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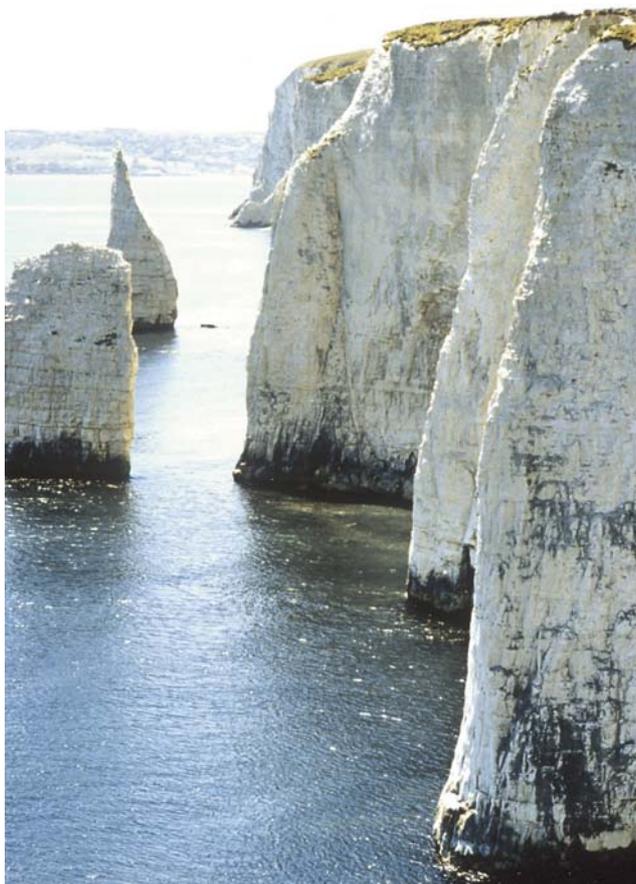
OFFICE OF THE
DEPUTY PRIME MINISTER

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

Isle of Wight

British Geological Survey Commissioned Report CR/02/130N

**F M McEvoy, A J Bloodworth, D G Cameron, E L Bartlett, S F Hobbs,
G K Lott, D J Evans, and N A Spencer.**



Keyworth, Nottingham 2002

BRITISH GEOLOGICAL SURVEY
TECHNICAL REPORT CR/02/130N
Mineral Resources Series

**Mineral Resource Information for
Development Plans:
Isle of Wight**

F M McEvoy, A J Bloodworth, D G
Cameron, E L Bartlett, S F Hobbs,
G K Lott, D J Evans, and N A Spencer.

This report accompanies the 1:100 000 scale
map: Isle of Wight

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Front cover photo:
The Needles Chalk Cliff, Isle of
Wight

BRITISH GEOLOGICAL SURVEY

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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 Isle of Wight 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 1:50 000. 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 form part of a *Summary of the Mineral Resources of 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 discussions on specific planning proposals for mineral 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, chalk, limestone, brick clay, building stone and hydrocarbons.

Resources and Reserves

Mineral resources are natural concentrations of minerals, or bodies of rock that are, or may become, of potential economic interest as a basis for the extraction of a commodity. They will

exhibit physical and/or chemical properties that make them suitable for specific uses and be 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 new uses are developed, product specifications change, recover 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 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.

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:

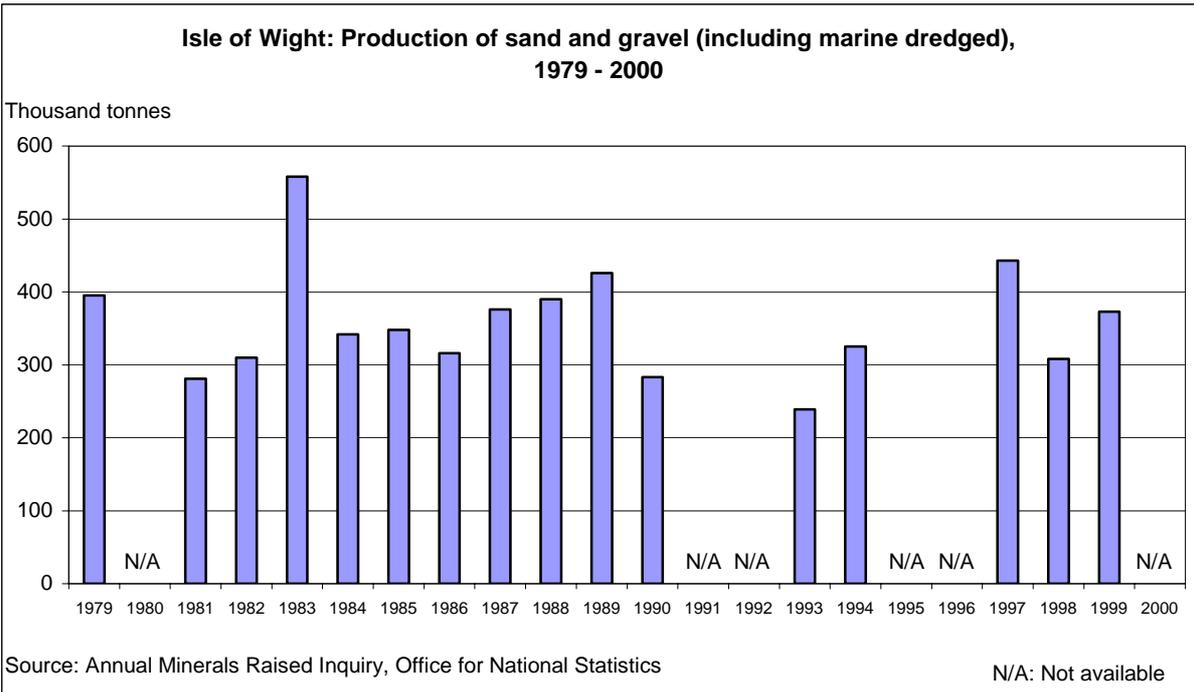
- Isle of Wight Area of Outstanding Natural Beauty (AONB)
- Heritage Coast
- National nature conservation designations - National Nature Reserves (NNR) and Sites of Special Scientific Interest (SSSI)
- International nature conservation designations – Special Areas of Conservation (SAC), Special Protection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

Mineral development may also be constrained by many other factors not shown on the maps, 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

SAND AND GRAVEL

Sand and gravel are defined on the basis of particle size rather than composition. In current usage, the term 'gravel' is used for material that is coarser than 5 mm, with a maximum size of 40 mm, and the term sand for the material that is finer, but coarser than 0.075 mm. 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. Unwashed sand and gravel can also be used for construction fill and as 'hoggin' for surfacing tracks and paths. An important source of sand and gravel is marine-dredged material.



Sand and gravel resources occur in a variety of geological environments. In the Isle of Wight, these resources fall into two categories:

- superficial or 'drift' deposits, subdivided into river sand and gravel, storm beach gravel and blown sand;
- bedrock, or 'solid' deposits represented by the Sandrock Formation of the Cretaceous Lower Greensand Group.

Superficial deposits

On the map, generally only exposed sand and gravel is defined, although sub-alluvial inferred resources of sand and gravel occurring beneath modern river flood plains may be extensive in some places. Narrow (< 200 m) 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.

River terrace deposits

Terrace deposits occur at several levels in most of the major valleys in the Island. These broadly comprise older, raised river terrace sequences (sometimes called 'Plateau Gravels') and younger, flood plain terraces associated with, and underlying, present day alluvium.

In the Isle of Wight, the older river terraces are generally high-level deposits forming caps to flat-topped hills, from 30 to 100 m above sea level. They occur in patches, with irregular boundaries indented by spring-combes, and in most cases are evidentially remnants of larger spreads. They consist mainly of water-worn material, and where thick, are usually stratified. They occur mostly in the north and west but small patches do occur scattered throughout. South of Newport, older river terraces are worked for crushed rock aggregate, roadstone and for the manufacture of concrete products.

The younger, low-lying terraces are well developed along the valleys of the Eastern and Western Yar. The river terraces of the Eastern Yar range in thickness up to 4 m and are generally loose and stony. In the lower part of the Eastern Yar, approaching the river mouth, there are no terraces. In the south-west of the island, gravel terraces of the Western Yar cap the sea cliffs in the vicinities of Chale, Brook and Freshwater. These terraces occur along what was previously the northern side of the Yar Valley prior to the encroachment of the sea. They are of variable thickness ranging from 2 m to 8 m and are often overlain by thick alluvial and brickearth deposits. In the Medina Valley, north of Shide, gravel occurs on both sides of the river and is predominantly derived from the Upper Greensand strata.

Angular flint gravel (clay with flints)

Angular flint gravel of unknown age occurs on the summits and upper slopes of the Chalk Downs in the central and southern parts of the island, where the low dips allow a comparatively wide development of outcrop-surface. The most important accumulation occurs on St. Boniface Down where it was dug in numerous pits to 3 m in depth. The maximum vertical thickness is not known but may well exceed 10 m. The gravel, which is structureless, consists of bleached, unworn flints and fragments of flints, mostly of greyish hue internally. Thinner more clayey deposits also occur between Carisbrook and Westover Down mostly resting on the White Chalk Subgroup. At Cheverton Farm, east of Westover Down, angular flint gravel is currently extracted.

Sub-alluvial gravel

Sub-alluvial gravels are encountered beneath the alluvium of the major valleys throughout the island and are compositionally similar to river terrace deposits. The deposits rest on an irregular channeled surface and are thus of very variable thickness. These deposits are generally saturated and require wet working.

Storm beach gravel

Storm beach gravels occur from Sconce Point to Bouldnor in the west of the island. The form of these deposits is dictated by the east-west longshore drift which prevails along this coast. They are generally made up of fine to coarse flint gravels and grade seawards into sands and laminated silty clays. These deposits are not currently worked.

Blown sand

The largest area of blown sand to be found in the Isle of Wight is in the south of the island. The deposit occurs on the top of a vertical cliff between Atherfield and Chale, at a height of approximately 50 m above sea level. The sand is blown up from the face of the cliff, not from the beach below and consists of disintegrated Lower Greensand Group up to 7 m in thickness.

A second tract of blown sand occurs at the mouth of the Eastern Yar protecting the north-east side of Bembridge Harbour.

Bedrock Sands

Sandrock Formation

The Sandrock Formation occurs within the Cretaceous Lower Greensand Group and is broadly equivalent to the Folkestone Formation of the Weald. The formation occurs as thin continuous beds running broadly east-west across the south of the island. The formation is thickest in the south where it occurs up to 50 m. It comprises white and yellow, medium- to coarse-grained quartz sands and weakly cemented sandstone. Currently, extraction occurs at two localities, Haslett Farm, south of Shorewell and at Knighton Sandpit, north of Alverstone.

HYDROCARBONS

Conventional Oil and Gas

The Isle of Wight sits astride two important structural features that influenced the sedimentation and structural evolution of the area during Mesozoic and Tertiary times. Beneath the island to the north lies the Hampshire-Dieppe High and to the south the Wessex-Channel Basin, separated by the important east-west trending and en echelon Portland-Wight and Wight-Bray fault zones. Some 20 km to the west, the Wytch Farm Oilfield is located a short distance to the north of the fault zone and offshore extensions to the east towards the Isle of Wight are now known and accessed from onshore drilling sites. The oil is sourced from mature source rocks in Jurassic sequences south of the zone and has migrated north across the fault zone to be trapped in both Triassic Sherwood Sandstone and Jurassic Bridport Sands reservoirs.

With this knowledge a total of seven exploration wells and a network of seismic reflection surveys, illustrates that much of the Isle of Wight has been explored for oil and gas since the early 1970s. Most wells have been drilled in positions structurally similar to those of Wytch Farm. To date, however, there have been no significant hydrocarbon shows and no producing oil or gasfields occur on the island.

Consequently, despite geological conditions similar to those of the Wytch Farm Oilfield, there appears to be limited oil and gas prospectivity on the Isle of Wight. It is likely, given the present understanding of the hydrocarbon system, that any oil and gas discoveries will only be small in nature and probably confined to the central, north-west and northern parts of the island north of the Purbeck-Wight Fault Zone. It is on the north-west of the island that the only current exploration licence is held, being part of PEDL89 (Wessex) covering a large area on the mainland north-west of the Solent.

Coal Mine Methane, Abandoned Mine Methane and Coalbed Methane potential

The basement rocks to the Permian-Tertiary rocks of Isle of Wight comprise strata of Devonian to Lower Carboniferous (Dinantian) in age. There are no recordings of Carboniferous Westphalian Coal Measures encountered in the available deep hydrocarbon exploration wells. The Tertiary succession of the Hampshire-Isle of Wight area contains scattered lignite occurrences, particularly within the Bracklesham Group. To the south-west of Southampton, the Ramnor Inclosure Borehole encountered one lignite band at the same stratigraphic level in the Wittering Formation as a lignite band found to the south-east at Whitecliffe Bay on the Isle of Wight. Traces of gas were encountered during drilling, although the quantities were minimal. Consequently, it is thought that little or no potential

exists for mine gas drainage, coal mine methane and coalbed methane development in the Isle of Wight.

Licensing

The Department of Trade and Industry grants licences for exclusive rights to explore and exploit oil and gas onshore within Great Britain. The rights granted by landward licences do not include any rights of access, and the licensees must also obtain any consent under current legislation, including planning permissions.

BUILDING STONE

The Isle of Wight has no commercially significant building stone resources, hence their absence from the face of the map. However, there has been extensive use of a number of local stones for building in the past.

The Upper Greensand (Lower Cretaceous) furnishes by far the best building stone in the Isle of Wight. It has been quarried from time to time in many places, principally in the areas of Ventnor-St. Boniface-Shanklin in the south-east and Whitcombe-Gatcombe further north.

Chalk from the Upper Cretaceous was quarried as a local source of building stone across much of its crop. As elsewhere in South-East England, flint (also obtained from the Chalk) has been used as a local building material.

In the Tertiary succession the freshwater Bembridge Limestone, known locally as Quarr Stone for centuries ranked among the chief natural products of the island. The principal quarries were at Quarr and Binstead and most of the rock obtained was sent to the mainland.

Quarrying has declined during the last 50 years, owing partly to the lessened demand for new buildings and partly to the use of brick in place of stone.

BRICK CLAY

The term 'brick clay' is used to describe clay used predominantly in the manufacture of bricks and, to a lesser extent, roof tiles 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 materials 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.

Brick clay is not currently produced on the Isle of Wight. Historically, a variety of clays were extracted for brickmaking at many localities throughout the island. The Weald Clay Formation, a principal brick clay in South-east England is shown as a resource on the map. It consists of red, purple, green, and variegated clays and calcareous mudstones with numerous intercalated beds of sand, sandstone and sandy limestone of variable thickness. The Weald

Clay Formation was previously extracted at Sandown for the manufacture of bricks. Brickyards once existed in the Gault Formation at both Rookley, and at Bierley near Niton. Other clays previously utilised for the manufacture of bricks and tiles include the clays of the Hamstead Beds and Quaternary 'brickearths'. These clay resources are only of local importance and are thus not shown on the face of the map.

CHALK

Chalk is a relatively soft, fine-grained, white limestone, consisting mostly of the debris of planktonic algae. The Chalk runs the length of the Isle of Wight from the Needles in the west to Culver Cliff in the east, known as the Central Downs. The Central Downs comprises both low and high dipping strata. The low dipping strata between Mottistone and Carisbrook form a combe-indented upland and where the dips are higher, the chalk forms a sinuous ridge. In the south of the island, a large outlier of slightly inclined chalk forms the higher parts of the Southern Downs. Approximately 85% of the chalk outcrop lies within the Isle of Wight AONBs.

The Chalk is divided into the Grey and White Chalk (formerly 'Middle and Upper Chalk') subgroups and on the island it attains its maximum known thickness for the British Isles, namely about 500 m. The White Chalk Subgroup is the thickest of the subgroups, decreasing in thickness eastwards from 450 m at the Needles to 370 m at Culver Cliff. The Grey Chalk Subgroup shows a decrease in thickness westwards from 64 m at Culver Cliff to 50 m at Compton Bay. The Grey Chalk Subgroup is characterised by relatively high clay content, particularly toward the base, and is classified as 'low purity' (<93% CaCO₃). The overlying White Chalk Subgroup is of a higher purity (93-98% CaCO₃). Flints are common in the White Chalk Subgroup.

Approximately 40,000 tonnes of chalk are produced annually in the Isle of Wight (1999) from up to five quarries within the Central Downs. The majority of extraction is from the White Chalk Subgroup at Arreton, Duxmore and Newbarn. At Cheverton and Shorewell chalk is extracted from both subgroups. Approximately three-quarters of the chalk extracted is used as construction fill material. The remainder is used as agricultural lime and for industrial purposes. Approximately 12 million tonnes of permitted chalk reserves currently exist.

The Chalk is a major aquifer and is the most important source of groundwater on the island.

LIMESTONE

The Oligocene in the Isle of Wight contains a fresh-water limestone called the Bembridge Limestone Formation. It comprises two or more beds of massive limestone and intercalated, fissile, greenish clays and calcareous mudstones. It is characterised by its whiteness, partly brecciated structure, and molluscs that are normally represented by clasts or moulds. It crops out in the west of the island between Sconce Point and Calbourne, in the north at Cowes and in the east, south of Bembridge. The thickness of the Bembridge Limestone Formation varies from 2.5 to 7.5 m or more on the coast, and averages about 3 m.

It was formerly of importance as a building stone and was once used for cement making at Brading. It is currently extracted at Prospect Quarry for crushed rock aggregate.

AIMS AND LIMITATIONS

The purpose of the maps in this series is to show the broad distribution of those mineral resources which 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 obtained from the appropriate statutory body (Countryside Agency, English Nature and English Heritage). For further information the relevant body should be contacted.

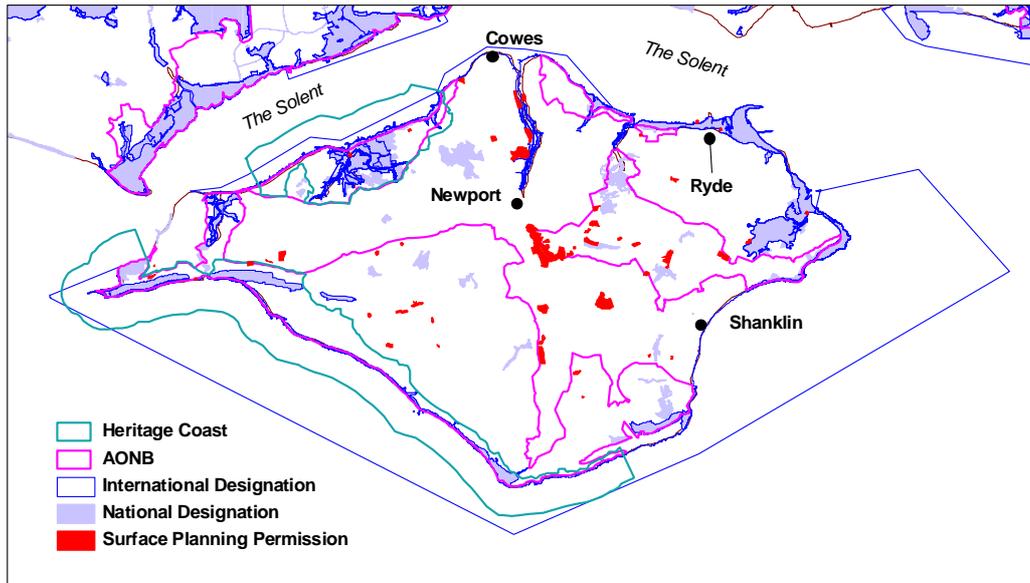
The mineral resource data presented are based on the best available information, but are not comprehensive and their quality is variable. The inferred boundaries shown are, therefore, approximate. Mineral resources defined on the map delineate areas within which potentially workable minerals may occur. 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 reflect very local or specific situations.

The maps are intended for general consideration of mineral issues 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.

PLANNING PERMISSIONS FOR MINERAL EXTRACTION

The extent of all known extant and former 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 Isle of Wight 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 reserve 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.



Isle of Wight surface planning permissions with AONB and Heritage Coast Boundaries and other National (SSSI, NNR) and International (SAC, SPA, Ramsar) designations

Contact address:

Isle of Wight Council, Directorate of Development, Council Offices, Seaclose, Fairlee Road, Newport, PO30 2QS, Tel: 01983 821000, Fax: 01983 823851, Web page: www.isleofwight.gov.uk.

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English Nature - Digital SSSI, NNR, SAC, SPA and Ramsar boundaries © English Nature 2000.

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 15th August 2001.

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: 020 7973 3132, Web page: www.english-heritage.org.uk.

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