



**Norfolk** County Council

## **Norfolk Minerals and Waste Local Plan Review**

### **Silica Sand Topic Paper**

2022

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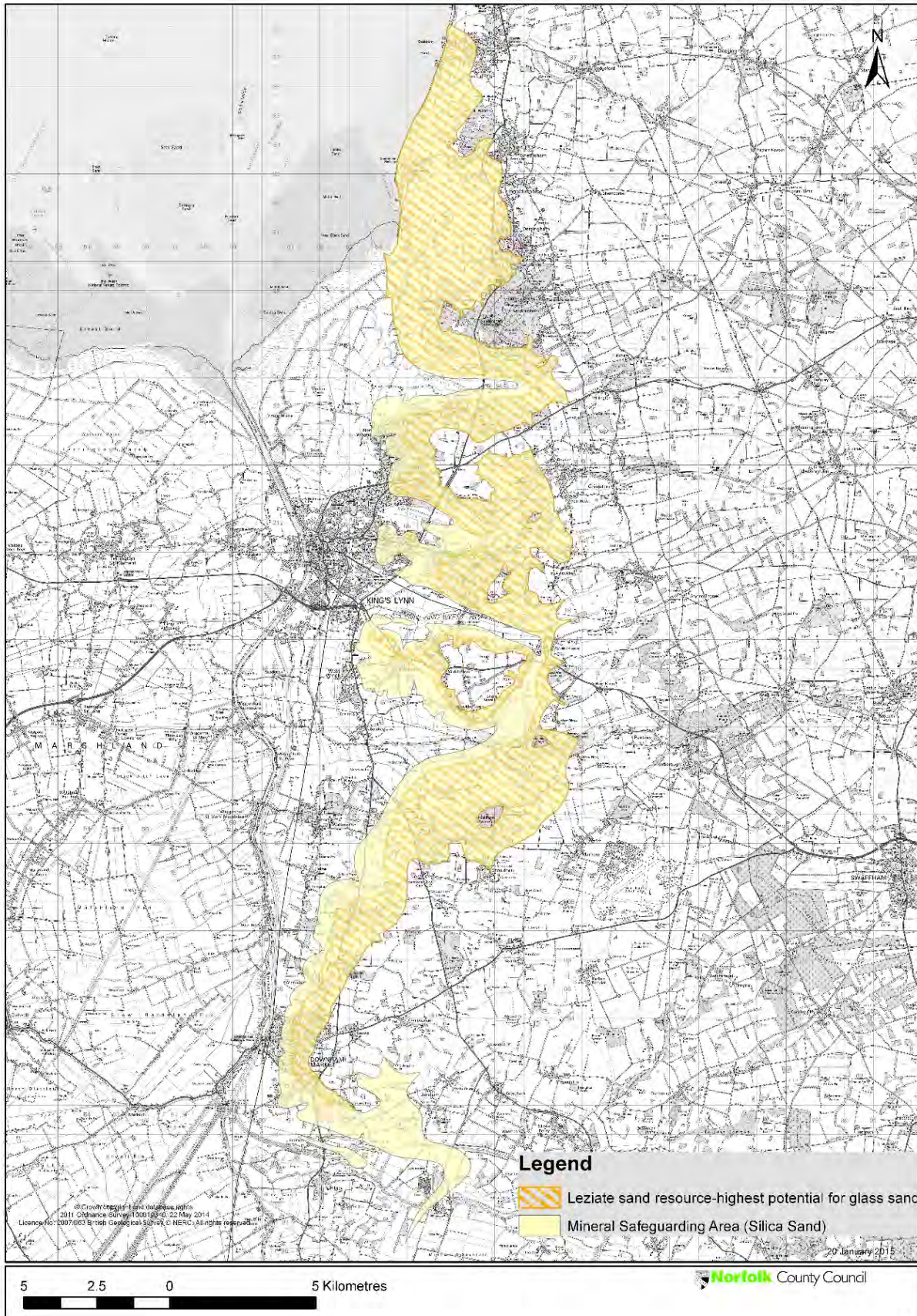


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# Map showing silica sand resource in Norfolk



## 1. Introduction

**1.1** The purpose of this topic paper is to provide background information on the issue of planning for the future provision for industrial (silica sand) in the Minerals and Waste Local Plan for Norfolk. This document brings together information on the properties of silica sand which make it a scarce and nationally important industrial mineral, the levels of production in Great Britain, the part that Norfolk plays in this and the next steps in future Plan provision for this mineral. Key information on silica sand supply in the UK is available in the British Geological Survey (BGS) [Silica Sand Mineral Planning Factsheet](#) (2020).

## 2. Properties of Silica (Industrial) Sand

**2.1** Silica Sand contains a high proportion of silica (normally more than 95% SiO<sub>2</sub>) which makes it an important raw material in many industrial processes. Silica sand is important due to a combination of both physical and chemical properties, which are not commonly found in other sand types. One of the key characteristics is the low level of impurities; very low levels of iron oxides and refractory minerals are particularly important for glassmaking. Physically, silica sands also need to have consistent grain sizes within a narrow range.

**2.2** Individual industrial processes may require specific grain shapes, as well as consistent grain sizes. As silica sand deposits across the country are heterogenous, this means that often particular deposits are suitable for specific industrial processes, and deposits from other locations cannot be substituted.

**2.3** Some deposits naturally contain a proportion of clay, this has historically been important to the foundry industry where the sand grains also have a high degree of sphericity, as naturally bonded foundry sand. However, for water filtration applications, while sand with a high sphericity is required, any naturally occurring clay would need to be removed, and this application requires a coarser grading. Modern foundry uses demand a higher quality product and increasingly foundry sands are processed to remove the natural clay, before either a resin coating is applied to the grains, or specialist clays such as bentonite are added, to provide a more consistent product.

**2.4** Glass sand has different properties - deposits where grains are more angular and linear in shape are required. Levels of iron oxides are important to glass manufacture, particularly colourless glass containers.

**2.5** Recycling of glass has led to an increased demand for high purity silica sand, which has very low levels of iron oxides. The reason for this is that colourless recycled glass (referred to as colourless cullet) generally has higher levels of iron than would be acceptable within the feedstock for colourless container making. However, it is the overall composition of the glass batch which is important; therefore, by adding glass sand with very low iron levels to the batch this balances the higher iron levels within the cullet and allows the manufacture of colourless glass containers using a proportion of recycled glass cullet.

## 3. National Policy for Silica (Industrial) Sand

**3.1** The National Planning Policy Framework (NPPF) (2021), paragraph 209, highlights that maintaining a sufficient supply of minerals, including silica sand, is essential 'to provide the infrastructure, buildings, energy and goods that the country needs'.

**3.2** The National Planning Policy Guidance (PPG), paragraph 086 (Ref ID: 27-086-20140306), notes that 'industrial minerals being essential raw materials for a wide range of downstream manufacturing industries. Their economic importance therefore extends well beyond the sites from which they are extracted'.

**3.3** Paragraph 086 (Ref ID: 27-086-20140306) of the PPG also recognises 'the fact that markets are based on the consistent physical and/or chemical properties of each mineral. Different uses can require different specifications, and industrial minerals are often not interchangeable in use'.

**3.4** The NPPF (2021), paragraph 214 contains the national policy for industrial minerals, which includes silica sand. Whilst there are no national or sub-national guidelines for future provision of industrial minerals, the NPPF does require Mineral Planning Authorities to plan for a steady and adequate supply of industrial minerals.

**3.5** The method to calculate the required stock of permitted reserves for silica sand sites (set out in paragraph ID: 27-090-20140306 of the PPG) is based on the average of the previous 10 years sales from the processing plant. The calculations should have regard to the quality of sand the use to which the material is put. This data could be requested from the mineral operator. For silica sand, the NPPF (2021) states that a Mineral Planning Authority should plan so that at least 10 years of permitted reserves should be available to support each silica sand processing plant within its area; this is increased to at least 15 years where significant new investment to the processing plant is required.

**3.6** Therefore, the emphasis in the NPPF is for the steady and adequate supply of industrial minerals to be achieved by permitted reserves; that is by land which has extant planning permission for silica sand extraction. This is different to the situation in relation to aggregate minerals where a steady and adequate supply is to be achieved by the allocation of specific sites, preferred areas and/or areas of search.

**3.7** However, the PPG (paragraph ID: 27-008-20140306) does not differentiate between aggregate minerals and industrial minerals and states that “Mineral planning authorities should plan for a steady and adequate supply of minerals in one or more of the following ways (in order of priority): 1. Designating specific sites ... 2. Designating preferred areas ... 3. Designating areas of search...” The same paragraph of the PPG also states: “Furthermore, in exceptional circumstances, such as where a local authority is largely made up of designated areas such as Areas of Outstanding Natural Beauty, it may be appropriate for mineral planning authorities to rely largely on policies which set out general conditions against which applications will be assessed.”

**3.8** Silica sand is recognised as a nationally important mineral resource and is one of a small number of such minerals which can be subject to the Nationally Significant Infrastructure Projects (NSIP) process. The criteria for a minerals project to be considered as a NSIP are that the proposal involves a strategically important industrial mineral, or that it is over 150 hectares in size. Silica sand would fit the first of these criteria. It is therefore possible that the prospective developer for any silica sand extraction could apply for an application to be determined by the Planning Inspectorate as an NSIP rather than as an application to the Mineral Planning Authority. The adopted Development Plan would be a material consideration in the determination of an NSIP. For more information on NSIPs see:

<http://infrastructure.planninginspectorate.gov.uk/>

#### **4. Extent of Silica Sand in the UK and its uses**

**4.1** Sand resources within the UK have been deposited over a succession of geological periods, which leads to different physical and chemical properties in various locations. Due to the geological forces which have been in play across the UK, sand and/or sandstone occurs in many places. However, only in a few locations do deposits have the necessary properties to be considered as silica sand. Silica sand is commercially extracted from loose sand beds and weak sandstone deposits.

**4.2** Silica sand is extracted in the following counties in England: Cheshire, Norfolk, Surrey, Kent, Essex, Bedfordshire, Nottinghamshire, North Yorkshire, and North Lincolnshire.

**4.3** The use to which a particular deposit is best suited is a product of its quality, purity, and grain size and shape. Natural variations are present within the deposits and a change in any characteristic may render part of the deposit unsuitable for a particular use.

**4.4** The largest single industrial use for silica sand is glass-making. Glass production can be split into several broad categories, container glass (such as bottles and jars), flat glass (such as windows and automotive glass), and glass products (such as glass fibre). Float glass is a method of manufacture in which the molten glass is floated on a bed of liquid tin. It is used to manufacture window glass to high specifications for building and automotive use. However, the process is very sensitive to impurities. Therefore, general recycled cullet is not used as part of the feedstock.

**4.5** Cullet created during the manufacturing process as any excess glass is trimmed away is reused, and in recent years segregated cullet returned from the window and automotive manufacturers has also started to

be used. All colourless glass manufacture requires high purity silica sand in the feedstock, to balance the impurities found within cullet.

**4.6** Use as foundry sand which was once significant, now only accounts for a small proportion of silica sand production. The demand for foundry sand is now as a higher quality product, used in specialist manufacturing to serve the aerospace, military and automotive sectors. Silica sand is also used by the water and food industries, where it is the main method of drinking water filtration to remove solid particles, due to its inert nature.

**4.7** Silica sand is used to manufacture cristobalite, which is a component of the glazes and enamels used in the manufacture of ceramic products, such as plates, tiles and items such as sinks etc. Silica sand is also milled to form silica flour, which is used in plastics, and paint manufacture to ensure consistent colours through the product.

**4.8** Sodium silicate is formed from silica sand, this is used in the manufacture of many silicon chemicals, such as silica sealants, silicone waterproofing materials, silicone polishes, and many other products, such as zeolites. The use of silica sand as a coating (known as facing) material is vital for the manufacture of clay products such as bricks, roofing tiles, glazed clay pipes. It is used to coat the inside of the moulds, to ensure products can be removed cleanly, and to improve the finish and function.

**4.9** Silica sand has been used as a proppant (commonly called 'frac' sand) in oil and gas production for many years, where specifications for grain size and shape are similar to those for foundry sand, with a narrow size distribution to maximise permeability. It is pumped into boreholes in oilfield reservoirs to increase production, especially in situations where horizontal drilling and hydraulic fracturing are used. This has been the case for many years in the offshore oil and gas industry in certain locations, such as the Southern North Sea. There are currently no extraction sites in the UK specifically producing proppants, although silica sand from Cheshire was used in exploratory hydraulic fracturing in Lancashire during 2011.

**4.10** Silica sands which are not an appropriate grade or specification for industrial processes have specialist uses in horticulture, sporting and equestrian uses as dressings and for surface construction. Ménages, all weather tracks and sports pitches all use silica sand in their construction, mixed together with plastic. Horticulture, sports and leisure uses have grown significantly over the last 15 years, and now account for a greater proportion of silica sand production in the UK than glass-making.

**4.11** The lowest grade silica sands are used for non-industrial purposes in construction, these are often extracted as co-products of the extraction of silica sand for industrial uses.

**4.12** Cheshire has two deposits classified as silica sand (the Congleton and Chelford Beds), one has been a source of foundry sand, and the other was historically important for glass manufacture, however it is believed that remaining resources are limited.

**4.13** Norfolk has two deposits of silica sand (the Mintlyn and Leziate Beds), these have produced silica sand with different properties. Historically the Mintlyn Beds supplied foundry sand, and although resources remain, no extraction is taking place and the processing plant buildings for foundry sand were removed some years ago. The [BGS silica sand Mineral Planning Factsheet](#) (2020) noted that "sands suitable for the manufacture of colourless glass containers are only produced at six locations in the UK". Currently, the deposit which is being worked at Leziate is one of two in England where silica sand of sufficient purity and correct composition for the manufacture of colourless flint (container), and float (window) glass is extracted. The other extraction site of silica sand of comparable quality is in Surrey, which also produces sand suitable for the manufacture of sodium silicates.

**4.14** The Folkestone Formation occurs in Kent, Surrey, Sussex, and Hampshire. The deposit is heterogenous with significant variances in composition, and while some locations produce glass, industrial and specialist sands, others extract sand which is sold into the construction market.

**4.15** In Bedfordshire, the silica sand is extracted for a variety of uses; rail braking, water filtration, horticultural use, as a coating in brick manufacture, and for foundry use. There is also some extraction of construction sands, highlighting differences in the physical and chemical properties found in the deposits.

**4.16** Nottinghamshire has deposits of soft sandstone which are worked to produce silica sand, for sports and foundry use, as well as specialist construction sand. Soft sandstone is also worked on a small scale for foundry sand in North Yorkshire, where it supplies local markets.

**4.17** Scotland contains extensive silica sand resources and has the largest permitted reserves of any part of the UK. High purity silica sand is extracted from a number of quarries to supply colourless container glass to the industry in Scotland, and northern England. Scotland also has the UK's only underground mine for silica sand at Lochaline, where most Scotland's permitted reserves are located. The mine produces the highest purity silica sand in the UK and has been used to produce optical glass.

## **5. Extent and uses of silica sand resources in Norfolk**

**5.1** The silica sand as a mineral resource in Norfolk is found in the west of the County, a relatively narrow band which runs north to south just to the east of King's Lynn. The northern extent of the silica sand resource is at Heacham, and the southern extent around Hilgay. Sibelco UK Ltd (the only mineral operator for silica sand in Norfolk) has indicated that the whole of the resource could be considered as potentially economic for mineral to be transported to the processing plant.

**5.2** The area of current extraction is centred on the parish of Leziate. This is also the centre for past workings. Joseph Boam were a company which extracted silica sand in the area from the 1860's and later set up the first processing plant to produce glass sand in commercial quantities. The silica sand processing plant is still located at Leziate, together with a railhead. The remains of a Medieval tile works and kiln have also been found in the area. It would seem probable that local silica sand would have been used as facing and glazing materials for these tiles.

**5.3** In Norfolk the silica sand resource is split into two broad categories, the Mintlyn Beds and the Leziate Beds; historically the Leziate Beds have been used principally for glass sand, and the Mintlyn Beds to produce foundry sand. Processing of sand for foundry use has stopped at Leziate and those parts of the processing plant dedicated to their production have been removed. This reflects a general decline in the demand for foundry sand in England.

**5.4** The quality and grade of silica sand can vary significantly within a deposit, and this can affect the uses which the sand can be put to. Information was sought from Sibelco UK Ltd regarding any areas of the resource which are likely to be unsuitable for industrial/specialist end uses, however no additional areas have been identified other than those already known to the Mineral Planning Authority.

**5.5** The deposits which have been worked in Norfolk to date have been used for glass-making and foundry uses, with only a very small proportion of material which does not make the required specification after processing being used for other specialist purposes. Information from Sibelco UK Ltd stated the sand produced at the Leziate Quarry was mainly used for container and float glass manufacture. The BGS silica sand Mineral Planning Factsheet (2020), states that the Leziate member is "one of the very few deposits where there is no associated production of construction sand."

**5.6** Silica sand which is to be used for glass manufacture requires a significant amount of processing prior to being suitable for onward shipment to the glass manufacturers. This processing requires large and capital-intensive plant such as the one located at Leziate. Processes include acid leaching and magnetic separation to remove iron oxides, washing and attrition scrubbing to remove fine material. Consistency of material is an important consideration, and this requires blending of sand from different areas of the working.

**5.7** Due to the cost and fixed nature of the processing plant and railhead, silica sand working has historically taken place near the Leziate processing plant. However, this now means that the most accessible areas have either been worked or are in the process of being worked.

**5.8** The majority (75%) of the processed silica sand is transported out of Norfolk by rail, to glass manufacturers in the North-east and North-west of England. There are a number of glassworks in East and South Yorkshire, in the vicinity of the Humber. The glassworks at Goole is also served by its own branch line and railhead.

## 6. Great Britain production of Silica sand

6.1 The table below provides a national picture of silica sand production by end use over the most recent 20 years for which data is available. The total production varied between 3.8 million and 5.3 million tonnes per annum, with an average production of 4.4 million tonnes per annum. Where it is listed that figures are not available in the years from 2001 to 2014, this is because the information is considered confidential by the BGS, due to a small number of extraction companies involved in that market. Where it is listed that figures are not available in the years 2015 onwards this is because the Annual Mineral Raised Inquiry, a survey carried out by the Office of National Statistics ceased in 2016. The total includes all end use sectors.

### Great Britain production of silica sand by end use

| Year | Foundry uses | Glass manufacture | Other industrial uses | Agricultural, horticultural and leisure uses | Total     |
|------|--------------|-------------------|-----------------------|--|-----------|
| 2020 | ...          | ...               | ...                   | ...  | 5,301,296 |
| 2019 | ...          | ...               | ...                   | ...  | 5,136,383 |
| 2018 | ...          | ...               | ...                   | ...  | 4,890,490 |
| 2017 | ...          | ...               | ...                   | ...  | 5,051,461 |
| 2016 | ...          | ...               | ...                   | ...  | 4,251,219 |
| 2015 | ...          | ...               | ...                   | ...  | 3,822,107 |
| 2014 | >284,000     | <1,288,000        | 982,000               | 1,394,000                                    | 3,948,000 |
| 2013 | >302,000     | <1,374,000        | 837,000               | 1,448,000                                    | 3,961,000 |
| 2012 | 340,000      | 1,489,000         | 782,000               | 1,277,000                                    | 3,888,000 |
| 2011 | 382,000      | 1,528,000         | 956,000               | 1,104,000                                    | 3,969,000 |
| 2010 | 353,000      | 1,582,000         | 913,000               | 1,222,000                                    | 4,070,000 |
| 2009 | >297,000     | <1,374,000        | 1,096,000             | 988,000                                      | 3,755,000 |
| 2008 | 443,000      | 1,932,000         | 1,186,000             | 1,216,000                                    | 4,777,000 |
| 2007 | 527,000      | 1,930,000         | 1,178,000             | 1,274,000                                    | 4,909,000 |
| 2006 | ...          | 2,206,000         | 1,306,000             | ...  | 5,174,000 |
| 2005 | ...          | 2,120,000         | 954,000               | ...  | 4,146,000 |
| 2004 | ...          | 2,663,000         | ...                   | 838,000                                      | 5,011,000 |
| 2003 | ...          | 1,896,000         | 1,645,000             | ...  | 4,073,000 |
| 2002 | ...          | 1,940,000         | 1,331,000             | ...  | 3,833,000 |
| 2001 | 880,000      | 1,853,000         | 1,115,000             | ...  | 3,848,000 |

... Figures not available Source: BGS UK Minerals Yearbooks



## **7. Norfolk production of Silica sand**

**7.1** Data provided to Norfolk County Council by Sibelco UK Ltd states that the 10-year average production for the Leziate site for 2011-2020 was 800,051 tonnes per annum. This is a 2.5% increase on the previous 10-year average (2010-2019) of 780,706 tonnes.

**7.2** Data provided to Norfolk County Council by Sibelco UK Ltd states that the three-year average of silica sand extraction in Norfolk from 2018-2020 was 814,625 tonnes per annum. This is a 4.6% decrease on the previous three-year average (from 2017-2019) of 854,092 tonnes. The most recent 3-year average production is approximately 16% of all silica sand production in Great Britain in the same period; and would be a far greater percentage of glass sand production. However, the BGS have not published silica sand production split by end use since 2014. In 2014, the proportion of glass sand supplied by Norfolk would have been approximately 60% of production in Great Britain.

## **8. Glass recycling in Norfolk**

**8.1** A significant number of public responses to the Preferred Options consultation on the Minerals and Waste Local Plan questioned the need for potential future silica sand extraction if improvements were made to the quantity of glass recycled in Norfolk.

**8.2** The NPPF 2021 (paragraph 210) states that “planning policies should, so far as practicable, take account of the contribution that substitute or secondary and recycled materials and minerals waste would make to the supply of materials, before considering extraction of primary materials, whilst aiming to source minerals supplies indigenously”. However, the PPG, which provides more detailed guidance on planning for aggregate and industrial minerals, only refers to the consideration of other supply options in relation to aggregate minerals.

**8.3** Norfolk has an integrated waste management system run by the City, District and Borough Councils as the Waste Collection Authorities, and Norfolk County Council as the Waste Disposal Authority. These authorities work together within the Norfolk Waste Partnership to promote recycling and reuse of waste. It should be noted that these are separate statutory functions to that of Norfolk County Council as the Waste Planning Authority. As the Waste Disposal Authority, Norfolk County Council is responsible for arranging the disposal of the waste collected by the Waste Collection Authorities that is not collected for recycling or composting.

**8.4** There are three main ways in which household waste is collected in Norfolk [data from Norfolk County Council]:

- Recycling banks to collect a range of materials, including glass bottles and jars, are located across Norfolk. In 2019/20 2,500 tonnes of mixed glass was collected this way. These recycling banks are run by a range of organisations - charities, clubs and societies, Parish Councils and Waste Collection Authorities.
- Twenty Recycling Centres provided by Norfolk County Council for the recycling and disposal of household waste. Waste is segregated by the householder at the recycling centre and put into the relevant container; glass is collected separately at the Recycling Centres and can be segregated into separate colours. Both flat glass and container glass (bottles and jars) are collected. In 2019/20, 690 tonnes of glass were collected at the Recycling Centres with 308 tonnes of this in the form of flat glass.
- Kerbside collection of waste by the Waste Collection Authorities. Household waste is segregated by the householder prior to collection into different bins. There are two main waste streams; recyclable waste and residual waste. In addition, some households have separate collections of green garden waste and/or food waste for composting. In 2019/20 19,355 tonnes of mixed glass bottles and jars were collected from the co-mingled recycling collections.

**8.5** Total household waste is the sum of recyclable, compostable and residual waste, and this is used to derive percentages for each waste stream. In Norfolk the percentage of household waste sent for reuse, recycling and composting as a proportion of the total was 44% in 2019/20 (Source: WasteDataFlow Defra). The majority of the household waste stream is still collected as residual waste because of a combination of reasons which include a lack of markets and/or a lack of reprocessing infrastructure for some waste types.

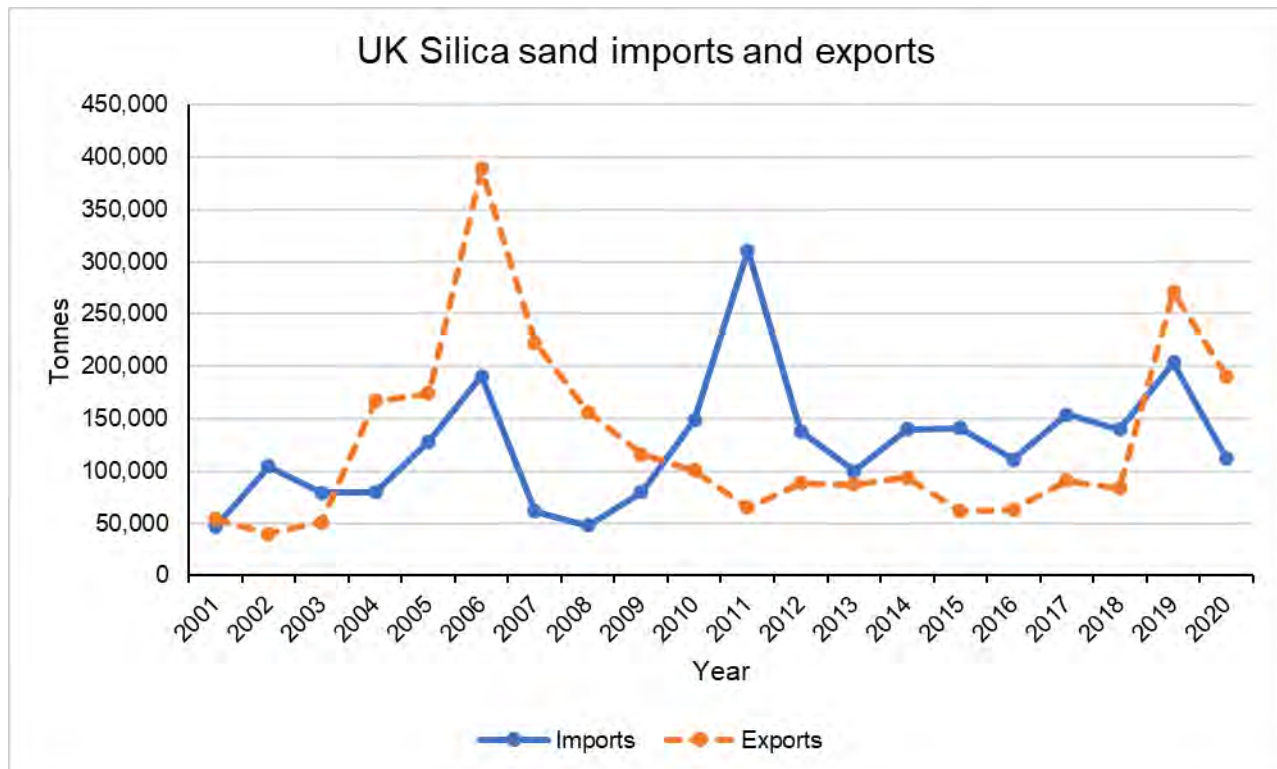
**8.6** However, glass is a highly recyclable material, and is included in the types of waste that are collected in Norfolk's recyclable waste. The Materials Recycling Facility at Costessey, used by Norfolk County Council, has specialist equipment which is used to segregate glass from all other recyclable waste. It is then recycled by crushing and sorting it into sizes and colour types. Once the glass has been reduced to cullet, it is all recycled, either by return to glassworks, or as an alternative to sand in the manufacture of asphalt for road surfaces. Therefore, not all recycled glass is made back into glass products again.

**8.7** The Norfolk Waste Partnership carries out audits of residual and recyclable waste to determine whether certain wastes are being placed by households in the incorrect bins. The most recent audit carried out in 2021/22 found that only 3% of the residual waste was made up of glass items. This 3% would equate to approximately 6,000 tonnes of glass per year in the household waste stream that was not being recycled. Therefore, this data suggests that around 80% of glass waste from Norfolk households is already being recycled (based on 6,000 tonnes in the residual waste stream compared to 22,500 tonnes collected for recycling). Annually, the total amount of household glass waste recycled in Norfolk [c. 22,500 tonnes in 2019/20 from recycling banks, recycling centres and kerbside collection] is only approximately 3% of the silica sand production for Norfolk. Therefore, even if measures were instigated to reduce the small amount of glass which remains in the household residual waste in Norfolk it would not materially reduce the need for silica sand.

**8.8** As stated earlier, the largest single industrial use for silica sand is glass-making, including container glass (such as bottles and jars) and float glass (such as windows and automotive glass). The UK glass packaging recycling rate in 2020 was 74.2% (DEFRA UK Statistics on waste). There is potential to increase float glass recycling in the UK as the majority of float glass currently recycled is from the manufacturing process (pre-consumed glass) rather than glass that has been utilised in end products, this is because there needs to be a high visual quality for float glass to be reused, so it cannot be contaminated in any way when being recycled. However, high purity silica sand, such as is found in Norfolk is needed in order to produce glass from recycled glass cullet; it is an ingredient within the feedstock which balances the higher level of impurities found in recycled glass so that glass of acceptable quality can be made. It is not possible to quantify the impact that potential glass recycling increases in the UK would have on the need for silica sand from Norfolk during the Plan period. Therefore, it is not proposed to make any adjustments to the forecast need for silica sand based on recycled glass.

## 9. Imports/exports of Silica sand

9.1 The BGS silica sand Minerals Planning Factsheet (2020), states that “The UK is essentially self sufficient in silica sand...” The graph below shows the level of imports and exports since 2001.



Source: BGS silica sand Minerals Planning Factsheet (2020) and HM Revenue and Customs

9.2 Over this period annual UK silica sand production has varied between 3.8 to 5.3 million tonnes per annum (averaging 4.4 million tonnes per annum), with imports and exports both averaging around 125,000 tonnes per annum. The BGS silica sand Minerals Planning Factsheet (2020) notes that “Imports are principally from the EU, with Belgium, the Netherlands and Portugal being the largest suppliers”, and “the vast majority of exports go to Ireland...”.

## 10. Calculation of Plan Provision for silica sand extraction in Norfolk

10.1 The NPPF (2021) states in paragraph 214 that Minerals Planning Authorities should plan for a steady and adequate supply of industrial minerals, such as silica sand. The NPPF and PPG states that the supply of silica sand should be planned as years’ worth of production for the processing plant site. The stock of permitted reserves of silica sand should be at least 10 years’ production for individual silica sand sites, and if significant new capital is required, then stocks for at least 15 years’ production should be planned for.

10.2 In the adopted Norfolk Minerals and Waste Core Strategy DPD (2011), Core Strategy Policy CS1 sets out that the plan provision for silica sand should be 750,000 tonnes per annum. This figure is based on evidence provided during that plan-making process regarding production and future needs.

10.3 The average silica sand production in Norfolk over the last 10 years (2011-2020) was 800,051 tonnes per annum. The average silica sand production in Norfolk over the last 3 years (2018-2020) was 814,625 tonnes per annum. The trend for the 3-year average production has been generally upwards since this information started being supplied; and has been above 750,000 tonnes per annum since 2013. More detailed information is available in the annual monitoring reports (Norfolk Local Aggregate Assessment and Silica Sand Assessment) available at: [Annual Monitoring Reports - Norfolk County Council](#)

**10.4** 10-year average sales data and 3-year average sales data is provided to Norfolk County Council annually by Sibelco UK Ltd, but annual silica sand production data is not provided. As stated earlier, the NPPF makes a specific link between silica sand supply and the production of the plant that it is supplying; therefore, it is considered appropriate to forecast the need for silica sand extraction in Norfolk based on the maximum lawful throughput of the Leziate processing plant site, which is 0.754 million tonnes of raw silica sand per annum.

**10.5** It should be recognised that the silica sand sales figures for the UK and Norfolk already take into account the contribution made to glass manufacture by recycled cullet. This is because, as has been mentioned previously in this paper, glass is highly recyclable and a sophisticated market has existed for this material over many years. In effect, the demand within the silica sand market has already taken into account the quantities of cullet available, and the products within which cullet can form part of the feedstock. Cullet provides economic benefits to glass makers, due to lower fuel requirements, as it makes the feedstock easier to remelt than if it was entirely composed of primary silica sand. Therefore, an incentive exists for glass manufacturers to maximise the use of cullet. However, the increased use of cullet may have driven the demand for certain high purity silica sands, such as those in Norfolk. Inclusion of such sand is a way of reducing the overall level of impurities in the feedstock to acceptable levels, as cullet has generally high levels of impurities, because it is a recycled product.

### **Forecast, reserves and shortfall**

**10.6** The total forecast plan provision is the maximum lawful annual throughput of the plant site at Leziate (0.754 million tonnes) multiplied by the number of years of the Plan.

**10.7** A permitted reserve is the amount of mineral for which there is an extant planning permission in place to permit its extraction. The current permitted reserve of silica sand, at 31/12/2020 was 3.232 million tonnes. The permitted reserve therefore provides a landbank of less than 10 years' worth of silica sand production, which is below the level required by the NPPF (2021). However, the level of permitted reserves is dependent upon the submission of suitable planning applications by mineral operators. Planning permission was granted in August 2021 for the extraction of 1.1 million tonnes of silica sand at Bawsey (allocated site SIL 01). A planning application for the extraction of 3 million tonnes of silica sand at East Winch (allocated site MIN 40) was received in 2018 and had not been determined by December 2021. However, even with the inclusion of the mineral resource in both these planning applications, the landbank of permitted reserves would still be less than 10 years' worth of silica sand production.

### **10.8 Calculation of forecast need for silica sand**

- The maximum total lawful throughput per annum for the Leziate Plant Site is 0.754 million tonnes of silica sand
- The forecast need for silica sand from 2021-2038 is therefore 0.754 million tpa x 18 years = 13.57 million tonnes
- Silica sand permitted reserve at 31/12/2020 = 3.232 million tonnes
- Total shortfall is the forecast need minus permitted reserve = 10.34 million tonnes

The total shortfall and the minimum quantity to be allocated is therefore 10.34 million tonnes which is equivalent to a need for 13.7 years' further supply over the period of the Minerals and Waste Local Plan.

## **11. The Single Issue Review of Silica Sand**

**11.1** The Single Issue Silica Sand Review was carried out between 2014 and 2017. A 'call for sites' took place in 2014 asking landowners and mineral operators to submit sites for consideration as potential specific site allocations for future silica sand extraction. Insufficient potential sites were put forward to meet the forecast need for silica sand over the Plan period to 2026. Therefore, the Mineral Planning Authority

investigated the potential to designate Areas of Search and/or Preferred Areas for future silica sand extraction. These areas are defined in the PPG (paragraph ID: 27-008-20140306) as follows:

- Preferred Areas are areas of known mineral resources where planning permission might reasonably be anticipated.
- Areas of Search are areas where knowledge of mineral resources may be less certain but within which planning permission may be granted, particularly of there is a shortfall in supply.

**11.2** A sieving exercise was carried to map Areas of Search for potential future silica sand extraction sites. The process for defining the Areas of Search sieved out land within the Leziate silica sand resource that was considered to be constrained for the purposes of mineral extraction. The Initial Consultation of the Silica Sand Single Issue Review (2015) asked a series of questions regarding both the type of constraints that should be included in the sieving process, and the distance of any initial stand-off distance from constraints. This Initial Consultation document was subject to public consultation in 2015. A summary of the constraints included in the Initial Consultation is set out below, more detail is included within Appendix 1.

**11.3** The potential constraints list contained within the Initial Consultation of the Single Issue Silica Sand Review 2015 was:

- 1) Special Areas of Conservation
- 2) Roydon Common and Dersingham Bog SAC
- 3) The Wash and North Norfolk Coast SAC
- 4) Sites of Special Scientific Interest
- 5) Ancient Woodland
- 6) Historic environment and heritage assets
- 7) Scheduled Monuments
- 8) Archaeology
- 9) Amenity
- 10) Air quality and Dust
- 11) Noise
- 12) Lighting
- 13) Agricultural land classification
- 14) Flood Risk
- 15) Previous workings and current permissions
- 16) Extent of deposits
- 17) Electricity and Gas Transmission, and water infrastructure
- 18) Landowner willingness

**11.4** Following the Initial Consultation on the Single Issue Silica Sand Review in 2015, the responses received were taken into account in mapping the draft Areas of Search.

**11.5** A summary of the sieving process to map the Areas of Search within the Preferred Options document of the Single Issue Silica Sand Review can be found below. Further details of the information, including maps, used in the sieving process, can be found in Appendix 3.

- a. The starting point for the areas of search was the extent of the British Geological Survey, Leziate Beds silica sand resource.
- b. The Norfolk Coast Area of Outstanding Natural Beauty was excluded
- c. All ancient woodland and 250 metres around them was excluded
- d. All SSSIs and 250m around them was excluded (except for Roydon Common and Dersingham Bog – see below)
- e. The hydrological catchment around Roydon Common and Dersingham Bog was excluded
- f. Registered Common Land was excluded

- g. Designated heritage assets (Listed Buildings, Scheduled Monuments, registered parks and gardens, Conservation Areas) and 250 metres around each designated heritage asset was excluded
- h. Sensitive receptors to amenity impacts (residential dwellings, workplaces, healthcare and leisure facilities) and 250m around each sensitive receptor was excluded
- i. Agricultural land grades 1 and 2 were excluded
- j. Allocated, current or restored mineral extraction sites were excluded
- k. The areas of the Leziate Beds silica sand resource that were remaining at this point were all potential areas of search
- l. Potential areas of search below 20 hectares in size were not taken any further
- m. The remaining ten areas of search were above 20 hectares in size and were included in the Preferred Options Consultation document for the Silica Sand Review.

**11.6** In 2015, it was determined that these were Areas of Search, and not Preferred Areas. Areas of Search are broader areas of the inferred mineral resource where detailed knowledge of the resource is less certain but within which a planning permission may be granted for a smaller area of land to meet the potential shortfall in supply. Preferred Areas are where knowledge of the mineral resource is greater through the interpretation of borehole data, and a planning permission might reasonably be anticipated. In 2015, no detailed borehole information was available for any of the silica sand mineral resource area, outside of the sites already covered by existing mineral extraction areas, or specific site allocations (MIN 40 and SIL 01), and therefore excluded from the Areas of Search.

**11.7** Following the public consultation period for the Preferred Options of the Silica Sand Review, the responses made were considered in the production of the Pre-submission Publication document of the Single Issue Silica Sand Review. No further specific sites had been submitted for consideration by landowners or mineral operators. A number of responses highlighted issues regarding the deliverability and suitability of some of the defined Areas of Search, which led to the removal of some potential Areas of Search from the Pre-submission document. Areas of Search AOS D, AOS E, AOS F, AOS I, and AOS J were included in the Pre-submission document.

**11.8** The Examination in Public for the Single Issue Silica Sand Review took place in May 2017. Following the Examination, AOS D was removed from the document by the Planning Inspector. In his report (July 2017) he found that AOS E, AOS F, AOS I and AOS J, together with the Area of Search Policy were sound and legally compliant. The revised version of the Minerals Site Specific Allocations Plan incorporating these changes was adopted by Norfolk County Council in October 2017.

## **12. Minerals and Waste Local Plan review process and silica sand allocations**

**12.1** The NPPF (paragraph 33) requires the policies in Plans to be reviewed every five years to see whether they require updating. The Core Strategy and Development Management Policies Development Plan Document (DPD) was adopted in 2011, the Waste Site Specific Allocations DPD in 2013, the Minerals Site Specific Allocations DPD was adopted in 2013 and amended by the Silica Sand Review in 2017. National policy at the time stated that there should be a single Local Plan and therefore the new Minerals and Waste Local Plan will replace the three existing minerals and waste DPDs and extend the Plan period to 2038.

**12.2** The Norfolk Minerals and Waste Local Plan review (the current process) commenced in 2017, with a 'call for minerals sites'. This was for all minerals planned for in Norfolk; aggregate sand and gravel, carstone, and silica (industrial) sand. A number of new potential mineral extraction sites were proposed, although only one area for silica sand extraction was proposed (SIL 02) which was located in the parishes of Shouldham and Marham. The County Council also contacted the landowners and/or mineral operators of existing adopted specific site allocations where a planning permission for mineral extraction had not yet been granted, to ask whether they still wished to promote those sites as mineral site allocations. Following this process, 41 sites had been proposed across the County for potential mineral extraction, with two specific site allocations for future silica sand extraction and one potential Preferred Area for a future silica

sand extraction site. The two specific site allocations were sites MIN 40 and SIL 01 which were already allocated in the adopted Minerals Site Specific Allocations DPD. As the Areas of Search had only just been examined and had been found sound and legally compliant by a Planning Inspector these were included within the Initial Consultation document in 2018. Public consultation took place on the Initial Consultation document from 29 June to 13 August 2018.

**12.3** There were hundreds of responses from the public, voicing objections to the potential Preferred Area SIL 02, which had been proposed by the silica sand operator, Sibelco UK Ltd. All the responses received regarding SIL 02 can be viewed on the consultation website at: <https://norfolk.oc2.uk/document/reps/3985>. The Defence Infrastructure Organisation responded raising potential birdstrike issues with silica sand extraction at the proposed site in relation to RAF Marham. Norfolk County Council asked the DIO to clarify certain aspects of its response. This resulted in an objection by the MOD (DIO) to the potential of wet working and restoration of proposed Preferred Area SIL 02. Due to the likely high watertable on significant parts of SIL 02 and Sibelco UK Ltd's proposed extraction method by dredging, this resulted in the Mineral Planning Authority concluding that the proposed area was unsuitable for allocation at the Preferred Options stage of the Minerals and Waste Local Plan. Therefore, SIL 02 is not allocated in the Pre-Submission Publication version of the Norfolk Minerals and Waste Local Plan.

**12.4** The Preferred Options consultation took place during September and October 2019. Thousands of objections from the public were received to Area of Search AOS E and SIL 02 during the Preferred Options consultation period. The responses received regarding SIL 02 can be viewed on the consultation website at: <https://norfolk.oc2.uk/document/reps/4225>. The responses received regarding AOS E can be viewed on the consultation website at: <https://norfolk.oc2.uk/document/reps/4215>.

**12.5** Many of the objections to AOS E related to the public rights of way and the permissive public access to Shouldham Warren which is within Area of Search AOS E. Shouldham Warren is a commercial forestry plantation which is managed by the Forestry England (part of the Forestry Commission), who leased it from the landowner in 1943 for 999 years. The landowner allows Forestry England to permit access throughout Shouldham Warren. Forestry England have a detailed Forest Plan to 2026, with a medium-term plan to 2046. However, while Shouldham Warren is a plantation woodland, and many of the trees have reached a suitable age for timber production, the Forest Plan considers that it is inappropriate to fell such a large area in a short time, due to the public access and landscape considerations. Therefore, given this, the importance of public access to open space (NPPF paragraphs 98 and 99) and Forestry England's aim to make land within its management accessible to the public, the deliverability of Shouldham Warren as an Area of Search for future silica sand extraction is very uncertain and considered unsuitable to allocate.

**12.6** The Preferred Options version of the Minerals and Waste Local Plan (2019) also showed two areas of AOS E as being unsuitable for allocation due to potential severe impacts on the setting of heritage assets at Wormegay and on the setting of Pentney Priory. The remaining land within AOS E is lower lying and likely to have a high water-table. This would significantly limit the depth of extraction, if issues in relation to open water and associated risk of potential bird-strike for RAF Marham were to be avoided. Together, this means that AOS E ceases to be an Area of Search with any realistic potential for providing a future silica sand site within part of it.

**12.7** The landowner of part of Area of Search AOS F also responded to the consultation, stating that they were unwilling for future mineral extraction to take place on land within their ownership. While MPAs are not required to ascertain landowner willingness prior to the inclusion of land within an Area of Search, definite unwillingness by the landowner would be such a significant barrier to deliverability that it is appropriate to exclude that land from the Area of Search. This is the same approach that was taken in the Single Issue Silica Sand Review. Therefore, the remainder of AOS F is a total of 51 hectares in size, consisting of two parcels of land – 21 hectares west of the A10 and 30 hectares east of the A10.

**12.8** As stated earlier, the forecast need for silica sand over the Plan period to 2038 is 10.34 million tonnes. The two allocated specific sites contain an estimated mineral resource of 4.1 million tonnes, leaving a shortfall of 6.24 million tonnes. Based on recent planning applications for silica sand extraction, 6.24 million

tonnes of silica sand would require a minimum extraction area of 45 hectares, depending on the depth of working, plus additional land for temporary soil storage. Without AOS E, the smaller remaining Areas of Search (AOS F at 51 hectares, AOS J at 23 hectares, AOS I at 47 hectares) are too fragmentary to form an appropriately sized area of search within which to find a potentially viable silica sand extraction site and it is considered unlikely that these areas provide any greater certainty of development, than any other part of the silica sand resource in the absence of AOS E.

### **13. Revised approach to addressing the shortfall in silica sand provision**

**13.1** As discussed in section 12, designating Areas of Search is no longer considered to be a deliverable method to use to plan for future silica sand provision in Norfolk.

**13.2** The NPPG states that Mineral Planning Authorities should plan for steady and adequate supply of minerals in one of the following ways (in order of priority): designating specific sites, designating preferred areas and designating areas of search. The NPPG also states that “in exceptional circumstances, such as where a local authority area is largely made up of designated areas such as Areas of Outstanding Natural Beauty, it may be appropriate for mineral planning authorities to rely largely on policies which set out the general conditions against which applications will be assessed.”

**13.3** The Pre-Submission Publication version of the Minerals and Waste Local Plan does allocate two specific sites for silica sand extraction which contain an estimated mineral resource of 4.1 million tonnes of silica sand. However, this is not sufficient to meet the full forecast need during the Plan period, leaving a shortfall of 6.24 million tonnes. Planning permission has been granted for one of these sites (SIL 01 at Bawsey for 1.1 million tonnes) and a planning application has been submitted for the other site (MIN 40 at East Winch for 3 million tonnes).

**13.4** We consider that there are exceptional circumstances in Norfolk to rely largely on a criteria-based policy which sets out general conditions against which applications for silica sand extraction will be assessed because:

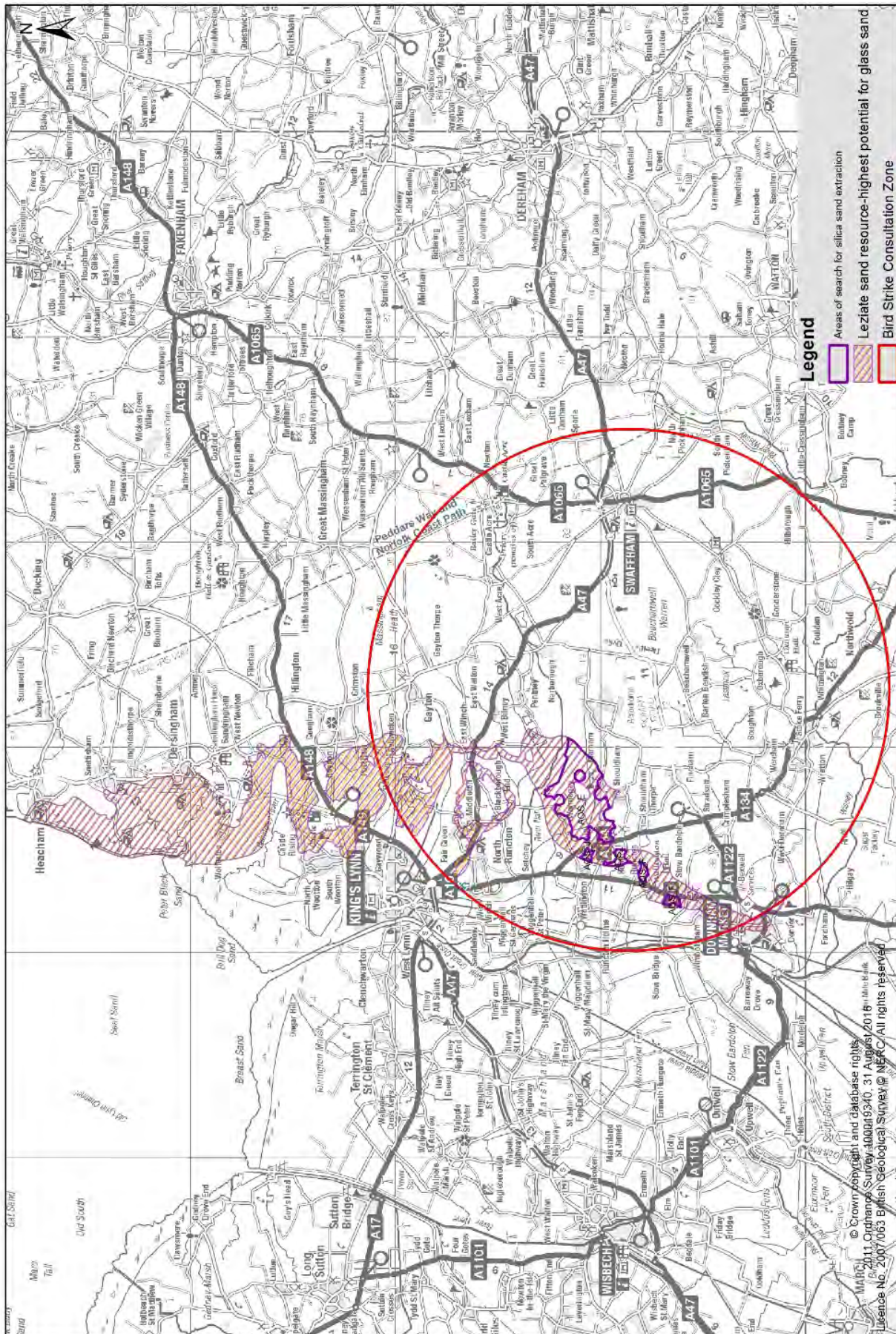
- having tried since 2008, through three separate local plan processes to find sufficient suitable specific sites or preferred areas for silica sand extraction only two suitable sites have been submitted and allocated.
- a thorough sieve-mapping process has been carried out to find suitable areas of search for silica sand extraction as described elsewhere in this paper. The result of the sieve-mapping process and the previous local plan processes did not find any suitable areas of the silica sand resource to designate as Areas of Search north of the A47, mainly due to the location of the Norfolk Coast AONB, Special Protection Areas and Special Areas of Conservation.
- The bird strike consultation zone for RAF Marham covers nearly all of the silica sand resource to the south of the A47. The Ministry of Defence (Defence Infrastructure Organisation) responded to the Minerals and Waste Local Plan consultations and raised concerns about all of the proposed Areas of Search because wet working and restoration at these locations would have the potential to attract and support hazardous waterfowl.
- due to the depth of silica sand resources in relation to the groundwater level it is likely that the mineral sites will be extracted wet and largely restored to water (as has historically been the case for silica sand extraction in Norfolk). Therefore, the MOD (DIO)'s concerns regarding birdstrike risk make silica sand extraction in this location unlikely to be deliverable.
- The area of the silica sand resource with the highest elevations within the birdstrike consultation zone (therefore least likely to be worked wet or restored to open water) is Shouldham Warren which has a number of Public Rights of Way within it and permissive public access provided by Forestry England. Due to the importance of access to open spaces (NPPF paragraphs 98 and 99) and



Forestry England's aim to make land within its management accessible to the public, Shouldham Warren is also concluded to be undeliverable for future silica sand extraction.

- The one potential 'Preferred Area' submitted by a mineral operator for consideration in the Minerals and Waste Local Plan (SIL 02 – land at Marham and Shouldham) is not suitable to allocate due to the size of the extraction proposed within 5km of RAF Marham and the likelihood of the site being restored to open water, there is a high risk of unacceptable adverse impacts on aviation safety and the MOD (DIO) has objected to the proposal. In addition, Norfolk County Council's Historic Environment Service concluded that mineral extraction within the north-eastern part of the site would have a relatively severe impact on the setting of Pentney Priory and should not be allocated.
- Together, these exceptional circumstances mean that the Areas of Search currently allocated in the Minerals Site Allocations DPD are no longer considered to be a deliverable method to use to plan for future silica sand provision in Norfolk.

**13.4** Therefore, in addition to allocating the two specific sites, the proposed approach for silica sand extraction is a criteria-based policy MPSS1 'Silica sand extraction sites' in the Pre-Submission Publication version of the Norfolk Minerals and Waste Local Plan. This policy is based on the existing Areas of Search policy requirements and the recognition that a far greater level of detail on the proposed development, potential impacts and appropriate mitigation would be available within a planning application than through the Local Plan process.



- Legend**
- Areas of search for silica sand extraction
  - Leziate sand resource-highest potential for glass sand
  - Bird Strike Consultation Zone

**Norfolk County Council**  
24 August 2020

0 2,500 5,000 10,000 Meters

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## **Appendix 1: Information and questions on potential constraints which were included in the Initial Consultation document of the Single Issue Silica Sand Review (2015)**

Please note: As this appendix is a copy of part of the 2015 Silica Sand Review Initial Consultation document, all paragraph numbers and references to the NPPF are from the 2012 version of the NPPF.

### **8. Environment**

A number of statutory and non-statutory designations occur in areas underlain by the silica sand resource. It is known that mineral extraction may have the potential to significantly affect some of these habitats.

#### **8.1 Special Areas of Conservation**

These European designated sites are subject to the provisions contained within *Directive 92/43/EEC (the Habitats Directive) on the Conservation of Natural Habitats and of Wild Fauna and Flora*; these provisions were transposed into UK legislation through the *Conservation of Habitats and Species Regulations 2010*.

##### **Roydon Common and Dersingham Bog SAC**

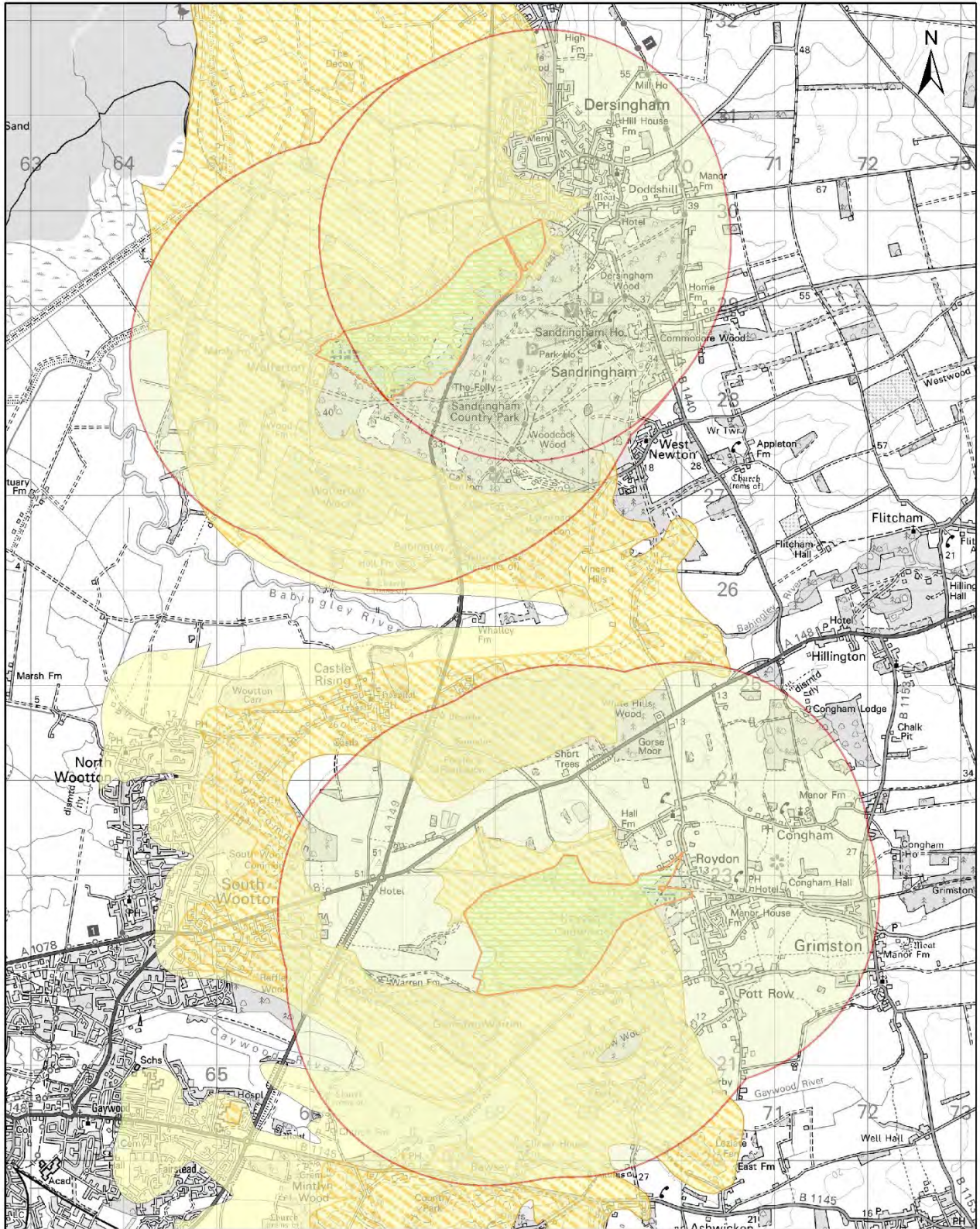
**8.1.1** The Roydon Common and Dersingham Bog SAC occurs within the silica sand resource. It is also designated as two wetlands of international importance: Roydon Common Ramsar site and Dersingham Bog Ramsar site. It is known from evidence provided at the previous Examination in Public that an uncertainty exists for significant effects on the designated habitat as a result of changes in the chemical composition of the groundwater supplying the SAC due to mineral extraction. The precautionary principle is engaged through the Habitats Regulations, such that where there is uncertainty it should be assumed that the potential exists for those effects. This was a key consideration in the decision not to allocate proposed silica sand site MIN 41 in the Minerals Site Specific Allocations Plan.

**8.1.2** Therefore, based on objections from Natural England and the Environment Agency to sites for silica sand extraction proposed during the production of the Minerals Site Specific Allocations Plan, an assumption has been made that any proposed specific sites within 2 km of Roydon Common and Dersingham Bog SAC will need to include enhanced evidence to indicate that no significant effects on the SAC or Ramsar sites are likely from silica sand extraction, including effects on groundwater quantities and composition.

**8.1.3** If insufficient suitable Specific Sites are proposed in response to the 'call for sites' the County Council would continue the Silica Sand Review by defining Preferred Areas and/or Areas of Search. It is proposed that such areas would exclude the 2 km area of land around Roydon Common and Dersingham Bog SAC.

**8.1.4** The map overleaf shows the location of the SAC (which is also designated as two Ramsar sites) and the 2km enhanced evidence area.

**Question 2:** [Should enhanced evidence on the potential effects of silica sand extraction on the Roydon Common and Dersingham Bog SAC and Roydon Common and Dersingham Bog Ramsar sites be provided in areas closer than 2km from the SAC/Ramsar, or should a different distance from these sites be used? In your answer, please provide information/evidence to support your view.](#)



**Legend**

- Roydon Common & Dersingham Bog SAC - Area within which hydrology and hydrochemical assessment to meet the Habitats Directive required
- Roydon Common and Dersingham Bog (SAC)
- Leziat sand resource-highest potential for glass sand
- Mineral Safeguarding Area (Silica Sand)

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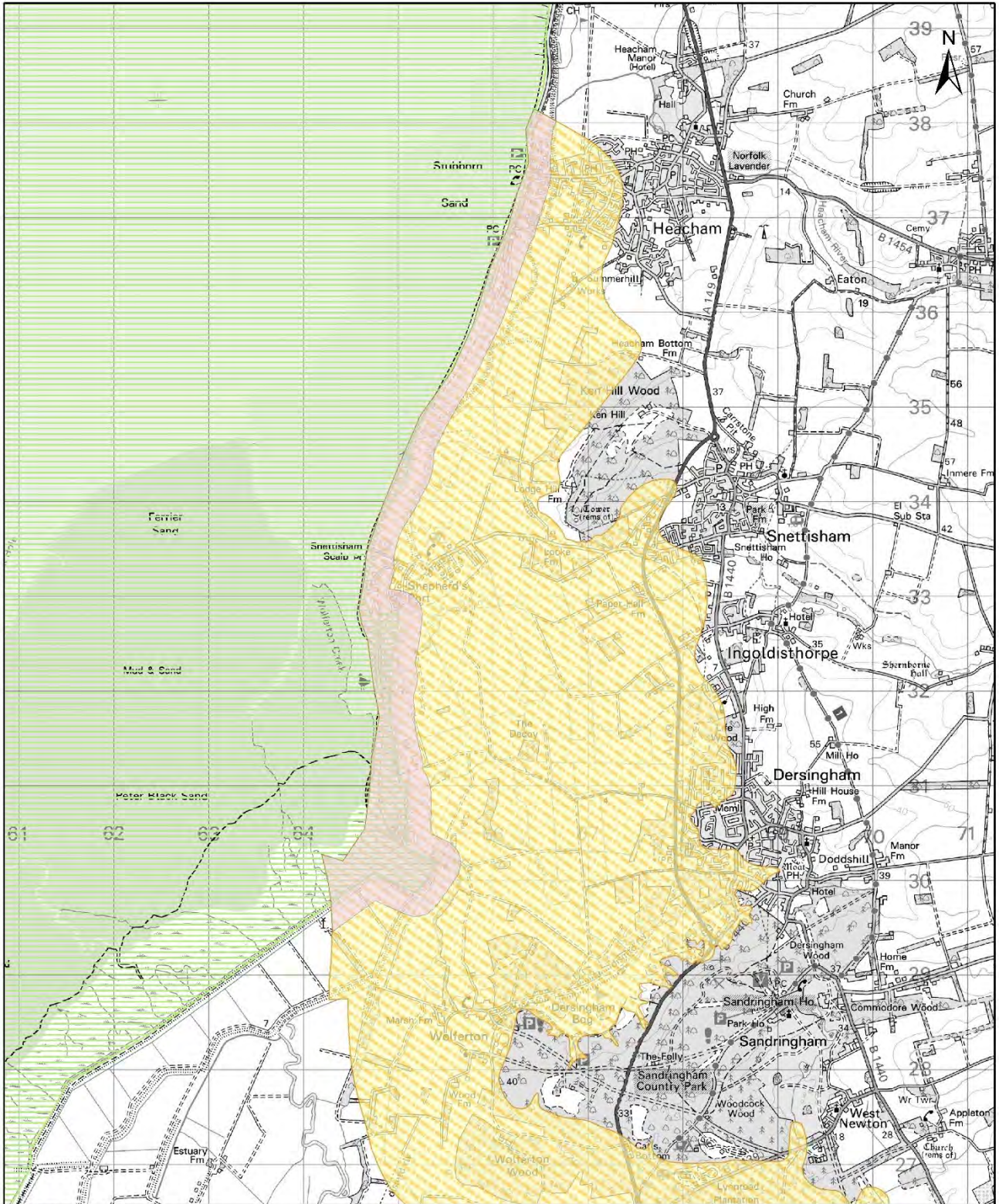
## **The Wash and North Norfolk Coast SAC**

**8.1.5** Parts of The Wash and North Norfolk SAC impinge on the north-western extent of the silica sand resource. The majority of qualifying features for this SAC are marine in nature, although coastal lagoons, common seals and otters may be found in close proximity to the shoreline. Therefore, areas proposed for allocation within 250 metres of the SAC boundary will need to provide enhanced evidence to show that significant effects on the qualifying features will not occur as a result of silica sand extraction. The area of the Wash and North Norfolk Coast SAC, which is relevant to the silica sand resource in Norfolk, is also designated as The Wash Special Protection Area and The Wash Ramsar site.

**8.1.6** If insufficient suitable Specific Sites are proposed in response to the 'call for sites' the County Council would continue the Silica Sand Review by defining Preferred Areas and/or Areas of Search. It is proposed that such areas would exclude land closer than 250 metres from The Wash and North Norfolk Coast SAC, The Wash SPA and The Wash Ramsar.

**8.1.7** The map overleaf shows the location of the SAC and the 250 metre enhanced evidence area.

**Question 3:** Should enhanced evidence on the potential effects of silica sand extraction on the Wash and North Norfolk Coast SAC, The Wash SPA and The Wash Ramsar be provided in areas closer than 250 metres from the SAC/SPA/Ramsar, or should a different distance from these sites be used? In your answer, please provide information/evidence to support your view



**Legend**

- The Wash & North Norfolk Coast SAC - Area within which evidence should include assessment to meet the Habitats Directive
- The Wash & North Norfolk Coast (SAC)
- Leziat sand resource-highest potential for glass sand
- Mineral Safeguarding Area (Silica Sand)

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## 8.2 Sites of Special Scientific Interest

**8.2.1** A number of Sites of Special Scientific Interest (SSSIs) occur within the silica sand resource. Some of these sites are contiguous with the internationally designated sites discussed in the previous section. No specific enhanced evidence area has been suggested for SSSIs as they have been designated for a number of different reasons which may have differing sensitivities to the effects of mineral extraction and will need to be addressed on a case by case basis. Proposers of sites for silica sand extraction should consider the extent to which enhanced evidence will be required. For example, if the qualifying features of the SSSI are groundwater sensitive, assessment should be included as to the potential for effects on these features. Evidence should be proportionate and based on an assessment of likely effects.

**8.2.2** Proposers of sites should note the wording of paragraph 118 of the NPPF (2012):

*“Proposed development on land within or outside a Site of Special Scientific Interest likely to have an adverse effect on a Site of Special Scientific Interest (either individually or in combination with other developments) should not normally be permitted. Where an adverse effect on the site’s notified special interest features is likely, an exception should only be made where the benefits of the development, at this site, clearly outweigh both the impacts that it is likely to have on the features of the site that make it of special scientific interest and any broader impacts on the national network of Sites of Special Scientific Interest;”*

**8.2.3** The following maps show the location of the SSSIs within 2km of the silica sand resource, as detailed in the table below.

| SSSI name                     | Interest                | Other designations    |
|-------------------------------|-------------------------|-----------------------|
| Bawsey                        | Geological              | N/A                   |
| Blackborough End Pit          | Geological              | N/A                   |
| Grimston Warren Pit           | Geological              | N/A                   |
| Heacham Brick Pit             | Geological              | N/A                   |
| Setchey                       | Geological              | N/A                   |
| Wretton                       | Geological              | N/A                   |
| Dersingham Bog                | Geological & Biological | NNR, SAC, Ramsar      |
| East Winch Common             | Biological              | N/A                   |
| Hilgay Heronry                | Biological              | N/A                   |
| Leziate, Sugar and Derby Fens | Biological              | N/A                   |
| Ouse Washes                   | Biological              | SPA, SAC, Ramsar      |
| River Nar                     | Biological              | N/A                   |
| Roydon Common                 | Biological              | NNR, SAC, Ramsar      |
| Snettisham Carstone Quarry    | Biological              | N/A                   |
| The Wash                      | Biological              | NNR, SPA, SAC, Ramsar |




**Question 4:** Should enhanced evidence areas for SSSIs be based on the sensitivity of qualifying features to the effects of mineral extraction, or should different criteria be used?

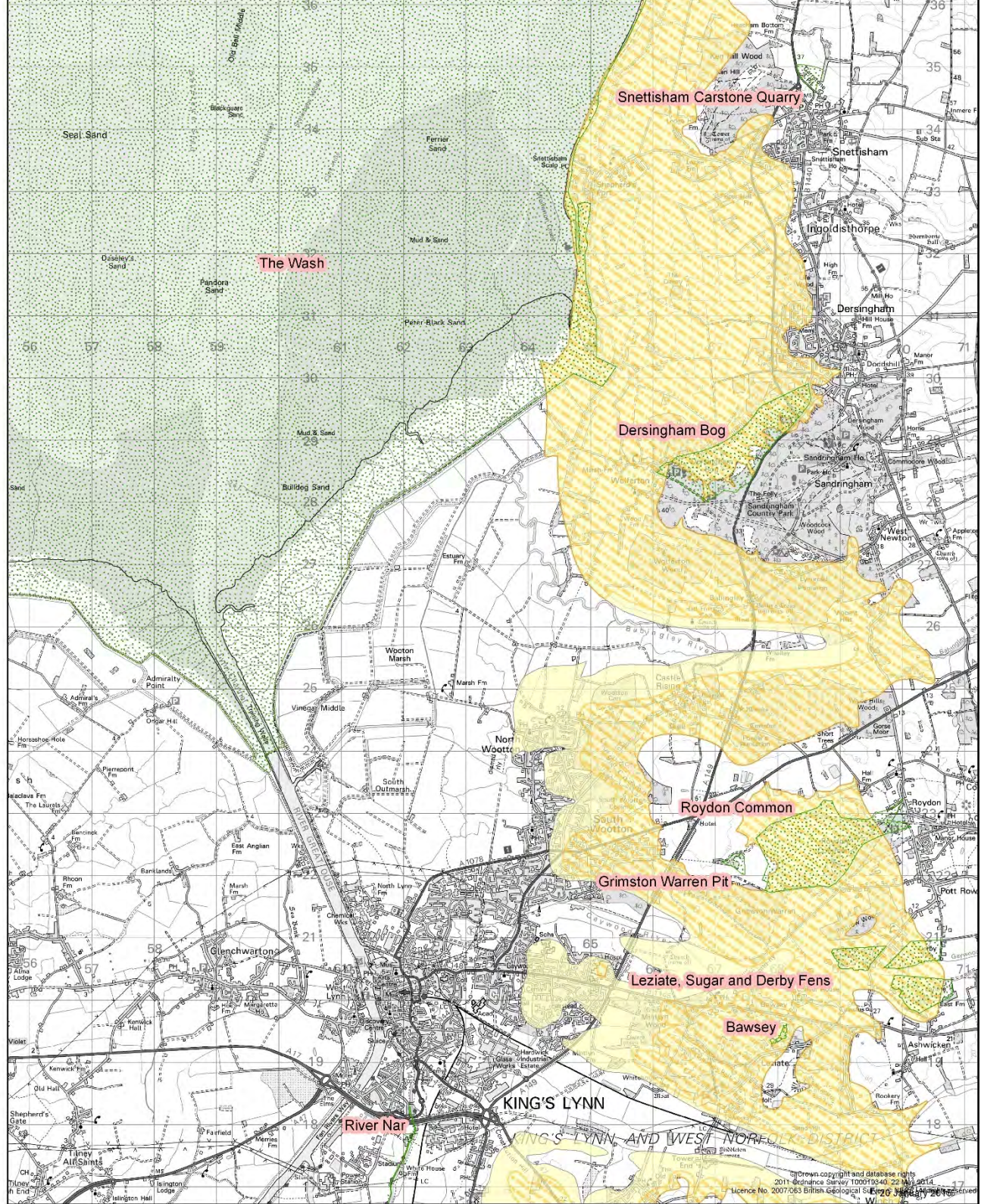
In your answer, please provide information/evidence to support your view

**Question 5:** Do you have information on the minimum distances from SSSIs within which an enhanced level of evidence would be required to ensure that harm is not caused to the qualifying features of a SSSI?

In your answer, please provide information/evidence to support your view

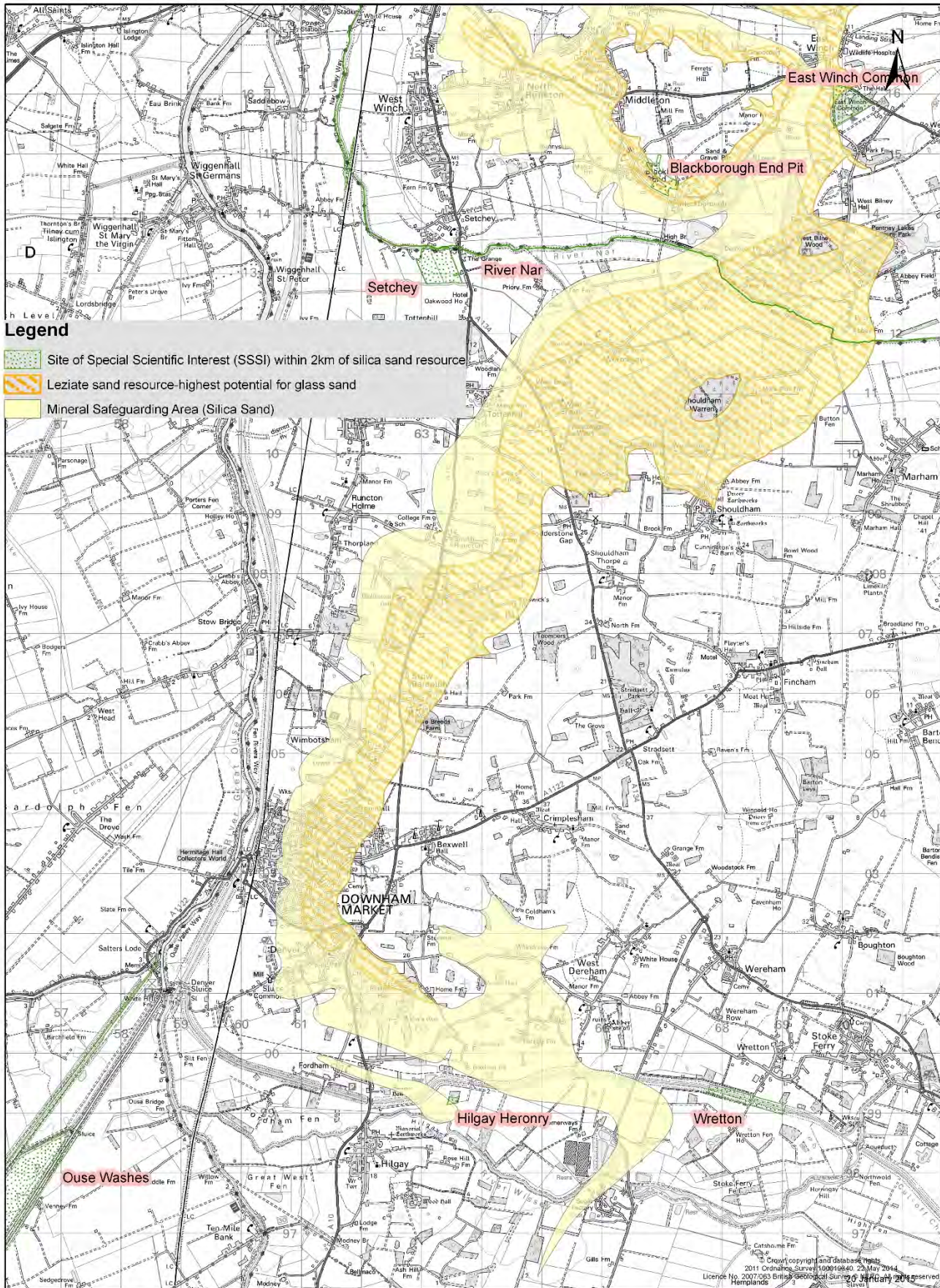
# Legend

-  Site of Special Scientific Interest (SSSI) within 2km of silica sand resource
-  Leziate sand resource-highest potential for glass sand
-  Mineral Safeguarding Area (Silica Sand)






2.5 1.25 0 2.5 Kilometres





**Legend**

-  Site of Special Scientific Interest (SSSI) within 2km of silica sand resource
-  Leziate sand resource-highest potential for glass sand
-  Mineral Safeguarding Area (Silica Sand)

2.5 1.25 0 2.5 Kilometres

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 Hemplands 2014

 **Norfolk** County Council

### **8.3 Ancient Woodland**

**8.3.1** The NPPF classifies Ancient woodland as an irreplaceable habitat. Paragraph 118 of the NPPF (2012) states that:

*“planning permission should be refused for development resulting in the loss or deterioration of irreplaceable habitats, including ancient woodland and the loss of aged or veteran trees found outside ancient woodland, unless the need for, and benefits of, the development in that location clearly outweigh the loss”*

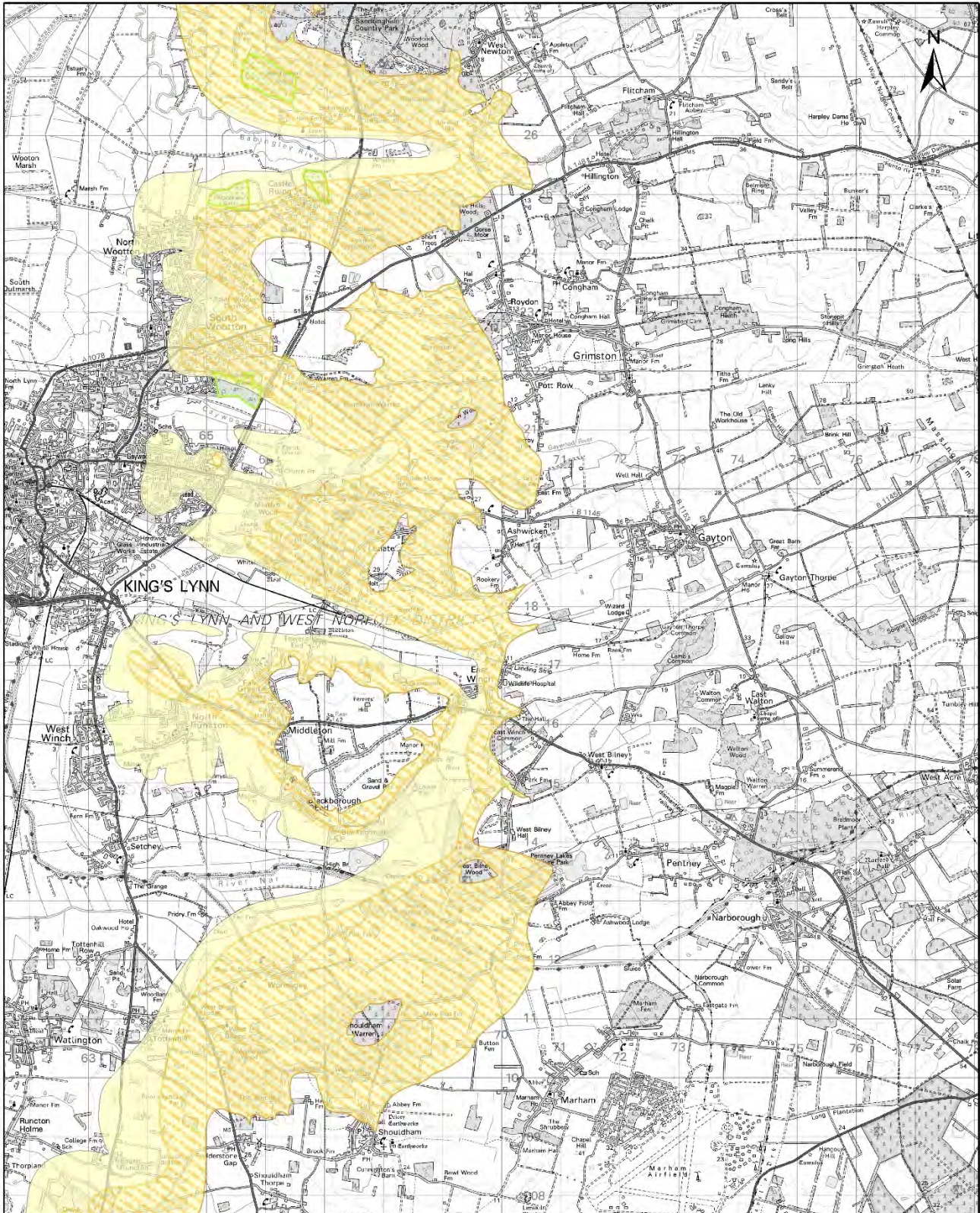
**8.3.2** A buffer zone of 15 metres surrounding an ancient woodland site was supported by the Secretary of State in determining a planning appeal for development close to an area of ancient woodland in West Sussex (The Four acres appeal - references: APP/D3830/A/05/1195897-98 and APP/D3830/A/06/1198282-83).

**8.3.3** Therefore, a 15 metre buffer has been assumed for the purposes of this review as a distance within which enhanced evidence will be required on potential impacts on ancient woodland.

**8.3.4** If insufficient suitable Specific Sites are proposed in response to the ‘call for sites’ the County Council would continue the Silica Sand Review by defining Preferred Areas and/or Areas of Search. It is proposed that such areas would exclude the 15 metre area of land around ancient woodland.

**8.3.5** The map overleaf shows the areas of designated ancient woodland within the silica sand resource.




**Question 6:** Should enhanced evidence on the potential effects of silica sand extraction on ancient woodland be provided in areas within 15 metres of the ancient woodland, as supported in the Four Acres appeal, or should a different distance be used? In your answer, please provide information/evidence to support your view.



KING'S LYNN

KING'S LYNN AND WEST NORFOLK DISTRICT

**Legend**

-  Area within which evidence inc ecology statement to fulfill para118 of the NPPF(Ancient Woodland)
-  Leziate sand resource-highest potential for glass sand
-  Mineral Safeguarding Area (Silica Sand)

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2.5 1.25 0 2.5 Kilometres

 Norfolk County Council

## **9. Historic environment and heritage assets**

**9.1** The historic environment is defined as ‘all aspects of the environment resulting from the interaction between people and places through time...’. Heritage assets are buildings, monuments, sites, places, areas or landscapes having a degree of significance because of its heritage interest within the historic environment. In most cases the setting of a heritage asset will influence its significance. Heritage assets can be formally designated through national legislation as either scheduled monuments, protected wreck sites, battlefields, listed buildings, registered parks and gardens, World Heritage Sites, and Conservation Areas or assets identified by a local planning authority. Scheduled monuments, protected wreck sites, battlefields, grade I and II\* listed buildings, grade I and II\* registered parks and gardens, and World Heritage Sites are heritage assets of the highest significance.

**9.2** The significance of a heritage asset may be influenced by its setting in the landscape (NPPF 2012 Paragraph 132). Therefore, changes to the setting through development such as mineral extraction, have the potential to affect the significance of a heritage asset without actually encroaching on the boundary of the asset itself. Paragraph 132 of the National Planning Policy Framework states that; *“Significance can be harmed or lost through alteration or destruction of the heritage asset or development within its setting.”*

**9.3** A recent Court of Appeal case [Barnwell Manor Energy vs. East Northamptonshire District Council and others] re-emphasised the weight to be given to Section 66(1) of the Planning (Listed Buildings and Conservation Areas) Act 1990 with regard to the desirability of preserving and enhancing the significance of listed buildings. It is understood that the considerable weight given to the desirability of preserving and enhancing of listed buildings equally applies to heritage assets as similar wording is applied in NPPF (2012), paragraph 131. The Secretary of State in his decision on the New Barnfield Energy from Waste project paid special attention to the desirability of preserving and enhancing historic parkland and Conservation Areas because of the similarity of wording in Section 72(1) of the Planning (Listed Buildings and Conservation Areas) Act 1990 regarding these assets.

**9.4** An enhanced evidence area of 250 metres is suggested around heritage assets; this is based on a recent mineral appeal in Norfolk (reference: APP/X2600/A/13/2197841) where mineral extraction was proposed within the setting of a grade I listed building. Proposers of sites within this enhanced evidence area will need to provide a Heritage Statement as part of the evidence supporting the submission of the site to assess whether any potential harm would be caused to the significance of the heritage assets. Following the two cases mentioned above, it is considered that sites which would be likely to cause harm to a heritage asset are likely to have significant deliverability issues in achieving a successful grant of planning permission. Therefore, a Heritage Statement should set out the degree of harm if any, its effect on significance, potential mitigation and its likely effectiveness (NPPF 2012, paragraph 128 contains an overview of what such an assessment should cover).

## Scheduled Monuments

**9.5** Scheduled Monuments are the heritage assets of the highest significance and occur within the silica sand resource. Scheduled Monuments are nationally or internationally important heritage sites.

**9.6** Paragraph 144 of the NPPF (2012) states that “*When determining planning applications, local planning authorities should:*

- *as far as is practical, provide for the maintenance of landbanks of non–energy minerals from outside... Scheduled Monuments;*
- *ensure, in granting planning permission for mineral development, that there are no unacceptable adverse impacts on the natural and historic environment...”*

**9.7** The map overleaf shows heritage assets, including Scheduled Monuments, and the enhanced evidence areas within the silica sand resource.

**9.8** If insufficient suitable Specific Sites are proposed in response to the ‘call for sites’ the County Council would continue the Silica Sand Review by defining Preferred Areas and/or Areas of Search. It is proposed that such areas would exclude the 250 metre area of land around heritage assets.

**Question 7:** [Should enhanced evidence on the potential effects of silica sand extraction on heritage assets be provided in areas closer than 250 metres from the heritage asset, or should a different distance be used?](#)

[In your answer, please provide information/evidence to support your view.](#)

## Archaeology

**9.9** The area covered by the silica sand resource has been subject to human activities for many centuries including exploitation of the silica sand resource. Areas of the resource are likely to contain important archaeology. Mineral extraction can have both positive and negative impacts on archaeological knowledge. Archaeological finds, as well as having an intrinsic value, are often important for what they tell us about the social and economic makeup of historic societies. Most, if not all proposed mineral extraction sites will require a site investigation to be undertaken prior to the submission of a planning application, influencing the mitigation strategy (e.g. preservation in situ, watching brief and/or preservation by record). An appropriate and agreed programme of works, as part of a mineral extraction operation, provides an opportunity for archaeological investigations to be undertaken where it would not normally be possible. However, in some cases it is important for archaeological assets to remain in-situ, as a major part of their significance is related to their location in a wider landscape.

**9.10** There have been published academic works which have proposed that the original settlement of what is now King’s Lynn was located further east than the current town, and possible locations include areas underlain by the silica sand resource. It is known that the site of a historic tile kiln is located within the silica sand resource, which is likely to have made use of nearby resources. There are also historic records which record the movement of glass sand from the port of King’s Lynn in the medieval period; indicating that the winning of this mineral has formed part of the economy of this area for a significant period.

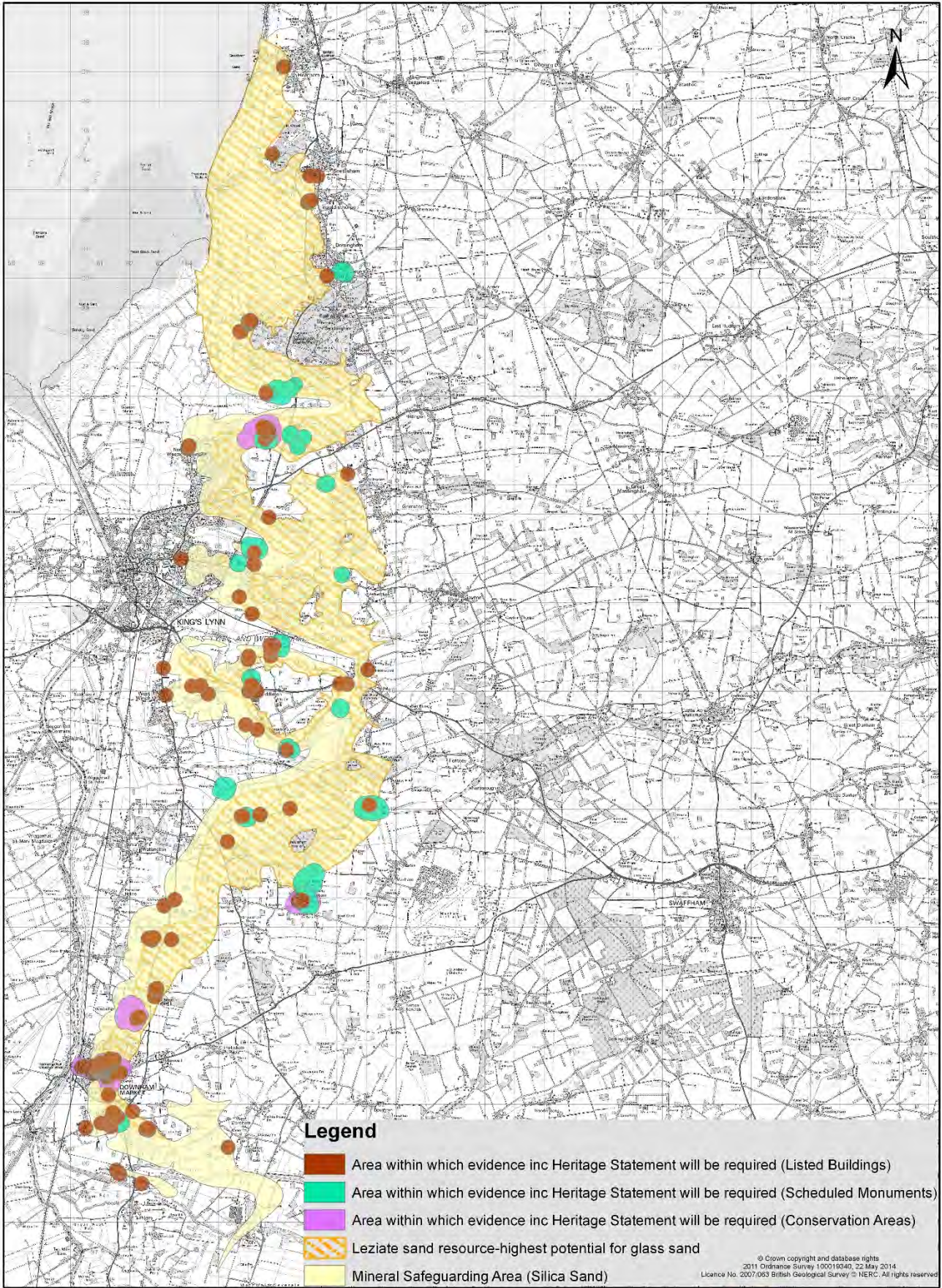
Therefore, it is important that in assessing sites for potential silica sand extraction appropriate technical advice on archaeology is sought.

**9.11** The site assessment of proposed Specific Sites will include officer consultation with English Heritage and the Norfolk Historic Environment Service. The purpose of these consultations will be to identify proposed areas where archaeology is likely to occur and the appropriate methods for managing this. If insufficient suitable Specific Sites are proposed in response to the ‘call for sites’ the County Council would continue the Silica Sand Review by defining Preferred Areas and/or Areas of Search. It is proposed that the same consultation process would be undertaken for these areas with regards to archaeology.

**9.12** There are various methods of managing archaeological assets which often depend on the nature of the sites. In some cases where archaeology is considered likely but no definite proof is available it may be that the provision for trial trenching and assessment as a requirement for future development may be appropriate. Where highly significant archaeological assets are known to exist, preservation in-situ through a suitable standoff area may be considered appropriate. This process was used as part of the previous Site Specific Allocations assessment, which was found to be sound at examination.

**Question 8:** Does consultation with English Heritage and the Norfolk Historic Environment Service provide an appropriate method for ascertaining the likely archaeological importance of proposed Specific Sites, designated Preferred Areas and/or Areas of Search, and potentially acceptable methods of protection/mitigation?

Please provide information/evidence to support your view.



2.5 1.25 0 2.5 Kilometres



## 10. Amenity

**10.1** The potential for amenity impacts will form part of the assessment of specific sites/ preferred areas and/or areas of search for silica sand extraction as appropriate. Proposers of sites to the allocation process should submit an assessment of potential amenity issues and proposed schemes for mitigation. Evidence will need to be supplied in greater detail for sites within 125 metres of sensitive receptors (such as dwellings). Based on previous mineral extraction in Norfolk, sites closer than this are likely to require greater levels of mitigation to ensure that no unacceptable amenity impacts occur. The enhanced evidence area does not indicate that workings will not be allocated closer than this, but that more detailed site specific assessment of potential impacts/mitigation is required.

**10.2** Subsequent planning applications for silica sand extraction will also need to address amenity issues. The following information on the assessment of amenity impacts is already included in the adopted Minerals Site Specific Allocations Plan in paragraphs 3.17 to 3.24.

“Policies CS14 and DM12 of the adopted Norfolk Core Strategy and Minerals and Waste Development Management Policies DPD cover amenity issues generally. Particular attention will also need to be paid to air quality, dust noise and lighting issues.

The National Planning Practice Guidance states that standoff areas may be required to reduce impacts to acceptable levels but that these should be site specific and based on proportionate evidence including potential mitigation schemes. Any standoff areas proposed for potential site allocations will be based on these principles.

### Air quality and Dust

Policy DM13 covers air quality. The National Planning Practice Guidance (Paragraphs 27-023 to 27-032) contains more detailed guidance on dust emissions and the control of dust generated by mineral workings, including the health effects of dust.

All planning applications – including those for allocated specific sites, preferred areas or within areas of search – will be judged against Core Strategy policies, with the National Planning Practice Guidance providing greater details on, for instance, the preparation of a dust assessment study. Paragraph 27-023 indicates the scope of the dust assessment study (including mitigation) which would need to accompany any future planning application:

“There are five key stages to a dust assessment study:

- Establish baseline conditions of the existing dust climate around the site of the proposed operations;
- Identify site activities that could lead to dust emission without mitigation;
- Identify site parameters which may increase potential impacts from dust;
- Recommend mitigation measures, including modification of site design;
- Make proposals to monitor and report dust emissions to ensure compliance with appropriate environmental standards and to enable an effective response to complaints.”

Paragraphs 27-025 to 27-028 of the NPPG provides further guidance on the stages and methodology of a dust assessment study, with paragraphs 27-029 to 27-032 covering the health effects of dust.

Development Management Policy DM13 ensures that all planning applications for mineral operations must ensure that they minimised harmful emissions to air, and would not impact negatively on existing Air Quality Management Areas, nor lead to the declaration of a new AQMA. Together with the site policies, Policies CS14, DM12 and DM13, form a set of criteria against which future developments will be considered, in respect of air quality and dust.



The view of the Health and Safety Executive is that the working of silica sand does not present a health risk to the general public.

## **Noise**

Policies CS14 and DM12 of the adopted Norfolk Core Strategy and Minerals and Waste Development Management Policies DPD cover amenity issues generally. The National Planning Practice Guidance (paragraphs 27-019 to 27-022) contains more detailed guidance on noise emissions and standards, including information on the preparation of noise impact assessments, and the noise standards applicable to mineral operations.

Development Management Policy DM12 – Amenity ensures that all planning applications for mineral operations must consider the impacts of noise on the amenity for people in close proximity. Together with the site policies, Policies CS14, DM12 and DM13, form a set of criteria against which future developments will be considered in respect of noise.

## **Lighting**

Policies CS14 and DM12 of the adopted Norfolk Core Strategy and Minerals and Waste Development Management Policies DPD cover amenity issues generally (including lighting) and the NPPF (2012) contains a policy (paragraph 125) encouraging good design to limit the impact of light pollution from artificial light on local amenity. Together with site policies, Policies CS14, DM12 and paragraph 125 of the NPPF (2012) form a set of criteria against which future developments will be considered in respect of lighting/light pollution.”

**10.3** All planning applications will need to address the amenity factors above. It is considered that the effective use of planning conditions can mitigate potential amenity impacts to acceptable levels. Proposals for Specific Sites will need to provide evidence of potential impacts on amenity. Within the enhanced evidence areas, mitigation could be more complex and a greater level of detail will need to be provided on the methods of mitigation and their efficiency in reducing potential impacts to acceptable levels at the sensitive receptors.

**10.4** If insufficient suitable Specific Sites are proposed in response to the ‘call for sites’ the County Council would continue the Silica Sand Review by defining Preferred Areas and/or Areas of Search. It is proposed that such areas would exclude the 125 metre area of land around existing sensitive receptors.

**Question 9:** [Should enhanced evidence on the potential effects of silica sand extraction on amenity be provided in areas closer than 125 metres from sensitive receptors, recognising that this does not represent a potential standoff distance which will be determined on a case by case basis, or should a different distance be used? In your answer, please provide information/evidence to support your view.](#)

**10.4** In addition to existing dwellings that are currently mapped, there are also sites within the silica sand resource, where planning permission has been granted that have not yet been developed, and sites that will be allocated in the King’s Lynn and West Norfolk Local Plan, following examination and adoption. In terms of assessing amenity impacts, it is proposed to deal with these sites as follows:

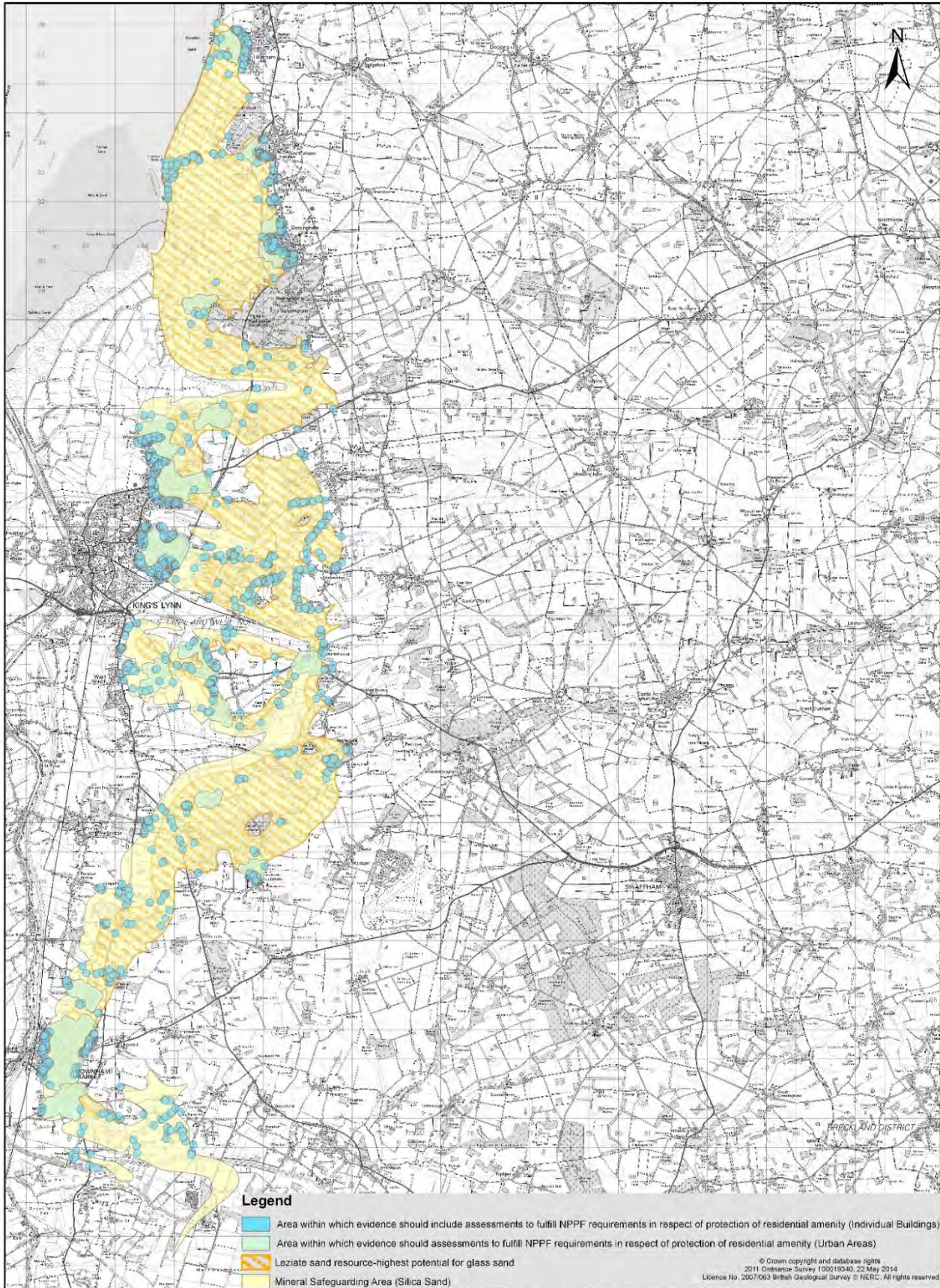
**10.5** Sites with planning permission and allocated sites in the King’s Lynn and West Norfolk Local Plan (once adopted) will be excluded from any Preferred Areas or Areas of Search for silica sand extraction defined by Norfolk County Council. If these sites contain a silica sand resource that can be economically extracted prior to non-mineral development taking place, then this would be an additional silica sand windfall and would be dealt with under Core Strategy Policy CS16 on safeguarding and paragraph 144 of the NPPF (2012).

**10.6** Mineral safeguarding assessments have already been carried out for proposed housing sites close to the Knight’s Hill roundabout and the northern part of the urban extension area at South East Lynn. These assessments have proved that no silica sand of commercial interest occurs at these locations.

**10.7** A buffer will **not** be put round sites with planning permission and allocated sites for enhanced evidence to be provided at the specific site allocation stage because as these sites are not currently developed there

are no sensitive receptors at the current time. If the sites were developed prior to a planning application for silica sand extraction being received on adjacent land, then potential amenity impacts would be assessed at the planning application stage.

**Question 10:** Should allocated sites and sites with planning permission for non-mineral uses that are located in or adjacent to the silica sand resource be excluded from Preferred Areas and Areas of Search, or should a different approach be taken? In your answer please provide information/evidence to support your view.



2.5 1.25 0 2.5 Kilometres



## 11. Agricultural land classification

**11.1** Land in England and Wales is classified according to its ability to grow crops. This work was originally started in the 1960s with the most recent review of guidelines carried out in 1988. Agricultural land is divided into five grades as follows:

- Grade 1 – excellent quality agricultural land
- Grade 2 - very good quality agricultural land
- Grade 3 – good to moderate quality agricultural land
- Sub-grade 3a – good quality agricultural land
- Sub-grade 3b – moderate quality agricultural land
- Grade 4 – poor quality agricultural land
- Grade 5 – very poor quality agricultural land

**11.2** The 1988 Agricultural Land Classification guidelines amalgamated sub-grades 3b and 3c into a new grade 3b. The published general classifications map for England and Wales does not map these sub-grades because the maps are based on surveys carried out prior to the sub-division of grade 3. The surveys were carried out prior to the publication of the first Agricultural Land Classification maps in 1976. Maps showing the agricultural land classifications based on current guidelines are not available except for limited sites where a detailed assessment has been carried out after 1988.

**11.3** Agricultural land classification is a material consideration in planning decisions. Where development over 20 hectares affecting agricultural land is proposed there is a requirement for consultation with Natural England.

**11.4** Agricultural land subgrade 3a is included in the classification of the ‘Best and Most Versatile’ agricultural land. The NPPF 2012 (paragraph 112) contains requirements to ensure that the ‘Best and Most Versatile’ (BMV) agricultural land is safeguarded.

**11.5** If land is proposed for silica sand extraction on over 20 hectares of land within agricultural grades 1, 2, or 3a an agricultural land report will be required to assess the potential long term impact on agricultural land quality, as set out in Core Strategy Policy DM16. However, as soils with sand topsoils are not eligible for Grades 1, 2 or 3a<sup>1</sup>, it is considered unlikely that sites within these areas would contain high quality silica sand of commercial interest. Proposals for site allocations with grades 1, 2 or 3a would need to contain evidence that the silica sand was of commercial interest for industrial uses.

**11.6** If there is the potential for impacts on agricultural land quality the land quality report should outline any public benefit to the development which would clearly outweigh these impacts. Where land in agricultural grade 3 is proposed, a land quality report will be required to divide the land into sub-grades 3a and 3b, and Policy DM16 will apply to sub-grade 3a.

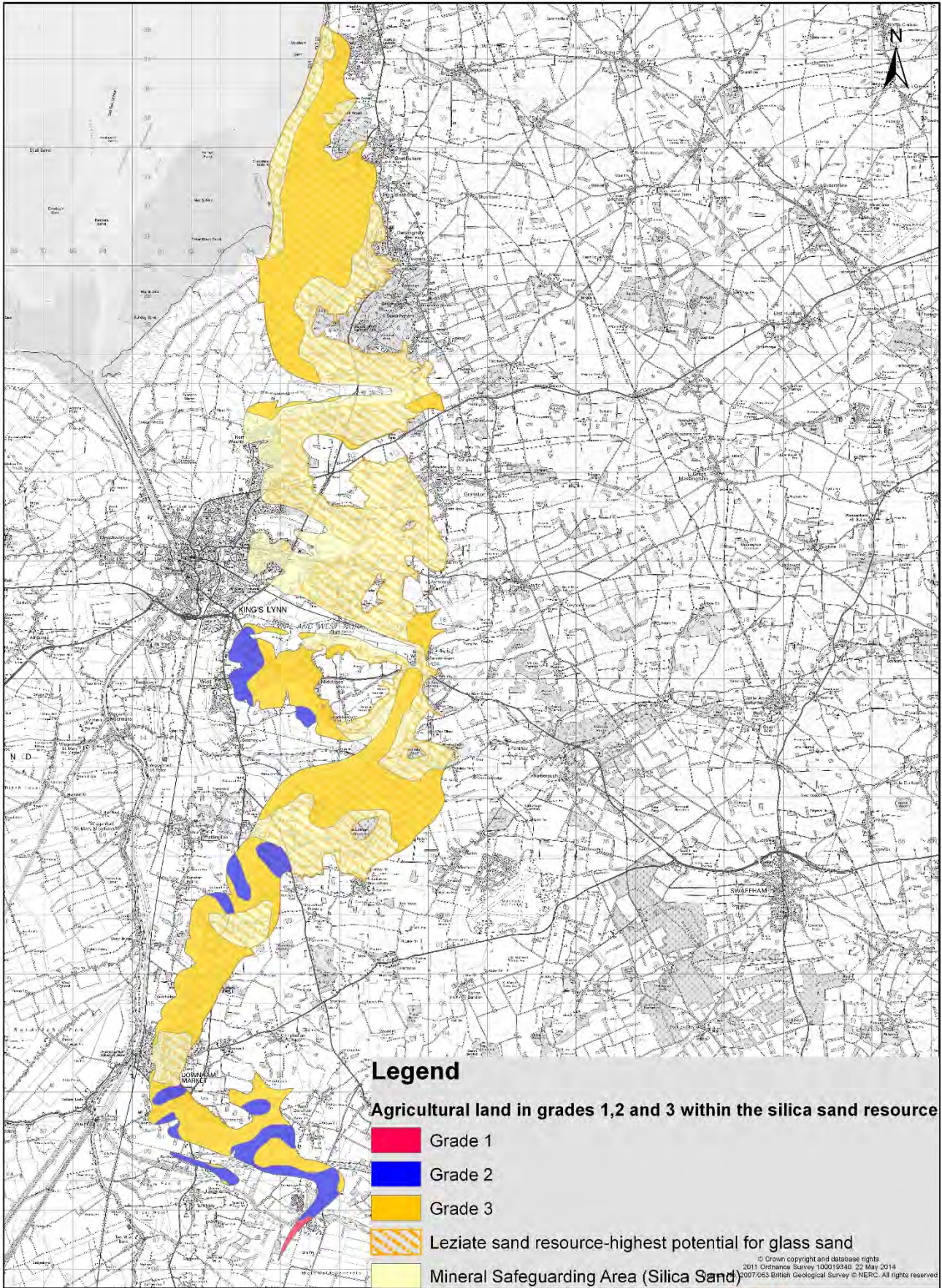
**11.7** It is proposed that if insufficient potential specific site allocations are submitted all land which is within agricultural grades 1, 2, or 3 will be excluded from the silica sand resource to be considered as potential Preferred Areas or Areas of Search.

This is because all previous silica sand workings have been located on grades 4 and 5 and as sand topsoils are not eligible for higher agricultural grades, these areas are less likely to generate suitable planning applications for silica sand extraction.

**Question 11:** [Should agricultural land grades 1, 2 and 3 be removed from consideration as potential Preferred Areas or Areas of Search for future silica sand extraction? Please supply information/evidence to support your view.](#)

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<sup>1</sup> ‘Agricultural Land Classification of England and Wales, Revised guidelines and criteria for grading the quality of agricultural land’, October 1988 (MAFF)



2.5 1.25 0 2.5 Kilometres

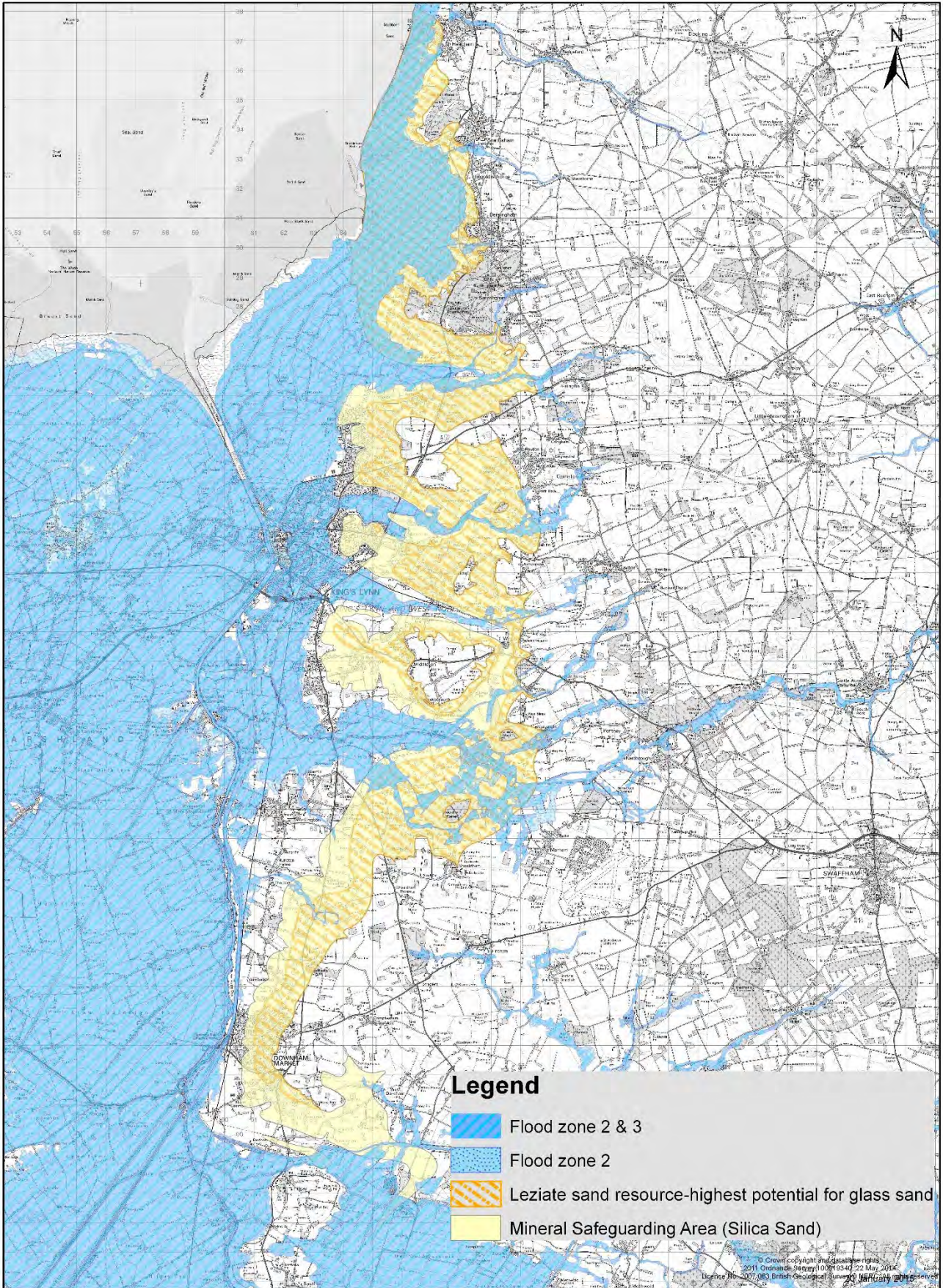
## **12. Flood Risk**

**12.1** In accordance with the National Planning Policy Framework (paragraph 100) a sequential test will be carried out on Specific Sites, Preferred Areas and Areas of Search for silica sand. The extraction of silica sand is a 'water compatible' development in the context of paragraph 7-066 (Table 2: Flood Risk Vulnerability Classification) of the National Planning Practice Guidance. In accordance with Core Strategy Policy DM4 (Flood Risk) and paragraph 103 of the National Planning Policy Framework, for all development over 1 hectare in size in Flood Zone 1 and all development within flood zones 2 and 3, a site specific Flood Risk Assessment (FRA) will be required at the planning application stage. The site specific FRA must identify and assess the risks of all forms of flooding to and from the development and demonstrate how these flood risks will be managed so that the development remains safe throughout its lifetime, taking climate change into account. The scale, nature and location of the proposed development will inform the scope of the FRA required.

**12.2** The Borough Council of King's Lynn and West Norfolk commissioned a Strategic Flood Risk Assessment, the final version of which was published in October 2010. This document agreed on Page 42 that sand and gravel workings are a water compatible use as in PPS25. The silica sand workings in Norfolk operate in a similar way to sand and gravel workings and are considered to be similar in terms of flood risk.

**12.3** Flood risk zones 2 and 3 indicate where flood events have occurred in the past that may resulted in the deposition of clays, silts and other contaminants which will have reduced the quality of the silica sand resource and/or increased overburden depth.

**Question 12:** [Should land in flood zones 2 & 3 be removed from consideration as potential Preferred Areas or Areas of Search for future silica sand extraction? Please supply information/evidence to support your view.](#)



2.5 1.25 0 2.5 Kilometres



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**Norfolk** County Council

### **13. Previous workings and current permissions**

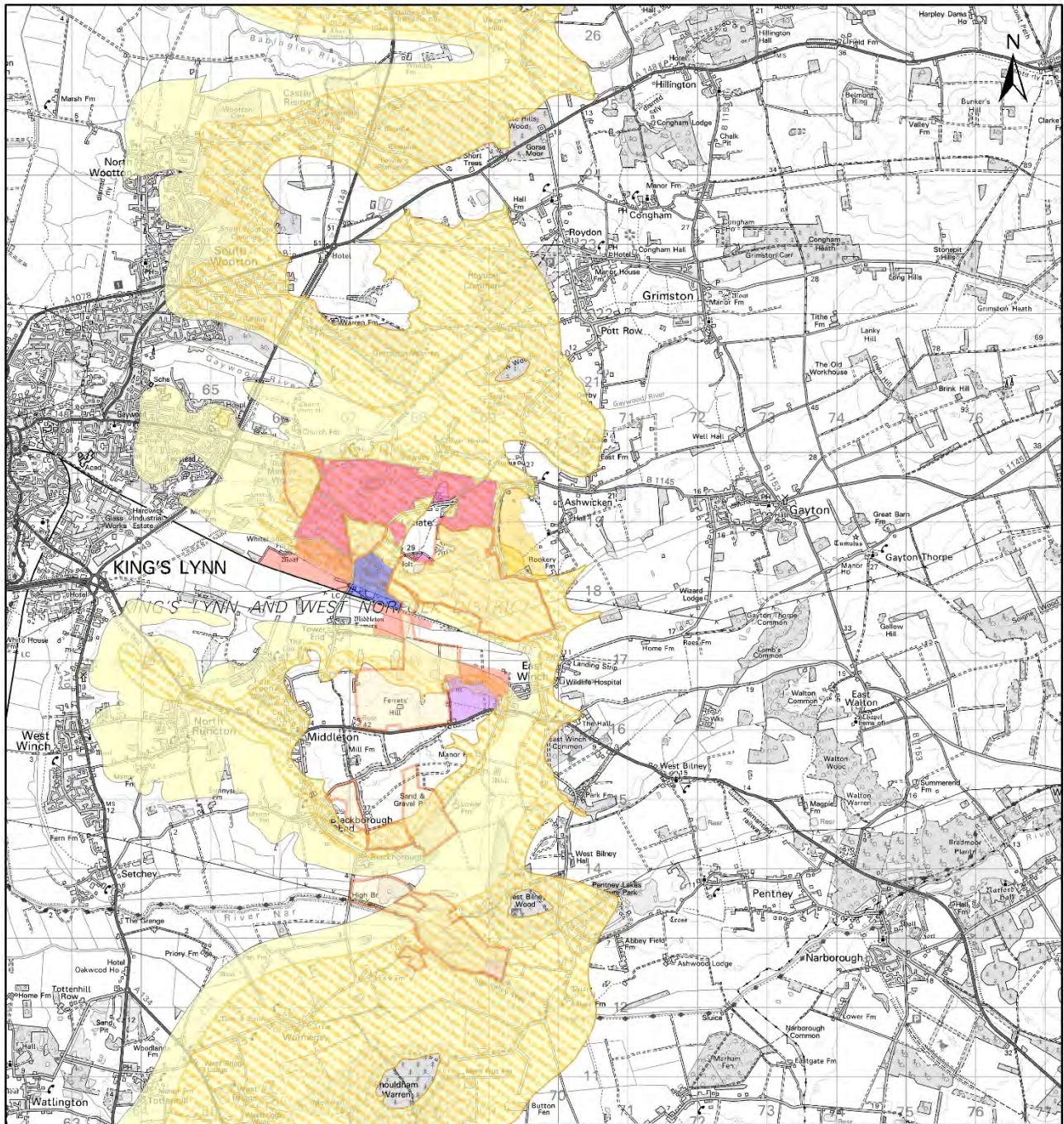
**13.1** Silica sand has been worked in Norfolk for centuries; records exist of exports of glass sand from King's Lynn during the medieval period. Historically working of silica sand has occurred in the area to the east of King's Lynn chiefly in the parishes of Bawsey and Leziate. Areas including and surrounding the current Leziate processing plant were worked by Joseph Boam Ltd as sand quarries from the 1860s. This history of mineral working means that significant areas of the mineral resource have already been worked for silica sand and should be discounted from the areas to be considered as part of this review.

**13.2** There are also areas of resource which are covered by current planning permissions and the reserves within these permissions have already been counted in arriving at the quantity of additional allocations needed through the review. There is also an area of land which is partly within the silica sand resource which is covered by a Section 52 legal agreement which precludes silica sand extraction on the land.

**13.3** The areas known to be previous workings or workings which have current planning permissions or are mineral allocations are shown on the following map.

**Question 13:** Are there any areas not shown as previous workings on the map which have been worked to the full extent of all commercially viable deposits of silica sand? Please supply evidence/information to support your view and a plan to show the area which should be removed from consideration in this review.









KING'S LYNN

KING'S LYNN AND WEST NORFOLK

**Legend**

-  Safeguarded Existing Mineral Extraction within silica sand resource
-  Unavailable areas of resource
-  S52 agreement for no mineral extraction
-  No sand of commercial interest
-  Previous silica sand working
-  Land sterilised by processing plant
-  Mineral site allocations within silica sand resource
-  Leziate sand resource-highest potential for glass sand
-  Leziate sand resource-highest potential for glass sand
-  Mineral Safeguarding Area (Silica Sand)

2.5 1.25 0 2.5 Kilometres

## 14. Extent of deposits

**14.1** The British Geological Survey (BGS) produced a Mineral Resources Map which outlines inferred mineral resources at the surface. This is the basis for the Mineral Safeguarding Areas within the adopted Norfolk Minerals and Waste Core Strategy. However, in relation to silica sand it is known that viable resources exist under surface deposits of other minerals, in particular carstone. A number of previous and current workings and planned allocations for silica sand extraction have wholly or partially taken place in areas where carstone is the superficial deposit. It is known from previous studies that the Upper Cretaceous Carstone sits unconformably on the Sandringham Sands deposits within which the Mintlyn and Leziate Beds of silica sand exist. This is most likely to occur where the Sandringham Sands and the Carstone deposits are in close proximity.

**14.2** It is therefore proposed that Norfolk County Council will accept potential Specific Sites for silica sand extraction from within the carstone deposit subject to:

- evidence in the form of borehole logs and analysis to indicate that the quality and grade of silica sand is suitable for glass manufacture, and that the depth of carstone/overburden is such that the working of the deposit would be commercially viable; and
- evidence to support the proposal in line with all other requirements contained in the review.

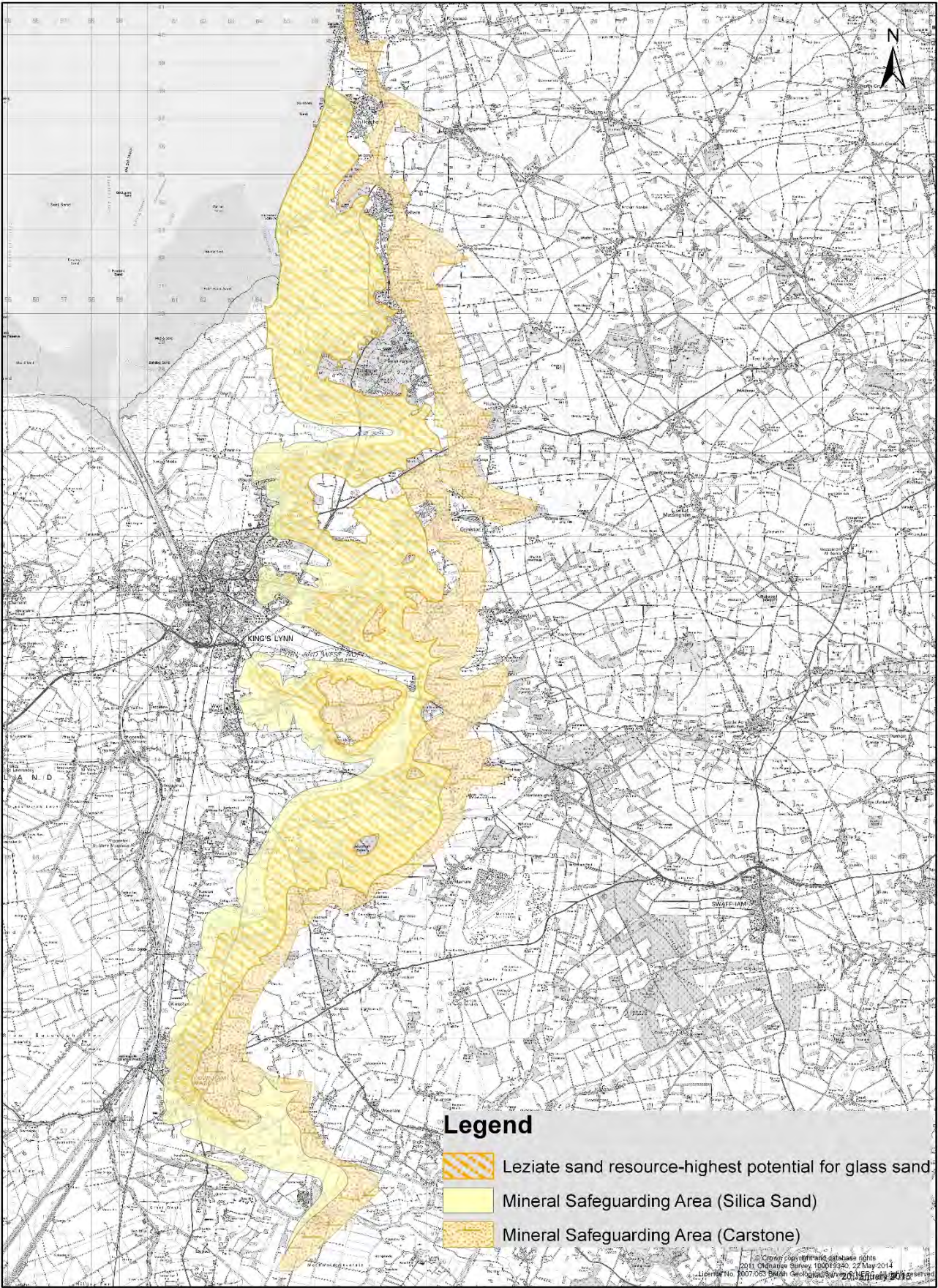
**14.3** It is known that in some locations where the Sandringham Sands underlie the carstone, the quality and grade of the silica sand is high and that these deposits meet the requirements for glassmaking. It can be implied that the carstone and/or the thin clay layer which occurs unconformably at the junction of the carstone and silica sand in these cases may have restricted the flow of material which might act as a contaminant.

**Question 14:** Should proposals for Specific Sites for silica sand extraction be considered from within the carstone resource, if suitable evidence is provided regarding the quality and grade of silica sand on the site? Please provide evidence/information to support your view.




**14.4** If insufficient suitable Specific Sites are proposed in response to the 'call for sites', the County Council would continue the review process by defining Preferred Areas or Areas of Search. It is currently proposed that such areas would exclude from consideration areas from outside the inferred silica sand mineral resource from the British Geological Survey (BGS) sources.

**14.5** As the demand for silica sand is specifically related to glass sand it is also proposed that there should be a preference for Preferred Areas or Areas of Search to be located within the Leziate beds, as this deposit has the highest probability of providing deposits of a suitable quality and grade for this use.

**Question 15:** Should defined Preferred Areas and Areas of Search only include the silica sand resource which is within the Leziate beds, or should the whole silica sand resource, as mapped by the BGS, be included? Please provide evidence/information to support your view.



**Legend**

-  Leziatite sand resource-highest potential for glass sand
-  Mineral Safeguarding Area (Silica Sand)
-  Mineral Safeguarding Area (Carstone)

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2.5 1.25 0 2.5 Kilometres



## **15. Electricity and Gas Transmission, and water infrastructure**

**15.1** High pressure gas transmission pipelines and electrical transmission lines cross the silica sand resources, as do a number of water mains. However, previous experience with silica sand workings has indicated that these do not form a significant barrier to extraction if the resource is of sufficiently high quality. In previous instances works to divert water mains, or working schemes which have allowed the winning of silica sand around transmission towers have been approved and implemented.

## **16. Landowner willingness**

**16.1** Landowner willingness for mineral extraction to take place is a key factor in deliverability. If a landowner is willing for silica sand extraction to take place they have an opportunity to put forward land as a potential specific site allocation. The proposed silica sand site allocation MIN 39 was withdrawn by the landowner on the eve of the examination hearings for the Minerals Site Specific Allocations Plan and it transpired that while an agreement had been reached with a mineral operator this was only an exploration agreement and was not for mineral extraction.

**16.2** Equally it is also important to know, especially in defining Preferred Areas/Areas of Search, land where the owner is unwilling to consider mineral extraction under any circumstances.

**Question 16:** If you are a landowner of over 10 hectares in the silica sand resource area and would be **unwilling** for silica sand extraction to take place on your land under all circumstances, please respond to us with details and a plan showing your land holding. This information would be used in defining Preferred Areas/Areas of Search only, and is valid for the purposes of this review only.

## 17. Criteria for land to be defined as a Preferred Area or Area of Search

**17.1** In the event that insufficient Specific Sites are proposed by landowners/minerals operators in response to the 'call for sites', the County Council considers that, in accordance with national policy and guidance, it will be necessary for the County Council to define Preferred Areas or Areas of Search. These areas are defined as follows:

- Preferred Areas are areas of known mineral resources where planning permission might reasonably be anticipated.
- Areas of Search are areas where knowledge of mineral resources may be less certain but within which planning permission may be granted, particularly of there is a shortfall in supply.

**17.2** It is proposed that only land that is within the inferred silica sand resource, as defined by the BGS, and which is **not** within the following areas will be included within the defined Preferred Area/Area of Search:

- Enhanced evidence areas or the designations to which they relate (SPAs, SACs, Ramsars, SSSIs, Ancient Woodland, heritage assets, sensitive receptors for amenity impacts, flood zones 2 & 3);
- Previous mineral workings;
- Existing silica sand extraction sites;
- Mineral site allocations;
- Agricultural land grades 1,2 and 3;
- Existing waste management facilities and waste site allocations; and
- Land where the owners are unwilling for silica sand extraction to take place.

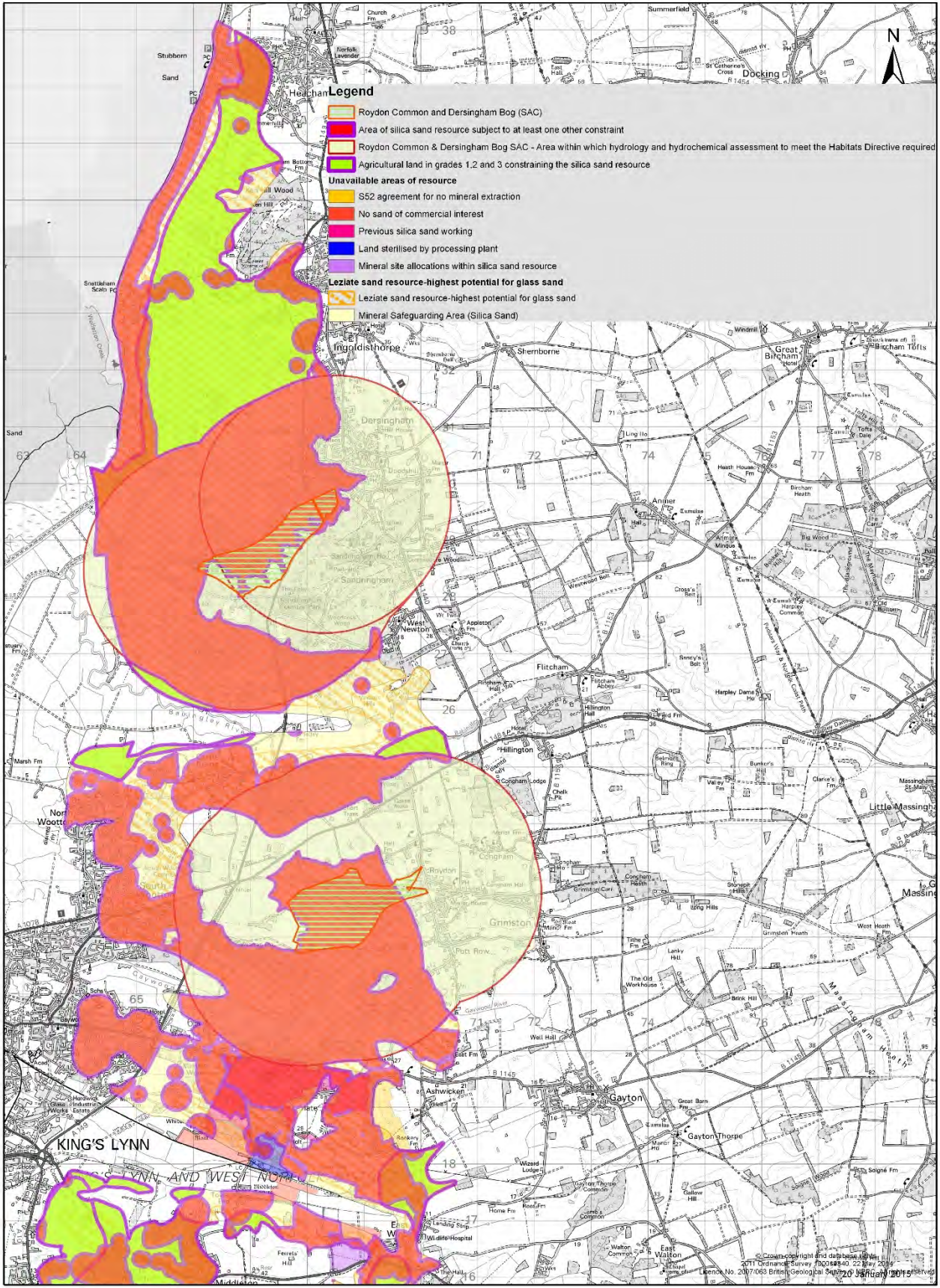
These areas are to be excluded to maximise the likelihood of suitable applications coming forward and being granted permission from within Preferred Areas/Areas of Search.

**17.3** As the demand for silica sand is specifically related to glass sand it is also proposed that there should be a preference for Preferred Areas or Areas of Search to be located within the Leziate beds, as this deposit has the highest probability of providing deposits of a suitable quality and grade for this use. It is likely that the site area required to provide sufficient Specific Sites for silica sand extraction, to address the allocated shortfall would be around 30 -40 hectares. The Preferred Areas/Areas of Search will cover a significantly greater area of land in order to allow for sites to come forward.

**Question 17:** [Is the approach to land to be excluded from Preferred Areas and Areas of Search appropriate, if these areas need to be defined through the Silica Sand Review process, or should an alternative approach be used? Please provide evidence/information to support your view, including alternatives which would comply with national policy and guidance.](#)

**17.4** The maps on the following pages show how the Preferred Areas/Areas of Search for silica sand extraction would look on the basis of excluding all the areas of constraint listed in paragraph 17.2.

**Question 18:** [Are there any other issues that should be taken into account in the assessment of proposals for Specific Sites and in the definition of Preferred Areas and/or Areas of Search for silica sand extraction? Please provide evidence/information to support your response.](#)

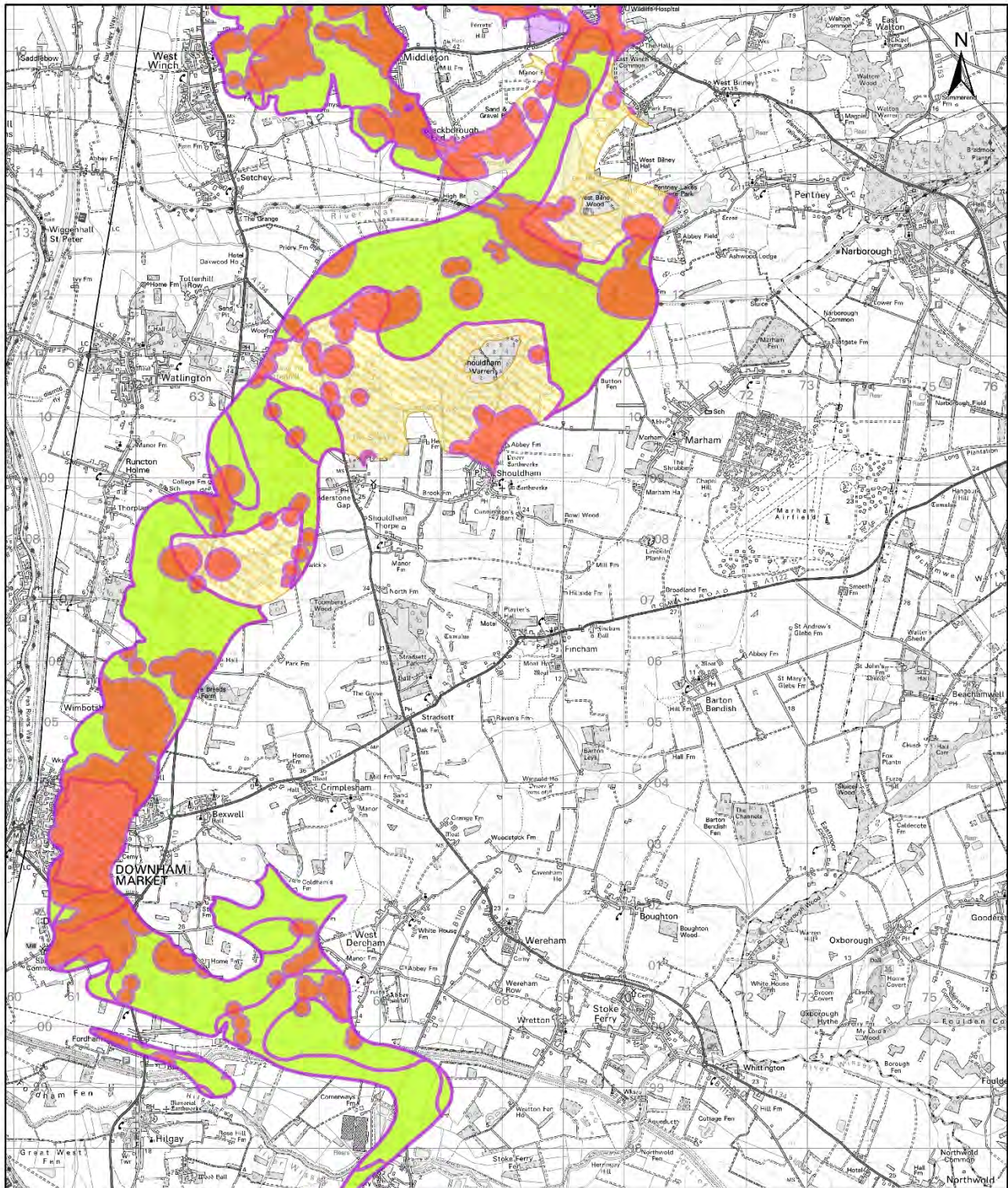


**Legend**

- Roydon Common and Dersingham Bog (SAC)
- Area of silica sand resource subject to at least one other constraint
- Roydon Common & Dersingham Bog SAC - Area within which hydrology and hydrochemical assessment to meet the Habitats Directive required
- Agricultural land in grades 1.2 and 3 constraining the silica sand resource
- Unavailable areas of resource**
- S52 agreement for no mineral extraction
- No sand of commercial interest
- Previous silica sand working
- Land sterilised by processing plant
- Mineral site allocations within silica sand resource
- Leziate sand resource-highest potential for glass sand**
- Leziate sand resource-highest potential for glass sand
- Mineral Safeguarding Area (Silica Sand)

2.5    1.25    0    2.5 Kilometres

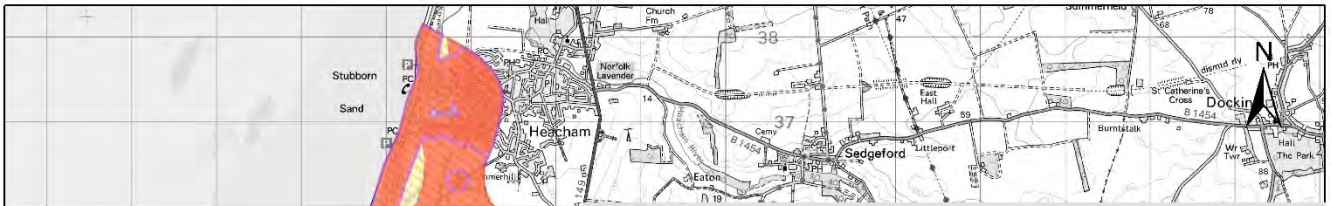
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**Legend**

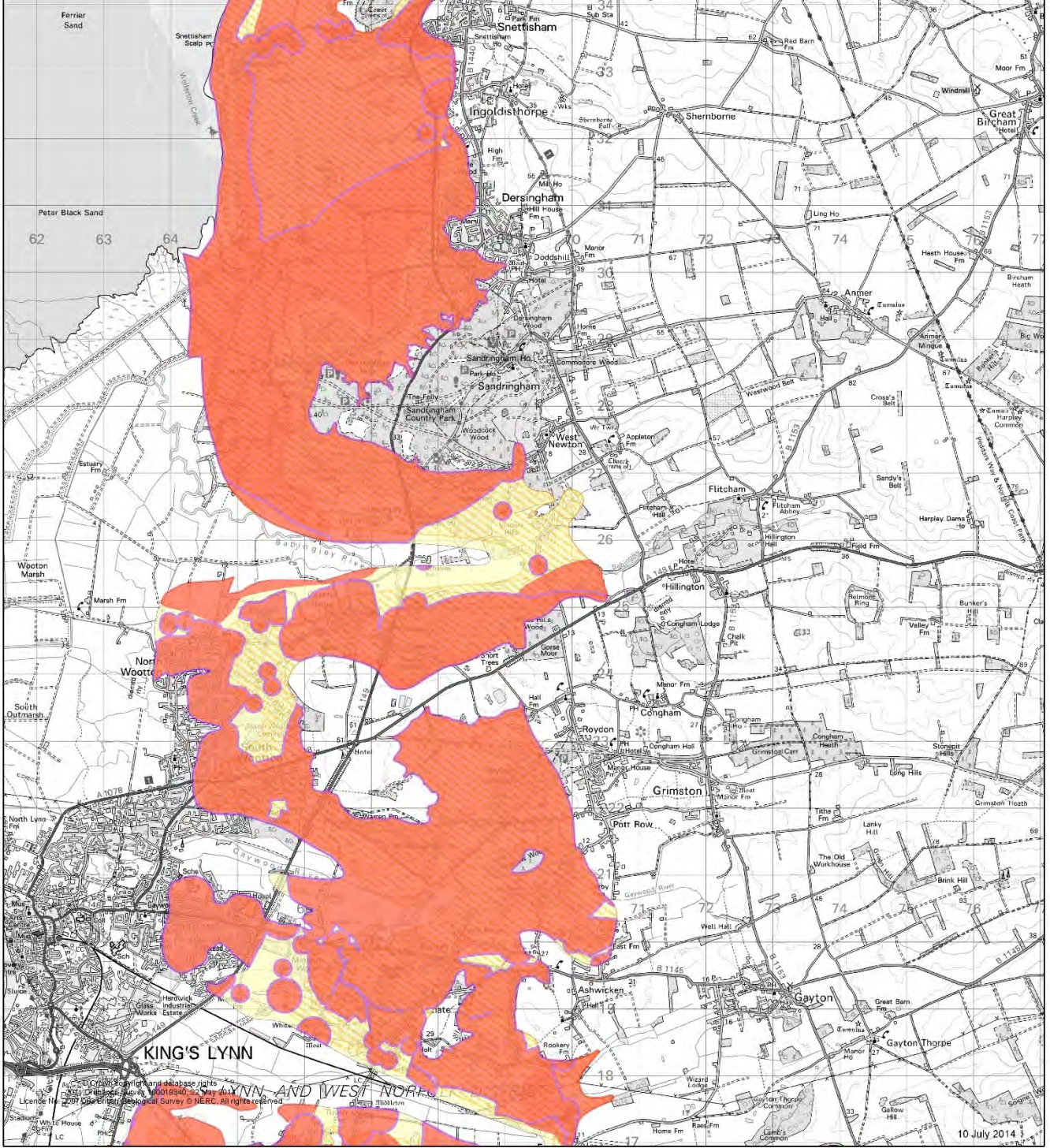
- Area of silica sand resource subject to at least one other constraint
- Agricultural land in grades 1,2 and 3 constraining the silica sand resource
- Mineral site allocations within silica sand resource
- Leziate sand resource-highest potential for glass sand
- Mineral Safeguarding Area (Silica Sand)





**Legend**

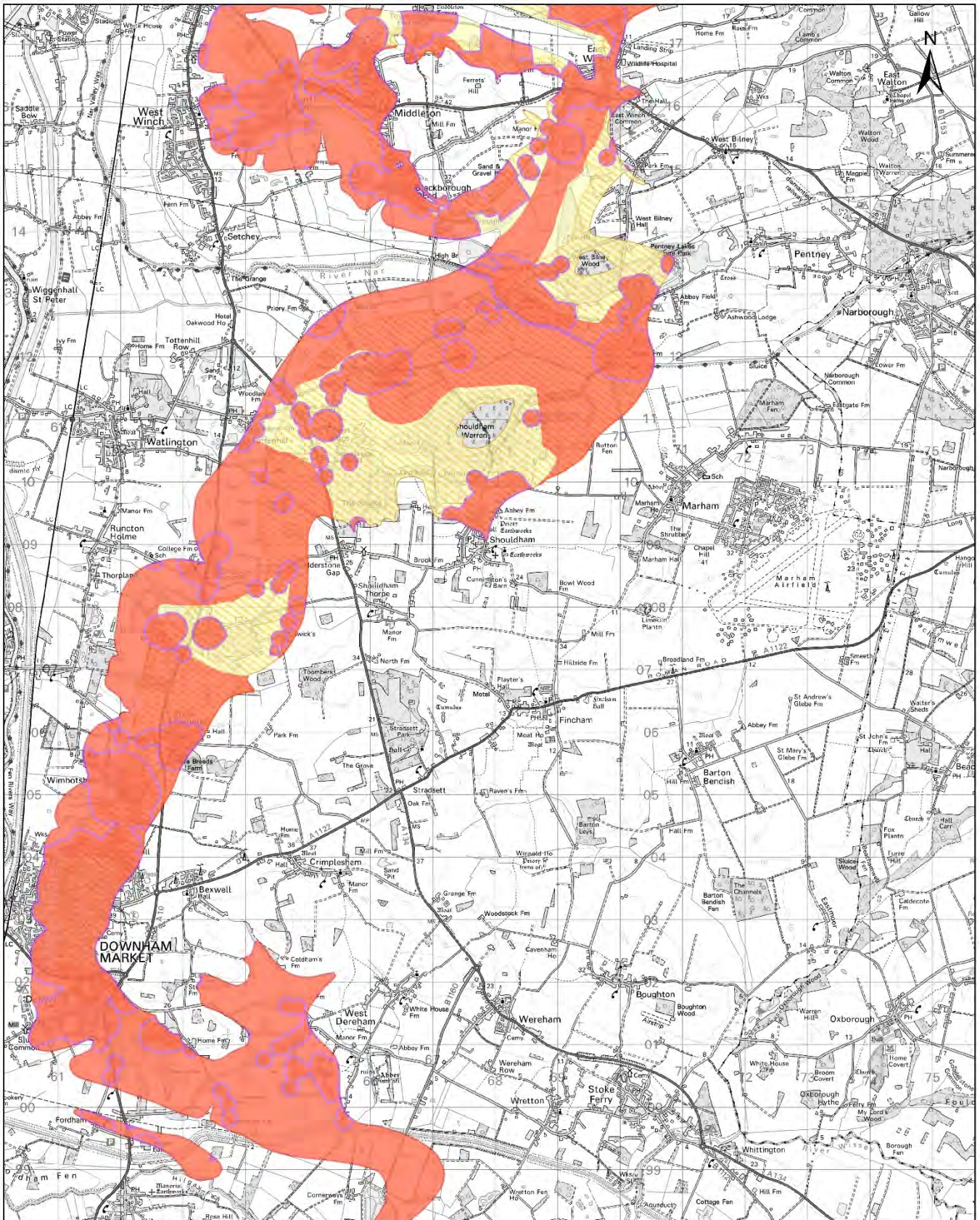
- Area of silica sand resource excluded from Preferred Area/AoS process
- Leziatite sand resource-highest potential for glass sand
- Mineral Safeguarding Area (Silica Sand)



10 July 2014







**Legend**

- Area of silica sand resource excluded from Preferred Area/AoS process
- Leziate sand resource-highest potential for glass sand
- Mineral Safeguarding Area (Silica Sand)

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## **Appendix 2: Information on potential impacts of Silica sand extraction and mitigation**

**This information was in Chapter 8 of the Preferred Options of the Single Issue Review of Silica Sand (2015)**

### **Changes in water level (dewatering)**

**8.1** Previous silica sand extraction sites in Norfolk have used dewatering to extract mineral which occurs below the natural groundwater level. Areas of the silica sand resource are known to have high groundwater levels. The Leziate Beds are part of a wider geological formation called the Sandringham Sands which are a Principal aquifer across parts of the area. Dewatering is used because it allows a selective extraction of particular grades of sand to allow precise blending as part of the processing operation.

**8.2** Uncontrolled dewatering will result in a local drop in groundwater levels in the area surrounding the extraction site. This could result in impacts to groundwater dependent environmental designations.

- Water dependent plant species may be affected if levels within the environmental designation drop.
- Animal species which prefer wet conditions or rely on water dependent plant species could be adversely affected as a result of the change in habitat.
- If water levels drop the habitat may be more prone to succession as plant species which are not as tolerant of wet conditions could establish themselves and out-compete the existing species.
- Geological formations which rely on being waterlogged to preserve them may be adversely affected by water level drops.

**8.3** Dewatering may also have effects on other receptors.

**8.4** Dewatering may result in the lowering of water levels in wells and abstraction boreholes impacting on water supply for the affected dwellings.

**8.5** The lowering of water levels may impact on future drainage, because if developers are unaware of dewatering operations then SUDs, soak-aways and cesspits may be used as appropriate forms of drainage on development sites. When dewatering operations cease and groundwater levels return to their normal higher level this may render these forms of drainage ineffective.

**8.6** The lowering of water levels on certain soil types may result in drying and shrinkage which can affect some sensitive building types. Sensitive soils are those with high plasticity such as clays, which occur as isolated pockets in the superficial deposits which overlie the silica sand resource.

### **Potential mitigation measures**

**8.7** The effects of dewatering may be mitigated through a number of techniques. A combination of techniques may be used. The National Planning Policy Framework contains policies to minimise impacts on biodiversity and water. The Norfolk Minerals and Waste Core Strategy contains policies DM1 – Nature Conservation, DM3 – Groundwater and surface water, and CS14 – Environmental Protection which are relevant to the silica sand extraction in relation to dewatering.

**8.8** Extraction sites where dewatering is undertaken could be located outside the hydrological catchment of water sensitive features which is likely to significantly reduce or remove effects on them.

**8.9** Extraction sites within a hydrological catchment could be located in areas down gradient from water sensitive features which may reduce the effects of dewatering, this will be dependent on distance and there may still be a drawdown effect which increases groundwater flow rates.

**8.10** Artificial recharge is a technique where water from a dewatering operation is piped to a drainage feature or recharge wells which protects a water-sensitive habitat or buildings from the effects of dewatering by artificially recharging the groundwater levels in proximity to them.

**8.11** Extraction of silica sand has taken place in other parts of England without dewatering. Extraction can use long reach excavators, draglines or suction dredging depending on the depth and nature of the deposits.

### **Changes in water chemistry**

**8.12** Information given at the Examination of the Mineral Site Specific Allocations Plan by Natural England suggested that the potential could exist for silica sand extraction to alter groundwater chemistry by reducing the amount of sand which rainwater would have to pass through to reach the groundwater. It was suggested that any change could have uncertain effects on habitats and species which depend on the existing chemical composition of the water. There is insufficient evidence available to prove whether silica sand extraction does change water chemistry, however in relation to European environmental designations such as SACs or SPAs a precautionary principle exists so that where uncertainty exists an impact is considered likely to occur.

### **Potential mitigation measures**

**8.13** The potential for changes in water chemistry may be mitigated through a number of techniques. The National Planning Policy Framework contains policies to minimise impacts on biodiversity. The Norfolk Minerals and Waste Core Strategy contains policies DM1 Nature Conservation, DM3 – Groundwater and surface water, and CS14 – Environmental Protection which are relevant to the silica sand extraction in relation to potential changes in water chemistry.

**8.14** Extraction sites where there is uncertainty regarding the potential for water chemistry changes could be located outside the hydrological catchment of features sensitive to changes in water chemistry, which is likely to significantly reduce or remove effects.

**8.15** Extraction sites within a hydrological catchment could be located in areas down gradient from features which may be sensitive to changes in water chemistry may reduce the effects, this will be dependent on distance and there may still be a drawdown effect which increases groundwater flow rates.

### **Dust and particles**

**8.16** If uncontrolled, dust can have impacts on plants, animals and humans. In relation to plants uncontrolled quarry dust emissions may cause smothering as a result of dust deposition, which affects photosynthesis, respiration, transpiration and leaf temperature. Animals and humans may be affected if the dust particles are capable of entering the lungs, which occurs if the particles are below a certain size (less than 10 microns, PM10). Silica sand extraction in Norfolk typically makes use of an excavator to extract material which is then moved to the processing plant by either conveyor or Articulated Dump Truck (ADT), if uncontrolled the most likely source of dust emissions is likely to be fugitive dust which becomes airborne as the result of the passage of ADTs along the haul route to the processing plant. Sand is damp when extracted and is not prone to fugitive dust emissions, however when dry and placed in stockpiles dust emissions may occur if uncontrolled.

**8.17** Dust emissions decrease with distance as the dust falls back to earth. The distance that nuisance dust travels is dependent on a number of factors including particle size, topography, height above ground that the emission occurs at, and wind speed. Information from the British Geological Survey indicates that silica sand particle size is generally in the range (0.5mm – 0.1mm).

**8.18** Dust is classified into three broad size ranges, large particles which would be greater than 0.03mm, intermediate particles which would be between 0.03 – 0.01mm, and fine particles which are less than 0.01mm which are also known as PM10. A further sub division is sometimes made for very fine particles which are below 0.0025mm referred to as PM2.5. Measurements for PM10 include PM2.5 within its range.

**8.19** If uncontrolled, large dust particles which make up the largest proportion of dust from mineral workings generally fall to earth within 100 metres of the source, and intermediate particles within 200-500 metres, while fine particles can travel up to 1000 metres. Very fine particles (<2.5µm) would be expected to travel considerably further. Sand extraction is not a significant source for fine particles as the nature of the extraction operations does not result in large volumes of dust, unlike hard rock quarrying where operations such as blasting take place. The sources of the majority of fine particles in the atmosphere are from vehicle exhaust emissions, sea salt, pollen, construction work, aerosols, chemicals, and stonework of various kinds.

**8.20** When silica containing materials are worked the potential exists for the creation of small particulate dust referred to as Respirable Crystalline Silica (RCS). Operations such as drilling, cutting, milling and crushing are most likely to produce RCS. Therefore stonemasonry, demolition, construction activities, activities at hard rock quarries and gravel crushing are likely to create RCS.

**8.21** Long term exposure to RCS in the workplace can lead to workers developing silicosis, a notifiable industrial disease affecting the lungs. The Health and Safety Executive have provided information on the level of risk to the general public: "Silicosis is a disease that has only been seen in workers from industries where there is a significant exposure to silica dust, such as in quarries, foundries, the potteries etc. No cases of silicosis have been documented among members of the general public in Great Britain, indicating that environmental exposures to silica dust are not sufficiently high to cause this occupational disease."

### **Potential mitigation measures**

**8.22** Dust emissions from mineral workings can usually be effectively controlled through the planning process. Local and National policy exists to control dust emissions from mineral workings. The National Planning Practice Guidance (Paragraphs 27-023 to 27-032) contains more detailed guidance on dust emissions and the control of dust generated by mineral workings, including the health effects of dust.

**8.23** The National Planning Practice Guidance requires a dust assessment study to be conducted as part of all mineral planning applications. The NPPG Paragraph 27-023 also sets out the five key stages of a dust assessment study, these are:

Stage 1: Establish existing baseline conditions;

Stage 2: Identify site activities that could lead to dust emission without mitigation;

Stage 3: Identify site parameters which may increase potential impacts from dust;

Stage 4: Recommend mitigation measures and site design modifications; and

Stage 5: make proposals to monitor and report dust emissions to ensure compliance with appropriate environmental standards and to enable an effective response to complaints.

**8.24** Paragraphs 27-025 to 27-028 of the NPPG provides further guidance on the stages and methodology of a dust assessment study, with paragraphs 27-029 to 27-032 covering the health effects of dust.

**8.25** The Norfolk Minerals and Waste Core Strategy contains policies DM1 – Nature Conservation, DM12 – Amenity, DM13 – Air quality and CS14 – Environmental Protection which are relevant to the silica sand extraction in relation to potential dust emissions. Development Management Policy DM13 ensures that all planning applications for mineral operations must ensure that they minimised harmful emissions to air, and would not impact negatively on existing Air Quality Management Areas, nor lead to the declaration of a new AQMA. Together with the site policies, Policies CS14, DM12 and DM13, form a set of criteria against which future developments will be considered, in respect of air quality and dust.

**8.26** It is usual for conditions to be attached to mineral planning permissions to require dust monitoring and control measures. These measures may include dampening operations to haul routes and stockpiles to reduce fugitive emissions. The County Council as the Mineral Planning Authority monitors mineral sites to ensure compliance with planning conditions and undertakes enforcement action if required.

## **Loss or fragmentation of green infrastructure**

**8.27** Mineral extraction has the potential to result in the loss and/or fragmentation of green infrastructure. Habitats often form a network which allows species to move between them along pathways such as hedgerows, small areas of woodland which form 'stepping stones' between larger more complex habitats. Therefore, the removal of a relatively small area of habitat may have greater cumulative impacts if it results in either the division of a larger area of habitat or the removal of a 'stepping stone' area which isolates species. The isolation of habitats may result in impacts which reduce species population density and the richness of species types, if the fragmentation results in deterioration in ecological function. As habitat areas become smaller more of the habitat will be prone to edge effects. The edges of habitats are influenced by neighbouring habitats which may result in a progressive reduction in habitat quality prior to the physical boundary. For example in areas surrounded by arable fields, the edges will be less sheltered from weather effects, influenced by crop species migration, and potentially overspray from fertilisers and crop protection chemicals.

### **Potential mitigation measures**

**8.28** Local and National policy exists to control impacts to biodiversity. All public authorities in England and Wales have a duty to have regard to the purpose of conserving biodiversity in the exercise of their functions. There is national policy and guidance on the conservation and enhancement of the natural environment as a priority within the planning system. The Norfolk Minerals and Waste Core Strategy contains policies DM1 – Nature Conservation, DM14 – Progressive working, restoration and after-use, and CS14 – Environmental Protection which are relevant to the silica sand extraction in relation to potential changes in habitats and biodiversity.

**8.29** Biodiversity impacts including habitat fragmentation and loss can be mitigated by consideration of these factors in the working and restoration schemes and by effective planning conditions. There have been examples in Norfolk where working schemes have protected certain habitats, including veteran trees and restoration has included ecological enhancement and habitat creation. The enhancement of the Ecological Network is a provision within policy DM14.

## **Loss or disturbance to functional habitat**

**8.30** Functional habitats are areas necessary for a particular species to exist in the landscape which is outside of the area in which the species resides which is referred to as structural habitat. This means that foraging areas are included in functional habitats even if these are outside nesting or roosting areas. For certain bird species agricultural land forms an important foraging habitat. This is the case for some qualifying bird species in The Wash Special Protection Area. Pink footed goose forage within agricultural and pasture land, the same areas provide overspill foraging for curlew, oystercatcher, dunlin and black tailed godwit during high tides. Pink footed geese roost at locations including Snettisham. Silica sand extraction often takes place on land which was previously in agricultural use. Therefore there is the potential that extraction could remove areas of functional habitat although whether the area would be significant would require case by case assessment.

### **Potential mitigation measures**

**8.31** A Habitats Regulations Assessment would be required at the plan making stage. This would assess whether the scale of development would be likely to cause significant effects to the qualifying features. If Likely Significant Effects were identified or there was uncertainty then in order for the development to take place mitigation would be suggested which could address this. This might include an alternative location for the extraction to take place on, or compensatory habitat creation.

**8.32** There are policies within the NPPF to ensure that such habitats are had regard to in plan making and the determination of planning applications. The Norfolk Minerals and Waste Core Strategy contains policies DM1 – Nature Conservation, DM14 – Progressive working, restoration and after-use, and CS14 –

Environmental Protection which are relevant to the silica sand extraction in relation to potential loss or disturbance to functional habitat.

## Noise

**8.33** Noise from mineral workings is often a major concern for the public. However, national and local policy exists to control noise. There is specific guidance and policy in relation to noise from quarry operations. Silica sand extraction in Norfolk normally involves the use of a tracked excavator that extracts the sand and loads it onto Articulated Dump Trucks (ADTs) for transportation to the processing plant by internal haul route. Previous silica sand extraction in Norfolk has also made use conveyors instead of ADTs. Noise emissions at the extraction site will be from these plant items and the associated operations however, the number of plant is relatively low in comparison with operations such as large hard rock quarries, no processing takes place at the current extraction site.



Figure 1: Sand loading operations at Grandcourt Farm

### Potential mitigation measures

**8.34** National policy and guidance provides requirements and information for mineral operators on how to control noise emissions. A noise impact assessment should be submitted to support mineral planning applications. The principle of a noise impact assessment is that it should identify all sources of noise and for each source, take account of the noise emission, its characteristics, the proposed operating locations, procedures, schedules and duration of work for the life of the operation and its likely impact on the surrounding neighbourhood. The noise impact assessment having assessed the sources of noise from the proposed operations also considers the surrounding noise climate, sensitive receptors and suggests mitigation and control measures by:

- Considering the main characteristics of the production process and its environs, including the location of noise-sensitive properties and sensitive environmental sites;

- Assessing the existing acoustic environments around the site of the proposed operations, including background noise levels at nearby noise-sensitive properties;
- Estimate the likely future noise from the development and its impact on the neighbourhood of the proposed operations;
- Identify proposals to minimise, mitigate or remove noise emissions at source;
- Monitor the resulting noise to check compliance with any proposed or imposed conditions.

**8.35** National guidance is provided on the appropriate noise standards for mineral operators for normal operations. Mineral Planning Authorities should aim to establish a noise limit through a planning condition at the noise-sensitive property that does not exceed the background noise level by more than 10dB(A) during normal working hours (0700-1900) unless such a limit would impose unreasonable burdens on the mineral operator in which case the limit should be set as close to that limit as practicable.

**8.36** Some short-term activities are recognised as being particularly noisy and specific national guidance is available with regard to appropriate noise limits for these operations. National guidance highlights activities such as soil-stripping, the construction and removal of baffle mounds, soil storage mounds and spoil heaps, construction of new permanent landforms and aspects of site road construction and maintenance as being particularly noisy and allows for increased temporary daytime noise limits of up to 70dB(A) for up to eight weeks a year at noise-sensitive properties. These limits should be allowed for essential site preparation and restoration work or for the construction of bunds where these will bring longer term environmental benefits.

**8.37** In the adopted Norfolk Core Strategy and Minerals and Waste Development Management Policies DPD, Policy DM12 (Amenity) ensures that all planning applications for mineral operations must consider the impacts of noise on the amenity for people in close proximity. Together with the site policies, Policies CS14, DM12 and DM13, form a set of criteria against which future developments will be considered in respect of noise.

### **Landscape change/ afteruse**

**8.38** Silica sand extraction results in significant landscape change as a result of the methods of extraction and the geology of the area. The silica sand resource is part of a wider geological formation which is an aquifer. There are high groundwater levels in parts of the resource, and dewatering has traditionally formed part of the extraction process. Following extraction, dewatering ceases and the workings will fill with water until the natural groundwater level is reached. This has resulted in a post extraction landscape that features waterbodies formed in voids created as part of previous mineral workings.

**8.39** Silica sand extraction can also make provide positive benefits to the landscape as part of the restoration scheme. Intensive agriculture in the last 70 years has resulted in significant landscape change and the reduction in areas of acid grassland, heathland and wet woodland. Restoration schemes for mineral extraction can provide the means for land to be restored to these habitat types. This results in landscape change away from intensive agriculture which has been predominant since the Second World War.

**8.40** Part of the Silica Sand resource underlies the Norfolk Coast Area of Outstanding Natural Beauty. AONB's are designated to conserve and enhance the natural beauty of the area. The Norfolk Coast AONB is not a landscape in which waterbodies form a significant part of the landscape to be conserved. Therefore, it is considered likely that any application for silica sand extraction within the AONB, which proposed waterbodies as part of the restoration scheme would be unlikely to conform with the statutory purpose of the AONB.

### **Potential Mitigation Measures**

**8.41** Silica sand extraction can result in landscape change through the creation of waterbodies, which may be seen as a negative landscape change. Therefore, the suitability of any future planning application must

be determined by also examining the potential for positive benefits to arrive at a planning balance. Silica sand extraction can however, result in a different landscape character which can be aesthetically pleasing. Areas around previous workings at Bawsey have resulted in cliff faces and woodland dropping down to the water which have been compared to Scandinavian landscapes. It is likely that post restoration landscapes of silica sand extraction will contain a variety of landscape elements. These landscape elements will typically be a mosaic of agricultural land, heathland, woodland elements and waterbodies. This variety can lead to biodiversity gains.

**8.42** In some areas waterbodies created by mineral extraction have been developed into fisheries, providing an economic benefit. However, this is not an option for the majority of silica sand workings. The underlying geology in the silica sand resource means that silica sand extraction often exposes pyritic deposits. These deposits decompose to produce naturally occurring acids when mixed with water, as occurs in groundwater. Where silica sand workings result in waterbodies which are groundwater fed this may result in water at the surface which is acidic to a point where it supports only a limited ecosystem and is therefore unsuitable for recreational fisheries. Some previous silica sand workings have been used for recreational sailing and board sports, however there are dangers with waterbodies in mineral workings, as they are often deep which leads to low water temperatures relatively close to shore and underwater obstructions which make them unsuitable for activities such as swimming.

### **Archaeology and heritage assets**

**8.43** The silica sand resource area is in a historically active and archaeologically significant landscape which has high historical value. The utilisation of resources has formed a key process in the development of the landscape. There are archaeological assets connected with iron-working, tile making and salt production as well as the extraction of sand for glass and foundry uses. Large parts of the landscape are unstudied and are likely to be of high evidential value for future research. Respondents to consultations on the Minerals Site Specific Allocations Plan indicated areas which were considered to be important to the war effort in the Second World War, such as the Bawsey quarry where sand was extracted for use in the foundries producing the engines which powered planes such as the Spitfire and Lancaster. In the area around Shouldham there was a training camp and a decoy airfield. Areas such as these have a high value at a historic, evidential and communal level. The resource contains areas of high aesthetic value; these take the form of designed landscapes such as parkland around high status buildings, a vernacular landscape which has arisen as function of agricultural uses or land management, and fortuitous landscapes which are the result of previous industrial operations such as the Leziat Country Park on the site of previous silica sand extraction.

**8.44** As silica sand extraction involves the disturbance and loss of surface deposits it can have significant impacts on archaeological assets. Typically silica sand in Norfolk would be extracted at depths below the archaeological layers, so extraction in a particular area would involve the removal of all archaeological assets in that area.

**8.45** As it is likely that archaeology will be removed if silica sand extraction takes place it is vital a proportionate evaluation takes place to ascertain the value of any archaeological assets and the most appropriate method of investigation and preservation. Archaeological investigation can take a number of different forms. It is likely that multiple investigations will be used to define the archaeological interest

**8.46** Desk Based Assessment is commonly the starting point for investigation. This takes the form of examination of historic maps and records, including aerial photography. The Historic Environment Records are also an important source of information for a DBA as this indicates archaeological information in the locality such as find spots, areas of known archaeological interest and features such as listed buildings. The results of a DBA allow an assessment of the potential for archaeological assets to be in the proposed extraction area. It is based on these assessments that decisions are made on what the next stage of the investigation needs to be.

**8.47** Assessment for archaeological assets may involve other non-intrusive investigation methods such as geophysical survey. These surveys help interpretation of the potential for archaeological assets on a site by



mapping anomalies which can indicate where below ground remains of structures, features and/or the remains of historical industrial activity exist.

**8.48** However, there is a limit to the information which can be gathered through non-intrusive investigation, and it is common for intrusive investigations to follow. Trial trenching is likely to build on the results of the DBA and geophysical surveys which will have identified potential areas where archaeology is thought to exist on site. Trial trenching provides a method of proving whether there is archaeology in these locations. If archaeology does exist then trial trenching will allow further information to be gathered by physical examination of the features and potentially allow the archaeology to be dated as finds may be recovered which can be identified as coming from a specific historic period.

**8.49** While, trial trenching can provide significant opportunities to prove the results of non-intrusive investigations there will be occasions where either the spread of potential archaeology or the potential importance of the site is such that larger scale evaluation will be required. Typically this may involve the stripping of topsoil to expose archaeology before larger scale trenching is undertaken again with the aim of identifying features to a specific time period.

**8.50** Identification of archaeology to a type of feature and a specific period may provide evidence which links the site to other known sites in the locality. The ability through such evidence to link sites in a historic landscape can provide a significant insight into the way in which previous societies interacted with the landscape.

**8.51** The area covered by the silica sand resource is known to have a significant number of archaeological assets over a number of different time periods. The location of the resource area within the wider landscape provided previous societies with significant reasons for activity to take place on the resource.

**8.52** As the various stages of investigation proceed, the archaeologists will decide on the most appropriate methods for preservation. Methods of preservation generally fall into two broad categories which are not mutually exclusive, preservation by record and preservation in-situ.

**8.53** As preservation in-situ requires the non-development of part of the site and the protection of the features, often by refilling the excavation, this tends to be the most appropriate method of preservation for archaeological assets of the highest value and where a significant part of their value is derived from the position of the asset in the landscape.

#### **Potential mitigation measures**

**8.54** There are benefits to archaeological knowledge that derive from silica sand extraction. Archaeological investigation is commonly a requirement of development and silica sand extraction is no exception.

**8.55** The requirement for investigations prior to mineral extraction often provide archaeologists with access to land and funding for evaluation which would not normally be available. The mineral operator will normally fund the archaeological investigations to support the development, and this will be conditioned as part of the planning permission.

**8.56** The Norfolk Historic Environment Service at Norfolk County Council is consulted not only as part of the plan preparation process but also for planning applications involving mineral extraction. They provide expert advice to planners and assist in the drafting of archaeological investigation conditions and the briefs which support them. The finished investigation reports are also examined by them, and artefacts recovered may be stored within the County record, allowing them to form part of additional studies in the future. A number of artefacts recovered from mineral extraction sites are on display through the Norfolk Museums service.

#### **Transport**

**8.57** The extraction of silica sand in Norfolk has the potential to cause impacts as a result of transportation. The transport of mineral occurs both as the raw material is taken from an extraction site and when the

processed mineral leaves the plant site. The potential impacts from transporting minerals are noise, dust, visual intrusion, road safety and vibration. These impacts are the same as the transport of any other commodity.

**8.58** Silica sand in Norfolk, unlike sand and gravel, makes significant use of rail transport for onward transportation of the processed mineral. This is because of the significant differences in distance that processed silica sand travels and its scarcity and value compared to sand and gravel. The potential end-users for silica sand are far fewer than the users of sand and gravel. Processed silica sand from Norfolk is used in glassworks in the north-east and north-west of England. Sand and gravel is generally considered to travel a maximum of about 30 miles by road.

**8.59** Rail transport greatly reduces transport impacts compared with road transport; one train might hold the equivalent of over sixty normal mineral lorries.

**8.60** The extraction sites for silica sand in Norfolk have historically been located only a relatively short distance from the processing plant. This has meant that off highway haul routes or conveyors have been used to transport raw material for processing. As suitable areas for extraction close to the processing plant become scarcer in the future it is likely that the transportation of raw material may involve some element of transportation on the public highway.

**8.61** The processing plant at Leziate is a fixed point to which raw material from any extraction site must travel. As the processing plant incorporates a railhead, as well a very substantial amount of plant it is unlikely to be practicable to consider relocating the plant.

**8.62** The processing plant is accessed from Station Road, Middleton and Brow of the Hill, Leziate. These roads link to the A47 and the B1145 which are both roads on the county's Heavy Goods Vehicle distributor network. The principal issue with using road transport to link extraction sites to the processing plant is the width of the connecting minor roads and the proximity of residential dwellings to the highway. The width of minor roads can lead to several issues; the potential exists for safety issues between HGVs and other road users unless correctly managed. Vulnerable road users such as pedestrians and cyclists are at particular risk if the potential for impacts of a development are not assessed as part of the application process and appropriate traffic management is not implemented.

#### **Potential Mitigation Measures**

**8.63** There are national and local policies and guidance to ensure that potential traffic impacts from development are correctly identified and appropriately addressed.

**8.64** In the Norfolk Minerals and Waste Core Strategy and Development Management Policies DPD the Policies CS15 and DM10 have been adopted to address the potential traffic impacts of mineral development. Policy CS15 states that HGV movements associated within minerals development should not generate:

- a) Unacceptable risks to the safety of road users and pedestrians;
- b) Unacceptable impacts on the capacity and/or efficiency of the highway network (including the trunk road network);
- c) Unacceptable impacts on air quality (particularly in relation to any potential breaches of National Air Quality Objectives and impacts on any Air Quality Management Areas) and residential and rural amenity, including from odour and noise;
- d) Unacceptable impacts on the natural and historic environment; and
- e) Unacceptable physical impacts on the highway network (e.g. road or kerbside damage).

**8.65** Policy DM10 specifies the information that must be provided within a Transport Statement accompanying any planning application for minerals extraction which would generate an increase in traffic

movements or traffic impact. It is considered that the use of these policies will ensure that potential impacts are identified and appropriate mitigation measure put in place.

**8.66** Potential mitigation measures might include some or all of the following:

- Junction and/or highway improvements
- Alternative off-highway haul routes
- Agreement of a formal routing agreement
- Limitations on hours of operation
- Limitations on the number of HGV movements per day
- Requirements for wheel washing when vehicles leave either the extraction site or processing plant
- Sheeting of HGV bodies when transporting sand.

**8.67** It is likely that the minor roads linking the extraction site to the strategic highway network and the minor roads close to the processing plant will require the greatest level of mitigation. It is considered that some Areas of Search will be close enough to the processing plant for a conveyor or off-highway haul route to be appropriate as a complete transport method. For Areas of Search further away from the processing plant at Leziate, it might be possible for an off-highway haul route or conveyor to be used for the transport of raw materials from the B1145 and the processing plant, where the mineral operator owns or has control of land between the processing plant and the strategic highway network.

## **Appendix 3: The method used to define areas of search as set out in the Single Issue Silica Sand Review**

This information was included in Chapter 10 of the Preferred Options Consultation document of the Single Issue Silica Sand Review.

References to the NPPF have been updated to the 2021 version of the NPPF.

The process used to define the areas of search is explained in the following section and illustrated in the following maps at the end of this section:

**The starting point for the areas of search is the extent of the Leziate Beds silica sand resource as mapped by the British Geological Survey (BGS)**

**Reason:** the purpose of the Silica Sand Review was to meet the shortfall in allocated sites suitable for the production of glass sand, as required by the existing processing facility at Leziate. The majority of previous extraction of silica sand for glass manufacture has taken place from the Leziate Beds and this deposit has the highest probability of providing deposits of a suitable quality and grade for this use.

The National Planning Policy Framework (NPPF) paragraph 214, part c ; states that: ‘Mineral Planning Authorities should plan for a steady and adequate supply of industrial minerals [silica sand] by maintaining a stock of permitted reserves to support the actual and proposed investment required for new or existing plant, and the maintenance and improvement of existing plant and equipment...’. The NPPF further quantifies the level of permitted reserves in footnote 74: “*These reserves should be at least 10 years for individual silica sand sites; at least 15 years for ... silica sand sites where significant new capital is required.*”

### **Stage 1**

#### **The Norfolk Coast Area of Outstanding Natural Beauty has been excluded**

**Reason:** The Norfolk Coast AONB is a statutory national designation with the purpose of the conservation and enhancement of natural beauty. The NPPF (paragraph 177) states that “*When considering applications for development within Areas of Outstanding Natural Beauty, permission should be refused for major development other than in exceptional circumstances, and where it can be demonstrated the development is in the public interest.*” It is therefore not considered appropriate for the areas of search to include the AONB. Any subsequent planning application in the vicinity of the AONB will need to assess the impact of the development on the AONB through a Landscape and Visual Impact Assessment (LVIA).

#### **Registered Common Land has been excluded**

**Reason:** Legislation protects the activities which can and cannot be carried out on registered common land. Therefore, it would not be appropriate for common land to be included within the areas of search for mineral extraction.

### **Stage 2**

#### **Designated heritage assets (Listed Buildings, Scheduled Monuments, registered historic parks and gardens, Conservation Areas) and 250 metres around each heritage asset has been excluded**

**Reason:** Listed Buildings, Scheduled Monuments and registered historic parks and gardens are designated at a national level by Historic England. Conservation Areas are designated by the local planning authority and usually contain a number of Listed Buildings within them. The NPPF (paragraph 200) states that “substantial harm to or loss of (a) grade II listed buildings, or grade II registered parks or gardens, should be exceptional; (b) assets of the highest significance, notably scheduled monuments, protected wreck sites,

registered battlefields, grade I and II\* listed buildings, grade I and II\* registered parks and gardens, and World Heritage Sites, should be wholly exceptional”.

An area of 250 metres around designated heritage assets has been excluded from the areas of search. This 250-metre area is not intended to identify the setting of the heritage asset and it is recognised that the extent of the setting of each heritage asset will be different and may extend more or less than 250 metres from the heritage asset. The setting of a heritage asset contributes to the significance of the heritage asset. The 250-metre stand-off is considered as a starting point for the consideration of setting. Any subsequent planning application within an area of search would need to provide a Heritage Statement if the proposal could potentially impact upon a heritage asset or its setting, which would provide the necessary detail.

### **Stage 3**

#### **All ancient woodland and 250 metres around them has been excluded**

**Reason:** The NPPF classifies ancient woodland as an irreplaceable habitat. Paragraph 180 of the NPPF (2021) states that: *“development resulting in the loss or deterioration of irreplaceable habitats (such as ancient woodland and ancient or veteran trees) should be refused, unless there are wholly exceptional reasons<sup>63</sup>, and a suitable compensation strategy exists”*. The NPPF in footnote 63 defines wholly exceptional reasons as, *‘For example, infrastructure projects (including nationally significant infrastructure projects, orders under the Transport and Works Act and hybrid bills), where the public benefit would clearly outweigh the loss or deterioration of habitat.’*

An area of 250 metres surrounding each ancient woodland site has also been excluded from the areas of search. This distance has been used because uncontrolled dust can have a significant effect on ancient woodland habitats, and it is considered that 250 metres would allow for the mitigation of dust with the minimum of controls. A planning application may be able to provide information to support an acceptable distance closer than this, but 250 metres is considered appropriate for an Area of Search. It is recognised that impacts on local hydrology from mineral extraction may occur at a distance greater than 250 metres from an ancient woodland, and any subsequent planning application within an area of search will need to address this.

#### **All Sites of Special Scientific Interest (SSSIs) and 250 metres around them have been excluded (except Roydon Common and Dersingham Bog – see below)**

**Reason:** All NNRs, SPAs, SACs and Ramsar sites are also SSSIs. Therefore, excluding all SSSIs and 250 metres around them, means that all NNRs, SPAs, SACs and Ramsar sites have also been excluded from the areas of search. SSSIs are designated and protected at a national level. Paragraph 180 of the NPPF (2021) states that: *“development on land within or outside a Site of Special Scientific Interest, and which is likely to have an adverse effect on it (either individually or in combination with other developments), should not normally be permitted. The only exception is where the benefits of the development in the location proposed clearly outweigh both its likely impact on the features of the site that make it of special scientific interest, and any broader impacts on the national network of Sites of Special Scientific Interest”*.

An area of 250 metres around each SSSI has been excluded from the areas of search because it is considered that this distance would allow for the mitigation of dust and noise with the minimum of controls. However, it is recognised that the special biological or geological features of interest for which each SSSI has been notified will vary from site to site and the vulnerabilities of these features will also vary. This variation means that the impacts from mineral extraction, including the distance at which an impact may occur, will differ between each SSSI. A number of the SSSIs which occur within 5km of the silica sand resource are vulnerable to changes in water flow and levels. Any subsequent planning application within an area of search will need to assess the impact of mineral extraction on SSSIs.

### **The hydrological catchment around Roydon Common and Dersingham Bog has been excluded**

**Reason:** Roydon Common and Dersingham Bog are designated as SSSIs, NNRs, SAC and Ramsar sites. Therefore, these sites are protected at a national, European and international level from development that would be likely to have a significant effect on their important interest features. Roydon Common and Dersingham Bog are sensitive and vulnerable to changes in water flow and levels and water chemistry. Natural England therefore recommended avoiding the hydrological catchment areas for Roydon Common and Dersingham Bog when defining areas of search.

### **Stage 4**

#### **Sensitive receptors to amenity impacts (residential dwellings, educational facilities, workplaces, healthcare and leisure facilities) and 250 metres around each sensitive receptor has been excluded**

**Reason:** An area of 250 metres around sensitive receptors has been excluded because this represents a distance at which amenity impacts (such as noise and dust) could be mitigated to acceptable levels with the minimum of controls. A planning application may be able to provide information to support mineral extraction closer than 250 metres from a sensitive receptor, but 250 metres is considered appropriate for an area of search.

### **Stage 5: Agricultural land grades 1 and 2 have been excluded**

**Reason:** Grades 1 and 2 are defined nationally as the highest quality agricultural land and the NPPF (paragraph 174) contains requirements to ensure that the Best and Most Versatile (BMV) agricultural land is protected. NPPF footnote 58 states, "Where significant development of agricultural land is demonstrated to be necessary, areas of poorer quality land should be preferred to those of a higher quality". Grade 3 agricultural land has not been excluded from the areas of search because only subgrade 3a is classified as BMV agricultural land. The subgrades of 3a and 3b are not mapped and therefore it is not possible to differentiate between them when defining the areas of search.

### **Stage 6: Allocated, current and restored mineral extraction sites have been excluded**

**Reason:** The estimated resource in the specific site allocated for silica sand extraction and the permitted reserve in the current silica sand extraction sites have already been taken into account in calculating the silica sand shortfall. Additional silica sand resources to meet the shortfall will not be found within sites where mineral extraction has already been completed. Sibelco UK have provided a map of a previous mineral working at Bawsey that had not been exhausted of silica sand and this land has therefore not been excluded from the areas of search.

**Stage 7:** an aggregation of all the potential constraint areas defined in Stages 1-6.

**Stage 8:** The areas of the Leziate Beds silica sand resource that were remaining at this point were all potential areas of search

#### **Potential areas of search below 20 hectares in size have not been taken further**

**Reason:** Based on planning permissions for previous extraction sites, it is considered unlikely that a commercial silica sand extraction operation would take place on less than 20 hectares of land. Therefore, areas of search below 20 hectares in size are unlikely to be deliverable.

#### **The remaining ten areas of search were above 20 hectares in size and were included in the Preferred Options consultation document of the Single Issue Silica Sand Review.**

County Wildlife Sites were not excluded from the areas of search because they are designated at a county level and silica sand is a nationally important industrial mineral. However, impacts on County Wildlife Sites and appropriate mitigation, would be assessed through the implementation of relevant Local Plan policies

and the relevant specific site and area of search policies. There are no Local Nature Reserves within the area underlain by the Leziate Beds.

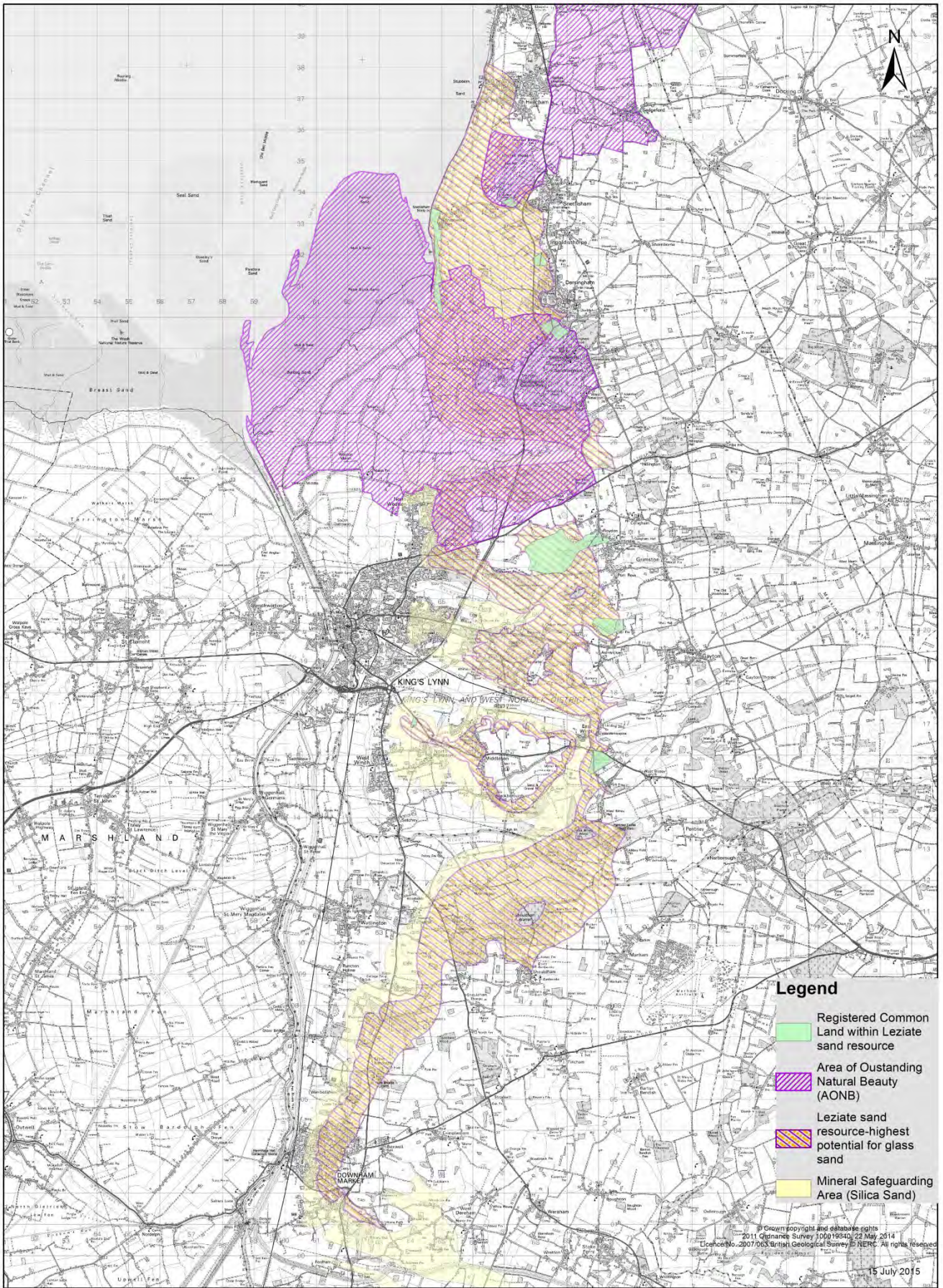
No flood zones were excluded from the areas of search because silica sand extraction is water compatible development in the NPPG. The Environment Agency did not consider that land within flood risk zones 2 and 3 needed to be removed from areas of search; however, a sequential approach was taken to the selection of areas of search.

The ten areas of search above 20 hectares in size are listed below. The Preferred Options consultation document of the Single Issue Silica Sand Review included initial site assessments of these potential areas of search.

| Reference  | Size (hectares) | Parish  |
|------------|-----------------|---|
| AOS A      | 548             | Ingoldisthorpe, Snettisham, Dersingham                    |
| AOS B      | 240             | Heacham, Snettisham                                       |
| AOS C      | 65              | Hillington, Fritcham with Appleton                        |
| AOS D      | 142             | East Winch, Pentney                                       |
| AOS E      | 979             | Wormegay, Shouldham, Marham, Tottenhill, Shouldham Thorpe |
| AOS F      | 234             | Runcton Holme   |
| AOS G      | 34              | Bawsey  |
| AOS H      | 29              | Bawsey  |
| AOS I      | 52              | Runcton Holme, Shouldham Thorpe, Tottenhill               |
| AOS J      | 24              | Tottenhill  |
| Total size | 2,347           | N/A   |

The total size of all the areas of search was 2,347 hectares. In the Preferred Options consultation of the Single Issue Silica Sand Review, it was estimated that **approximately 40 hectares** of land from within the areas of search and/or specific site would need to be developed for silica sand extraction during the plan period to 2026 to meet the identified shortfall. The defined areas of search cover a significantly larger area than is required for silica sand extraction over the plan period. This situation is to be expected due to the purpose and definition of areas of search. However, this also meant that there was some flexibility for the boundaries of areas of search to be amended or for some areas of search to not be taken forward into the Pre-Submission version of the Silica Sand Review.

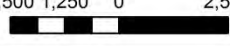
Based on the information available at the Preferred Options stage of the Silica Sand Review, our opinion was that AOS B, AOS C and the majority of AOS F were unsuitable to be taken forward due to a number of constraints, including potential historic environment, landscape and ecology impacts. However, all the areas of search listed above were included in the Preferred Options Consultation document of the Silica Sand Review, along with our initial assessments. This enabled consultation comments, both positive and negative, to be made on all potential areas of search, to support an informed decision making process. Decisions on whether areas of search should be amended or removed were made after the Preferred Options consultation on the Silica Sand Review, taking into account the responses received.



- Legend**
- Registered Common Land within Leziate sand resource
  - Area of Outstanding Natural Beauty (AONB)
  - Leziate sand resource-highest potential for glass sand
  - Mineral Safeguarding Area (Silica Sand)

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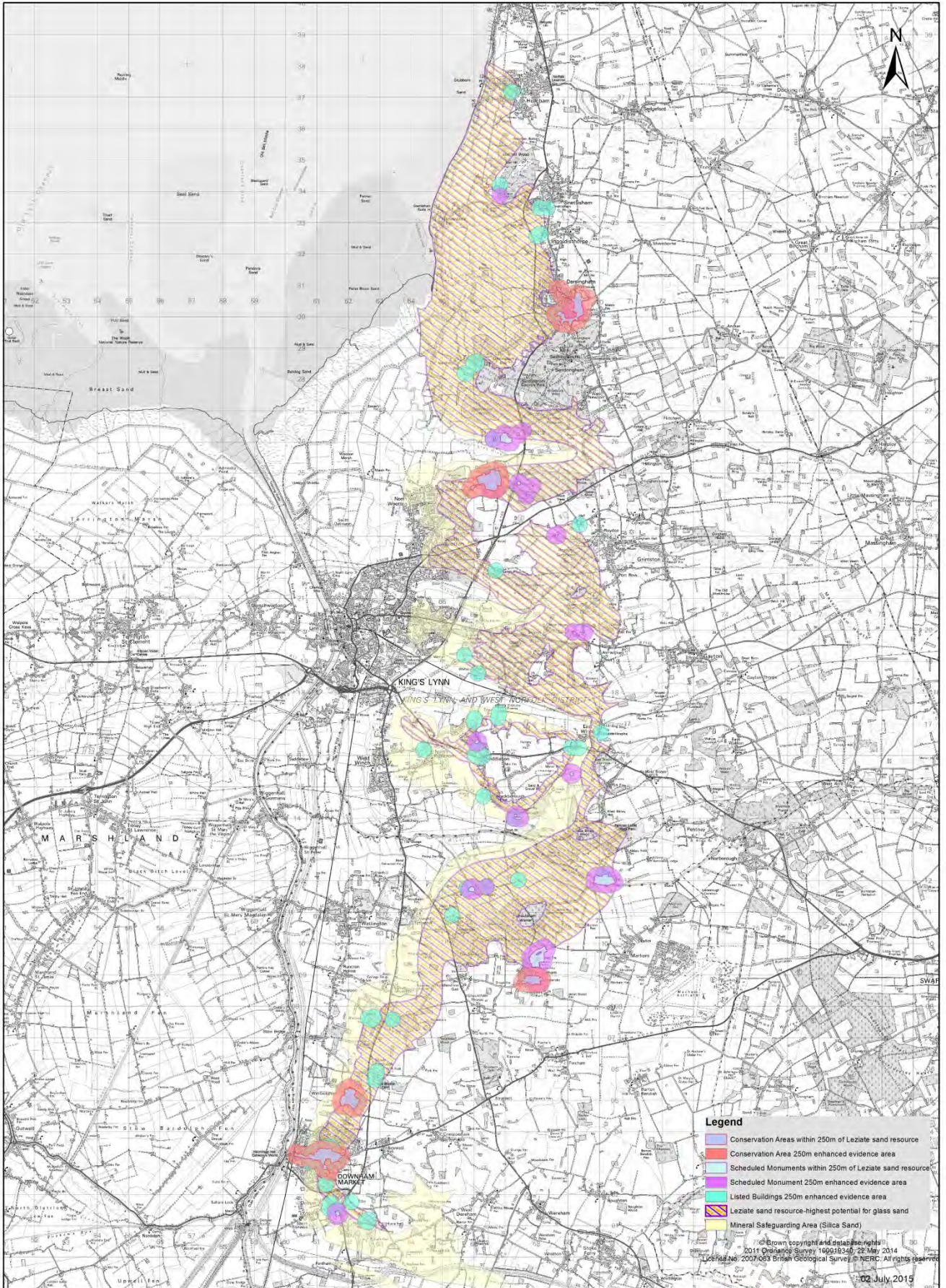
2,500 1,250 0 2,500 Metres



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**Area of Search sieve mapping stage 1: AONB and registered Common land**



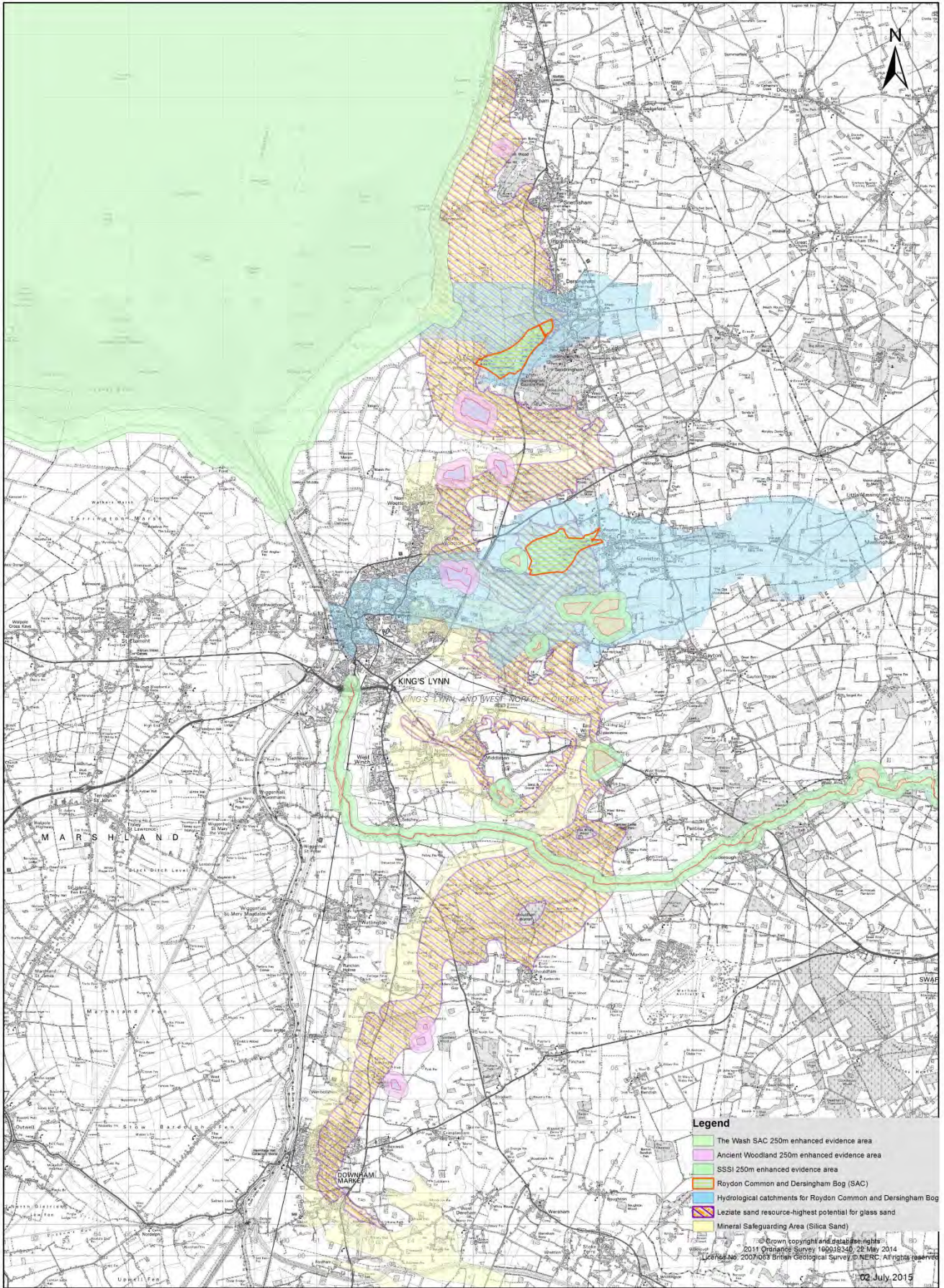


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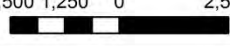
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Area of Search sieve mapping stage 2: Designated Heritage Assets



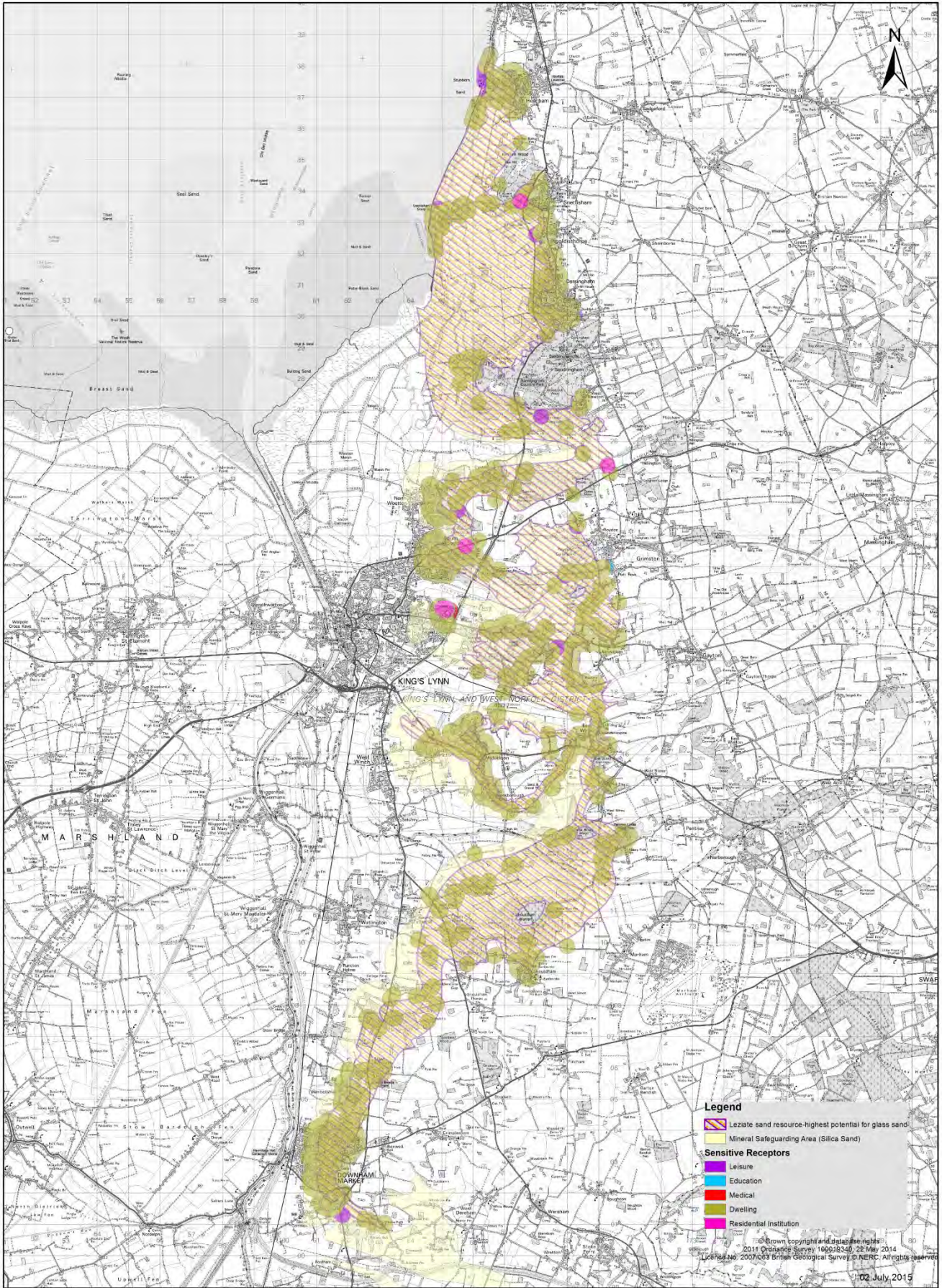
- Legend**
- The Wash SAC 250m enhanced evidence area
  - Ancient Woodland 250m enhanced evidence area
  - SSSI 250m enhanced evidence area
  - Royston Common and Dersingham Bog (SAC)
  - Hydrological catchments for Royston Common and Dersingham Bog
  - Leziate sand resource-highest potential for glass sand
  - Mineral Safeguarding Area (Silica Sand)
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2,500 1,250 0 2,500 Metres



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**Area of Search sieve mapping stage 3: environmental designations**



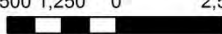
**Legend**

-  Leziate sand resource-highest potential for glass sand
-  Mineral Safeguarding Area (Silica Sand)
- Sensitive Receptors**
-  Leisure
-  Education
-  Medical
-  Dwelling
-  Residential institution

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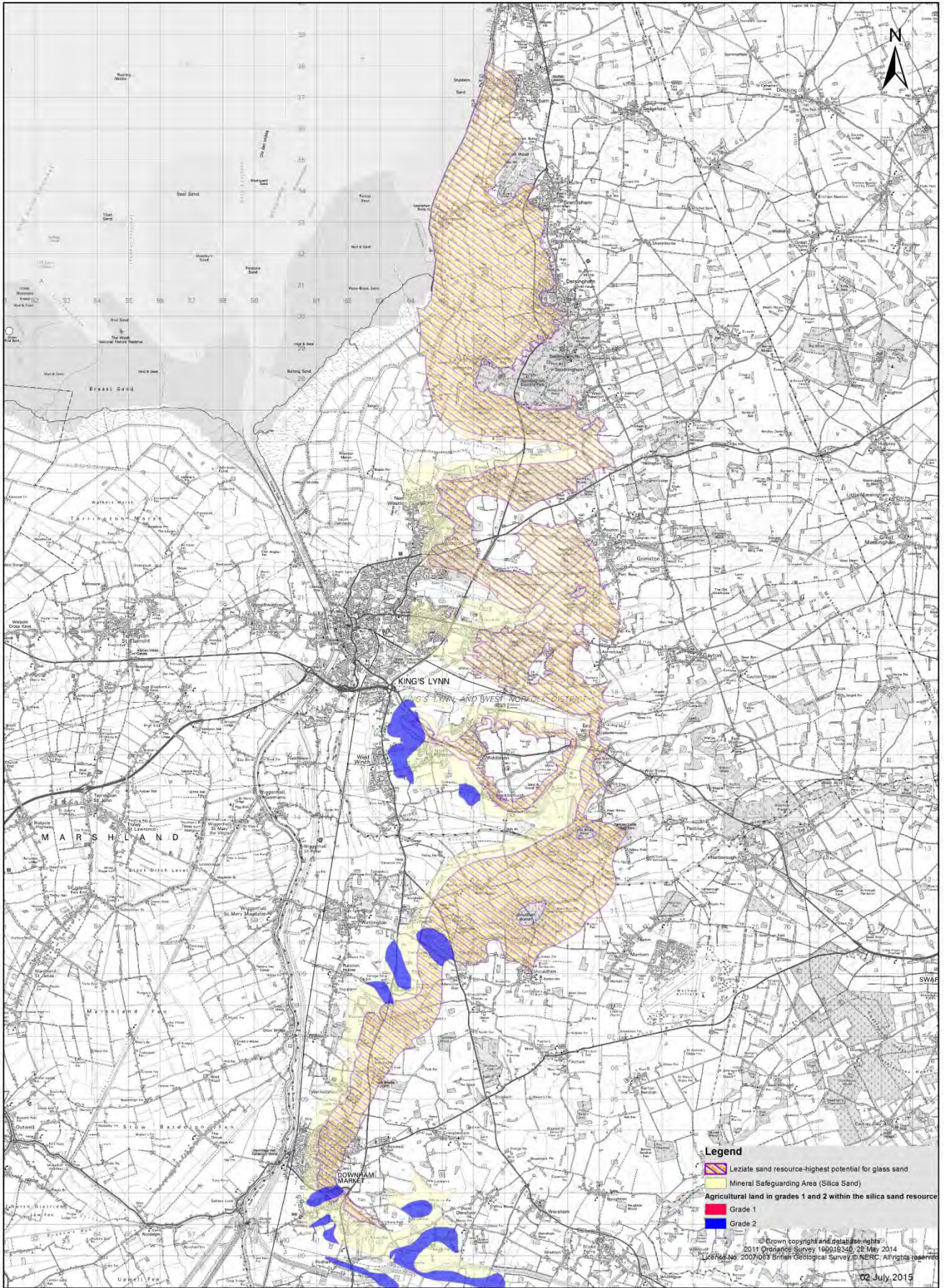
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



2,500 1,250 0 2,500 Metres



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**Area of Search sieve mapping stage 4: Sensitive receptors**



- Legend**
-  Leziate sand resource-highest potential for glass sand
  -  Mineral Safeguarding Area (Silica Sand)
  -  Agricultural land in grades 1 and 2 within the silica sand resource
  -  Grade 1
  -  Grade 2

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2,500 1,250 0 2,500 Metres



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**Area of Search sieve mapping stage 5: Agricultural Land Grade**



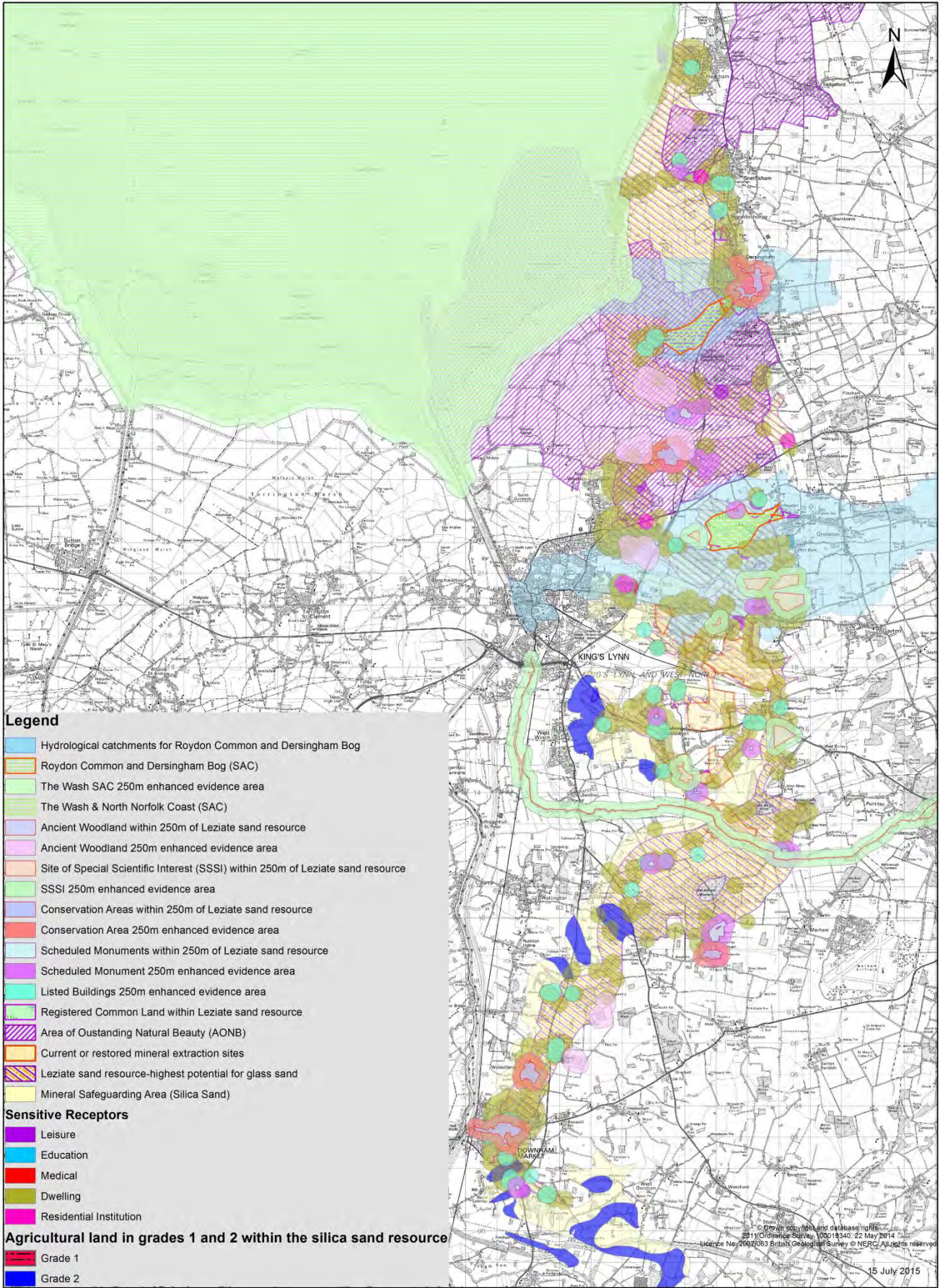
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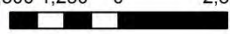
Area of Search sieve mapping stage 6: current or restored mineral extraction sites

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Legend  
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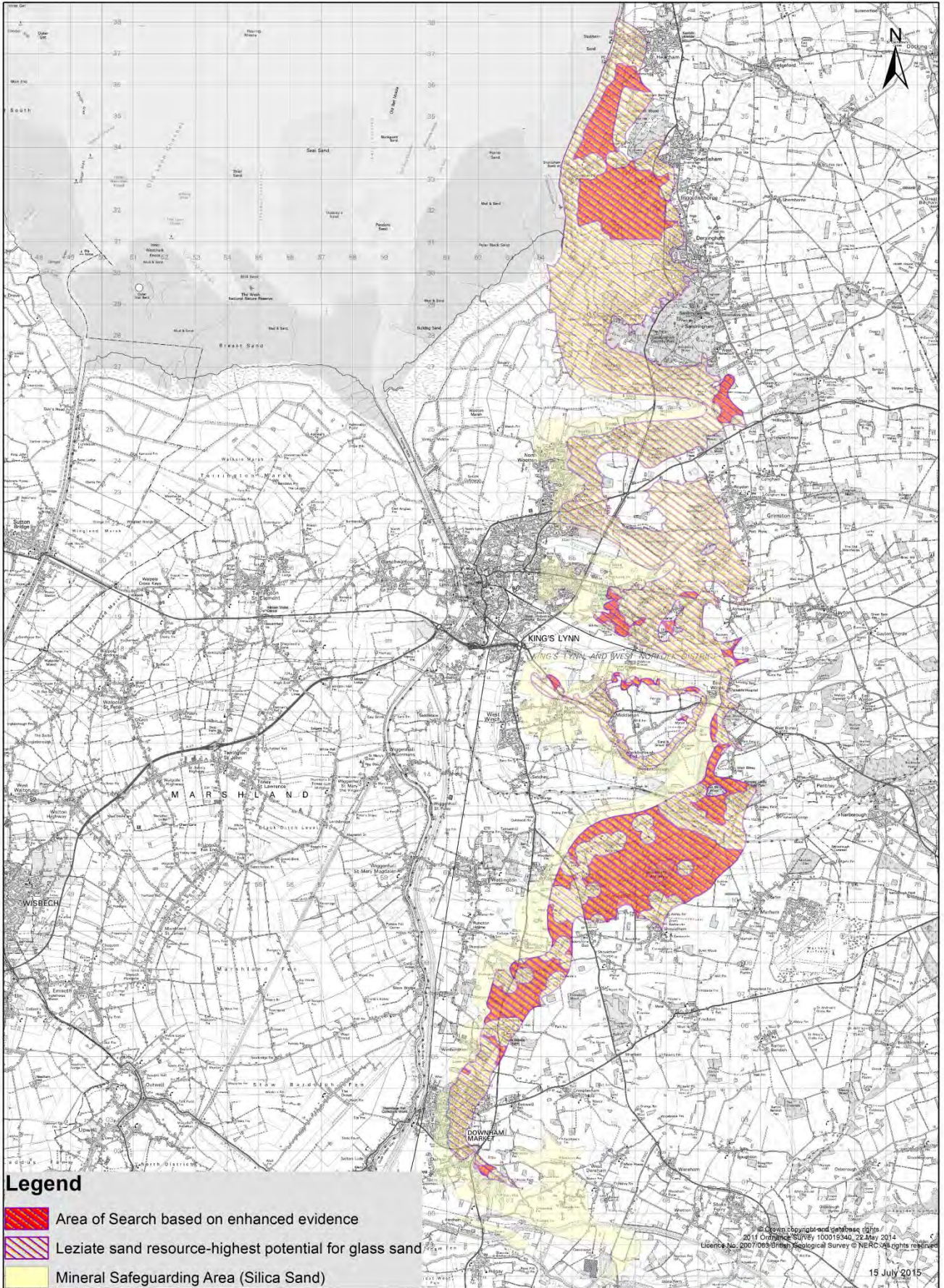


2,500 1,250 0 2,500 Metres






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Area of Search sieve mapping stage 7: aggregation of Stages 1-6



**Legend**

-  Area of Search based on enhanced evidence
-  Leziatite sand resource-highest potential for glass sand
-  Mineral Safeguarding Area (Silica Sand)

2,500 1,250 0 2,500 Metres



Area of Search sieve mapping stage 8: Areas of Search showing resource remaining after Stages 1-7



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**Legend**

- Area of Search over 20ha
- Leziatite sand resource-highest potential for glass sand
- Mineral Safeguarding Area (Silica Sand)

2,500 1,250 0 2,500 Metres

Area of Search sieve mapping stage 9: Areas of Search over 20ha

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