granite
Delabole Quarry	Delabole	Active (currently working)	Slate
Eathorne Quarry	Constantine	Dormant	Granite
Goodygrane Quarry	Mabe	Dormant	Granite
Gwendreath Quarry	Kennack Sands	Dormant	Serpentine
Hantergantick Quarry	St Breward	Active (not currently working)	Granite
Helsbury Quarry	St Breward	Dormant	Granite
Jobswater Quarry	Mabe	Dormant	Granite
Kestle Quarry	Sladesbridge	Dormant	Slate/Dolerite
Lambest Quarry	Menheniot	Active (not currently working)	Granite
Lantoom Quarry	Dobwalls	Active (currently working)	Slate
Maen Cairn Quarry	Constantine	Dormant	Granite
Molingey Quarry	St Austell	Dormant	Dolerite
Palastine Quarry	Mabe	Dormant	Granite
Pilsamoor Quarry	Egloskerry	Active (currently working)	Dolerite
Retallack Quarry	Constantine	Dormant	Granite
Rosevanion Quarry	St Columb Major	Dormant	Granite
Spargo Downs Quarry	Mabe	Active (not currently working)	Granite

<b>Site</b>	<b>Location</b>	<b>Status</b>	<b>Mineral type</b>
Trago Mills Quarry	Doublebois	Active (not currently working)	Slate
Trannack Quarry	Helston	Active (currently working)	Granite
Trecarne Quarry	Delabole	Active (currently working)	Slate
Tredinnick Quarry	St Issey	Active (currently working)	Slate
Tregunnon Quarry	Laneast	Active (not currently working)	Greenstone
Trenoweth Quarry	Mabe	Active (currently working)	Granite
Tresahor Quarry	Constantine	Dormant	Granite
Trevaney Quarry	Constantine	Dormant	Granite
Trevillet Quarry	Tintagel	Active (currently working)	Slate
Trevone Quarry	Mabe	Active (not currently working)	Granite
Trolvis Quarry	Longdowns	Dormant	Granite
Tubbs Mill Quarry	Tregony	Dormant	Dolerite
Tynes Quarry	Delabole	Active (currently working)	Slate
Westwood Quarry	Doublebois	Active (not currently working)	Slate

'Figure 2.2: Geology, currently worked and other permitted building stone sites' shows all the permitted building stone sites in Cornwall

Figure 2.2: Geology, currently worked and other permitted building stone sites



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.

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

Building stone production in Cornwall mainly serves local needs for construction, walling 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.

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

### **4.1 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. Mineral Planning Statements and Mineral Planning Guidance notes were replaced by the NPPF and are no longer extant.

The NPPF is generally supportive of the building, roofing and ornamental stone extractive industries; reference is made to the need to ensure a sufficient supply of material for buildings. It also states that consideration should be given to how to meet any demand for small-scale extraction of building stone, at or close to, relic quarries needed for the repair of heritage assets.

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 also clarifies the status of existing plans with full weight given to policies adopted since 2004 until March 2013. In all other cases and from March 2013 due weight should be given to relevant policies in existing plans according to their degree of consistency with the NPPF (the closer the policies in the plan to the policies in the Framework, the greater the weight that may be given).

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.

In addition, the Localism Act received Royal Assent in November 2011. The aims of the new legislation include decentralising and strengthening local democracy,

empowering communities and the introduction of neighbourhood planning. Information on the Localism Act can be viewed at: <http://www.communities.gov.uk/localgovernment/decentralisation/localismbill/>

## **5 History of local planning policy in Cornwall for building stone**

### **5.1 Cornwall Structure Plan 2004**

The policies of the Cornwall Structure Plan 2004 have been saved and will remain extant until replaced by Cornwall Local Plan. Structure Plan Policy 5 Minerals states that *“Mineral resources should be conserved and managed to provide a steady supply of minerals to meet the needs subject to environmental and special considerations and the need for high standards in restoration and aftercare. Development should ensure:*

- *The conservation of mineral resources;*
- *A steady supply if minerals is available;*
- *Impacts on the environment are minimised and encouragement given to the use of secondary or recycled aggregates;*
- *An increased use in non road based transport;*
- *The improvement of operational standards in all mineral workings;*
- *The high standards of restoration and aftercare are secured on a progressive basis;*
- *That adequate overall capacity for mineral waste arisings in Cornwall is provided for during the Plan period.”*

### **5.2 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.

### **5.3 Cornwall Minerals Development Framework**

Since the reform of the planning system (as required by the Planning and Compulsory Purchase Act 2004), work has been undertaken to replace the Cornwall Minerals Local Plan. Initially, Cornwall County Council was working towards the production of a Cornwall Minerals Development Framework. However, since the amalgamation of the former County and District/Borough Councils for Cornwall to form the unitary Cornwall Council minerals policy for Cornwall is now to be included in the Cornwall Local Plan see Section 5.4 below.

To progress this work consultations / stakeholder participation has been undertaken to date on the following publications:

- Cornwall Minerals Development Framework: Report on Issues and Options October 2004
- Cornwall Minerals Development Framework: Report on Preferred Options November/December 2006
- Cornwall Minerals Development Framework: Core Strategy Revised Report on Preferred Options May 2008

These documents can be viewed on Cornwall Council's website  
<http://www.cornwall.gov.uk/Default.aspx?page=22887>.

The 2006 and 2008 consultation documents maintained the need for specialist building stone quarries and the principle of heritage quarries was maintained.

**The Minerals Development Framework will no longer be progressed; strategic mineral policies are included in the Cornwall Local Plan – Strategic Policies**

## 5.4 Cornwall Local Plan

Following creation of the unitary authority for Cornwall in April 2009, minerals planning policy is now being prepared for inclusion in the Cornwall Local Plan, although it is anticipated that a specific Minerals Plan will be prepared following adoption of the Local Plan.

A consultation document, "Options and Preferred Options for Minerals, Waste and Energy" was prepared in January 2012 and detailed options and preferred options for minerals. With reference to building stone, the preferred options included:

- Support building and roofing stone extraction in response to market demand, including small-scale working within the AONB and WHS.

The pre-submission Local Plan – Strategic Policies March 2013 sets out the Council's proposed strategic mineral policies. These aim to support appropriately scaled building, roofing and ornamental stone development throughout Cornwall. Proposed policy also seeks to safeguard building and ornamental stone (including roofing and heritage materials) resources and reserves.

## 6 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.

### 6.1 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:

Estimated reserves = Number of remaining permitted years X 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 **44.5 million tonnes**. It is worth 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 34,000, 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.

## 6.2 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 Development Framework Report on Preferred Options, 2006, identified a total of 24 Heritage Quarries and these included elvan, dolerite, granite, slate and serpentine quarries. All these sites contained stone of a limited distribution and either did not have extant planning permission for extraction or were classified as 'dormant' under the Environment Act 1995. This study has been updated and is available as a technical paper<sup>2</sup>. The forthcoming Minerals Plan (to be published after the adoption of the Local Plan – Strategic Policies) will consider the need to safeguard 'heritage quarries'.

## 6.3 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](http://www.bgs.ac.uk/mineralsuk/mines/stones/eh_project.html).

## 7 Key considerations for planning policy development for building stone

**Consideration 1** To safeguard important and rare building stone deposits for future use and prevent their direct and indirect sterilization by other development.

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<sup>2</sup> The Building Stones of Cornwall: Identification of Heritage Quarries.

**Consideration 2** To maintain a sustainable and efficient supply of building stone to meet the needs for locally distinctive building materials. This may require the re-opening of disused quarries in sensitive locations in appropriate circumstances (e.g. for small scale or short term working) where harm to the environment and amenity can be mitigated satisfactorily.