Minerals Local Plan Site Options and Draft Policy Framework Evidence Paper

Minerals Technical Evidence

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Gloucestershire COUNTY COUNCIL

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3.0 Building and Roofing stone

3.1 Introduction & Local Policy Context

3.1.1 Natural building and roofing stone plays a major role in the UK economy by enhancing our living and working environments. It is also a vital part of our cultural heritage, which itself is a major asset for expanding leisure and tourism industries.

3.1.2 Natural stone has been used in building work across the UK for more than a millennium. Its geological diversity across the country has resulted in a varied use of different stones, which is probably unrivalled anywhere else in the world. The products include architectural masonry (dimension stone); natural stone 'slates' for roofing; sawn paving; natural paving; rough walling stone and crazy paving; kerbs and setts and monumental stone.

3.1.3 However, since the late 19th century natural stone production has been declined. This is largely due to changes in architectural styles, the availability of cheaper alternative building materials such as brick, steel or concrete, and the importation of less expensive stone from Europe and elsewhere in the world (e.g. South America and South-East Asia).

3.1.4 Nevertheless, natural building and roofing stone has remained important to the building industry, particularly in respect of building conservation and high-grade architectural projects.

3.1.5 Without access to the "right" natural stone, the built environment will become devalued. Historic buildings and monuments would either fall into disrepair, or be inappropriately restored. For new buildings, local vernacular styles and distinctive local characters may become degraded. Whilst traditional building techniques and skills such as stonemasonry would be lost over time and consigned to historic technical manuals. These concerns are recognised in the concept of 'heritage' quarries.

3.1.6 However, the working of natural stone, albeit often on an intermittent and small 'cottage industry' scale, but occasionally with periods of more intensive working, due to the specialised product, is an activity which, as with other types of mineral extraction, can result in adverse impacts on the environment and local amenity. Many of the country's remaining natural stone resources lie within designated rural landscapes, which also need to be protected and where possible enhanced.

3.1.7 In addition, whilst relatively new quarries may be subject to modern operating conditions, many of the historic building stone quarries were granted planning permissions in areas that have since become designated rural areas and were permitted at a time when the highway access was considered to be acceptable. The review of planning

permissions and their conditions to bring quarries up to modern operating standards[43] cannot alter the size of the permissions or the depth of mineral extraction, nor can it close a quarry because of poor access. Natural stone quarries can therefore sometimes pose a number of difficult planning challenges in seeking to provide for the stone necessary for new building and also for the sympathetic restoration and maintenance of existing structures.

3.1.8 It is also the case that many building and roofing stone sites that supplied local building work (both quarries and mines) predate planning controls and have long since been abandoned. Some have since been developed for other purposes but many have become overgrown and naturally colonised with little obvious sign of their previous use.

3.1.9 Consequently, a sound policy framework is needed to ensure the appropriate supply of natural building and roofing stone alongside the protection and enhancement of our valuable landscapes, natural environments and local amenities.

Local Policy

3.1.10 Local level policies for natural building and roofing stone in Gloucestershire are currently found in the Minerals Local Plan (1997-2006) which was adopted 2003. Chapter 4 and Policy NE1 of the Gloucestershire Minerals Local Plan sets out the approved local policy for the supply of building stone in the county. Policy NE1 states that:

"Proposals for sandstone and limestone working for natural building stone by extensions to existing workings, at new *"greenfield"* sites, or at sites where no valid planning permission exists, will only be permitted where: -

i. It can be demonstrated that the needs for the local stone cannot be met adequately from existing reserves and that the proposals are for predominately the production of natural building stone purposes; and

ii. the need for the stone together with other planning benefits outweighs any adverse environmental, local amenity and other impacts of its winning and working; and

iii. any crushing or screening of stone or overburden is confined to that removed in order to work the natural building materials and which cannot be used in the landscaping or reclamation of the site; and

iv. they are in accordance with all other policies of this plan, in particular those relating to the Environment, Reclamation and Development Control."

[43] Environment Act 1995

3.1.11 The Issues and Options Report that was produced for consultation in 2006 as part of the initial work on a Minerals Core Strategy, which is now to be replaced by this Local Plan, offered stakeholders their first opportunity to comment on the future of natural building and roofing stone in Gloucestershire. During the consultation and public minerals forums[44], three headline issues were raised –

- Local stone being used to the benefit of the local built environment;
- Designated landscapes such as AONBs need to be protected from the impacts of quarrying; and
- Transporting local stone needs to be carefully managed to make sure impacts on local amenity and the rural highway network are minimised.

3.1.12 Subsequently three preferred options were developed by the MPA for consultation as Preferred Options in 2008. These were;

MPO7a
Looks to apply the existing building stone policy used in the adopted MLP- Policy NE1. This policy provides a clear decision making framework including four criteria for new building stone proposals-

- A demonstration of 'need' for the stone
- The consideration of restoration benefits, heritage and the local economy
- An evaluation of crushing and screening of stone linked to aggregate production; and
- A review of other generic issues including local amenity, the environment and transportation

MPO7b

Proposes to expand upon the existing building stone policy used in the adopted MLP. It seeks to introduce the concept of 'local distinctiveness' and to develop a more 'spatial' approach to the management of the county's building stone resources. It sets out four additional elements;

- A direct reference to the county's key natural building and roofing stone resource areas
- A link between the MCS's mineral safeguarding policy and delineated minerals safeguarding areas (MSAs) for natural building and roofing stone
- Specific criteria for hybrid- building stone quarries; and
- A link between rural economy strategies and relevant District Local Development Framework (LDFs) in the context of local employment opportunities

[44] In July 2006, GCC undertook two public minerals forums to introduce headline issues and options for the emerging MCS. Information on the forum outcomes can be viewed on the GCC website via - http://www.gloucestershire.gov.uk/index.cfm?articleid=13348

MPO7c

Proposes the same resource safeguarding approach as highlighted in option MPO7b. However, it also looks to allocate specific sites for the future working of natural building and roofing stone

This option would provide a greater degree of certainty in terms of securing future provision. However, due to the complexity of resources in the county, preferred areas will only be considered where a sufficient evidence base has been made available. This would include the geological reliability of resources and a clear demonstration of the 'need' for the stone; or particular stone products at a local, regional and / or national level. Information to this effect should be forthcoming from interested stakeholders, such as prospective quarry operators alongside English Heritage and local building conservation officers in respect of the 'need' issue.

3.1.13 Option MPO7b received the most positive support from respondents to the consultation on these options which was seen as the overall preferred option. Whilst this option was supported because of its 'local distinctiveness' in recognising the unique character of the different building stones in the county and safeguarding building stone resources , concerns were raised about the practicality of delineating suitable MSAs.

3.1.14 The MPA concluded that Option MPO7b should form the basis for the emerging policy in the MCS.

3.2 Natural Building and Roofing Stone in Gloucestershire

3.2.1 The working of natural building and roofing stone is an important part of the mineral industry in Gloucestershire. It is required for the on-going repair and maintenance of the county's rich and diverse historic built environment and for supplying new-build and specialist, high-grade architectural projects.

Natural Building and Roofing Stone Resources

3.2.2 Gloucestershire's natural building and roofing stone resources may be divided into two main mineral types: Limestone and Sandstone. These sedimentary rocks are separated over geological time and resource locations across the county. The following paragraphs provide a brief overview of the different stone resources starting with the oldest and ending with the youngest over geological time; more details on the mineral resources of the county are also to be found in the evidence report relating to Mineral Safeguarding Areas.

3.2.3 The oldest natural building and roofing stone currently worked in Gloucestershire is derived from Palaeozoic sandstones of the Devonian

"*Brownstone Formation".* These were deposited between 400 and 360 million years ago and have a characteristic deep purple / red and green colour. The resource is present within the Forest of Dean on the edge of the coalfield and outcrops between Mitcheldean in the north and Lydney to the south. The Brownstones have recently been worked at Wilderness Quarry near Mitcheldean and thinner beds are worked at Copes Quarry near Blakeney for roofing slates.

3.2.4 Another Devonian rock that is particularly resistant to erosion and which has been widely used is the very coarse grained sandstone and conglomerates of the *"Quartz Conglomerate Formation*". The latter is noted for its mix of substantial pebbles of quartz and igneous (volcanic) rock. Although examples of this stone can be seen in local buildings and also as quern stones and as apple cider presses it has not been worked for some time.

3.2.5 The county's most significant building and roofing stone from within the Forest of Dean area comes, however, from a series of younger, Carboniferous sandstones known as the "*Pennant Formation*". These sandstones were deposited around 360 to 280 million years and are known locally as Forest of Dean Blue or Forest of Dean Grey when referred to as a building stone due to subtle differences in their colour. The sandstones are commonly characterised by the presence of haematite or iron ore which creates a very distinctive red veining effect through the stone.

3.2.6 The Pennant Sandstone makes up the greater part of the Coal Measures in the Forest of Dean and the sequence has some notable coal seams. Extensively worked, especially where the beds have a low angle of dip, it is used locally and further afield as a building and engineering stone for use in heavy construction projects (railway bridges/docks etc;).

3.2.7 The younger Carboniferous limestone, also sourced from the Forest of Dean but from much larger quarries, is a further local source of a natural building stone. However, the vast majority of this particular mineral is crushed for use as an aggregate by the construction industry. More details about this can be found in the County Council's Local Aggregates Assessment and in the Section 2 of this paper which are concerned with the provision of crushed rock aggregate.

3.2.8 To the east of the Forest of Dean the county is dominated by much younger, gently inclined rocks of Mesozoic age. In the far north-west of Gloucestershire are the sandstones of the "*Bridgnorth and Bromsgrove Formations*". These were deposited between 280 and 200 million years ago during the Permian and Triassic periods. The relatively soft Bridgnorth sandstone is poorly cemented and although it has been used as a building stone its main use is as an aggregate (sand) after crushing; it is quarried at Bromsberrow. More information on this particular

resource can also be found in Section 2 of this paper which deals with sand and gravel.

3.2.9 The Bromsgrove Sandstone, though no longer quarried, has been widely used as a building stone and is a mixture of pebbly sandstones, similar to the Devonian Quartz Conglomerate of the Forest of Dean, siltstones and mudstones. There are numerous examples of this stone being used in local buildings.

3.2.10 In the Severn Vale grey and cream thinly bedded White Lias limestones that mark the transition between the Triassic and Jurassic periods and similar limestones and iron rich marlstones of the overlying Lower Jurassic (Blue Lias) have been quarried. However, the Jurassic rocks that have been and are most widely worked are the limestones of the Inferior and Great Oolite Groups that cap the Cotswold Hills above Cheltenham. This upland area is the source of some of the most important natural building and roofing stone in Gloucestershire.

3.2.11 These limestones, which were deposited between 200 and 130 million years ago, are made up of spherical or sub-spherical calcareous rock particles (ooliths *c.*<1mm diameter) that were formed from the accretion of successive, concentric layers of calcium carbonate around a central organic (e.g. shell fragment) or inorganic (e.g. sand grain) 'nucleus' that was caused by the constant agitation of the ooliths in the shallow waters. The shape and size of the ooliths have made this type of limestone relatively easy to cut in any direction. They have also allowed for a smooth and precise finish, which is often termed as "*freestone*" by the traditional stone craftsmen. Some other limestones may be comprised of pisoliths–these are larger ooliths (3-6mm diameter) which because of their 'pea' size give rise to the locally named Pea Grit.

3.2.12 In addition, the differences in the type of shelly materials available and their subsequent deposition, has resulted in many subtle variations in the limestone across the resource. Variations can be seen in the texture, colour and quality of quarried stone, at different locations and even between different horizons within a single quarry site, with stone varietals often having a local name.

3.2.13 The limestones of the Inferior Oolite group are the oldest of the two groups and are between 200 and 150 million years old. The group is comprised of a varied sequence of mainly oolitic limestones that range in thickness from <20m in the east and south of the county to over 100m in the Cheltenham-Cleeve area. A number of distinctive rock types can be distinguished including a range of freestones.

3.2.14 The overlying Great Oolite, which may be up to 90m thick, has an even greater variety of rock formations and different stone types with individual formations that thicken, thin and die out laterally. It includes limestones,

clayey limestones and shelly oolitic limestones. The flaggy, sandy oolitic limestones that comprise the Stonesfield Slate Beds are up to 8m thick and are more prominent in the mid and north Cotswolds; these limestones are an important source of traditional roofing stone.

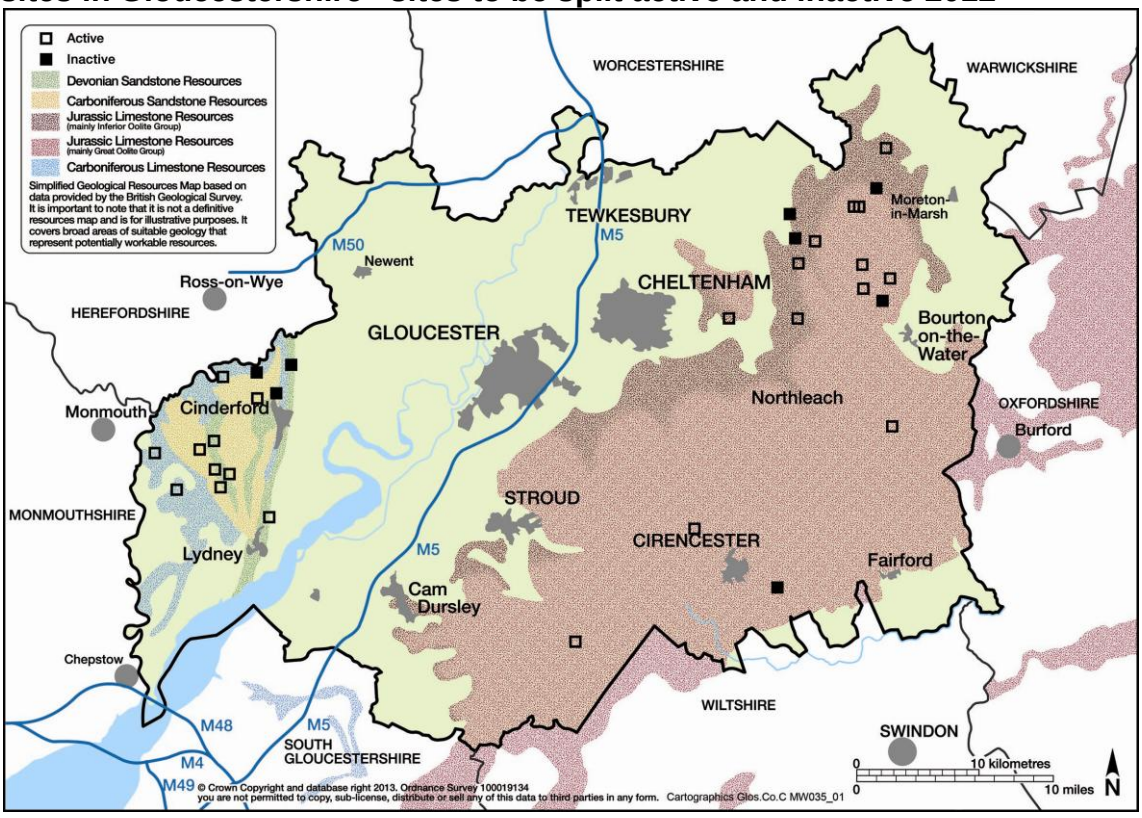
3.2.15 Appendix B of this report provides an example list of the different local stone types, particularly the Jurassic limestones that are derived from the Inferior and Great Oolite limestone groups in the county. This list is not exhaustive and may not include all the stone types that have been worked. It is also worth noting that many of the stone types represent '*relic'* stones, which have not been supplied locally for some time, or are no longer available in the UK. Furthermore, the name given to each stone could be subject to local variation.

3.2.16 Although Gloucestershire contains a wide range of locally distinctive natural stone types their use is not confined to the administrative boundaries of the county. Consequently natural stone from quarries in Gloucestershire have been used for many building and conservation projects in the neighbouring areas of Wiltshire, Bath and North East Somerset and Oxfordshire[45] and in projects much further afield. In its report '*Strategic Stone Study A Building Stone Atlas of Gloucestershire*' (2011), English Heritage cites many historic examples of the widespread use of the county's building stones in buildings and other structures in Gloucestershire and beyond.

3.2.17 Figure 3 highlights the distribution and extent of natural building stone resources in Gloucestershire.

[45] Farmington Natural Stone Ltd has supplied stone from its quarry in Gloucestershire for a housing scheme in Biddestone, Wiltshire and the large re-development of Sydney Wharf in Bath.
http://www.farmingtonnaturalstone.co.uk/projectofthemonth_march.html *(as of May 2007)*
Natural Stone Markets Ltd also exemplifies the supply of its stone to several Colleges of Oxford University and the refurbishment of the 'Alms Houses' in Corsham, Wiltshire. http://www.cotswoldstone.co.uk/home.htm *(as of May 2007)*

Figure 3: Natural Building and Roofing Stone Resources and permitted sites in Gloucestershire –sites to be split active and inactive 2012

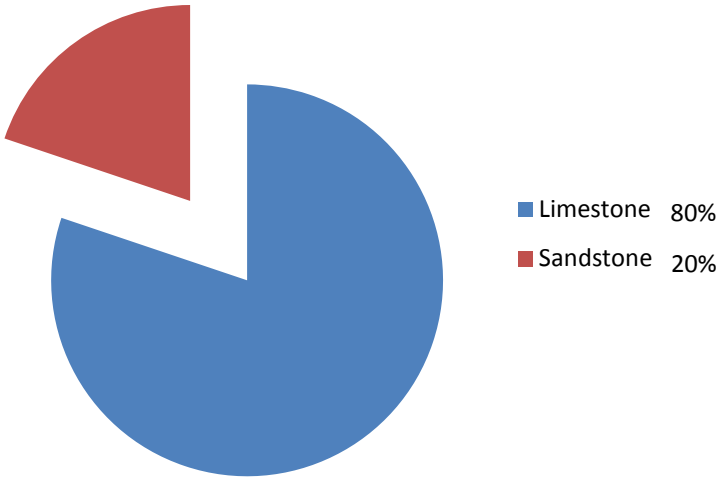


Natural Building and Roofing Stone Supplies

3.2.18 As at 31/12/2012, the supply of natural building and roofing stone from Gloucestershire was just less than 61,000 tonnes, of about which *c.*12,000 tonnes were sourced from sandstone quarries[46]. The vast majority was sourced from the Jurassic limestone resource found in the Cotswolds. The remainder was supplied by the Devonian and Carboniferous sandstone and limestone quarries in the Forest of Dean. No building stone was supplied from the Permian and Triassic sandstones located in the northwest of the county.

[46] Gloucestershire County Council Survey

Figure 4: Natural building and roofing stone supplied from Gloucestershire during 2012 by key mineral type



3.2.19 Over the 10 year period from 2002 to 2012 inclusive, the supply of natural building and roofing stone from Gloucestershire has shown a fairly steady increase in output, although there have been some local variations. The more recent annual breakdown of natural building and roofing stone supplies between 2008 and 2012 inclusive can be found in Appendix C.

Natural Building and Roofing Stone Reserves

3.2.20 Due to the variability of the county's building stone resources and the lack of continuity of some, particularly those found in the Cotswolds, and the tendency for mineral operators to extract different quarry products alongside building stone, it is difficult to provide an accurate indication of the permitted reserves that are present in the county. Overall reserves and reserves intended for a particular end use are prone to rise and fall according to geological circumstances and commercial considerations.

3.2.21 This is a key issue with the county's Carboniferous and Jurassic limestone quarries which also supply crushed rock aggregate, mineral for industrial purposes and quantities of agricultural lime. Where reserve assessments are carried out at relevant quarries it can prove extremely difficult to distinguish between which part of the reserve will prove suitable as a building stone and will not be used for another quarried product.

3.2.22 Nevertheless, local operators are actively encouraged to provide annual estimates of their non-aggregate reserves. These estimates cover all

natural building stone products, agricultural lime and mineral for industrial purposes, where it is also worked.

3.2.23 As at 31/12/2012, Gloucestershire's reserves of rock to be used for non-aggregate purposes were estimated to be 8.2 million tonnes. This amount increased from earlier years due to an increase in the reserves of Carboniferous limestone to be used for industrial purposes. Previously just over half of the reserves were present at Jurassic limestone quarries in the Cotswolds with the remainder being comprised of sandstone and limestone reserves in the Forest of Dean.

Remaining Years of the natural building and roofing stone Landbank[47]

3.2.24 Based on the current rate of supply as at 31/12/2012, the county's non-aggregate reserves could provide for up to 35 years of non aggregate supplies. However, this is a gross amount that does not take into account the complexity of the resources; the requirements for particular product and building stone types. This level of detail cannot currently be presented due to issues of confidentiality of individual company data.

Natural Building and Roofing Stone Sites in Gloucestershire

3.2.25 As of 31/12/2012, 22 building and roofing stone sites were in production. Appendix C shows the number of sites that were in production since 2008 and their annual output to 2012.

3.2.26 As can be seen from Appendix C, the vast majority of the county's natural building and roofing stone sites lie within the Cotswolds, and Figure 3 shows these to be concentrated to the east of Cheltenham and north of Northleach. However, there is also a strong concentration of operations within the Forest of Dean.

3.2.27 In addition to these sites there are many, known historic (relic) building stone quarries present in the county and probably many more that are not evident today. According to English Heritage, the known relic sites and the permitted sites number more than 250 sites.[48] Although some of these sites may be barely recognisable as a former quarry, some could still contain workable building stone that could be required at some point in the future for certain specialist building and conservation projects. However, the re-opening and working of these sites must be able to meet all modern operational standards and where none are in place will require new planning permissions; some of these quarries, which may have provided supplies of building stone in the past, are listed in Appendix D.

3.2.28 This list of known quarries is not exhaustive and will need to be revised over time as it is based initially upon survey work carried out by the County Council for the "Review of Old Mineral Permissions (ROMPs)" as

[47] Permitted reserves divided by the latest annual production level
[48] Strategic Stone Study A Building Stone Atlas of Gloucestershire 2011 English Heritage

required by the Environment Act 1995[49]; which does not take account of quarries closed before the advent of the UK planning system in 1947, and more extensive work on quarries that has been undertaken by English Heritage as part of its Strategic Stone Study. Further liaison with English Heritage, District conservation officers and County Heritage Team is likely to throw up more historic building stone sites as records are reviewed, some of which, subject to the necessary permissions, could possibly be re activated to provide a variety of building stone that has not been won for many years or further resources of a stone that is worked today.

3.2.29 The results of the Strategic Stone Study to date has revealed just how widespread the extraction of building stones has been in the county but also the popularity of particular stones. For instance, the study has shown that in excess of 80% of the sites recorded by the Study had worked Jurassic limestones, mainly the Birdlip Limestone, Coppice Limestone, Forest Marble and White Limestone but that about 15% of sites had worked Carboniferous rocks, mainly Pennant sandstones; Devonian, Triassic and other Jurassic limestone sites made up the remaining contributions.

Size and Scale of operations

3.2.30 Most natural building and roofing stone operations in Gloucestershire are small-scale and focus on the supply of products for local building conservation and more bespoke new building projects. Many of the quarries are worked intermittently; this is due in part to the limited nature of the market for their particular quarried stone.

3.2.31 However, there are also some quarries, particularly within the Cotswolds area, which are more intensively worked. These are characterised by the working of aggregates in bulk volume as well as the usual lesser quantities of building stone and may be described as “hybrid building stone quarries”. This type of operation is attractive to the quarry owners as it provides more diverse and consistent revenue streams.

3.2.32 There are a number of issues surrounding this type of quarry operation which are not normally associated with small building stone quarries: -

- The rational and sustainable working of resources to their full potential;
- The increased potential for adverse amenity impacts due to crushing operations and increased scale of working (noise, dust, traffic etc.);
- The potential loss of valuable building stone to aggregate uses;
- The size and nature of operations with landscaping impacts; and

[49] Through the Environment Act 2005, MPAs are required to periodically review and update old mineral permissions. As part of this process local surveys have been carried out in order to establish which sites would meet the various review criteria as set down by the Act. As a result a list of redundant / closed sites was formulated in Gloucestershire. All of these sites failed to meet the review criteria and as such would need completely new permissions before new working can take place.

- The loss of quarry 'waste' material for restoration.

3.2.33 The challenges and problems posed by hybrid working are possibly more acute in Gloucestershire than elsewhere because of the substantial extent of designated and protected landscapes over much of the key limestone resource (i.e. Cotswold AONB). In addition, highway safety and management issues resulting from a limited rural road network present a further compounding factor.

3.2.34 The small amount of building stone produced by crushed rock aggregate sites in the Forest of Dean represents only a small proportion of their total annual output[50].

Techniques: Quarrying

3.2.35 Unlike quarrying for the production of crushed rock aggregates, which normally involves the use of explosives, to reduce the size of the rock to small fragments at the quarry face followed by crushing and screening to produce a range of sized aggregates, the use of blasting is limited (if used at all) in the production of natural building and roofing stone. This is because the intention here is to recover large, 'undamaged' blocks of stone from the quarry face that can then be dressed to size. Where blasting does take place it is associated with the county's limestone quarries that are primarily operated to produce crushed rock aggregate (i.e. Carboniferous Limestone in the Forest of Dean); any building stone produced by these quarries is regarded as a by-product of the operation.

3.2.36 Most of Gloucestershire's natural building and roofing stone is therefore quarried by mechanical excavators, which are used to take careful advantage of the rocks' natural discontinuities at the quarry face such as bedding planes and joints to prise blocks and smaller stone (e.g. rubble, slates) free. However, stone blocks may also be quarried or subsequently reduced in size by hand using picks, jacks, hammers and wedges.

Processing

3.2.37 There are many different ways of processing natural stone after it has been won at the quarry face. These directly relate to the quality of quarried materials and the intended end-uses.

3.2.38 In Gloucestershire several processing techniques are employed. The simplest of these is simple splitting and breaking to create rough walling stone and naturally "riven" paving. In the majority of cases this operation is carried out on-site either by hand or by using a mechanical stone guillotine. When larger blocks of stone (dimension stone) are needed to

[50] As at 31/12/2012 building stone derived from larger-scale crushed rock aggregate quarries accounted for approximately 8% of their total annual output. These crushed rock operations are referred to in more detail in Section 2 of this paper on crushed rock aggregates.

create masonry, cladding and some types of paving products more complex processing techniques are employed. In this case blocks are either cut or sawn down using heavy-duty frame saws and rotary blades before being handcrafted by stonemasons into complex or ornate designs.

3.2.39 Due to the investment needed for specialist equipment and the limited availability of stonemasonry skills, dimension stone cannot always be worked on-site. As a result it is often transported to stone yards in and near Gloucestershire for processing[51].

3.2.40 Some of the building stone resources in Gloucestershire are also worked to provide stone 'slates' for roofing. Three different methods of slate production have been practiced in the county. Their use is linked to the characteristics of the particular stone and the technical skills available.

3.2.41 The first method involves the laying out of quarried limestone for frost shattering between the winter months of November and January. This creates a very thin slate, which can be lightly worked by hand to create a roof stone e.g. "Stonesfield Slate". The origins of this technique can be traced to the village of Stonesfield in West Oxfordshire. It is very much an historic process, which is heavily dependent upon local weather conditions.

3.2.42 The second method is by splitting the stone by hand shortly after it has been extracted from the ground. This is the oldest method of producing slates in the Cotswold area. Although it requires a degree of skill and timing to perfect it is still practiced at a small number of local quarries that work the "Forest Marble" limestone.

3.2.43 The third and final method of producing stone slates is by sawing stone to thickness using frame saws and rotary blades. This method is less precise than the "splitting" of more traditional methods and does not always provide for the variety of stone slates. As a result some concern has been expressed locally in applying mechanically cut stone slates to certain building and conservation projects[52].

Building Stone Markets in Gloucestershire

3.2.44 As referred to earlier, there are two principal markets for natural building and roofing stone i.e. repair of historic buildings and new build projects.

3.2.45 In Gloucestershire, the repair of historic buildings is a significant driver of local demand. The county has a renowned and rich built heritage of

[51] e.g. Forest Stone Firms in the Forest of Dean imports local stone from Barnhill / Bixhead Quarry *(see diagram 1)* to its stone works at Parkend near Lydney for processing into finished products and bespoke pieces of masonry. Cotswold Natural Stone Ltd exports stone from Oxleaze Quarry near Cheltenham to its stone yard based at Shilton near Burford in Oxfordshire.

[52] Cotswold District Council and Tewkesbury Borough Council Technical Notes on Stone Slate Roofing, both advise that: - *Stone slates which have been sawn to thickness, rather than split, can be technically and aesthetically unacceptable and, if they fail to meet these criteria, should not be used on historic buildings.*

listed buildings and conservation areas[53]. A significant number of buildings and structures covered by one of the listings or which lie within a conservation area will at some point require new stone for repair and maintenance purposes.

3.2.46 Despite the UK wide downturn in the production of building stone over the last 100 years or so, and notwithstanding the 'blip' caused by the current economic depression, the local market has remained relatively constant with an upsurge in demand being evident in recent times. This has been due in part to the heightened public interest in building conservation, greater access to financial assistance (particularly through the heritage lottery fund)[54] and until 2008, a buoyant national economy. Planning policies and controls have also had an influence on the strength of this local market. This is demonstrated through district local plans and technical planning guides wherein policy support is given for the use of natural local stone where it will act as a direct or suitable replacement in the repair of the historic environment.

3.2.47 The other key market for local building stone is new build projects. This is concerned primarily with maintaining vernacular styles and local distinctiveness through the greater use of local building materials. It also refers to the specific requirements of certain contemporary styles in both external and internal decoration (e.g. carved fireplaces, statutes, ornaments and flagstones). Similar to the sector for historic stone, district planning policies look to encourage the use of local building stone where it contributes to the quality of the built environment. The 'export' market to provide stone for 'prestigious' building projects also contributes to this demand.

[53] Conservation Areas are designated under the terms of the Planning (Listed Buildings and Conservation Areas) Act 1990. They are areas of special architectural or historic interest that through the planning process should be '*preserved and enhanced'*.

[54] According to the Heritage Lottery Fund (LHF) over £3.6 billion has awarded to more than 22,500 building conservation projects across the UK since 1994.

3.3 Key Issues facing Natural Building and Roofing Stone in Gloucestershire

3.3.1 As referred to earlier there has been an increased interest in the use of natural building and roofing stone in recent years. This coincides with greater public awareness and interest in building conservation, more financial support for conservation practices and increased policy guidance and technical advice on using the *'right'* materials in the built environment.

3.3.2 However, this interest does not come without its own set of issues and challenges. As with all extractive industries, the working of natural stone is inherently unsustainable and relies upon ever decreasing resources. This is compounded by environmental and amenity issues and other conflicting development pressures which can limit the availability of otherwise workable resources.

3.3.3 In the case of natural building stone there are also more specific considerations that need to be taken into account in Gloucestershire. These are concerned with: -

- The availability of specific requirements for certain building stone types and products;
- The balance of the rural economy and in particular, employment from quarrying, agriculture and tourism;
- The competing interests for mineral resources from other quarry market sectors (*e.g. the use of natural stone resources for aggregates)*.

3.3.4 The following paragraphs seek to explore in more detail the specific local nature and relative significance of these considerations.

Availability of the 'right' local stone

3.3.5 Gloucestershire is renowned for its rich and diverse built environment, which is characterised by wide variations in local natural building and roofing stone and vernacular styles. Many traditional local buildings were originally constructed using nearby materials which have unique colour, texture and weathering properties. It is therefore often possible to

identify the exact type and source of the stone that has been used in buildings and thereby to seek to use of a stone that matches the original for new build and especially for use in restoration work. Using the 'right' technically suitable, compatible and historically appropriate stone, i.e. stone that closely replicates the original in its appearance, chemical, physical and mineralogical properties, strength and durability, will ensure the continued integrity, regional identity and historic value of the county's built environment.

3.3.6 However, local provision for the different types of building stone of Gloucestershire can be extremely variable. This is due in part to the number of available quarries still in operation, planning and other constraints that restrict the extension to, and / or opening of new workings, and other land-use pressures that may sterilise un-worked or previously worked resources. Importantly many original, often pre 1947 sources of natural building and roofing stones are no longer worked and supplies of these have been missing from the local market for some time.

3.3.7 The varied availability of local building stone has undoubtedly had an impact on the supply and demand of different building stone products and alternative stones may have had to be used. This is not always possible or acceptable and possibly may have contributed to "stone stripping" which has taken place across parts of the county[55].

Competition for Resources

3.3.8 A significant proportion of the county's limestone and sandstone building and roofing stone resources have the potential to be used as a relatively high specification aggregate mineral e.g. for use in concrete or, in the case of Pennant sandstones, as a high value road surfacing aggregate, and all the building stone resources could be used for lower specification materials such as construction fill. This potential dual use is most clearly exemplified within the Cotswolds resource area where some of the Jurassic limestone formations are an important source of both natural building and roofing stone and crushed rock aggregate. Notwithstanding the higher price per tonne commanded by building stone and a general increase in demand, the influence of other factors such as an uncertain and often fluctuating building stone market and the lower volumes it calls for and the ready availability of lucrative aggregate minerals which, and notwithstanding their lower price per tonne than building stones, will be required in bulk quantities has made 'hybrid quarrying' an attractive proposition where the geology and planning permissions allow.

3.3.9 However, hybrid quarries are, by the nature of their product range, more intensively worked and can increase the impact of quarrying on local amenity and the environment. They also increase the rate of extraction

[55] Cotswold District Council has raised concerns over the stripping of stone slates from outbuildings and barns for use in historic repair and other new build projects. This issue was set out in the CDC's response to the Issues and Options consultation in 2006. It was also an item discussed at the District's Planning (Regulatory) Committee in December 2006.

and the exhaustion of mineral resources which might otherwise be used in the future for building stone purposes.

3.3.10 A further problem is the use, as an aggregate, of the quarry waste that is invariably generated at building stone quarries where stone is selectively quarried. Ordinarily this material would have a potential role in the restoration of the void. However, if it is instead used as an aggregate, imported fill materials could be needed for the completion of restoration works in the quarry.

Protecting and Enhancing Designations

3.3.11 A significant number of Gloucestershire's building stone quarries lie within, or close to, important landscape and other natural environmental designations. Therefore, a balance needs to be struck between facilitating new mineral working, for the maintenance of the historic built environment and for sympathetic new build, and ensuring that these valued designations are protected and enhanced.

3.3.12 Many of the quarries are historic in nature and have not been afforded the same degree of consideration and control as seen at more modern operations. Despite efforts to improve matters through stricter new permissions and reviews of planning conditions under the Environment Act 1995 and legislation that covered even earlier planning permissions[56], many quarries retain examples of inappropriate and poor methods of working represented by, for instance, quarry face instability, a lack of appropriate infill materials and the absence of a comprehensive restoration, afteruse and aftercare programme.

Changing Markets

3.3.13 Although there are well-established markets for natural building and roofing stone in Gloucestershire, their relative importance to each other rarely remains the same from quarry to quarry. The specialist and often, localised demand for certain stone types can create notable differences in sales figures over a period of time. Furthermore, changes in both architecture and design fashions and preferences may result in new and / or expanded business opportunities or shrinking markets. This is particularly the case with the new build market, which includes ornamental pieces, fireplaces, garden landscaping products and high-grade architectural masonry.

3.3.14 In Gloucestershire, there is some evidence that operators have sought to increase their businesses and product ranges to serve an ever expanding new build market[57]. Although this is an expected part of a well-run business, a degree of caution needs be to taken in facilitating or supporting any notable shifts in the market as this could be to the

[56] Planning and Compensation Act 1991

[57] The operators at Farmington, Brockhill, Veizey's and Stanley's quarries, all promote associated new-build products such as fireplaces, ornamental landscaping stone, and internal flooring slates along with more traditional stone walling and slate for historic repair and decoration.

disadvantage of supplies of building and roofing stone to the more 'traditional' markets for historic repair purposes.

Quarrying and Processing

3.3.15 Quarrying of any new mineral will require a significant degree of capital investment. This may include acquiring or leasing the site, obtaining relevant licenses and permissions, employing staff and developing site infrastructure. However, the profitability and subsequent viability of certain smaller-scale operations, such as the building and roofing stone quarries, is becoming ever more challenging with rising costs and increased controls and regulation.

3.3.16 In response to these ever increasing economic pressures there has been a degree of consolidation in the ownership and / or operation of Gloucestershire's building stone quarries[58]. This has resulted in the development of local site networks that include several satellite quarries which supply stone to a central quarry with stone processing plant or to a designated stone yard such that a number of activities, including heavy-duty processing, may be carried out only at one centralised location, stone being worked at a satellite quarry only as and when its particular variety of stone is needed

3.3.17 These types of network have a number of economic benefits in terms of reduced costs and economies of scale but they can pose a number of challenges. These include; increases in local haulage and associated amenity impacts, a potential increase in the lifespan of certain sites due to the husbanding of reserves and the development of more permanent and substantial centralised processing sites / manufacturing operations within rural locations.

[58] Examples of consolidated building stone operations in Gloucestershire include: Cotswold Stone Quarries, which runs a total of four sites *(Brockhill, Syreford, Swellwold, and Tinkers Barn)* and Huntsmans, which also has four sites *(Huntsmans, Three Gates, Hornsleasow and Shenberrow).*

3.4 Natural Building and Roofing Stone Draft Policy Framework

3.4.1 Like all other mineral resources, natural building and roofing stone can be worked only where it is found. Consequently the options available for its future working are initially determined by the geological distribution of the resource and then the commercial viability of working a particular deposit. Other factors may also influence whether working is a practicable and commercial proposition, some of these may rule out working completely or may just add costs to the development e.g. sterilisation by surface development, the availability of mineral infrastructure; accessibility to markets; and other engineering complexities such as slope instability, flooding etc.

3.4.2 As part of the county's strategy for mineral extraction the MLP policies will be concerned with the location and the extent of future building and roofing stone extraction in the county and the way in which it is to be controlled to ensure the successful management of the resources in the future. National guidance supports the supply of building stones but unlike aggregates, there is no guidance on the level of future provision for this mineral or on the use of a determining mechanism. In the case of aggregates, this mechanism is a Local Aggregates Assessment and also within Section 2 of this paper.

3.4.3 Due consideration should therefore be given to those policy mechanisms that will support appropriate supplies of local stone to meet demand for historic repair and maintenance purposes and the wider quality of the built environment. These mechanisms include:

- The safeguarding of resources;
- The use of policy criteria for assessing new proposals; and
- The allocation of preferred areas for the future working of natural stone.

3.4.4 As part of the preparation of the MLP stakeholders were encouraged to submit their thoughts and ideas on draft options that were developed following the *"issues and options"* consultation on the then Minerals Core Strategy and comments received as a result of the mineral forums held in

July 2006[59]. These investigations culminated in the identification of the preferred option (MPO7b) in 2008 which proposed the expansion of the existing building stone policy in the adopted MLP (2003). The following expanded Policy NE1 seeks to address the requirements of MPO7b.

Draft Policy Building Stone Policy

"Proposals for the winning and working of the county's key natural building and roofing stones will be permitted only where: -

- it can be demonstrated that the need for the stone cannot be met adequately from existing reserves and that the proposals are predominately for the production of stone to be used as a natural building or roofing stone; and
- any winning and working of rock for non building stone use is a by-product, and is ancillary, to the production of the natural building or roofing stone and is confined to that of overlying or interbedded waste stone that has to be removed in order to work the natural building materials or waste stone arising from the dressing of the building stone and which is unsuitable for on site landscaping or for use in the reclamation of the site; and
- they will help to conserve the historic built environment in Gloucestershire and to maintain its local distinctiveness or are to be used in the conservation of buildings built of the same or similar materials; and
- the proposals demonstrate that the winning and working will increase or maintain employment in Gloucestershire and make a positive contribution to maintaining the rural economy.

3.4.5 As the Mineral Safeguarding Policy is more fully developed that will make the link between those natural building and roofing stone resources which require safeguarding. With regards to a specific criteria for hybrid building stone quarries, where an operator intends to also work minerals for aggregate purposes the draft policy framework for aggregate working outside of preferred areas (see Section 2) will apply.

[59] On the 11th and 18th July 2006 Gloucestershire County Council held two minerals forums to introduce to stakeholders the key mineral issues facing the then emerging MCS for Gloucestershire. A summary report of the forums can be viewed on the Council website: http://www.gloucestershire.gov.uk/media/adobe_acrobat/c/6/MCS_Forum_Outcomes_Report.pdf

Appendix A GLOSSARY and List of Abbreviations

SWRA -South West Regional Assembly
MLP – Minerals Local Plan
MCS – Minerals Core Strategy
MPA - Mineral Planning Authority
RSS – Regional Spatial Strategy
FoD – Forest of Dean
UTV – Upper Thames Valley
CWP – Cotswold Water Park
AMM – Abandoned Mine Methane
CMM – Coal Mine Methane
CBM – Coal Bed Methane
BGS – British Geological Survey
DECC – Department for Energy and Climate Change
OUGO – Office of Unconventional Gas and Oil
UGS – Underground Gas Storage
PONs – Petroleum Operation Notice
COG - Conventional Oil and Gas

SILICEOUS MINERALOGY

BROWNSTONE – A type of sandstone used for building stone purposes. In Gloucestershire it occurs as a purple-red and green stone and outcrops in the Forest of Dean
BUILDING STONE – Naturally occurring rock, which is sufficiently consolidated to enable it to be cut or shaped for use as a walling, paving or roofing material
CARBONIFEROUS – A major division of geological time. It approximately covers the period between 360 and 280 million years ago
COMMUNITIES AND LOCAL GOVERNMENT (DCLG) – The Government department responsible for spatial planning and other local government matters
CORE STRATEGY – Sets the long-term spatial vision and strategy for the local planning authority area and provides the strategic locations for future development opportunities
CONGLOMERATE – a rock that consisting of individual stones that have become cemented together.
DEVONIAN – Is a geological period spanning from roughly 420 to 360 million years ago.
DEVELOPMENT PLAN – Sets out the policies and proposals for development and the use of land within the local planning authority area
DEVELOPMENT FRAMEWORK – A non-statutory term for describing the folder of documents, which includes all the local planning authority's local planning documents
FREESTONE – Any stone that can be freely worked in any direction.
JURASSIC – A major division of geological time. It covers the period between 200 and 130 million years ago

LANDBANK – The stock land with planning permissions but where development has yet to take place. Landbanks are commonly used for land, minerals, housing

MASONRY STONE – Used in construction and is more often bonded with mortar. It can be structural or as a cladding or paving.
MINERAL PLANNING STATEMENTS (MPS) – Guidance documents, which set out national policy for minerals
OOLITIC LIMESTONE – A carbonate rock made up mostly of ooliths *(or ooids)*, which are sand-sized carbonate particles that have concentric rings of $CaCO_3$ *(Calcium Carbonate)*. These rings are formed around grains of sand or shell fragments that were rolled around on the shallow sea floor, gathering layer after layer of limestone
PENNANT SANDSTONE – The term used to cover all sandstone quarried from the Carboniferous period that outcrop in South Wales and the Forest of Dean in Gloucestershire
PERMIAN – A relatively short period of geological time between 280 and 250 million years ago
PREFERED AREA – Areas identified in the development plan with a high degree of certainty for potential development / extraction *(in the case of minerals)*
RESERVES – Known mineral deposits with the benefit of planning permission for extraction
RESOURCES – A potential mineral deposit where the quality and quantity of material has not been fully tested. Resources do not benefit from planning permission
SOUTH WEST REGIONAL SPATIAL STRATEGY (RSS) – The 20-year spatial strategy for the South West region
SPATIAL PLANNING – Spatial planning goes beyond traditional land use planning to bring together and integrate policies for the development and use of land with other policies and programmes which influence the nature of places and how they function
TRIASSIC – Is a relatively short geological period from roughly 250 to 200 million years ago

APPENDIX B Key Natural Building and Roofing Stones in Gloucestershire

Devonian
Lower
Old Red Sandstone

Carboniferous
Carboniferous Limestone Series
Pennant Group

Jurassic
Inferior Oolite Limestone Group
Crickley Limestone (Pea Grit)
Lower Freestone (Birdlip Stone)
Guiting (Yellow) Stone
Notgrove Freestone
Oolite Marl and Upper Freestone
Salperton Stone
Witchellia Stone (Cleeve Hill Stone)
Great Oolite Limestone Group
Chipping Norton Stone
Cornbrash
Cotswold Limestone
Dagham Stone
Fullers Earth
Forest Marble
Hampen Stone
Taynton Stone
Througham Tilestones
Stonesfield Slates
Eyford Stone
White Limestone

Appendix C Natural Building and Roofing Stone –Production and recent site numbers *(Data provided in tonnes unless otherwise stated)*

Natural Building and Roofing Stone - Supply Data 2008 – 2012

Supply Year	Limestone*	Sandstone	Total Supply
2008	39,382	16,696	56,078
2009	37,580	9,310	46,890
2010	44,631	12,684	57,315
2011	38,640	11,266	49,906
2012	48,884	12,094	60,978

* Limestone Sites in the Forest of Dean and Cotswolds have been combined

Natural Building and Roofing Stone Sites# Data 2008 - 2012

Supply Year	Number of Limestone* Sites		Number of Sandstone Sites		Total
	In production	Not in production+	In production	Not in production+	
2008	14	15	10	3	42
2009	16	12	8	5	41
2010	18	10	8	5	41
2011	15	11	8	4	38
2012	14	12	8	4	38

* Limestone Sites in the Forest of Dean and Cotswolds have been combined
# Includes some sites classified as “Dormant”
+ This is only referring to building and roofing stone production, some sites may have been “in production” for purposes other than building and roofing stone during a given year

Appendix D
Historic / Relic Quarries in Gloucestershire

IMPORTANT INFORMATION: - The quarries listed below represent old mineral workings in Gloucestershire which were previously granted planning permission but which no longer have valid planning permissions. These quarries were once worked for building stone amongst other quarried products such as aggregates and agricultural lime and would have likely contributed to the different types of building stone supplied in the county. Whilst there are other quarries which produce the same or similar stone types to those found at a number of the listed sites, there may be historic / relic quarries that represent the only local source of a certain stone type that could be required in the future. Consequently, the inclusion of these sites within this evidence paper of the MLP may assist in the development of a deliverable safeguarding policy for ensuring the necessary diversity in local building stone types.

It is also important to acknowledge that the list is not exhaustive. It is based on the survey work carried out by the County Council as part of the "Review of Old Mineral Permissions (ROMPs)' which was required under Environment Act 1995. The survey looked to identify those sites in the county which ceased to have a valid planning permission under the provisions of the Act. Decision on this basis were made under paragraph 12 of MPG14, which stated that planning permissions which were no longer capable of implementation, had time expired, or had been worked out and restored should be discounted from future review and thus ended.

NB Sites in bold text are listed on the Stone Atlas database for Gloucestershire; those in black are not on this database but they may have been recorded under another name.
Furthermore, it is also important to note that older workings, which operated but were subsequently closed prior to the advent of the planning system in 1948, are not included in the list. Many of these (>200) are recorded on the Stone Atlas database. However, as more evidence becomes available particularly from English Heritage and the County's Archaeology Unit, additional sites may need to be added to the database of stone sites.
The list is divided between the generic resource groups of:

Carboniferous (Forest of Dean) Limestone,
Forest of Dean Sandstone, and
Jurassic (Cotswold) Limestone

Carboniferous (Forest of Dean) Limestone

Bearse	Edge Hill	Staunton
Bluestone *(Proberts Farm*)	Galders Wood	Stowfield Farm
Boatwood	Hawthorns	Tidenham Chase
Clearwell *(Village)*	Howbeach	Whitecliff
English Bicknor	Little Drybrook	Woodcroft *(Lancau)*
	Plump Hill	Worrells

Forest of Dean Sandstone

Addis Hill
Brand Green
Collafield *(Greenway)*
Darkhill
Eastbach
Edge Hill *(Hazel Hill)*
Gorsty Knoll
Forest of Church
Hangerberry
Howbeach
Howlers Hill
Howlers Slade
Knockley
Lambquay
Milkwall
Miss Grace's Lane
Spion Kop
Sterry

Jurassic (Cotswold) Limestone

Bath Road, Tetbury
Bourton
Breakheart
Burleigh
Broadfield Farm *(Lodge Park)*
Cats Abbey
Catsbrain
Cirencester Road
Coln Lane Ground
Coates *(Jarvis Quarry)*
Coopers Hill
Cotstone *(Longhill)*
Dean *(Chedworth)*
Edge
Fish Inn
Forest Green
Foss Cross
Gawcombe
Hampen Farm
Harvey's Grave
Hillbarn *(Snowshill)*
Honeycombe Leaze
Ilsom Farm
Jackdaw
Kilkenny
Leckhampton
New Park
Orchard Farm
Pyke
Quarhouse
Ready Token
Salperton
Sheepridge
Slade
Smiths Cross
Station Road
Stratton
Sunhill
Vatch Lane
Welsh Way
Winterwell