



Botley West Solar Farm

Environmental Statement

Volume 3

Appendix 11.14: Mineral Resource Assessment

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Glossary

Term	Meaning
The Applicant	SolarFive Ltd
The Project	The Botley West Solar Farm (Botley West) Project

Abbreviations

Abbreviation	Meaning
DCO	Development Consent Order
EIA	Environmental Impact Assessment
EA	Environment Agency
ES	Environmental Statement
MCA	Mineral Consultation Area
MPA	Mineral Planning Authority
MRA	Mineral Resource Assessment
MSA	Mineral Safeguarding Area
NGET	National Grid Electricity Transmission
NPPF	National Planning Policy Framework
NPS	National Policy Statement
NSIP	Nationally Significant Infrastructure Project
PEIR	Preliminary Environmental Information Report
PINS	The Planning Inspectorate
PV	Photovoltaic
PVDP	Photovolt Development Partners GmbH

Units

Unit	Description
%	Percentage
ha	Hectare
km	Kilometre
km ²	Square kilometres
kWh	Kilowatt hour
m ³	Cubic metres
MW	Megawatt
MWe	Megawatt electrical

1 Mineral Resource Assessment

1.1 Introduction

1.1.1 This Appendix of the Environmental Statement (ES) has been prepared by RPS on behalf of Photovolt Development Partners GmbH (PVDP) for the Applicant, SolarFive Ltd (SolarFive). This Appendix supports Chapter 11 of the ES.

1.2 Background

1.2.1 The Project will be located in the county of Oxfordshire, across an area of approximately 1,300 ha. The Project extends from an area of land in the north, situated between the A4260 and the Dorn River Valley near Tackley and Wootton (Northern Site Area), through a central section, situated broadly between Bladon and Cassington (Central Site Area), and connecting to a section further south near to Farmoor Reservoir and north of Cumnor (Southern Site Area), where the Project will connect to the National Grid transmission network. The name 'Botley West' is derived from the location of the grid connection point. The consent being sought for the Project is a temporary one. Temporary consent is being sought for a 42-year period during which the solar farm will be constructed, operated and decommissioned.

1.2.1 The Project comprises three main development sites for installation of ground-mounted solar photovoltaic (PV) panels (Botley Northern, Central and Southern area) The Project's solar arrays will be connected by electrical cables within each of the Site Areas. The interconnecting cable routes between the Site Areas will largely follow the public highway, but some parts will cross land either leased by the Client or the subject of an easement agreement.

1.2.2 A Site Location Plan showing the location and order limits for The Project is presented as Drawing 1. In order to provide sufficient detail for the PRA, the three main areas of The Project have been sub-divided by RPS into fourteen land parcels (referenced as Land Parcels 01 – 14) and the two linking cable route corridors (referenced as Land Parcels 15 and 16). Land Parcel 1 was discounted from requirement for further assessment following completion of an initial EIA Scoping exercise undertaken by RPS in February 2023.

1.3 Development Details

1.3.1 The current illustrative masterplan for the proposed development is presented in Figure 1 below. The proposed development is to comprise a temporary 1,350 MWp solar farm installation linked to a grid connection from National Grid at Cowley substation, the power will be transmitted there via the existing 400 kV overhead line and a new substation. The substation is to be constructed in the southern area of The Project development. The majority of the development will comprise solar PV modules (solar panels) with associated transformers, a power converter station, and Direct Current (DC) electrical cabling.

1.3.2 The preferred method of foundation support and anchoring of the solar panels has not been confirmed however it is likely that this will be through

use of galvanised steel piles or screws driven into the ground by an impact piling or screwing rig, to a depth of approximately 1.0 to 2.5 m below ground level (bgl). Cable routes are to be installed at depths ranging from 1.5 m to 30 m bgl.

1.3.3 Horizontal Directional Drilling (HDD) is to be utilised where it is not feasible to use the ‘open cut’ method to cross obstacles such as hedges, rivers, railway lines, public rights of way, roads and sensitive archaeological or ecological areas. Immediately west of the area designated Land Parcel 14 is a Substation location as proposed by National Grid. The construction of all aspects of the Project is subject to the final Project design and constraints.

1.3.4 There are likely to be four main temporary construction compounds in the development areas, one in the Northern Site Area, two in the Central Site Area and one in the Southern Site Area.

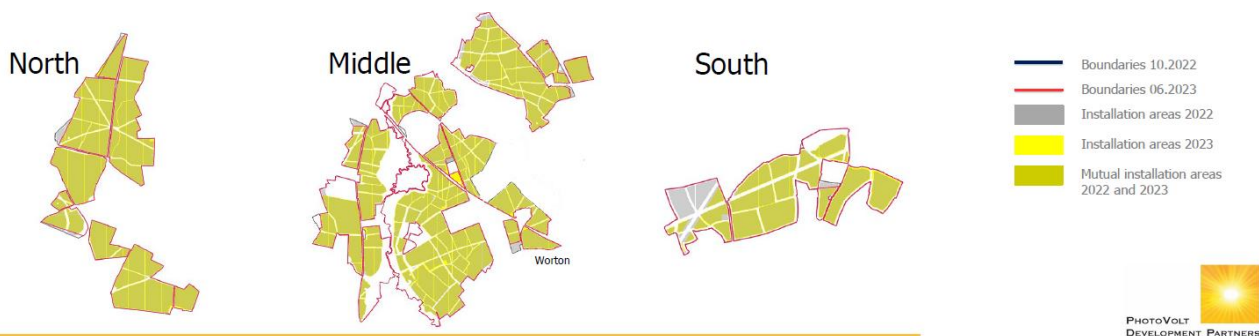


Figure 1: Current Illustrative Masterplan for The Project

1.4 Mineral Resources Across The Project

1.4.1 A number of the land parcels making up The Project are indicated by Oxfordshire County Council to fall within Mineral Safeguarding Areas (MSAs) for sharp sand and gravel or Mineral Consultation Areas (MCAs) that comprise a buffer around designated MSAs. Land parcels 9, 10, 12, 13 and 16 fall wholly or partially within designated MSAs (green shading) as presented in Drawing 1, whilst a portion of Land Parcels 7 and 8 fall within an MCA (cross hatching), or marginally into the boundary of the MSA.

1.4.2 The remainder of this report presents a Mineral Resource Assessment for the above land parcels that are located within MSAs and / or MCAs. These land parcels coinciding with the MSA/MCA designations are herein referred to as the ‘Site’.

1.5 Report Structure

1.5.1 The subsequent report structure is as follows:

- *Section 2: General Approach* – Provides a summary of the general approach adopted to deliver the agreed scope of works including a summary of all key data sources used in the MRA.
- *Section 3: Review of Mineral Planning Policy* – Provides a summary of the National, Regional and Local planning policy context in relation to

minerals. It also provides commentary on any supplementary planning documents relating to minerals.

- *Section 4: Site Setting* – Provides a summary of key aspects of the site setting, including a description of the geological and hydrogeological context for the assessment. This section describes the mineral designations relevant to The Project site.
- *Section 5: Mineral Resource Assessment* – Provides the mineral resource assessment for The Project site in terms of likely quantity and quality of mineral reserves and likely constraints on mineral extraction and an evaluation against mineral planning policies.
- *Section 6: Summary and Conclusions* – Summary of mineral resource assessment and evaluation of potential constraints for development resulting from criteria outlined in planning context applicable for The Project site.

2 General Approach

2.1 Overview

2.1.1 This MRA utilises available published geological and site setting information to evaluate the constraint that mineral resources present are likely to place on The Project given local mineral planning policy. The MRA provides a resource assessment that defines the extent of viable (extractable) mineral resources present on the Site, principally in relation to designated Mineral Safeguarding Areas (MSAs) and Mineral Consultation Areas (MCAs) defined by the Mineral Planning Authority (MPA) of Oxfordshire County Council (OCC). The available mineral resource is then evaluated against the mineral planning policy, with the viability and practicability of extraction and practicability of prior extraction of the safeguarded resources considered.

2.2 Data Sources

2.2.1 The geological setting for the Project has been determined from a review of publicly available data sources that include:

- British Geological Survey (BGS), Geology of Britain Viewer; and
- BGS Geindex Onshore.

2.2.2 In addition to material published by the BGS, the following mineral planning documentation produced by the MPA at OCC has been reviewed. This includes:

- Oxfordshire Minerals and Waste Local Plan, Part 1 – Core Strategy Adopted Plan (September 2017);
- Oxfordshire Minerals and Waste Local Plan Policies Map North (2017); and
- Oxfordshire Minerals and Waste Local Plan Policies Map South (2017).

- 2.2.3 It is understood that OCC has approved the production of a new plan to replace the adopted Oxfordshire Minerals and Waste Local Plan Part 1 - Core Strategy, and also in place of Part 2 – Site Allocations which had been in production. The new plan is yet to be produced and therefore the Oxfordshire Minerals and Waste Local Plan Part 1 – Core Strategy remains the current Development Plan Document and will be utilised to assess against within this MRA.
- 2.2.4 The following local policies have also been reviewed:
- West Oxfordshire Local Plan 2031 (adopted September 2018); and
 - West Oxfordshire Local Plan 2031 Policies Map.
- 2.2.5 RPS were also commissioned by Photovolt Development Partners GmbH to undertake a Desktop Study and Preliminary Risk Assessment (DTS & PRA) of The Project, which has been divided into a separate report for each land parcel, to provide sufficient detail for the PRA. The relevant land parcel reports should be read in conjunction with this report.
- 2.2.6 From a review of historical borehole logs made available on BGS Geoinformatics Onshore, there are a number of boreholes located within or within proximity to the land parcels considered in this report. Where necessary, reference is made throughout to the available BGS borehole records.
- 2.2.7 The general environmental setting has been obtained from publicly available data sources including:
- Defra Magic Maps (geology, hydrogeology and environmental sensitivity);
 - Ordnance Survey mapping;
 - Aerial photography; and
 - Environment Agency (EA) dataset of historical landfill sites in England.

3 Review of Mineral Planning Policy

3.1 Mineral Planning Context

- 3.1.1 For England, the key national planning policies for minerals are set out in the National Planning Policy Framework (NPPF), updated in December 2023. The focus of the NPPF is a presumption in favour of sustainable development. The NPPF recognises that minerals are essential to support sustainable economic growth and our quality of life. It is therefore important that there is a sufficient supply of material to provide the infrastructure, buildings, energy, and goods that the country needs whilst ensuring that permitted mineral operations do not have unacceptable adverse impacts on the natural and historic environment or human health. The NPPF also recognises that, since minerals are a finite natural resource, and can only be worked where they are found, it is important to make best use of them and to secure their long-term conservation through the mechanism of mineral safeguarding.
- 3.1.2 In the context of local planning, the land parcels affected by MSA and / or MCA designations fall within the West Oxfordshire District Council (WODC) Local

Authority area. WODC lies within administrative area of OCC which oversees all mineral and waste matters within the county. The principal documents and policies relating to strategic mineral planning within OCC are as follows:

- Oxfordshire Minerals and Waste Local Plan, Part 1 – Core Strategy Adopted Plan (September 2017); and
- West Oxfordshire Local Plan 2031 (adopted September 2018).

3.2 Oxfordshire Minerals and Waste Local Plan, Part 1 – Core Strategy (Adopted September 2017)

3.2.1 The Oxfordshire Minerals and Waste Local Plan, Part 1 – Core Strategy (MWLP) was adopted in 2017 to cover the period to 2031 and therefore represents the relevant current mineral policies in relation to mineral resources and mineral safeguarding across the Site. The following mineral planning policies are considered as part of this assessment.

3.2.2 Policy **M8: Safeguarding Mineral Resources** is the key policy in the MWLP (2017), that states:

“Mineral resources in the Mineral Safeguarding Areas shown on the Policies Map are safeguarded for possible future use. Development that would prevent or otherwise hinder the possible future working of the mineral will not be permitted unless it can be shown that:

- *The site has been allocated for development in an adopted local plan or neighbourhood plan; or*
- *The need for the development outweighs the economic and sustainability considerations relating to the mineral resource; or*
- *The mineral will be extracted prior to the development taking place.*

Mineral Consultation Areas, based on the Mineral Safeguarding Areas, are shown on the Policies Map. Within these areas the District Councils will consult the County Council on planning applications for non-mineral development.”

3.2.3 Mineral Policy 8 seeks to ensure that appropriate weight is accorded to the prior extraction of minerals which would otherwise be sterilised by built / non-mineral development. The above measures outlined in Mineral Policy 8 will be used to assess against as part of this MRA.

3.2.4 In addition, Policy **M3: Principal locations for working aggregate minerals** states that:

“The principal locations for aggregate minerals extraction will be within the following strategic resource areas, as shown on the Policies Map:

Sharp Sand and Gravel

In northern Oxfordshire (Cherwell District and West Oxfordshire District):

- *The Thames, Lower Windrush and Lower Evenlode Valleys areas from Standlake to Yarnton.*

Sites allocated for sharp sand and gravel working (including both new quarry sites and extensions to existing quarries, including any extensions outside the

strategic resource areas), to meet the requirement in policy M2 will be located such that approximately 25% of the additional tonnage requirement is in northern Oxfordshire and approximately 75% of the additional tonnage requirement is in southern Oxfordshire, to achieve an approximately equal split of production capacity for sharp and gravel between northern and southern Oxfordshire by 2031.”

3.2.5 The Project is partly situated within the Mineral Strategic Resource Area for sharp sand and gravel and therefore falls within an area identified for proposed future working of sharp sand and gravel. The Mineral Strategic Resource Area outlined above has been identified based on the Preliminary Assessment of Mineral Site Options (revised April 2016) issued by Oxfordshire County Council and sits within the Site boundary:

“SG-08 Land at Lower Road This site contains a small part of the Church Hanborough Conservation Area in the western parcel of the site below church road. However, this is a large site and the exclusion of this area should not restrict the majority of the site being deliverable. It is within the setting of the Cotswolds AONB, within the IRZ for several SSSIs and in close proximity to residential areas. Therefore, the site has been given an overall assessment of Amber.”

3.2.6 The location of SG-08 is indicated in Figure 2 below, and the corresponding Mineral Resource Strategic Area is presented in Figures 3(a) and 3(b).



Figure 2: Extract from Preliminary Assessment of Mineral Site Options (April 2016)

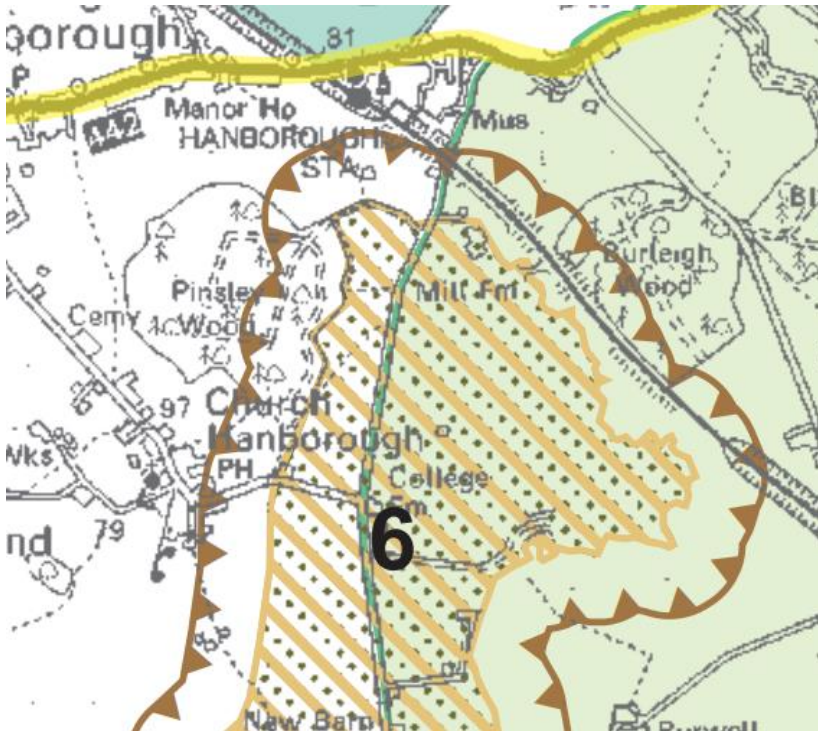


Figure 2: Mineral Resource Strategic Area

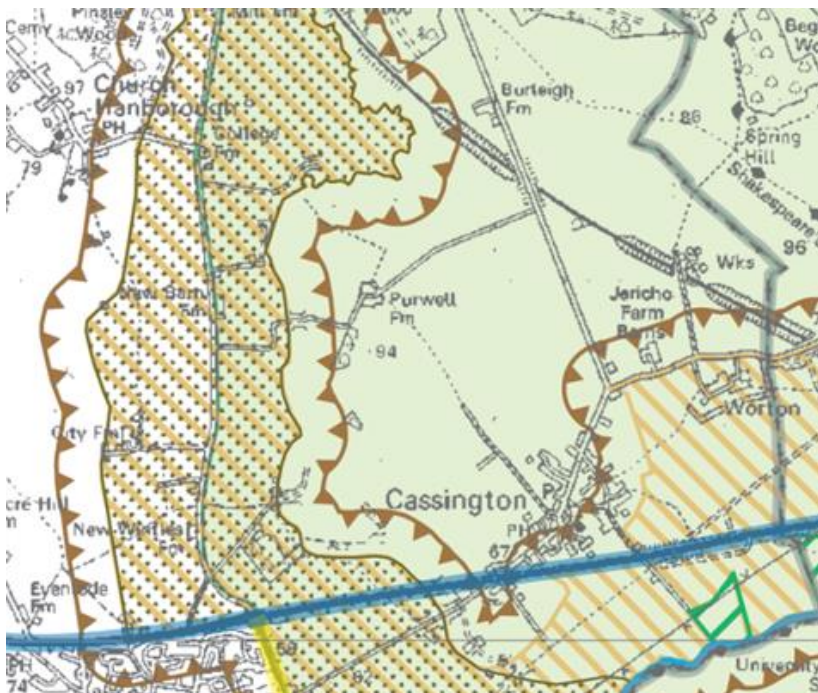


Figure 3: Cont. of Mineral Resource Strategic Area

3.2.7 Policy M1: Recycled and Secondary Aggregate states that:

“So far as is practicable, aggregate mineral supply to meet demand in Oxfordshire should be from recycled and secondary aggregate materials in preference to primary aggregates, in order to minimise the need to work primary aggregates.”

3.2.8 It is therefore considered that although The Project partially falls within a Mineral Resource Strategic Area, the OCC favour existing extraction sites and

the reuse of recycled and secondary aggregate materials where possible. Where primary aggregate material is required to meet sharp sand and gravel demand, the adopted MWLP indicates that additional sites where required should be met primarily in the southern part of the county under Policy M2 and as set out in Policy M3 above.

3.3 West Oxfordshire Local Plan 2031 (adopted September 2018)

3.3.1 The current West Oxfordshire Local Plan (WOLP) was adopted in 2018 and covers the period up to 2031. The core objectives of the WOLP include meeting the specific housing needs of the communities and protecting and enhancing the environment. One of the objectives to support enhancing the environment is to minimise the use of non-renewable natural resources and promote more widespread use of renewable energy solutions (CO17), and to improve the sustainable design and construction of new development, including improving energy, water efficiency and water management (CO18).

3.3.2 Five overall strategies to address the objectives that applies to all development regardless of scale or type are set out below:

- Presumption in favour of sustainable development (Policy OS1);
- Locating development in the right places (Policy OS2) – influencing where development takes place where most needed i.e. to protect important areas such as Green Belts;
- Prudent use of natural resources (Policy OS3) – consider the use of renewables;
- High quality design (Policy OS4); and
- Supporting infrastructure (Policy OS5).

3.3.3 West Oxfordshire District Council (WODC) state that sustainable development could be considered ‘protecting the Green Belt’.

3.3.4 To conserve and enhance the character of the natural environment, WODC have enlisted several designations.

3.3.5 Policy **EH2: Landscape Character** states that:

“...New development should conserve and, where possible, enhance the intrinsic character, quality and distinctive natural and man-made features of the local landscape...Conditions may be imposed on development proposals to ensure every opportunity is made to retain such features and ensure their long-term survival through appropriate management and restoration....Proposed development should avoid causing pollution, especially noise and light, which has an adverse impact upon landscape character and should incorporate measure to maintain or improve the existing level of tranquillity and dark-sky quality, reversing existing pollution where possible. Special attention and protection will be given to the landscape and biodiversity of the Lower Windrush Valley Project, the Windrush in Witney Project Area and the Wychwood Project Area.”

3.3.6 The Project is identified to fall within a designated Landscape Character Area, in accordance with Policy EH2 above. In addition, portions of Land Parcels 9,

10, 12, 13 and 16 also fall under the Wychwood Project Area, as presented in Figure 4 below. The project aims to restore the landscape character and mix of habitats associated with the Royal Hunting Forest of Wychwood and is considered to be an area identified for special landscape protection, conservation, and enhancement.

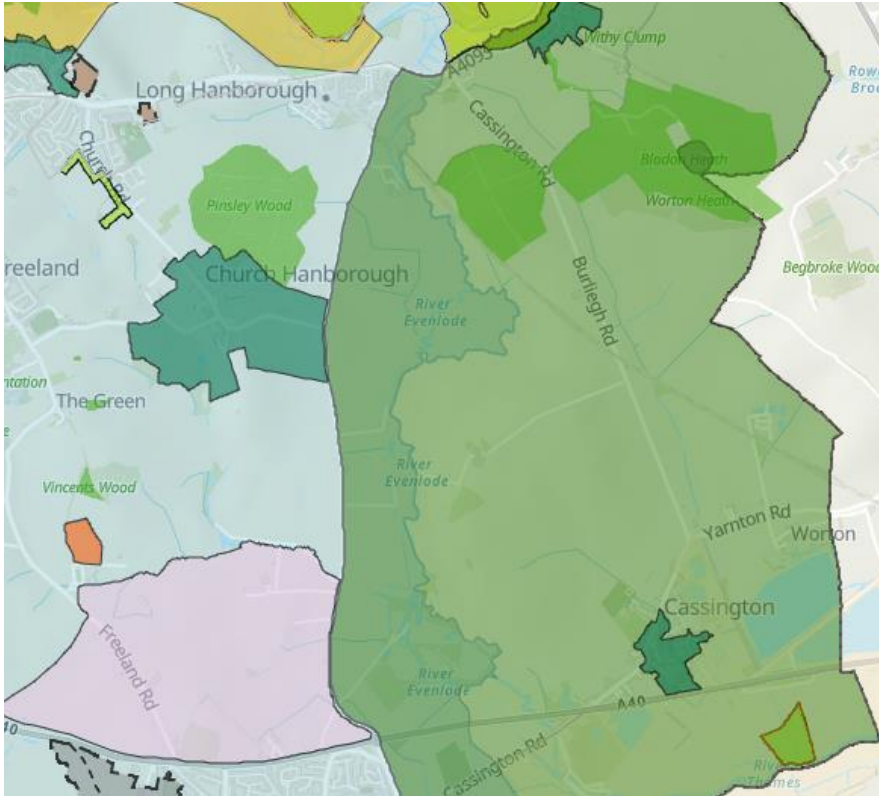


Figure 4: Extract from WODC Policies Map (adopted 2018)

3.3.7 Figure 4 is an extract from WODC Interactive Policies Map where the Wychwood Project Area is indicated as the shaded blue region (and also runs beneath the green shaded area of Green Belt).

3.3.8 WODC state that national policies should be adhered to for Green Belts, under Policy **OS2: Locating development in the right places**. It is however noted in the NPPF in paragraph 155 that “*certain other forms of development are also not inappropriate in the Green Belt provided they preserve its openness and do not conflict with the purposes of including land within it. These are...*

(a) Mineral extraction...”.

3.3.9 Notwithstanding, paragraph 217 of the NPPF states that “*When determining planning applications, great weight should be given to the benefits of mineral extraction, including to the economy. In considering proposals for mineral extraction, minerals planning authorities should:*

(a) as far as is practical, provide for the maintenance of landbanks of non-energy minerals from outside National Parks, the Broads, Areas of Outstanding Natural Beauty and World Heritage Sites, scheduled monuments and conservation areas.”

3.3.10 It is noted that the north portion of Land Parcel 12 is located within a Conservation Area, associated with the neighbouring village of Church

Hanborough. Policy **EH10: Conservation Areas** of WODC Local Plan (2018) states:

“Proposals for development in a Conservation Area or affecting the setting of a Conservation Area will be permitted where it can be shown to conserve or enhance the special interest, character, appearance and setting, specifically provided that:

- *The location, form, scale, massing, density, height, layout, landscaping, use, alignment and external appearance of the development conserves or enhances the special historic or architectural interest, character and appearance of the Conservation Area;*
- *The development conserves or enhances the setting of the Conservation Area and is not detrimental to views within, into or out of the Area;*
- *There would be not loss of, or harm to, any feature that makes a positive contribution to the special interest, character, or appearance of the Conservation Area, unless the development would make an equal or greater contribution.”*

3.3.11 It is anticipated based on the current indicative masterplan layout, as presented in Figure 1, that no solar panels are to be placed within the designated Conservation Area of Land Parcel 12.

4 Site Setting

4.1 General Site Setting

4.1.1 The Project is situated on predominantly undeveloped land that comprises agricultural fields.

4.2 Topography and Hydrology

4.2.1 The general topography of the Project generally follows the valley of the River Evenlode, sloping towards the east and south-east towards where the River Evenlode meets the River Thames and then crosses the Thames valley.

4.2.2 The nearest surface water features are the River Evenlode which runs through Land Parcel 9 and defines the eastern boundary of Land Parcel 9 and 13, and the southern boundary of Land Parcel 7 and the River Thames crossed by the cable route corridor linking the Central Site Area with the Southern Site Area.

4.3 Geological Setting

Regional Geology

4.3.1 The regional geological setting for the Project, as determined from publicly available data sources of the BGS is summarised in Table 4-1 and Figures 5 to 8 below. It should be noted that the bedrock geology has not been included in this section, given the safeguarded mineral of interest is solely the overlying superficial material.

Table 4.1: Regional Geology

Strata	Description & approximate thickness	Locations Identified
Superficial		
Alluvium	Typically comprises clay, silt, sand and gravel.	<ul style="list-style-type: none"> Southern portion of Land Parcel 7 (within MCA) Eastern half of westernmost Land Parcel 9, and whole adjacent land parcel 9, and western extents of the eastern land parcel 9 Eastern half and southern half of Land Parcel 13 Majority of Land Parcel 16 (southern cable route corridor)
Summertown Radley Sand and Gravel	Typically up to 6 m thick comprising sand and gravel.	<ul style="list-style-type: none"> Northern half of Land Parcel 10 South-west portion of westernmost Land Parcel 9 Eastern half and south-west of Land Parcel 12 North-western portion of Land Parcel 13 South-east of largest Land Parcel 9 South-west portion of south-eastern most Land Parcel 8
Wolvercote Sand and Gravel Member	Typically up to 3 m thick comprising cold phase sands and gravels of limestone, quartz/quartzite and flint.	<ul style="list-style-type: none"> North-east of Land Parcel 9 directly south of the railway South-west of largest Land Parcel 9 Northern tip of Land Parcel 7 Localised cover in Land Parcel 8 adjoining railway line.
Hanborough Gravel Member	Typically up to 6 m thick comprising sand and gravel.	<ul style="list-style-type: none"> North-west corner of Land Parcel 12 Central area of largest Land Parcel 9
Northmoor Sand and Gravel Member	Typically up to between 3 m and 7 m comprising cold phase sands and gravels of limestone, quartz/quartzite and flint.	<ul style="list-style-type: none"> North-western portion of Land Parcel 13 Underlying Alluvium in Land Parcel 16
Northern Drift Formation	Typically comprises quartzose and quartz gravel in a clay matrix.	<ul style="list-style-type: none"> North-east of largest Land Parcel 9

4.3.2 It is anticipated that sand and gravel deposits are present beneath the Alluvium, and where no superficial cover is indicated, are likely areas where the bedrock is outcropping / very shallow.

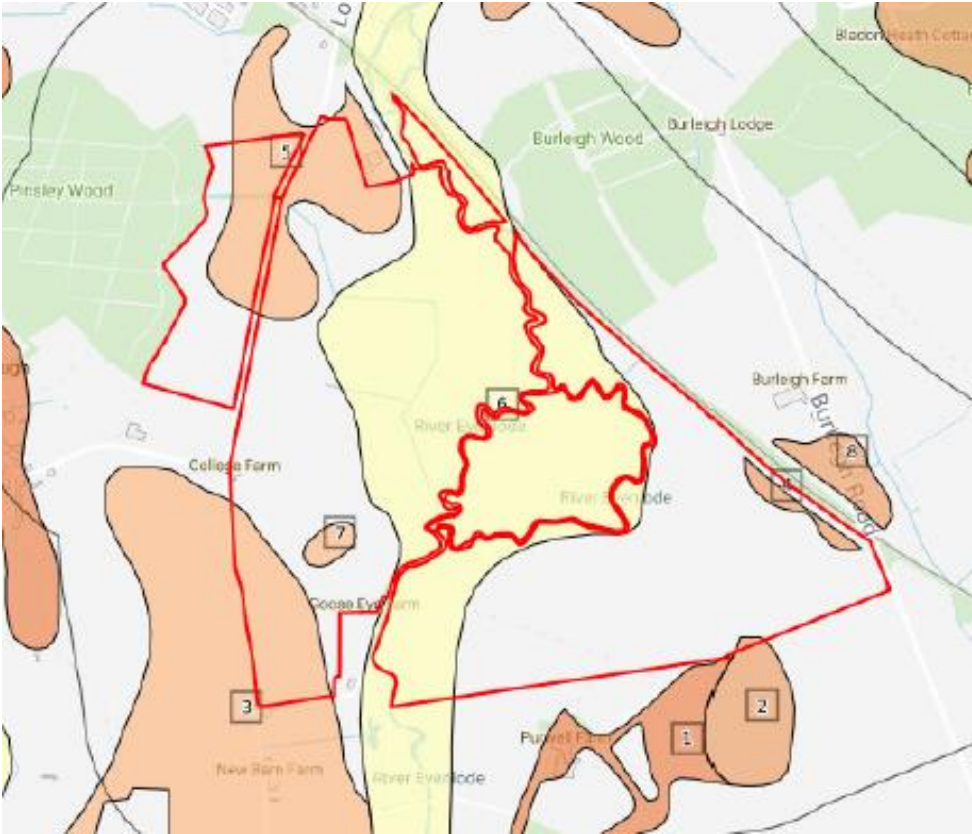


Figure 5: Extract from Groundsure Report ref. GSIP-2022-12757-10510_2 for Land Parcels 9 and 10

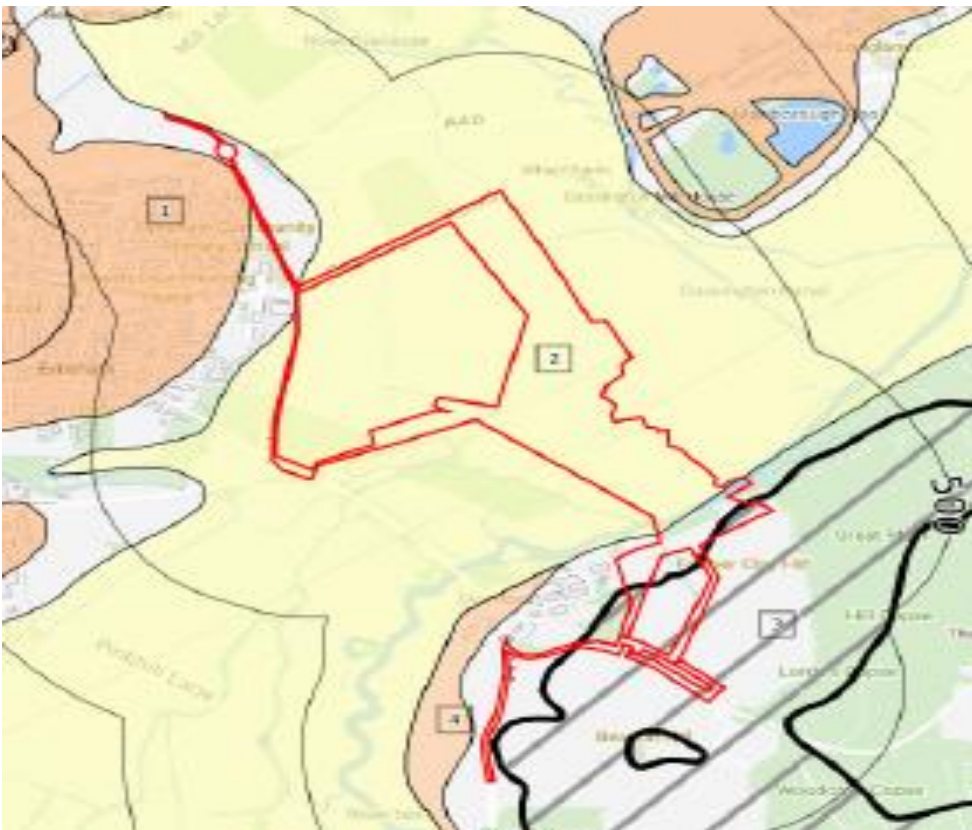


Figure 6: Extract from Groundsure ref. GS-VXZ-ISE-8WE-3DP for land parcel 16

Safeguarded Mineral Resource

4.3.3 The sand and gravel members (Summertown Radley, Wolvercote, Hanborough and Northmoor) constitute the safeguarded mineral resource present as defined by the ‘Sharp Sand and Gravel’ MSA defined in Drawing 1. Sand and gravel members are anticipated to underlie areas of Alluvium / Head Deposits where present.

Site-Specific Geology

4.3.4 The site-specific geology has been determined from historical borehole records available on the British Geological Survey (BGS) website. A general summary of the available borehole records is presented in Table 4-2 below, with the location of the records presented in Figure 9. It should be noted that where River Terrace Deposits are identified on historical records, these correlate to the sand and gravel members outlined above. Details of the underlying bedrock has not been included in the below table.

Table 4.2: Site-Specific Geology

Strata	Lithological Description	Thickness (m)
Topsoil	Brown silty clay with fragments of quartz and white limestone.	0.80
Alluvium	Yellowish brown silty clay.	0.70
Terrace Deposits	Very clayey gravel or gravel with white limestone, locally reddish brown sandstone, subrounded quartz and flint. Sand is fine to coarse or medium to coarse with occasional silt bands.	1.10 – 3.00

4.3.5 Only two available borehole records are present within anticipated areas of superficial cover and within the subject land parcels of this report; Refs SP41SW30 and SP41SW29.

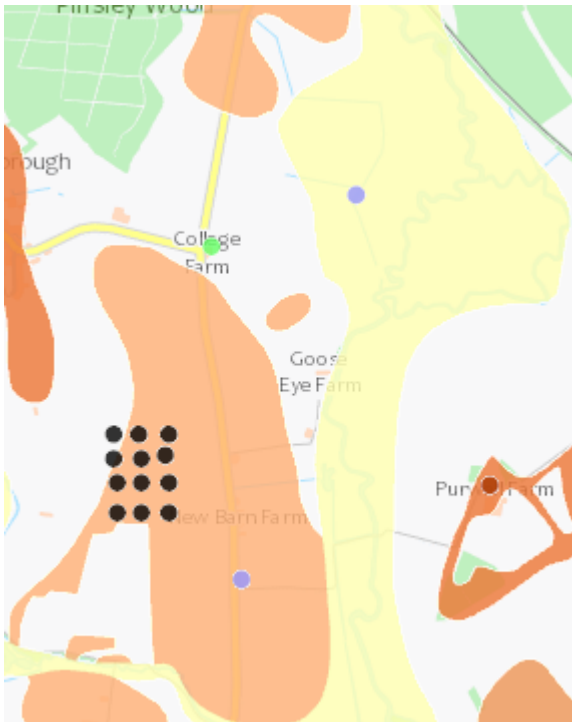


Figure 9: Two available borehole records in areas of superficial cover denoted in purple (BGS, 2023)

4.3.6 The available geological logs demonstrate that the sand and gravel at the site is relatively consistent with occasional silt bands or clayey in nature. Proven thicknesses of sand and gravel are recorded between 1.10 m and 3.00 m with overburden material comprising either topsoil or Alluvium between 0.70 m and 0.80 m in thickness.

4.3.7 The sand and gravel members are discontinuous across the Project, as proven by additional available borehole logs located in areas not indicated by BGS to be underlain by superficial deposits. The sand and gravel is also variable in thickness, and therefore likely to be highly variable across the Project. Given these findings are based on two available records only, a review of BGS Mineral Assessment Report ‘The sand and gravel resources of the country around Eynsham, Oxfordshire’ has been undertaken.

4.3.8 The Memoir reports on the identified thickness ranges of each sand and gravel (terrace) deposit based on Mineral Assessment Unit boreholes. In general, the thickness of Alluvium was indicated to be 2.50 m, which represents overburden material. Table 4-3 below summarises the thicknesses of each sand and gravel deposit.

Table 4.3: BGS Memoir Stratigraphic Thicknesses (1977)

Strata	Boreholes No.	Thickness Range (m)	Mean (m)
Glacial Sand and Gravel	5	1.00 – 2.50	1.60
Fourth Terrace (Hanborough)	3	1.00 – 1.90	1.60
Third Terrace (Wolvercote)	3	1.00 – 2.00	1.50

Strata	Boreholes No.	Thickness Range (m)	Mean (m)
Second Terrace (Summertown-Radley)	15	0.60 – 5.10	2.60
First Terrace (Northmoor)	43	1.10 – 6.60	3.30

4.3.9 The Memoir also reports that a correlation was made between topography and the volume of fines within samples, whereby at higher level (topography), the sand and gravel had greater fines content, and goes on to state that there is some variation within each terrace in different areas. In general, across the Project the deposits are generally gravel in nature with very clayey gravel recorded in the south.

4.4 Environmental Sensitivity

4.4.1 The Site is located within or near the following environmentally sensitive sites:

- Conservation Area – situated in the north half of Land Parcel 12;
- Green Belt – situated in Land Parcel 7, 8, 9, 13, 16;
- Site of Special Scientific Interest (SSSI) – approximately 10 m to the north of Land Parcel 7, identified as Blenheim Park;
- Ancient Woodland – within 5 m of Land Parcels 7, 8, 10 (within 20 m of Land Parcel 9);
- Landscape Character Area – situated in Land Parcels 7, 8, 9, 10, 12, 13, 16; and
- Wychwood Project Area – situated in Land Parcels 7, 9, 10, 12, 13, 16.

4.5 Hydrogeology

4.5.1 The sand and gravel members are designated Secondary A Aquifers.

4.5.2 An available BGS borehole ref. SP41SW35 located approximately 2 m from the westernmost Land Parcel 9 indicates the groundwater level at 12.20 m BGL, and a second (ref. SP41SW34) recorded the rest water level as 4.90 m BGL, both within bedrock where no superficial cover is present.

4.5.3 Given the presence of mudstone bedrock underlying a significant proportion of The Project, it is anticipated that the groundwater is shallow and is possibly in hydraulic continuity with the Rivers Evenlode and Thames.

5 Mineral Resource Assessment

5.1 Extent of Potentially Viable Mineral Resource on the Site

Total Volume of Potentially Viable Mineral Resource

- 5.1.1 The borehole logs summarised in Table 4-2 and Memoir records in Table 4-3 demonstrate that the safeguarded mineral resource is predominantly a gravel unit which is locally very clayey. The sand and gravel deposits underlying the Project represents the potentially viable mineral resource that could be of commercial interest for mineral extraction.
- 5.1.2 Based on limited available data, the thickness and distribution of safeguarded sand and gravel is variable. The presence of superficial cover is presented in Figures 5 to 8. Figures 5 to 8 also demonstrate the presence of clay-rich overburden material (predominantly Alluvium) across much of the Site and is typically up to 2.50 m thick across the Eynsham area.
- 5.1.3 It is reasonable to expect that:
1. Some mineral resource would be lost during excavation / removal of overburden where present, by an over-dig into the mineral resource horizon; and
 2. Some mineral resource will be left in place at the base of each excavation to ensure underlying clay is not intercepted during extraction.
- 5.1.4 Given that a proportion of the mineral resource will therefore be lost or left in-situ following excavation, it is reasonable to consider that the viable mineral resource present on the Project is represented by those areas where at least 1 m of laterally continuous sand and gravel mineral resource is present. Given the recorded thickness of terrace deposits documented in the BGS Memoir, it is reasonable to assume that in general, the sand and gravel is at least 1.00 m thick where present. Based on these assumptions, an estimate of the volume of potentially viable mineral resource across the Project has been estimated and summarised in Table 5-1 below. The average thickness of sand and gravel has been taken as the average of the mean thicknesses across the terrace deposits stated in the BGS Memoir. The estimated area is the area over which superficial cover is present across the Site i.e. the area of which there is potential mineral resource and is presented in Figure 9 below.

Table 5.1: Volume of Potentially Viable Sand and Gravel Mineral Resource

Site Area	Estimated Area (m ²)	Average Sand and Gravel Thickness (m)	Volume of Resource (m ³)	Volume of Resource Less 'Lost Resource' (m ³)
Area of Total Viable Mineral Resource	2,695,000	2.10	5,659,500	4,581,500 *

*Based on assumption that up to 0.40 m of lost resource (i.e. 0.20 m of resource below overburden and above clay bedrock)

- 5.1.5 The calculations presented in Table 5-1 suggest there is potentially approximately 4,581,000 m³ of potentially viable (i.e. extractable) Sharp Sand and Gravel mineral resource across The Project. Although this is considered a substantial resource of sand and gravel, this does not take into account the areas of superficial deposits that will not be affected by development i.e. development footprint. It is estimated that at least 1,000,000 m² of the area of total viable mineral resource will not be overlain by development, as presented in Figure 9. If this were to be considered, the volume of potential resource less 'lost resource' would reduce substantially to approximately 3,581,000 m³.
- 5.1.6 In addition, the above calculations do not consider the application of reasonable buffers.
- 5.1.7 It is also noted that where the cable route within Land Parcel 16 is proposed along existing roadways/highways, these areas have not been considered within the calculated volumes above. It is considered that where cable is routed along existing roads within service trenches, this will not cause any additional sterilisation of sand and gravel resources above what is already sterilised by the roads and services infrastructure present.

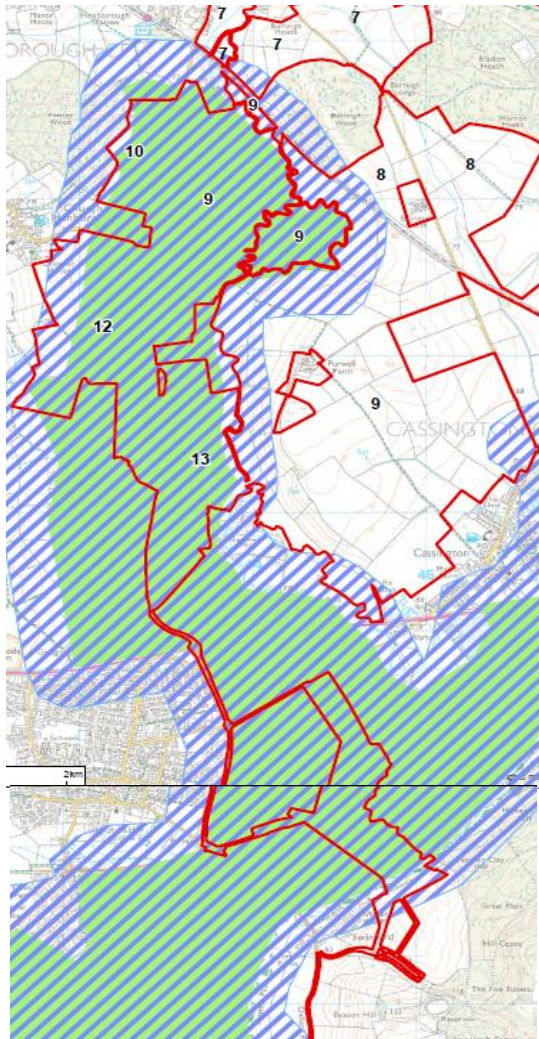


Figure 10: Areas of Viable Sharp Sand and Gravel within designated MSA/MCAs that fall within the Site (areas indicated by blue line). This figure does not take into account the development footprint or buffers.

5.1.8 The above volume does however reflect the areas of cable within Land Parcel 16 that is proposed for routing across non-development land (i.e. potentially available resource). However given the cable is proposed to be routed within 1.60 m BGL of the ground surface, it is likely that any excavation and removal of material will be limited to within the overlying Alluvium material.

Buffer Zones and Constraints on Mineral Extraction

5.1.9 The estimate of potentially viable sand and gravel resource presented in Table 5-1 does not consider other limitations to mineral extraction that may reasonably be expected to apply given the site setting and nature of the extraction process. As described in Mineral Safeguarding in England: good practice advice (BGS, 2011) buffer zones are commonly applied around safeguarded mineral areas and used in the consideration of the extent of viable resources. Buffer zones limit the area of potentially extractable resource, by defining those areas where the extraction of safeguarded mineral resources would not be expected due to:

- Proximity to existing sensitive development that could be adversely affected by the effects of extraction (i.e. noise, dust, visual impact, transport and / or vibration as per paragraph 217c of the NPPF, 2023) most notably:
 - Schools, hospitals, and nurseries.
 - Residential development and supporting infrastructures (e.g. parks and amenity areas).
 - Community centres.
- The requirement to protect sensitive environmental receptors protected under paragraph 217 of the NPPF (2023) that could be impacted by extraction and include:
 - Designated sites (e.g. SSSI).
 - Ancient Woodland.
- Strategic infrastructure including:
 - Roads & highways.
 - Above or below ground utilities and services.
- Geotechnical and operational considerations associated with mineral extraction, most notably securing a geotechnically sound site boundary.

5.1.10 The width of protective buffer zones that may potentially be applied are not prescribed in the planning policies reviewed as they would typically be determined as part of the planning process for a mineral extraction proposal. Furthermore, the detailed quantitative assessment required to determine impacts and define buffer zones are beyond the scope of an MRA. However, it is noted that:

- Industry guidance does provide some indication of possible standoffs that may be required, for example, the *Environmental Effects of Dust from Surface Mineral Workings* (Department of the Environment Minerals

Division, 1995) states that in the absence of a quantitative dust assessment a minimum standoff of 100 – 200 m is recommended from significant dust sources.

- The Welsh Assembly Government takes the view that the following minimum distances should be adopted unless there are clear and justifiable reasons for reducing the distance (Mineral Planning Policy (Wales): Mineral Technical Advice Note (Wales) – 1. Aggregates) :
 - Sand and gravel (and others where no blasting is permitted): 100 metres; and
 - Hard rock quarries: **200 metres**.
- A Topic Paper entitled Preliminary Assessment of Mineral Site Options (revised April 2016) issued by Oxfordshire County Council considers that “mineral workings are unlikely to be acceptable in close proximity to residential areas. Where a site is within 100 m of a residential area, the effects are likely to be such that they are unacceptable in terms of residential amenity. There may be some cases where a small part of the site is within 100 m of a residential area, and this may be acceptable depending on the level of impact, which will need to be subject to further consideration. The following weightings have been used:
 - Whole site within 100 m = Red (site is unlikely to be acceptable for minerals development);
 - Part of the site within 100 m = Amber (depending on the amount of site within 100m) (site may be acceptable, but further detailed considerations are needed to confirm this); and
 - Site outside of 100 m = Green (no reason as this stage to exclude the site from proceeding as a nomination).

5.1.11 SG-08 (identified site for Mineral Resource Strategic Areas (MRSA)) to the south of Lower Road, Church Hanborough is designated as Amber. In accordance with Figures 3(a) and 3(b), the identified MRSA accounts for Areas of Natural Outstanding Beauty, Special Conservation Areas and waterbodies associated with the latter but does not include buffers for residential development nor designated Conservation Area to the north of Land Parcel 12. As stated above, an Amber site requires further consideration.

5.1.12 For the purpose of this MRA, the following buffer zones are considered reasonable and have been initially applied to further evaluate the distribution, extent and volume of viable mineral resource and its associated economic viability as a resource:

- 25 m standoff to protect mineral excavation boundary structural integrity;
- Existing residential development: 100 m buffer zone;
- River Evenlode: 50 m buffer zone;
- Ancient Woodland: 25 m buffer zone;

- Conservation Area: 100 m buffer zone; and
- SSSI (Blenheim Park): 50 m buffer zone.

5.1.13 If the above buffers are also considered, the volume of potentially viable mineral resource is reduced further. It should also be noted that given the proposed development is to be temporary in nature, the potentially viable mineral resource beneath the Site will not be permanently sterilised.

5.2 Current Extraction of Sharp Sand and Gravel in West Oxfordshire

5.2.1 In accordance with Policy M2 of Oxfordshire County Council's MWLP, the minimum landbank of sharp sand and gravel reserves is 7 years. The most up to date Local Aggregate Assessment (LAA) was produced in 2014 which included for a provision rate of 1.015 million tonnes per annum and therefore up to 2031, a total provisional requirement of 18.270 million tonnes is required. The LAA stated that existing planning permissions could provide a supply of sharp sand and gravel until 2028 (up to 12 years of landbank reserve). The current permissions for extraction largely fall within the West Oxfordshire District Council, and therefore OCC have stated that the preferred strategy to meet the demand to 2031, is for 25% of additional tonnage required to be provided within areas of West Oxfordshire, and 75% from Southern Oxfordshire. OCC consider that this reflects the current situation of concentration of remaining permitted reserves predominantly within West Oxfordshire District and this should lead to an approximately equal split of production capacity for sharp sand and gravel between northern and southern Oxfordshire by 2031.

5.2.2 It is therefore understood that the requirement for additional sharp sand and gravel extraction sites should primarily be met within southern Oxfordshire over areas within northern Oxfordshire (under WODC).

5.2.3 There are a number of active mineral working sites within WODC, with the closest to the Site being in Cassington. Cassington Quarry, located in Worton, OX29 4EB, approximately 500 m to the south-east of the south-eastern most Land Parcel 8. Available records on WODC planning website indicate that permission was granted to extend the extraction period at Cassington Quarry to December 2024 to allow sufficient working of sand and gravel beneath the plant site under planning permission ref. 15/04415/CM. From aerial imagery, there does not appear to be permanent plant or conveyors at the quarry site, and therefore, an extension from the quarry towards the Site is likely not viable. The extension was formerly identified to locate SG-08 as a potential extension of the existing Cassington Quarry, however they are over 1 km apart, and there is no evidence of a mineral manufacturing or plant existing. If a new planning application was to be made for mineral extraction in the vicinity of SG-08, new access routes for plant would need to be established and a new plant processing/manufacturing facility constructed.

5.3 Need for the Development Against Potential Mineral Sterilisation

- 5.3.1 One of the five objectives of the adopted WOLP is to support the enhancement of the environment by minimising the use of non-renewable natural resources and by promoting the use of renewable energy solutions.
- 5.3.2 The Project is considered to be a Nationally Significant Infrastructure Project (NSIP) as it could deliver 840 MWe of power to the National Grid. It is estimated that the Project will generate approximately 1,350 MWp of power to the National Grid, which will provide clean energy to the equivalent of approximately 330,000 homes in Oxfordshire and support Oxfordshire's Energy Strategy target of a 50 % reduction in carbon emissions by 2030, and 100% net zero carbon emissions by 2050 countywide. The Project is considered a real opportunity to contribute to the transition to net-zero in Oxfordshire.
- 5.3.3 Much of the UK still does not have the capacity to provide the same scale of power generation from solar given the current capacity of the overhead line (OHL) network and no new generation can be connected until 2032. The Project site location benefits from an existing OHL network with a 440 kV capacity, available land for a new substation, suitable land for the solar arrays and an existing enlarged substation at Cowley. The period for the submission of the Development Consent Order (DCO) for The Project is winter of 2024 and the anticipated decision from Secretary of State is expected 2025/2026. The current grid connection date is expected to be in the Autumn of 2027.
- 5.3.4 The county's annual electricity consumption is approximately 5.7 terawatt-hours (TWh). With the solar farm generating 840 MW, assuming an average capacity factor of 20% (which is typical for solar farms), it could produce about 1.5 TWh of electricity annually. This output would cover circa 26 % of Oxfordshire's total electricity needs, contributing significantly to the county's energy supply.
- 5.3.5 As of 2021 consensus, there were 288,000 homes across Oxfordshire. The planned growth for the period 2016 to 2031 is to increase this to 388,000 homes. The Project will contribute to generating power to 330,000 homes, meeting 85% of the projected residential energy demand while simultaneously contributing to Oxfordshire's clean growth strategy and industrial strategy.
- 5.3.6 While the loss of mineral resources is a concern, the solar farm's significant contribution to Oxfordshire's renewable energy supply and its role in meeting climate targets provide a compelling argument for its development.

5.4 Practicability of Prior Extraction

- 5.4.1 Notwithstanding the assessment of the extent of viable resource and the economic viability for its commercial extraction, the practicability of the prior extraction of safeguarded mineral reserves, in advance of any proposed development, must also be considered. Prior extraction could involve either:
- Full extraction of safeguarded reserves in advance of, or in parallel with, construction.

- Incidental extraction – the extraction of safeguarded reserves by virtue of activities required as part of development construction activities (e.g. foundations, services, site reprofiling etc.).

Full Prior Extraction

- 5.4.2 The prior extraction of sharp sand and gravel could be considered practicable where time allows, however given the importance of the Project and timelines to get clean power on the grid in Oxfordshire to meet Oxfordshire's Energy Strategy, the prior extraction is not considered practicable here. The following considerations have been taken account of to support this.
- 5.4.3 There is a relatively sporadic distribution of sharp sand and gravel across a number of the land parcels, which with the application of reasonable buffer zones, is considered that some land parcels may not be favourable for prior extraction.
- 5.4.4 The land parcels making up The Project are either separated by main roads, railway or the River Evenlode, which impose their own buffers to each land parcel in terms of mineral extraction. This means that if prior extraction were to be undertaken, a number of working sites would need to be established – set up at each land parcel with construction of conveyors and plant. A higher cost would be associated with a number of mineral extraction sites, and the associated costs for excavation backfill of each and restoration to c. ground level using imported infill materials of an appropriate quality to enable development.
- 5.4.5 The high sensitivity of proximal receptors should also be considered, most notably existing residential development within and neighbouring the land parcels of the Site which would impose a minimum 100 m buffer around. In land parcels 12 and 9, there are dwellings / buildings in central areas of indicated superficial cover which would limit the viability and extractability of considerable resources.
- 5.4.6 Allocated sites for additional mineral extraction is also set to be met primarily within southern Oxfordshire with less importance placed on the need for sites under West Oxfordshire District Council.
- 5.4.7 There is also a considerable amount of overburden material that would need to be removed should prior extraction be an option. The typical thickness of Alluvium is proven in the area to 2.50 m, whilst the topsoil overlying the sand and gravel where Alluvium is absent, is up to 0.80 m thick. The Alluvium comprising an estimated 80% of the superficial cover, which would result in an estimated 3,165,750 m³ of overburden material required to be removed prior to sharp sand and gravel. It should be noted that this is not taking into account any buffers nor the development footprint but does highlight that comparable volumes of overburden material, if not greater volumes of material, would need to be removed to extract similar volumes of sharp sand and gravel.
- 5.4.8 It should also be noted that the development is temporary in nature and there are to be no permanent structures constructed as part of the development. Current planning guidance on Renewable and Low Carbon Energy, issued on 18th June 2015 by the UK Government, states that “solar farms are normally

temporary structures and planning conditions can be used to ensure that the installations are removed when no longer in use and the land is restored to its previous use”.

- 5.4.9 The temporary nature of the Project therefore indicates that the development will not permanently sterilise safeguarded sharp sand and gravel in West Oxfordshire and there is a possibility that the minerals can be extracted in the future following decommissioning of the solar farm. The exception to this will be all 33 kV and 275 kV cables where they have been laid in the public highway and where cables have been laid using horizontal directional drilling – either under rivers, road, rail crossings, or existing landscape features. In such cases, the cable is routed in areas that have already been sterilised by the existing infrastructure and therefore does not contribute to sterilisation of further resource. In areas where the cable is routed through non-developed land, and subsequently removed during decommissioning, it is considered that the material disturbed by routing and removal is likely to be within the overlying Alluvium in those areas. The only permanent structure following the lifetime of the solar farm and decommissioning, that would be considered to permanently sterilise potential resource are any NGET substation. However, given the typical minimal footprint of such features, it is not considered they will sterilise any economically viable mineral resources.

Incidental Extraction

- 5.4.10 The majority of The Project is to be predominantly covered by solar arrays as set out in Figure 1. The distribution of anticipated superficial cover is sporadic, with some areas considered likely to have greater overburden material where Alluvium is present.
- 5.4.11 It is considered that incidental extraction may be possible during the construction phase where excavations, for example, for foundations and / or subsurface utilities encounter the safeguarded sand and gravel resources. Given the potential overburden material, it is considered that small volumes of mineral resource may be generated from such excavations and should be primarily reused on-site, including as a sub-base material for development structures where suitable. Where not required, any surplus material may be taken to the local market and sold off-site. Details of such sales would need to be provided to Oxfordshire County Council’s Minerals and Waste team to support future mineral planning.
- 5.4.12 It should also be noted that where small volumes of safeguarded resource are subject to incidental extraction, this would not significantly impact on the total volumes of potential resource and still renders the Site viable for future full extraction following decommissioning.

5.5 Assessment Against Planning Policies

- 5.5.1 The finding of the mineral resource assessment presented above has been evaluated against the mineral planning policies relevant and described in Section 3. This assessment is presented in Table 5-2 below.

Table 5.2: Assessment Against Mineral Planning Policies

Policy	Planning Condition / Position Statement	Summary of Assessment
Oxfordshire County Council Minerals and Waste Local Plan (adopted 2017)		
Policy M8: Safeguarding Mineral Resources	Mineral resources in the Mineral Safeguarding Areas shown on the Policies Map are safeguarded for possible future use. Development that would prevent or otherwise hinder the possible future working of the mineral will not be permitted unless it can be shown that:	
	<ul style="list-style-type: none"> The site has been allocated for development in an adopted local plan or neighbourhood plan; or The need for the development outweighs the economic and sustainability considerations relating to the mineral resource; or 	<p>Not Applicable – The Project has not been allocated for development, however, is within a Mineral Resource Strategic Area.</p> <p>Applicable – One of the main objectives of the WODC Local Plan is to increase the use of renewable natural resources. The Project is considered to be a nationally significant infrastructure project that will provide enough clean energy to power approximately 330,000 homes. As of the 2021 consensus, there were 288,000 homes across Oxfordshire but this is projected to increase by 100,000 homes between 2016 and 2031 in accordance with Oxfordshire’s Energy Strategy. The Project is key to addressing the increased energy generation required to support the forecasted increase in homes.</p> <p>The Project is uniquely located with an OHL network of the capacity required for a large-scale solar farm, located near an already enlarged substation, and there is suitable available land for a new substation and for the solar farm arrays.</p>
	<ul style="list-style-type: none"> The mineral will be extracted prior to the development taking place. 	<p>Not Applicable – Site wide prior extraction is not viable or practicable considering:</p> <ul style="list-style-type: none"> With a capacity of 840 MW and a projected annual generation of 1.5 TWh, the Project will meet around 26 % of Oxfordshire’s electricity demand during its 42-year operational period. This temporary development is essential for addressing the county’s immediate energy needs and supporting its climate goals, including net-zero emissions by 2050.

Policy

Planning Condition / Position Statement

Summary of Assessment

- The Project's limited lifespan ensures that full extraction remains viable after decommissioning, balancing the urgent need for renewable energy with long-term resource management.

Incidental mineral extraction may occur during excavations, where required, for foundations and services / utilities. That material will be reused on Site during the development, with surplus material released into the local market.

6 Summary and Conclusions

- 6.1.1 A mineral resource assessment has been undertaken for a proposed development on land in Oxfordshire. This assessment was required in support of the planning application for the proposed Botley West Solar Farm Project. For ease, The Project has been divided by RPS into 16 land parcels. A number of land parcels fall within a designated Sharp Sand and Gravel Mineral Safeguarding Area (MSA) or a Mineral Consultation Area (MCA).
- 6.1.2 Mineral issues associated with the proposed development have been considered in relation to the currently adopted Oxfordshire County Council Mineral and Waste Local Plan (MWLP) for the period up to 2031 (adopted in 2017).
- 6.1.3 This mineral resource assessment has utilised publicly available geological information but has placed particular reliance on site-specific geological and hydrogeological data obtained from available historical BGS borehole records and BGS Mineral Assessment Report on sand and gravel within the county of Oxfordshire.
- 6.1.4 The safeguarded mineral resource present is 'Sharp Sand and Gravel' from a number of river terrace deposits. The site-specific and county dataset has demonstrated that the sharp sand and gravel deposits of potential commercial interest are variable in thickness across and from mapped extents of superficial cover across The Project by BGS, indicates that the superficial deposits are sporadically distributed, and therefore discontinuous.
- 6.1.5 The total volume of potentially extractable minerals present beneath the affected Land Parcels is relatively substantial however comparable volumes of overburden material are also anticipated which would need to be removed prior to extraction of the safeguarded mineral resource. The volume of viable (i.e. extractable) safeguarded resource is substantially reduced by the application of the suitable and reasonable buffers, applied given the proximity of sensitive receptors. Each land parcel is separated by the River Evenlode or a main road, and therefore a number of extraction sites would need to be established – at least one for each land parcel.
- 6.1.6 The incidental extraction of safeguarded sand and gravel resources is expected to occur during the construction phase for foundations of the substations, and that small volume of mineral resource will be re-used on the Site.
- 6.1.7 The Project is considered essential in meeting 85 % of the projected residential energy demand to 2031 and playing a pivotal role in reducing county-wide emissions by 50 % by 2030. Given the scale of Oxfordshire's planned development and the necessity of sustainable energy solutions, the benefits of this Project far outweigh the temporary impact of mineral sterilisation. The long-term advantages of securing energy for 330,000 homes and contributing to the county's clean growth strategy make the Project indispensable for Oxfordshire's future.
- 6.1.8 The results of the mineral resource assessment have been evaluated against Policy M8: Safeguarding Mineral Resources of the adopted Oxfordshire

County Council Minerals and Waste Local Plan for the period to 2031. The assessment has concluded that the proposed development will not result in the permanent sterilisation of mineral resources, and the national importance of the Project outweighs the importance of the safeguarded resources beneath the affected Land Parcels of the Site, and is therefore consistent with Policy M8, without the need for prior extraction.

7 References

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