DERBYSHIRE AND DERBY MINERALS LOCAL PLAN

Towards a Minerals Local Plan:
Spring 2018 Consultation

Background Paper
Building Stone

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DERBYSHIRE County Council

Derby City Council

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1. Introduction and Background

1.1 Natural stone has been used for building and roofing purposes in the UK for over two thousand years. Potential building stones are naturally occurring rocks of igneous, sedimentary or metamorphic origin, which are consolidated to an extent that enables them to be cut, shaped or split into blocks or slabs[i].

1.2 In Derbyshire, the main source of building stone is the sandstone/gritstone of Carboniferous origin. Limestone is also produced in small amounts for this purpose mainly as a by-product at some of the aggregates producing quarries.

1.3 The market for building stone is small but profitable and is concerned mainly with the repair and restoration of historic buildings or with the repair/extension of existing properties or new build properties and structures in areas of high environmental value, such as conservation areas where it is important to preserve and enhance local distinctiveness and local building character.

1.4 In Derbyshire, resources of building and roofing stone can often be found in areas which are close to the Peak District National Park and as a result this increases the sensitivity of the landscape in these areas. The need to protect the landscape will, therefore, be a significant factor in any proposals to work this resource.

1.5 There are no known resources of building stone in Derby City. As a result, this paper refers mainly to Derbyshire (i.e. that part of the Plan area that does not include the City).

2. National Policy Context

2.1 Part 13 of the National Planning Policy Framework (NPPF) sets out the national approach to planning for the sustainable use of minerals. At paragraph 144, it states that local planning authorities should consider how to meet demand for small scale extraction of building stone at or close to relic quarries needed for the repair of heritage assets and to recognise the mainly small scale, intermittent nature and impact of building and roofing stone quarries.

2.2 Part 12 of the NPPF sets out the national policy approach to the conservation and enhancement of the historic environment, referring to the treatment of

[i] British Geological Survey, Building and Roofing Stone Factsheet: March 2007

historic buildings and the wider historic environment and the wide range of social, economic and environmental benefits that the conservation and enhancement of the historic environment can bring. It recognises that new development within historic areas can make a positive contribution to the area.

3. Geology and Resource Data

3.1 Three main groups of building stone have been exploited in the area.

3.2 The Visean (Lower Carboniferous) Limestones were formed around 330 million years ago from an organic rich sediment, made up of the broken shells of millions of marine organisms that accumulated on the seabed in tropical or sub-tropical settings. This material is cemented together with natural calcium carbonate. The limestones are concentrated in the north western part of Derbyshire, mainly around Buxton and the Matlock/Wirksworth area.

3.3 Namurian (Upper Carboniferous) sandstones were deposited by large rivers flowing into those shallow limey seas, forming large deltas around 320 million years ago. They are known as Millstone Grit or gritstone where it is coarse grained, and are located in the north western parts of the county. Finer grained sandstones of the same age are found in eastern parts of the county, in association with the Pennine Coal Measures.

3.4 In essence, the Visean Limestones are structurally complicated, but also massive, whereas Namurian sandstones (the Millstone Grits) are generally thinner and more uniformly bedded stone.

3.5 The Cadeby (Permian) Limestone outcrop on the eastern side of the county was also an important source of building stone. This was deposited around 250 million years ago.

3.6 In most of the Permian limestones of north eastern Derbyshire, some of the calcium in the calcium carbonate originally deposited has been altered by an influx of magnesium. The resultant mineral, a double carbonate of calcium and magnesium, is known as dolomite which is also the traditional name of the rock which it forms, although the term dolostone is now used by geologists to describe the rock.

3.7 All these stones and less significant local types have been used in Derbyshire for centuries and their particular characteristics have influenced strongly the pattern of traditional building.

3.8 The most important attributes of a good building stone are hardness, durability and porosity. The two most common building stone rocks in Derbyshire, as described above; sandstone and limestone, are composed mainly of the minerals quartz and calcite respectively, whose contrasting properties affect the character of the whole rock. Consequently, quartz-rich sandstones are tough and durable; by contrast, calcite rich limestones tend to corrode and crumble over time. If the silica grains are cemented by silica, the stone may be too hard to cut economically; if the silica grains are cemented by calcite, it may be more friable than a solidly cemented limestone such as most of the Carboniferous limestones.

3.9 Sediments are composed of individual particles (grains of sand or clay, plant or shell fragments etc.). There are, therefore, initially gaps between them that are filled with water or air. Porous rocks can suffer from frost damage if they become soaked with water and then frozen, especially if the mineral grains are poorly cemented. When water in the pores turns to ice, it expands. This may cause the rock to split, and in extreme cases, it becomes a crumbling mass of fragments — an undesirable tendency in a building material.

3.10 The main sedimentary building stones in Derbyshire have undergone lithification, which involves the closure of voids by compaction during burial, combined with their infill by natural mineral cements. This process of cementation involves dissolution of material such as silica (SiO_2) or calcium carbonate ($CaCO_3$) from the sedimentary particles, followed by reprecipitation of the same material in the voids. This process makes the rocks extremely tough and less porous.

3.11 The geology of the sandstones and limestones often creates landscapes which are rich in environmental, historical and ecological diversity. The need to protect the landscape will therefore be a significant consideration on any new proposals for working these reserves and should be balanced against the need for the material. In practice, compared with aggregate extraction, operations to extract stone for building purposes are often small in scale with modest production levels, enabling their impact to be minimised.

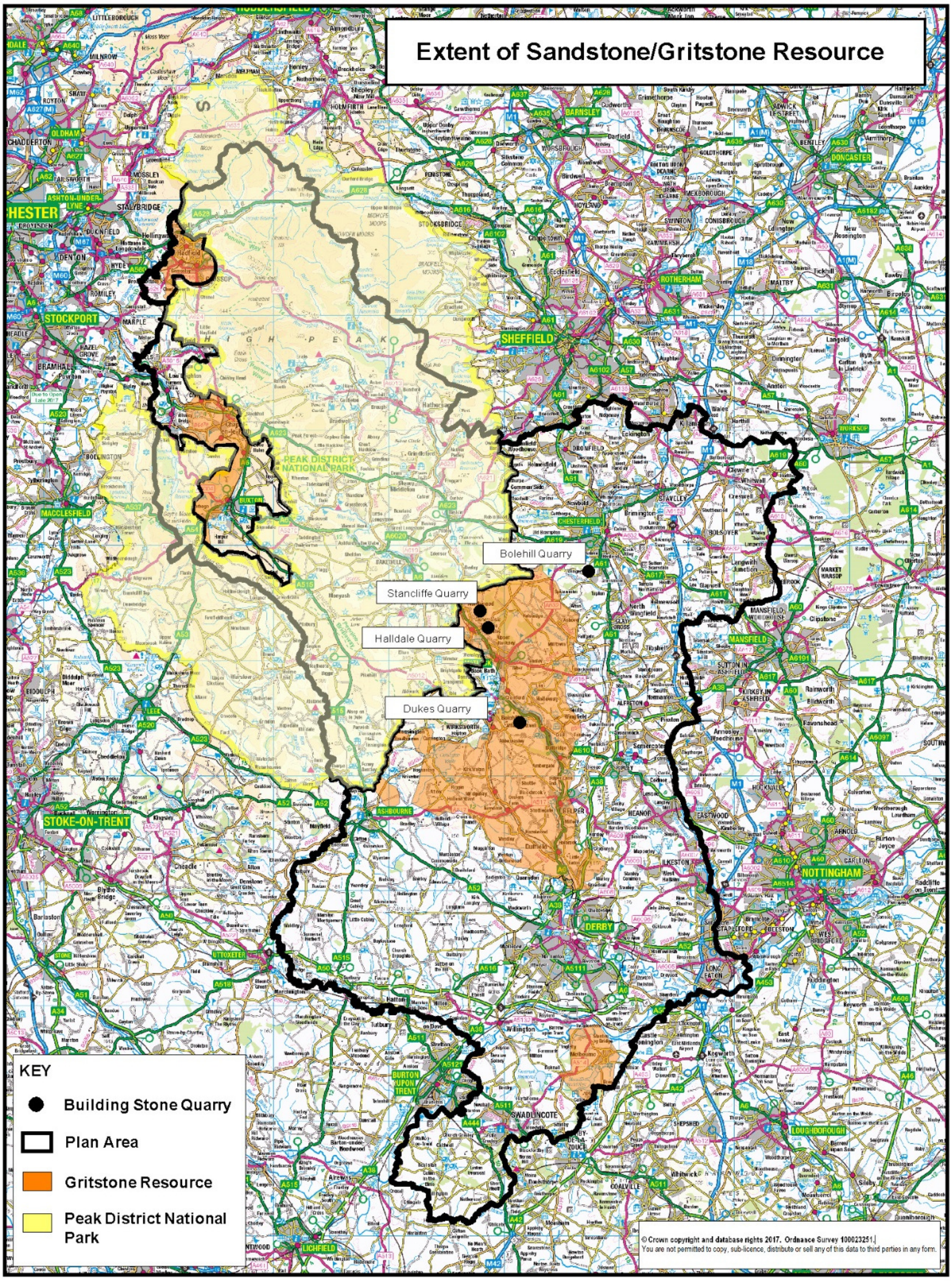

Figure 1: Extent of Sandstone/Gritstone Resource in Derbyshire and Derby and Sites which produce stone for building purposes

3.12 Geological maps can indicate the general location of the resources, but are not necessarily always a good guide to quality and suitability for building use. This is mainly because rock materials were deposited and subsequently changed by a combination of variable natural processes. In order to attempt to define building stone resources more effectively, two studies have been conducted. Firstly a national investigation known as the Strategic Stone Study has been undertaken. This was carried out by Historic England (formerly English Heritage) with the British Geological Survey, with the groundwork in this area being conducted by the National Stone Centre, the data then being entered onto a national data-base by the British Geological Survey. This Study now covers 35 counties in England.

3.13 The second piece of research was also carried out by the National Stone Centre, commissioned by Derbyshire County Council and Historic England, called "Mineral Safeguarding Areas for Building Stone and Other Matters in Derbyshire". In the absence of specific guidance on identifying and safeguarding building stone deposits (existing guidance is focussed on bulk minerals), this sought to examine options for defining the resources of building and roofing stone, which should be safeguarded in Derbyshire as a result of their economic or conservation potential and to assign relative levels of significance to such deposits e.g. local, national or intermediate – as implied by the NPPF (NPPF para. 143).

4. Current Permissions and Production

4.1 In Derbyshire, there are four quarries that produce stone specifically for building purposes, as shown on Figure 1 above. Larger quarries, both sandstone and limestone, producing mainly aggregate as their principal product, can also produce quantities of building stone to order, as an ancillary product. Figures for the period 2011-2016 are set out in Table 1 below. These show the sporadic nature of building stone production. In 2015, the quarries produced around 30,000 tonnes of building stone. In 2016, none of the specific building stone quarries produced any stone although Dove Holes Quarry (a large aggregate quarry) produced a significant amount of stone for building purposes. Production has generally been variable over the last few years, possibly as a result of specific orders for large scale projects.

Table 1: Building Stone Production at Derbyshire Quarries (tonnes) (*=specifically for building stone production)

Quarry	2011	2012	2013	2014	2015	2016
*Bolehill Quarry, Wingerworth	0	0	0	0	0	0
*Dukes Quarry, Whatstandwell	0	0	0	2000	0	0
*Halldale Quarry, Darley Dale	0	0	0	965	0	0
Hayfield Quarry		0	0	0	0	0
Mouselow Quarry, Glossop	240	0	0	1334	1000	0
*Stancliffe Quarry, Darley Dale	0	0	0	0	27,777	0
Hardwick Hall Quarry	0	0	0	0	0	0
Dove Holes Quarry						172,729
Whitwell Quarry						202
Other	1051		0	4299	1722	

4.2 A combination of architectural or market preferences and technical processing requirements has resulted in a distinct focus upon consistently medium to fine grained stone, available in very thick beds lacking any form of imperfection or weakness. In terms of colour, there is generally a strong desire (subject of course to any detailed matching criteria), for buff/light brown or peach, pink or lilac tints. Where possible stone which cuts easily when fresh but hardens with exposure is sought after.

5. Provision to be Met

5.1 Unlike for aggregates, a specific provision figure for building and roofing stone is not identified at the national level and thus not cascaded into the Minerals Local Plan. Provision for building and roofing stone is, therefore, made on the basis of specific demand at the time.

6. Past, Current and Future Demand

6.1 With the notable exception of churches and bridges, stone was little used as a building material in the area until the C18th. Growing affluence followed by industrialisation, the development of canals then railways led to an increase in its use, which peaked in the 19th century during Victorian times.

6.2 Through the 20th century, natural stone was gradually substituted by other materials such as brick, clay, concrete, steel and glass, particularly in domestic housing. The main reason for this substitution is cost — particularly the cost of dressing natural stone to the required size and shape for building. Bricks and concrete blocks are much easier to make; their production is highly mechanised and, as they are of a standard size and shape, building with them is easier, and cheaper, than with stone.

6.3 Since the 1970s, however, the use of locally sourced building and roofing stone has increased, becoming an increasingly important factor in the promotion of local identity and together with the desire to create a diversity of building forms with a wider range of materials in new housing outside designated areas, the national demand for traditional building materials has increased. Producers have responded to this demand by introducing increasingly sophisticated processing machinery, which might be computer-controlled from drawing board to despatch. The market for building stone is now small but relatively buoyant[ii].

[ii] BGS Building and Roofing Stone Factsheet: March 2007

There is no reason to assume that this general trend will not continue throughout the period of the Minerals Local Plan.

The Mineral Products Association recognises the reference to the need for small scale building stone extraction for repair of heritage assets in the NPPF. However, it believes this understates the wider more national maintenance needs that arise particularly in the major cities.[iii]

7. Method of Working

7.1 Unlike aggregates quarrying extraction of building stone does not generally use high explosives, because of the need to recover large, undamaged blocks from the quarry face; blasting would seriously affect the structure and size of the stone. Much quarrying of building stone today is undertaken by mechanical means. Rock is usually extracted from the face by an excavator. Black powder (a much less powerful and less destructive explosive than, for example, ANFO (Ammonium Nitrate Fuel Oil), an explosive employed by aggregates producers) is used to assist to gently detach rock from the face and the quarried stone is removed from the quarry floor using an excavator and dump truck. Processing of the stone either begins at the quarry or at centralised cutting sheds.

7.2 Joint and bedding planes rarely provide perfectly shaped blocks and will require careful cutting to maximise saleable rock and minimise waste.

7.3 Large blocks can be reduced in size by hammer (usually mechanical) and chisel, drilling and the use of iron wedges, but normally blocks are reduced by saws using straight or circular blades or wire. Finishing might involve for example further cutting by saw or blade, block splitting, routing, buffing/polishing.

8. Restoration

8.1 Quarries which produce building stone often produce relatively small amounts of stone over long periods of time and often regenerate naturally to some extent

[iii] Dimension Stone: An Essential UK Industry, MPA 2015

between periods of extraction. Final restoration depends on the particular characteristics of the site but usually, given their generally secluded countryside location, a variety of uses including agriculture, woodland and nature conservation is appropriate.

9. Transportation

9.1 The often remote location of these quarries and the volumes and form of material involved means that traditionally, transportation of the stone by means other than road is often impractical and unviable. However with the increased investment in mechanisation and growth of stone for prestige projects, unlike the distribution of aggregates, building stone may undertake journeys of several hundred miles from say a quarry only worked occasionally, to a processing works, then ultimately to the customer. For example, in addition to local plants, there are several in the far north of England or just over the Scottish border, and many key clients are in southern England or the Midlands. No building stone quarries are connected to the commercial rail network[iv].

9.2 The specific properties and value of building stone mean that it is often economically viable to transport it substantial distances to where it is required.

10. Markets

10.1 Unprocessed building stones are relatively low value commodities (although higher value than aggregates). As a result, the cost of moving them to where they are needed can soon outstrip their value. This means they tend to be produced in local quarries supplying a relatively small area.

10.2 However, should building stones be processed, by polishing and cutting, they can command a much higher price. In addition, they can also have very specific qualities which are important in the restoration and repair of prestigious buildings throughout the country. As a result, in these cases, the economics dictate that the stone can be transported longer distances to its market. For

[iv] Mineral Safeguarding areas for building stone in Derbyshire; National Stone Centre 2009

example, stone from the Dukes Quarry at Whatstandwell has been used recently in the restoration of Hereford Cathedral and in the building of the Mappa Mundi Library, also in Hereford[v]. Halldale Quarry in Darley Dale was reopened in 2007 to provide stone for a prestigious building project in Derby[vi]. This prestige sector has maintained a steady rate of production in recent years, boosted by projects undertaken with Heritage Lottery Funding. The heritage repair market for building stone is also growing.

11. Environmental Impact

11.1 Small quarries with low output, characteristic of building stone extraction in the UK at the start of the 21st century, tend to be fairly 'environmentally friendly'. High explosives — which would shatter the stone — are avoided; heavy machinery is employed sparingly; and associated traffic is light due to the low output of small quarries.

[v] Planning Application ref CM6/1008/113

[vi] Planning application ref CM3/0602/36

12. Contribution to the Economy

12.1 Prices for building and dimension stone range from a few tens of pounds a tonne to in excess of £1000 pounds per tonne[vii]. Total sales of building stone in Great Britain in 2010 were estimated to be in the region of £350 million.[viii] Sales figures for Derbyshire are not readily available.

13. Working Towards a Policy

13.1 The market for building stone fluctuates greatly, making future demand difficult to predict. There are also wide variations in the character of the stone which are specific to market needs, making it difficult to assess reserves. In view of these factors, it is not considered to be possible to make specific provision for sites for future working of building stone. A criteria policy would appear to be the most appropriate approach in this case.

[vii] Dimension Stone: An essential UK Industry, MPA, 2015
[viii] United Kingdom Minerals Yearbook, BGS