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Mineral Resource Information in Support of National, Regional and Local Planning

Oxfordshire

Commissioned Report CR/04/062N

BRITISH GEOLOGICAL SURVEY

COMMISSIONED REPORT CR/04/062N

Mineral Resource Information in Support of National, Regional and Local Planning

Oxfordshire

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Mineral resources, mineral planning, Oxfordshire.

Front cover

Excavator working bed of sand from the Highworth Grit (Kingston Formation, Corallian Group) at Shellingford Quarry near Faringdon.

Bibliographical reference

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BRITISH GEOLOGICAL SURVEY

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1 Introduction

This report is one of a series prepared by the British Geological Survey for various administrative areas in England for the Office of the Deputy Prime Minister's research project *Mineral Resource Information in Support of National, Regional and Local Planning.*

The accompanying map relates to the county of Oxfordshire and delineates the mineral resources of current, or potential, economic interest in the area and the sites where minerals are or have been worked. It also relates these to national planning designations, which may represent constraints on the extraction of minerals.

Three major elements of information are presented:

- the geological distribution and importance of mineral resources;
- the extent of mineral planning permissions and the location of current mineral workings; and
- the extent of selected, nationally-designated planning constraints.

This wide range of information, much of which is scattered and not always available in a consistent and convenient form, is presented on a digitally-generated summary map on the scale of 1:100 000. This scale is convenient for the overall display of the data and allows for a legible topographic base on which to depict the information. However, all the data are held digitally at larger scales using a Geographical Information System (GIS), which allows easy revision, updating and customisation of the information together with its possible integration with other datasets. The information will be incorporated into a regional GIS which will provide a *Summary of the Mineral Resources of the South East Region.*

The purpose of the work is to assist all interested parties involved in the preparation and review of development plans, both in relation to the extraction of minerals and the protection of mineral resources from sterilisation. It provides a knowledge base, in a consistent format, on the nature and extent of mineral resources and the environmental constraints which may affect their extraction. An important objective is to provide baseline data for the long term. The results may also provide a starting point for discussion on specific planning proposals for minerals extraction or on proposals, which may sterilise resources.

It is anticipated that the map and report will also provide valuable background data for a much wider audience, including the different sectors of the minerals industry, other agencies and authorities (e.g. The Planning Inspectorate Agency, the Environment Agency, The Countryside Agency and English Nature), environmental interests and the general public.

Basic mineral resource information is essential to support mineral exploration and development activities, for resource management and land-use planning, and to establish baseline data for environmental impact studies and environmental guidelines. It also enables a more sustainable pattern and standard of development to be achieved by valuing mineral resources as national assets.

The mineral resources covered are sand and gravel, crushed rock aggregate, chalk, fuller's earth, brick clay, building stones, coal and hydrocarbons.

1.1 RESOURCES AND RESERVES

Mineral resources are natural concentrations of minerals or bodies of rock (or fluids such as oil and gas) that are, or may become, of potential interest as a basis for the economic extraction of a mineral product. They exhibit physical and/or chemical properties that make them suitable for specific uses and are present in sufficient quantity to be of intrinsic economic interest. Areas that are of potential economic interest as sources of minerals change with time as markets decline or expand, product specifications change, recovery technology is improved or more competitive sources become available.

That part of a mineral resource, which has been fully evaluated and is commercially viable to work is called a mineral reserve. In the context of land-use planning, the term mineral reserve should strictly be further limited to those minerals for which a valid planning permission for extraction exists (i.e. permitted reserves). Without a valid planning consent no mineral working can take place and consequently the inherent economic value of the mineral resource cannot be released and resulting wealth created. The ultimate fate of mineral reserves is to be either physically worked out or to be made non-viable by changing economic circumstances.

Mineral resources defined on the map delineate areas within which potentially workable mineral may occur. These areas are not of uniform potential and also take no account of planning constraints that may limit their working. The economic potential of individual sites can only be proved by a detailed evaluation programme. Such an investigation is also an essential precursor to submitting a planning application for mineral working. Extensive areas are shown as having no mineral resource potential, but some isolated mineral workings may occur in these areas. The presence of these operations generally reflects local or specific situations.

1.2 ENVIRONMENTAL DESIGNATIONS

The map shows the extent of selected, nationally-designated planning constraints as defined for the purposes of this study. These are defined on a common national basis and therefore represent a consistent degree of constraint across the country. No interpretation should be made from the map with regard to the relative importance of the constraints, either in relation to mineral development proposals or in relation to each other. Users should consult policy guidelines issued by the relevant Government department, statutory agency or local authority.

The constraints shown on the map are:

- Area of Outstanding Natural Beauty – Chilterns (part)
- National nature conservation designations – National Nature Reserves (NNR) and Sites of Special Scientific Interest (SSSI)
- International nature designations – Special Areas of Conservation (SAC), Special Protection Areas (SPA) and Ramsar sites
- Scheduled Monuments

Mineral development may also be constrained by many other factors not shown on the map, including local landscape designations, considerations relating to the protection of other resources, such as groundwater, and local amenity or environmental concerns, such as noise, traffic and visual impact. These have been excluded because the constraint is not defined on a national basis or the information is not generally available. The extent or degree of relevance of such constraints can be ascertained from the relevant statutory agency or the appropriate Mineral Planning Authority.

2 Sand and gravel

Sand and gravel are defined on the basis of particle size rather than composition. In current commercial practice, following the introduction of new European standards from 1st January 2004, the term ‘gravel’ (or more correctly coarse aggregate) is used for general and concrete applications to define particles between 4 and 80 mm, and the term ‘sand’ for material that is finer than 4 mm, but coarser than 0.063 mm. For use in asphalt 2 mm is now the break point between coarse and fine aggregate. Most sand and gravel is composed of particles that are rich in silica (quartz, quartzite and flint), but other rock types may occur locally.

The principal uses of sand are as fine aggregate in concrete, mortar and asphalt. The main use of gravel is as coarse aggregate in concrete. Substantial quantities of sand and gravel may also be used for construction fill.

Oxfordshire produced 1.5 million tonnes of sand and gravel in 2002, and has estimated permitted reserves of 12 million tones. Recent production figures are shown in Figure 1.

Sand and gravel resources occur in a variety of geological environments. In Oxfordshire, these resources fall into three categories: river terrace deposits; glaciofluvial deposits; and bedrock sand and gravel. The first two categories are considered as superficial deposits and were assessed in parts of Oxfordshire by BGS in the 1970s and 1980s. Resources identified in these areas are identified separately on the map, and the possible extent of sand and gravel concealed beneath overburden is shown. These concealed resources were defined by overburden to mineral ratios (overburden to mineral less than 3:1). Outside these areas, available data are more limited. Generally, only exposed sand and gravel are defined, although sub-alluvial resources of sand and gravel occurring beneath modern river floodplains may be extensive in some areas, and are marked on the map. However, narrow (< 200 m width) spreads of sub-alluvial deposits are mainly excluded from the map. Their limited width is likely to preclude economic working of any sand and gravel present.

The river terrace deposits and the glaciofluvial deposits were probably formed by a similar mechanism, i.e., deposited mostly from meltwater during glacial episodes. However, the superficial deposits are split into these two different categories on this map for the following reasons. The glaciofluvial deposits are older (Anglian and pre-Anglian age) and are generally less continuous than river terrace deposits, and smaller in extent. Glaciofluvial deposits are thought to be derived partly from lithologies in the Midlands and thus have a higher proportion of quartz-rich clasts. Most current sand and gravel workings are in river terrace deposits.

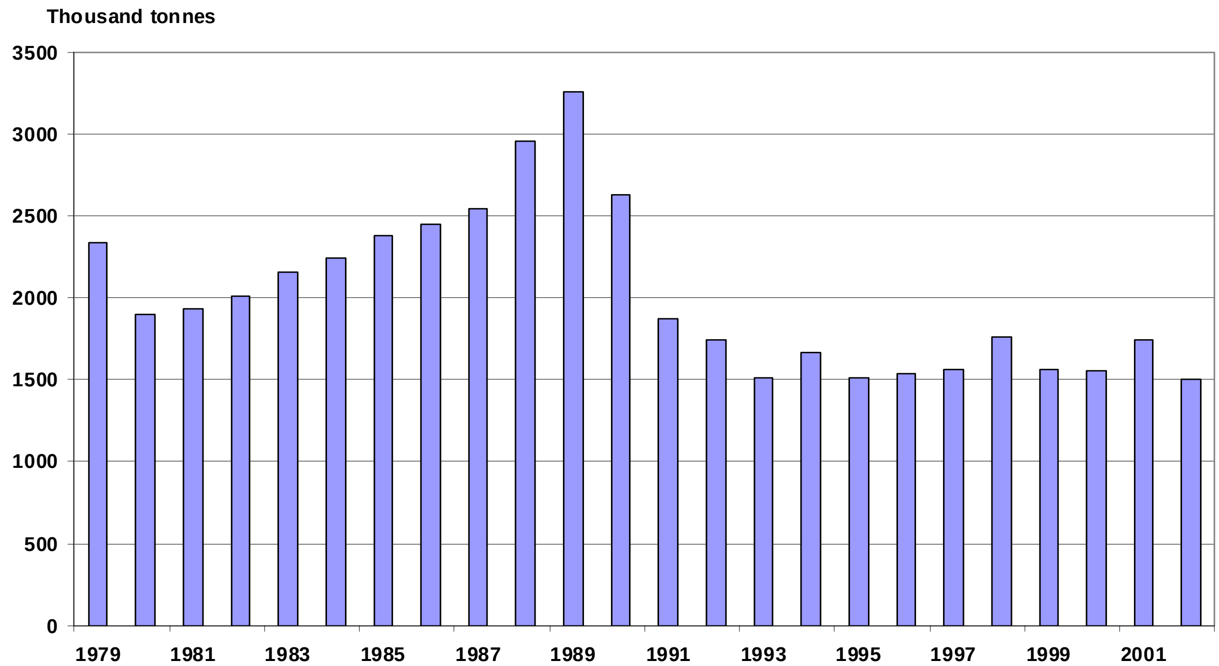

Figure 1. Production of sand and gravel in Oxfordshire, 1979-2002 (Source: Annual Minerals Raised Inquiry, Office for National Statistics)

2.1 RIVER TERRACE DEPOSITS

These deposits occur in both raised river terrace sequences and as flood plain terraces associated with and underlying present day alluvium. They are of late Anglian to Devensian age. River terraces occur at several levels in most of the major valleys in the county flanking the present floodplain, particularly associated with the River Thames and the major tributaries thereof. The older terraces are higher above the present course of the river and are generally dry in their upper parts. Younger terraces can be saturated at their bases. The deposits comprise sequences of sands and gravels with sheet-like morphology, sub-horizontal upper surfaces, and thicknesses of up to a few metres. The younger deposits are more laterally continuous since they have been cut down less by subsequent river erosion.

River terrace deposits represent an important resource in the county since they are generally clay-poor. They are being worked extensively throughout the Thames Valley and its tributaries. These deposits, particularly above Oxford, are largely derived from the Jurassic limestones of the Cotswolds.

2.2 GLACIOFLUVIAL DEPOSITS

In Oxfordshire there are several areas where fast-moving, high-volume rivers derived from glacial meltwater laid down gravelly deposits in pre-Anglian to Anglian times. These earlier deposits are here named 'glaciofluvial' deposits, and are described below. Previously some of these deposits have been mapped as glacial deposits or head gravel.

Through the central part of Oxfordshire to the south of Woodstock, and further upstream on the banks of the River Evenlode there are some patches of high-level glaciofluvial sand and gravel. These are thought to be of pre-Anglian age. The largest outcrop of these gravels occurs around Freeland where BGS boreholes revealed the presence of up to 2.5 m thickness of clay-rich sand and pebble beds. However, the outcrops are generally small and are thus not currently worked anywhere; they are unlikely to be a major resource, but are included on this map for completeness.

In the south-east of Oxfordshire to the east of Wallingford, a series of gravels known as the Wallingford Fan Gravels crops out. The age of the deposits is uncertain, but they are thought to be mostly of early Anglian age. These are largely solifluction deposits, although they may have also accumulated in part as a result of fluvial action, and are found on the steep edge of the chalk escarpment. They are rich in flints, and up to 4.5 m thick. Around the Ewelme area they have been extensively quarried, although there are no current workings.

In the north of Oxfordshire, there are several areas of sand and gravel that were probably laid down in rivers in close proximity to the Anglian ice sheet. The most extensive outcrop of this glaciofluvial deposit is in the north-east of the county near Finmere where it is currently worked.

2.3 BEDROCK DEPOSITS

Several formations in Oxfordshire consist of poorly consolidated sandstones that are being worked for building sand. In particular, the Horsehay Sand Formation of the Great Oolite Group (Middle Jurassic), the Highworth Grit of the Kingston Formation in the Corallian Group (Upper Jurassic) and the Faringdon Sponge Gravel Formation of the Lower Greensand (Lower Cretaceous) are currently being quarried.

The Horsehay Sand Formation crops out in a limited area in the north of the county. It consists of a medium to fine-grained quartzose sand, locally cemented into calcareous or weakly ferruginous sandstone with thin dark grey mudstone and siltstone beds in places. It is up to 7 m thick, and is quarried near Duns Tew.

The Kingston Formation crops out in the southern part of Oxfordshire and runs approximately west-south-west to east-north-east from Faringdon to the north-east of Oxford. The whole formation is up to 30 m thick, although the principle resource, the Highworth Grit, is only a part of the formation and probably has a maximum thickness of 10 to 20 m. The Highworth Grit consists mainly of medium-grained quartzose sands. It is currently being quarried near Faringdon and near Tubney Wood.

The Faringdon Sponge Gravel Formation crops out in a small area near Faringdon and is composed of red and yellow sponge gravels in the lower part of the unit, overlain by clayey sands and sandy clays and capped by ferruginous sands and sandstones. The matrix is a coarse quartz sand with many small, smooth quartz pebbles. It is thought to be up to 49 m thick from borehole information and is quarried to the south of Faringdon.

3 Crushed rock aggregate

A variety of hard rocks, when crushed, are suitable for use as aggregates. The technical suitability for different applications depends on their physical characteristics, such as crushing strength and resistance to impact and abrasion. Higher quality aggregates are required for coating with bitumen for road surfacing, or mixing with cement to produce concrete. For applications such as constructional fill and drainage media, with less demanding specifications, lower quality materials are acceptable.

Oxfordshire produced 626,000 tonnes of crushed rock aggregate in 2002, and has estimated permitted reserves of 10 million tonnes. In Oxfordshire, two main rock types are quarried for use as crushed rock aggregates: limestone and ironstone.

3.1 LIMESTONE

Limestones are found in several formations in Oxfordshire. In particular, the Great Oolite Group of the Middle Jurassic has two limestone formations that are currently being worked for crushed rock aggregate: the Chipping Norton Limestone Formation and White Limestone Formation. The Great Oolite Group runs from north-east to south-west across the northern part of Oxfordshire.

The Chipping Norton Limestone Formation is up to 10.7 m thick near Chipping Norton, where it forms an extensive plateau, but thins towards the north-east and east. It is a fine- to medium-grained oolitic limestone with some minor intercalated mudstone bands. It is currently quarried at Flick (Little Rollright) and Fairgreen Farm to the north-west and south of Chipping Norton respectively.

The White Limestone Formation crops out extensively across Oxfordshire reaching a thickness of about 20 m near Woodstock, but locally having thicknesses of up to 30 m. It mostly consists of a cream-coloured, fine-grained oolitic limestone with thin mudstones. It is currently quarried at Ardley, Burford and Woodeaton.

Other limestones in the Great Oolite Group, and the Corallian Group and Portland Group of the Upper Jurassic have been worked in the past, but are not currently being exploited as a result of high mudstone content or limited thickness of beds. These include the Taynton Limestone Formation, Forest Marble Formation and Cornbrash Formation from the Great Oolite Group, the Highworth Limestone Formation in the Corallian Group and the Portland Formation from the Portland Group. These are not shown on the map face.

3.2 IRONSTONE

The Marlstone Rock Formation in the Lower Jurassic is currently quarried for crushed rock aggregate at two locations in north Oxfordshire. This is a ferruginous massive limestone up to 7.6 m thick, and is also quarried as a building stone. The ironstone, which had an average Fe content of greater than 25 % with 10 % SiO_2, 13 % CaO and 0.25 % P, was worked between 1860 and 1964 as a source of iron ore. Minor outcrops of ironstone in the centre and west of the county are not shown on the face of the map.

Figure 2. Marlstone Rock Formation ironstone being worked for crushed rock aggregate at Wroxton Fields Quarry near Banbury, Peter Bennie Ltd.

4 Chalk

Chalk is a relatively soft, fine-grained, white limestone, consisting mostly of the debris of planktonic algae. In Oxfordshire, it crops out in the south of the county in a broad band running from east to west. On this resource map, the chalk is subdivided into two categories: low purity and high purity. Low purity chalk (generally less than 93% $CaCO_3$) is found in the formations of the Grey Chalk Subgroup (formerly known as the Lower Chalk) of the Upper Cretaceous. These formations tend to have a relatively high clay content. The Grey Chalk Subgroup is about 60 m thick in Oxfordshire. High purity chalk (93-98% $CaCO_3$ excluding flints) includes formations in the White Chalk Subgroup (formerly known as the Middle and Upper Chalk) of the Upper Cretaceous. Flint bands are common, particularly towards the top of the subgroup. The White Chalk Subgroup is about 150 m thick in Oxfordshire.

The White Chalk Subgroup was quarried until recently for agricultural lime at Playhatch in south Oxfordshire. The Grey Chalk was formerly worked for cement manufacture at Chinnor.

Chalk is also an important aquifer and a major source of groundwater in the county.

5 Building stone

The Jurassic and Cretaceous rocks of the county have provided a wide variety of stone for building purposes. In the Lower Jurassic succession, the ferruginous limestone, sandstones and ironstones (Marlstone Rock Formation) were extensively worked for building stone around Alkerton, Hornton and Wroxton.

The Middle Jurassic limestones were the county's most important building stone resource and were quarried over much of the county, including operations at Taynton, Barrington, Milton, Bladon, Cornbury and Hanborough. Also locally important were extensive quarries working the fissile limestones of the Great Oolite Group at Stonesfield, Filkins, Westwell, and Fulwell for roofing slates which lasted until the early 1900s. The thinly bedded Forest Marble Formation limestones were worked for stone roofing slates and paving around Brize Norton, Holwell and Bradwell.

Upper Jurassic limestones and sandstones were worked around Oxford at Headington and Wheatley (Corallian Group) and at Great Milton and Great Haseley (Portland Stone Formation).

Elsewhere, in the south and east of the county, chalk from the Cretaceous and cemented sandstones from the Tertiary were worked locally for building stone.

There are currently three quarries working the Marlstone Rock Formation for aggregate at Alkerton, Hornton and Wroxton, which also produce building stone, and building stone is also worked at Great Tew.

6 Coal

The concealed Oxfordshire-Berkshire Coalfield lies on the western margin of the London Platform in two broad synclines, the style of folding of which indicates it lies to the north of the (main) Variscan Fold-belt. The strata are mainly Upper Coal Measures and typically the coals are thin and of low quality. A total of 7.85 m of coal was recorded in the Steeple Aston borehole, but the thickest succession was proved at Apley Barn, near Witney, where Coal Measures were intersected between 250 and 1210 m. Here the total combined thickness of coal is 8.8 m, with the thickest seams being 1.46 m and 1.49 m. It is thought that these strata link at depth with the exposed Warwickshire Coalfield to the north-west. The coalfield is not considered economic, and it is unlikely that it will be mined in the foreseeable future.

7 Hydrocarbons

7.1 CONVENTIONAL OIL AND GAS

The county of Oxfordshire lies on the southern flanks of the ancient London-Brabant Massif where Variscan Basement lies at relatively shallow depths. Across this area thin Mesozoic sequences were deposited, impacting on the quality and extent of the potential reservoir and source rock facies found in the main Wessex Basin depocentre to the south. Any source rocks present will be neither thick enough nor likely to have been buried deep enough for the generation of commercial hydrocarbons in these parts.

The early 20th Century saw exploration for concealed Coal Measures in the neighbouring county of Buckinghamshire, when the Charndon (Dunsty Hill) and Calvert East boreholes were drilled in 1911 and 1912 respectively. Both failed to encounter any Coal Measures strata, although significant gas shows and pressures were recorded in the former.

Exploration for commercial hydrocarbons in Oxfordshire dates back to 1954 when D'Arcy drilled the Faringdon No.1 well in the south west of the county. Other boreholes were subsequently drilled at Noke Hill (1958), Whichford (1964), Steeple Aston (1972) and Bicester (1976). Steeple Aston penetrated Westphalian Coal Measures, thereby proving part of the concealed Oxfordshire-Berkshire Coalfield that is now known to underlie much of the two counties. It is these coals that are presumably the source of the gas in the area. The number of exploration wells (see inset map) and a network of seismic reflection surveys, illustrates that between the mid 1950s and mid 1970s much of Oxfordshire has been explored for hydrocarbons. However, to date, no oil or gas fields have been discovered in the county, although gas has been encountered in minor amounts in a few of the holes drilled, mainly from the Lower Lias and deeper strata.

The county thus appears to have limited hydrocarbon prospectivity, as evidenced by the fact that there were, as at early 2003, no active hydrocarbon exploration or production licences. However, the possibility for the discovery of (small) gas accumulations may still exist.

7.2 COAL BED METHANE (CBM) POTENTIAL

The basement rocks to the Mesozoic-Palaeogene rocks of Oxfordshire comprise strata of Cambrian, Devonian and Carboniferous age. The Carboniferous rocks include strata of Westphalian (Coal Measures) age, forming the Oxfordshire-Berkshire Coalfield and lying at depths of between 300 and 1500 m. Covering an area of 3,327 km^2, high volatile bituminous coals are preserved in synclines with an intervening anticline. They are thin with an average total thickness of 10 m and average gas seam content of 0.4 m^3t^{-1}. No coal has been mined and the Coal Measures succession is also considered unprospective for coalbed methane because of its low gas content.

8 Brick clay

The term 'brick clay' is used to describe clay used predominantly in the manufacture of bricks and, to a lesser extent, roof tile and clay pipes. These clays may sometimes be used in cement manufacture, as a source of construction fill, and for lining and sealing landfill sites. The suitability of a clay for the manufacture of bricks depends principally on its behaviour during shaping, drying and firing. This will dictate the properties of the fired brick such as strength and frost resistance and, importantly, its architectural appearance.

Most facing bricks, engineering bricks and related clay-based building products are manufactured in large automated factories. These represent a high capital investment and are increasingly dependent therefore on raw material with predictable and consistent firing characteristics in order to achieve high yields of saleable products. Blending different clays to achieve improved durability and to provide a range of fired colours and textures is an increasingly common feature of the brick industry. Continuity of supply of consistent raw materials is of paramount importance.

Currently there are no brick and tile manufacturing sites in Oxfordshire, and thus brick clay is not shown as a resource on the map face. However, clays that are, or have been, exploited in neighbouring counties such as Buckinghamshire (Clay-with-flints), Wiltshire (Oxford Clay Formation, Kimmeridge Clay Formation), Hampshire (Gault Formation, Reading Formation), and Bedfordshire (Gault Formation and the Peterborough Member of the Oxford Clay Formation) are also present in Oxfordshire, and may constitute a resource in the future.

9 Fuller's earth

The term 'fuller's earth' is used to describe clays composed essentially of the clay mineral Ca-smectite, which exhibits a unique combination of properties on which its industrial applications are based. Ca-smectite can be easily converted into Na-smectite (bentonite) by a simple sodium-exchange process and most fuller's earth is used in this form in papermaking and foundry bonding applications. Fuller's earth deposits were formed as a result of the alteration of volcanic ash deposited in seawater. The accumulation and preservation of volcanic ash into thick beds involved a complex set of geological processes. Consequently, fuller's earth deposits of potential economic interest have a very restricted distribution in Britain and Oxfordshire is one of the very few counties in which the mineral occurs and is worked.

Lenticular beds of fuller's earth occur within the Lower Cretaceous Lower Greensand in Oxfordshire. A number of small, isolated outliers of Lower Greensand occur unconformably overlying Jurassic strata in Oxfordshire. Fuller's earth occurs where the Lower Greensand infills troughs cut into the underlying Jurassic sediments and is confined to the Baulking-Fernham area to the south of Faringdon. Only this outlier is, therefore, shown on the map.

With the cessation of fuller's earth working in the Redhill – Nutfield area of Surrey in 1998, production of fuller's earth is now confined to Oxfordshire and Bedfordshire. Reserves with planning permission in Bedfordshire will be exhausted by the end of 2005, leaving Oxfordshire as the sole producing county. Unlike in Surrey and Bedfordshire, where fuller's earth has been worked for many centuries, in Oxfordshire the clay does not occur at outcrop. Fuller's earth was first discovered by the BGS in the Baulking-Fernham area in 1969 and a drilling programme subsequently established the presence of extensive resources at Baulking. Production at Baulking started in 1980 and the deposit has supplied some 750,000 tonnes of dry product but is now exhausted and current output is based on stockpiled material. Two beds of fuller's earth were worked; the uppermost (Bed 2) is the thickest (up to 4 m) and by far the most extensive. The beds occur some 5-10 m above the basal unconformity of the Lower Greensand.

In 1989 a smaller, satellite deposit of fuller's earth was discovered at Moor Mill Farm about 2 km west of the Baulking deposit. This deposit was granted planning permission for extraction in 1998 and is due to be opened up in 2004. Reserves are reported to be some 300,000 dry tonnes in a single bed up to 3.8 m thick.

Work carried out by the BGS in 1969 indicated that fuller's earth also occurs in the Fernham area. However, beds more than 0.3 to 0.6 m thick are rare and only one borehole proved clay substantially thicker that 1 m. The remaining parts of the Baulking-Fernham Lower Greensand outlier do not appear to be very prospective.

10 Aims and limitations

The purpose of the maps in this series is to show the broad distribution of those mineral resources that may be of current or potential economic interest, and to relate these to selected nationally-recognised planning designations. The maps are intended to assist in the consideration and preparation of development plan policies in respect of mineral extraction and the protection of important mineral resources against sterilisation. They bring together a wide range of information, much of which is scattered and not always available in a convenient form.

The maps have been produced by collation and interpretation of mineral resource data principally held by the British Geological Survey. Information on the extent of mineral planning permissions has been obtained from the relevant Mineral Planning Authority (MPA). Some of these permissions may have lapsed or expired. The status of individual areas can be ascertained from the appropriate MPA. Location information on national planning designations has been

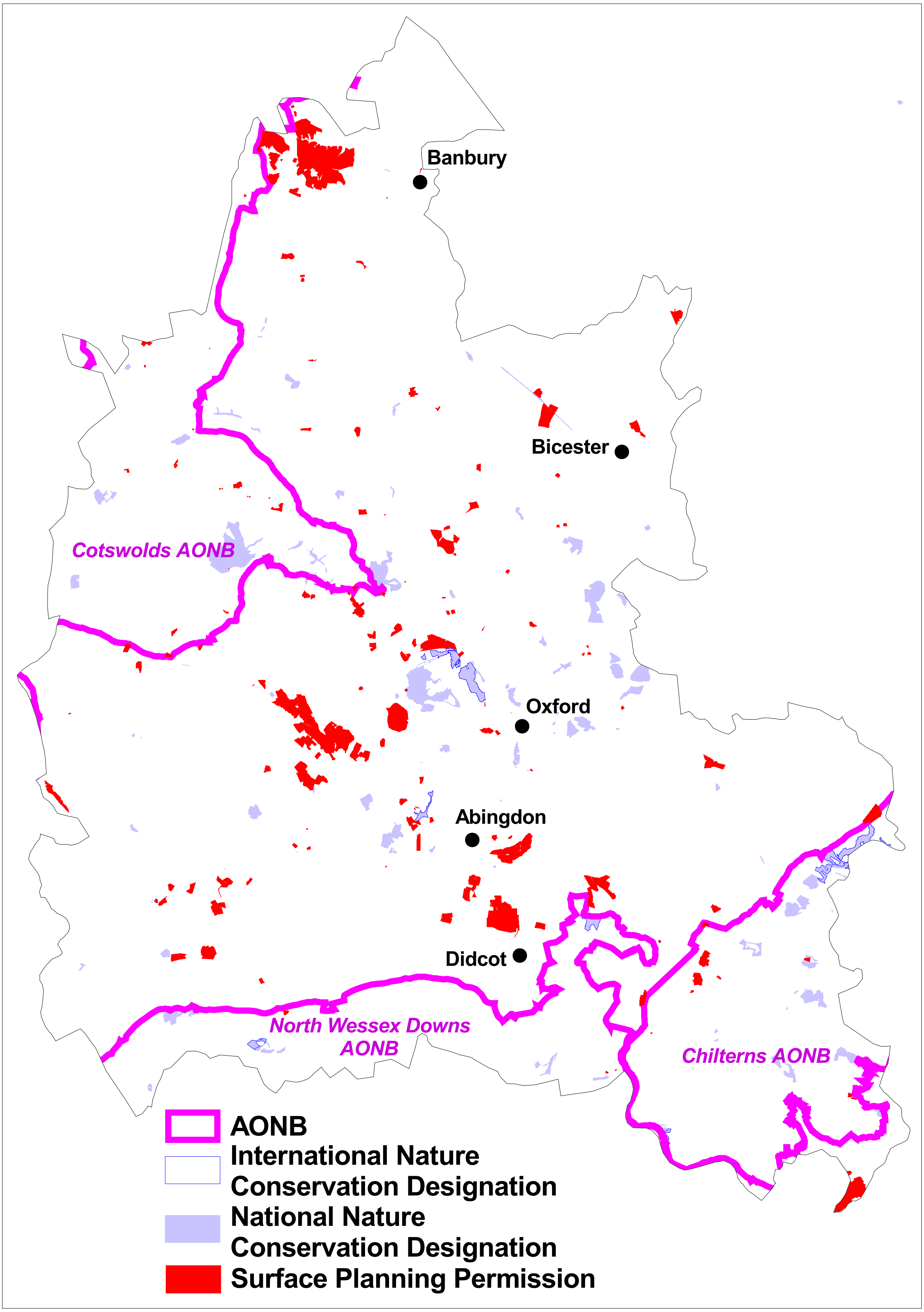

Figure 3. Surface planning permissions and landscape and nature conservation designations in Oxfordshire.

obtained from the appropriate statutory body (Countryside Agency, English Nature and English Heritage). For further information the relevant body should be contacted.

The mineral resource data presented are based on the best available information, but are not comprehensive and their quality is variable. The inferred boundaries shown are, therefore, approximate. Mineral resources defined on the map delineate areas within which potentially workable minerals may occur. These areas are not of uniform potential and also take no account of planning constraints that may limit their working. The economic potential of specific sites can only be proved by a detailed evaluation programme. Such an investigation is an essential precursor to submitting a planning application for mineral working. Extensive areas are shown as having no mineral resource potential, but some isolated mineral workings may occur in these areas. The presence of these operations generally reflects very local or specific situations.

The maps are intended for general consideration of mineral issued and not as a source of detailed information on specific sites. The maps should not be used to determine individual planning applications or in taking other decisions on the acquisition or use of a particular piece of land, although they may give useful background information which sets a specific proposal within context.

11 Planning permissions for the extraction of minerals

The extent of all known extant and non-extant planning permissions for the extraction of minerals is shown on the map, irrespective of their current planning or operational status. The polygons were digitised by BGS from Plotting Sheets and other documents supplied by Oxfordshire County Council, and any queries regarding the sites shown should be directed to these authorities at the address shown below. The polygons cover active, former and restored mineral workings and, occasionally, unworked deposits.

Planning Permissions represent areas where a commercial decision to work mineral has been made, a successful application has been dealt with through the provisions of the Town and Country Planning legislation, and the permitted preserve will have been depleted to a greater or lesser extent. The current planning status is not qualified on the map, but is available in the underlying database.

Contact address:

Oxfordshire County Council, Environmental Services, County Hall, New Road, Oxford OX1 1SD. Tel: 01865 815718. Fax: 01865 246110.Web address: www.oxfordshire.gov.uk.

Appendix

TOPOGRAPHIC BASE

CONSTRAINT INFORMATION

Constraint information published on the accompanying map has been provided from the various agencies listed below; any enquiries on this information should be addressed to the relevant agency.

English Nature

Digital SSSI and NNR boundaries © English Nature 2003.

Contact address: English Nature, Northminster House, Northminster, Peterborough PE1 1UA. Tel: 01733 455000. Fax: 01733 455103. Web page: www.english-nature.org.uk

English Heritage

Positions of scheduled monuments at 25th September 2003.

The majority of monuments are plotted using a centred NGR symbol. Consequently the actual area and/or length of a monument protected by the legal constraints of scheduling cannot be represented here. Monuments scheduled since that date are not accounted for. © Copyright English Heritage.

Contact address: English Heritage, 23 Savile Row, London W1S 2ET. Tel: 0207 973 3132. Web page: www.english-heritage.org.uk

Countryside Agency

Digital AONB boundaries © Countryside Commission 1986

Contact address: Countryside Agency, John Dower House, Crescent Place, Cheltenham, Gloucestershire GL50 3RA. Tel: 01242 521381. Fax: 01242 584270. Web page: www.countryside.gov.uk