Great North Road Solar and Biodiversity Park

Environmental Statement Report

Volume 4 – Technical Appendices

TA A10.8 – Desk Top Study and Preliminary Risk Assessment Study – Area 8

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A10.8.1. INTRODUCTION

A10.8.1.1. PREAMBLE

1 RPS Consulting Services Ltd (RPS) was commissioned by Elements Green Trent Ltd to undertake a Phase 1 Desk Study and Preliminary Risk Assessment (DTS and PRA) of The Great North Road Solar and Biodiversity Park (GNR; "the Development"), within the Order Limits. The report has been commissioned prior to the submission of the application for DCO consent for the Development.

2 The Development would be located to the north-west of Newark, in the Newark and Sherwood district, Nottinghamshire, East Midlands. The Development would be within an area bound by the Order Limits. The Order Limits are to the west of the A1, north of the A617, east of Eakring, and south of Egmanton, to the north and north-west of Staythorpe. The Development essentially consists of discrete land parcels proposed to be occupied by solar PV panels, BESS and associated infrastructure, and connected by cable route areas. The eastern side of the Development runs from the north of Norwell to Egmanton in the north (with additional parcels of land for mitigation/enhancement around North Muskham). The western side of the Development runs north-west from Staythorpe Power Station and then splits at Maplebeck, with spurs running to Eakring in the north-west and Kneesall to the north-north-east, then connecting with the eastern side of the Development.

3 A plan showing the location and Order Limits for the Development is provided as Figure 10.1: Site Desk Study Zoning Plan in Volume 2 Chapter 10 – Ground Conditions and Land Contamination [EN010162/APP/6.2.10]. In order to provide sufficient detail for the PRA, the Development has been subdivided by RPS into eight study areas (referenced as Study Areas 1 – 8). It should be noted that the split of the Study Areas are based on the previous Order Limits for PEIR and therefore the DTS and PRA presents an assessment of an area that is inclusive of the current Order Limits. It should be noted that where cable routes extend beyond the Study Area, along existing public highway, these cable routes have not been subject to specific desk based review or considered within the conceptual site model on the basis that these public highways would have been constructed to adoptable standards and therefore are not considered to represent potentially contaminated areas.

1 This report presents the Desk Top Study (DTS) information and Preliminary Risk Assessment (PRA) for Study Area 8, as shown in Figure A10.8.1: Study Area 8 Boundaries. This constitutes Field Parcel ID's 62, 63, 68, 69, 83, 84, 85, 86, 87, 89, 91, 92, 94, 96, 97, 98, 99, 100, 101, 103, 104, 105, 106, 107, 108, 110, 111, 112, 114, 115, 118, 119, 120, 128, 135, 136, 578, 138, 218, 227, 228, 229, 233, 234, 235, 270, 292, 340, 397, 441, 442, 448, 463, 486, 496, 537, 538, 539, 540, 541, 542, 552, 137 and 579, and as shown in Figure A10.8.2: Study Area 8 Field Boundaries.

2 The wider area within and surrounding the Order Limits are generally composed of agricultural land, interspersed by occasional woodlands.

Surrounding villages and hamlets are connected by rural roads and public rights of way. Smaller fields and tree cover are more common close to the villages and along water courses, with larger and more open fields set further away. The total area of the Development Site is approximately 1,765 hectares (ha), the majority of which is currently used for arable crops or pasture.

3 The Desk Study assessment is based upon a review of published information available from local, regional, and national agencies. The desk study information is derived from Insight Reports provided by Groundsure, Refs. GSIP-2024-16448-21124_A and GSIP-2024-16448-21124_B which Volume 4 Technical Appendix A10.11 – Desk Study and Preliminary Risk Assessment Groundsure Data [EN010162/APP/6.4.10.11]. Please note the terms and conditions attached to the supply of data from Groundsure. It should be noted that the Study Area boundaries presented within the Groundsure Insights Reports are based on the previous Preliminary Environmental Information Report site boundary which was provided at the time of purchasing the Groundsure data. Only information relating to the Study Areas and a data search buffer of 250 m, where relevant, has been included within this assessment.

A10.8.1.2. OBJECTIVES

4 The principal objectives of this assessment were as follows:

- Establish from published sources the geological sequence for Study Area 8 and potential for ground instability to occur through development proposals;
- To assess potential sources of contamination associated with historical and current land uses both on Study Area 8 and within a data search area of 250 m radius;
- To review the environmental setting to assess the sensitivity of the surrounding area to contamination/pollution;
- To produce an outline Conceptual Site Model (CSM) detailing how any contamination may impact the identified receptors via pollutant linkages; and
- To conclude on the likely requirement for any further assessment and ground investigation required in support of the DCO application.

5 The PRA methodology utilised in the preparation of this assessment is presented in detail in Annex B.

A10.8.1.3. LEGISLATION AND GUIDANCE

6 The assessment has been undertaken in general accordance with British Standard BS EN ISO 21365:2020[1] and is considered suitable to meet the initial requirements of planning as outlined within the National Planning Policy

[1] British Standards Institution (2020). BS EN ISO 21365:2020 soil quality. Conceptual site models for potentially contaminated sites. Available at: https://standardsdevelopment.bsigroup.com/projects/2017-02617 (accessed 21.05.2025)

Framework (NPPF)[2]. The assessment also reflects the recommendations of Environment Agency guidance, Land Contamination: Risk Management, (LCRM 2023)[3].

7 This report has been produced in general accordance with:

- Contaminated Land (England) Regulations 2006 (as amended);
- DEFRA Environmental Protection Act 1990: Part 2A – Contaminated Land Statutory Guidance (2012);
- Environment Agency (2023) Land Contamination: Risk Management (LCRM 2023);
- National Planning Policy Framework (2024);
- CIRIA Document C665 (2007): Assessing Risks Posed by Hazardous Ground Gases to Buildings;
- British Standard requirements for the 'Investigation of potentially contaminated sites – Code of practice' (ref. BS10175:2011+A2:2017);
- British Standard requirements for the 'Code of practice for ground investigations' (ref. BS5930:2015+A1:2020); and,
- British Standard requirements for the 'Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings' (ref BS8485:2015+A1:2019).

8 Details of the limitations of this type of assessment are described in Annex C.

A10.8.2. DESCRIPTION OF STUDY AREA 8 AND DESK STUDY

9 Study Area 8 comprises the north-west of the Order Limits and is bounded by the village of Maplebeck to the south-west, the village of Kersall to the west, Ossington Road in the north and the village of Norwell Woodhouse to the east and is bisected by the A616 aligned north-west to south-east. See Figure A10.8.2: Study Area 8 Boundaries for the extent of Study Area 8.

10 The Study Area has a general topographic trend of slope from north-west to south-east from approximately 90 m Above Ordnance Datum (AOD) in the north-west to 60 m in the south-east and in the south from north-east (60 m AOD) to south-west (35 m AOD) on the northern side of The Beck valley.

11 Given the absence of potentially significant contaminative land uses / sources, as identified from environmental data searches, within the Study Area, a targeted site inspection has not been required of this Study Area.

12 Study Area 8 is located in an area of predominantly agricultural land use. The neighbouring land consisted of the following:

[2] Ministry of Housing, Communities and Local Government, National Planning Policy Framework (Dec 2024/ Amended Feb 2025) Available at: https://assets.publishing.service.gov.uk/media/67aafe8f3b41f783cca46251/NPPF_December_2024.pdf (accessed 21.05.25)
[3] Environment Agency (2023). Land Contamination: Risk Management (LCRM). Available at: https://www.gov.uk/government/publications/land-contamination-risk-management;lcrm (accessed on 25.01.2025).

Table A10.8.1: Neighbouring Land Uses

Direction	Description
North	Undeveloped agricultural land, Ossington Road, Study Area 7, Laxton Wood and Middle Wood.
East	Undeveloped agricultural land, village of Norwell Woodhouse, High Wood, farm buildings.
South	Undeveloped agricultural land, village of Maplebeck and Study Area 1.
West	Undeveloped agricultural land, village of Kersall, Victoria Plantation, ponds.

A10.8.2.1. THE DEVELOPMENT

A10.8.2.1.1. The Great North Road Solar and Biodiversity Park (GNR) ("the Development")

4 Full details and a detailed description of The Development are outlined in Environmental Statement (ES) Volume 2 Chapter 5 - Development Description [EN010162/APP/6.2.5].

A10.8.2.1.2. Study Area 8

13 The majority of this Study Area comprises fields allocated as Work Area No 1 Solar PV panels. These areas include solar PV panels, mounting structures and poles, switchgear, inverters and controls/monitoring equipment, transformers and switchgear, local medium voltage substations/switchrooms, low voltage switchrooms and equipment, cabling and earthing conductors/cables, fencing, security cameras, SuDS measures, operating staff welfare/office facilities (intermediate substations) and storage containers.

14 Three areas of designated as Work Area No 3 environmental mitigation/enhancement areas are allocated for the east adjoining Caunton Lodge, in the central area around Kneesall Lodge and in the south adjoining The Beck.

15 Also within this Study Area are fields allocated as Work Area No 2 cable corridors and cable areas linking with Study Area 1 to the south and the eastern section of the Study Area with the northern and central areas. Cable Areas, are shown as a "corridor" 60 m wide, typically – this is much larger than is expected to be needed but is the corridor within which the cable route is expected to be located, to give flexibility for the designer post-consent.

A10.8.2.2. SITE HISTORY

A10.8.2.2.1. Historical Map Review

16 The following review is based on past editions of readily available Ordnance Survey (OS) maps. These include scales of 1:1,250, 1:2,500, 1:10,560 and 1:10,000 dated 1884 to 2024. Extracts from historical maps are provided

within Volume 4 Technical Appendix A10.11 – Desk Study and Preliminary Risk Assessment Groundsure Data [EN010162/APP/6.4.10.11]. Historical site uses are presented in Table A10.8.2, below.

Table A10.8.2: Historical Site Uses within Study Area 8

Study Area 8 Land Use and Features	Dates
Undeveloped agricultural land.	1884-2024
Gravel Pit in west. Later infilled.	1899-1920

17 Pertinent historical site uses within 250 m of Study Area 8 are presented in the table below.

Table A10.8.3: Historical Neighbouring Land Uses within 250 m

Surrounding Land Use	Orientation	Distance from Study Area 8	Dates	
			From	To
RAF Ossington (Airfield)	North-east	10 m	1941	1950
Gravel Pit	North-west	54 m	1884	1975
Disused Windmill, becomes Mill Cottage in 1975	West	174 m	1884	2024

A10.8.2.2.2. Planning History

18 There are three planning records relevant to Study Area 8 available on the Newark and Sherwood District Council planning website as of November 2024.

- 02/01056/TEL24, Lodge Farm, Kneesall, Proposed 3 x No 4 stack dipole antennae, 1 x 0.3M dish antenna, 1 x feeder gantry and 1 x meter cabinet, Application Received 20/05/2002, Application Validated 24/05/2022. Decision – Prior Approval Is Not Required 11/07/2002.
- 95/50799/FUL, Lodge Farm, Kneesall, New Offices and Laboratory for Agricultural / Horticultural Contractors and Ancillary External Works, Application Received 11/08/1995, Application Refused 04/01/1996.
- 11/00589/FUL Field Reference Number 4374 Kneesall Newark, Erection of 1 twin-bladed wind turbine, with maximum height to tip of 24.8m, and concrete base of 5m^2. Application permitted.

A10.8.2.3. ENVIRONMENTAL SETTING

19 The Groundsure Insight Reports used in preparation of the environmental setting assessment are included in Volume 4 Technical Appendix A10.11 – Desk Study and Preliminary Risk Assessment Groundsure Data [EN010162/APP/6.4.10.11].

A10.8.2.3.1. Geology

20 Based on British Geological Survey (BGS)[4] mapping (1:50,000-scale) and the Environment Agency (EA) Groundwater Vulnerability mapping (1:100,000-scale), the stratigraphic sequence and aquifer classifications beneath the Study Area are indicated to be as follows:

Table A10.8.4: Descriptions of Geological Strata

Stratum	Description & approx. thickness (based upon BGS Lexicon of Rock Units and borehole data)	Aquifer Classification
Superficial Deposits		
Alluvium	Generally comprises unconsolidated clay, silt, sand and gravel. Variable thickness, limited to the south and alluvial tract of The Beck. Location coincides with Work Area No 3 environmental mitigation/enhancement areas and Work Area No 2 cable corridors.	Secondary A Aquifer
Glaciofluvial Deposits	Sand and gravel, locally with lenses of silt, clay or organic material. Limited to fields 96-96 and 104, partly Work Area No 1 and No 3. Thickness in SK76SW/26 – 10 m.	Secondary A Aquifer
Glacial Till (mid Pleistocene)	An unsorted heterogenous mixture of clay, sand, gravel, and boulders varying widely in size and shape (diamicton). Present underlying Glaciofluvial Deposits. Thickness in SK76SW/26 – 13.60 m.	Secondary Undifferentiated
Bedrock		

[4] British Geological Survey (2025). Geoindex Onshore. Available at: https://www.bgs.ac.uk/map-voewers/geoindex-onshore/ (accessed on 21.05.2025).

Stratum	Description & approx. thickness (based upon BGS Lexicon of Rock Units and borehole data)	Aquifer Classification
Mercia Mudstone Group – Mudstone	Generally comprises red, green-grey mudstones with subordinate siltstones and widespread beds of gypsum/anhydrite. Rare thin sandstone beds possible, up to 83.90 m.	Secondary B
Mercia Mudstone Group – Siltstone, Dolomitic	Generally comprises siltstones and thick-halite bearing units set within green-grey mudstones, up to 83.90 m.	Secondary Undifferentiated

21 BGS borehole logs ref SK76SW/25 located in the south of Study Area 8 and SK76SW/26 located approximately 215 m west indicate a variation in the presence of superficial deposits, consistent with the BGS mapping and confirm underlying bedrock of the Mercia Mudstone Group bedrock. Borehole SK76SW/25, which extended to 697.50 m depth confirmed Mercia Mudstone Group strata to 83.90 m BGL underlain by strata of the Sherwood Sandstone Group to 245.30 m BGL and the Zechstein Group to 365.53 m BGL. This depth marks the depth of the Upper Coal Measures with the first identified coal seam at a depth of 408 m BGL. These deep boreholes were drilled by the Coal Authority (previously NCB) for the purpose of coal exploration, and similar geological sequences were seen in each.

22 There is no recorded evidence on the published geological mapping of Made Ground within Study Area 8. The majority of Study Area 8 is indicated to be mainly on outcropping bedrock strata of the Mercia Mudstone Group with localised cover of superficial deposits associated with the course of The Beck in the south of the Study Area and localised Glaciofluvial Deposits and Glacial Till in the central area, north of Kersall.

A10.8.2.3.2. Hydrogeology

23 The southern and central parts of Study Area 8 are located above Secondary A Aquifers relating to the localised superficial cover of Alluvium and Glaciofluvial Deposits, Secondary Undifferentiated Aquifer relating to the Glacial Till and Secondary B/Secondary Undifferentiated Aquifer bedrock outcropping across the remainder of the Study Area. These are defined below:

- Secondary A Aquifer: These formations are formed of permeable layers capable of supporting water supplies at a local scale, in some cases forming an important source of base flow to rivers.

- Secondary Undifferentiated Aquifer: Assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.
- Secondary B Aquifer: Predominantly lower permeability layers which may store/yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.

24 According to EA data, Study Area 8 is not located in a groundwater Source Protection Zone (SPZ).

25 Information provided by the EA indicates that there are no active licensed groundwater abstractions within 250 m of Study Area 8.

A10.8.2.3.3. Surface Water

26 There are two watercourses within Study Area 8 which are classified within a River Basin Management Plan published by the EA under the European Water Framework Directive (2000). A list of readily identifiable nearby watercourses and water bodies is as follows:

Table A10.8.5: Nearby Watercourses and Water Bodies

Watercourse/Body	Quality Classification (2019)	Approx Distance and direction from Study Area 8
Lower Trent Erewash – Secondary Combined (groundwater body)	Good	Onsite
The River Beck (surface water)	Moderate	Flows from west to east across the south
Un-named	-	Crosses north and defines southern boundaries of fields 114, 115, 135. Flow direction from west to east and north-east.
Un-named	-	Flows from west to east through field no 91 (Work Area No 2 cable route)
Un-named	-	Defines the southern boundary of field no's 105, 106, 442. Flows from west to east

27 Information provided by the EA indicates that there are no records of active licensed surface water abstractions within 250 m of Study Area 8.

A10.8.2.3.4. Ecologically Sensitive Sites

28 Natural England data indicates that there are no ecologically sensitive sites, that constitute environmental receptors as defined within Table 1 of the

DEFRA Environmental Protection Act 1990: Part 2A - Contaminated Land Statutory Guidance (2012)[5], located within a 250 m radius of Study Area 8. Ecologically sensitive sites protected under the NPPF are listed in the table below.

Table A10.8.6: Ecologically Sensitive Sites

Name	Approx. Distance and Direction from Study Area 8	Details
Designated Ancient Woodland		
High Wood	0 m north-east	Ancient and Semi-Natural Woodland
Laxton Wood	18 m north	Ancient and Semi-Natural Woodland, Ancient Replanted Woodland
Laxton Middle Wood	20 m north	Ancient and Semi-Natural Woodland
High Wood	208 m north-east	Ancient Replanted Woodland

A10.8.2.3.5. Radon

29 According to the online Indicative Atlas of Radon in England and Wales published by the UK Health Security Agency (UKHSA)[6] and BGS, the Study Area lies within kilometre grid squares with maximum radon potential of between less than 1 %. The Indicative Atlas is based upon Radon Potential Data and classifies areas based upon the likelihood of a property having a radon action level at or above the Action Level of 200 Bq m^3 based upon a dataset of over 500,000 records provided by the UKHSA and geology provided by the BGS. The Radon Potential is calculated from statistics (geometric mean and geometric standard deviation) of indoor radon measurements collected over each geological unit.

30 The higher resolution Radon Potential dataset, as included within the Groundsure Insight report, provides a more accurate assessment of the level of risk and the requirements for inclusion of preventative measures during construction based upon BGS Geology (1:50,000 scale) geological map data. This indicates that Study Area 8 has maximum radon potential of less than 1 % of properties having a radon level at or above the Action Level in Great Britain.

[5] DEFRA (2012). Contaminated Land Statutory Guidance. Available at: www.gov.uk/government/publications/contaminated-land-statutory -guidance (accessed on 21.05.2025).
[6] UK Health Security Agency (2022). UK maps of radon. Available at: https://www.ukradon.org/information/ukmaps (accessed 21.05.2025).

A10.8.2.3.6. Mining Remediation Authority

31 The Interactive Map Viewer on the Mining Remediation Authority[7] (formerly Coal Authority) website indicates that Study Area 8 is located in a Coal Mining Reporting Area but is not located within a Development High-Risk Area. The Coal Authority have previously commented on the Development in response to Environmental Impact Assessment (EIA) scoping and have confirmed that 'does not fall within the defined Development High Risk Area and is located instead within the defined Development Low Risk Area. This means that there is no requirement under the risk-based approach that has been agreed with the Local Planning Authority (LPA) for a Coal Mining Risk Assessment to be submitted or for The Coal Authority to be consulted'.

A10.8.2.3.7. Non-coal Mining

32 BGS sources indicate that Study Area 8 is not located in an area of recorded non-coal mining (vein minerals, chalk, oil shale, building stone, bedded ores, evaporites and 'other' commodities including ball clay, jet, black marble, graphite and chert).

33 BGS holds a database of British Pits, abbreviated to 'BritPit', comprising currently active, closed surface and underground mineral workings. Records indicate two former BritPits to be present within Study Area 8 or within the 250 m study area. These are detailed in the table below.

Table A10.8.7: British Pit Record Details

Name	Commodity	Status	Approx. Distance & Direction from Study Area 8
Kneesall Lodge Gravel Pits	Sand & gravel	Ceased	Onsite (centre)
Kersall Lodge Gravel Pit	Sand & gravel	Ceased	85 m north-west

A10.8.2.3.8. BGS Ground Stability Hazard Ratings

34 BGS Ground Stability Hazard ratings for the Study Area are summarised as follows:

Table A10.8.8: BGS Ground Stability Hazards

Ground Stability Hazard	BGS Risk Rating
Collapsible Ground	Very low
Compressible Ground	Moderate
Ground Dissolution	Negligible
Landslide	Moderate

[7] Mining Remediation Authority (2025). Map Viewer. Available at: https://datamine-cauk.hub.arcgis.com (accessed 21.05.25).

Ground Stability Hazard	BGS Risk Rating
Running Sand	Low
Shrinking or Swelling Clays	Very low

35 A moderate ground stability hazard in relation to compressible ground has been identified within Study Area 8. This relates to compressibility and uneven settlement hazards, which are probably present. Land use should consider specifically the compressibility and variability of the Development.

36 A moderate landslide hazard has also been identified, this is likely to relate to steeper topography and the variability of the composition of the Mercia Mudstone Group bedrock.

A10.8.2.4. AUTHORISED PROCESSES AND POLLUTION INCIDENTS

A10.8.2.4.1. Landfill and Waste Sites

37 Data provided by the EA, Local Authority and BGS indicates that there are no recorded licensed or known historical landfill sites located within 250 m of Study Area 8.

38 Information provided by Groundsure shows that there are no waste treatment/transfer sites recorded within 250 m.

A10.8.2.4.2. Environmental Permits

39 EA and Local Authority data indicates that there are no processes regulated by an Environmental Permit (under the Environmental Permitting Regulations (2010)) within 250 m of the Study Area.

A10.8.2.4.3. COMAH Sites

40 There are no records of any operations under the Control of Major Accident Hazards (COMAH) Regulations 1999, located within 250 m.

A10.8.2.4.4. Pollution Incidents

41 Environment Agency data indicates that there are no records of ‘major’ or ‘significant’ pollution incidents within 250 m of the Study Area.

A10.8.2.5. UNEXPLODED ORDNANCE

42 CIRIA Report C681[8] (Stone *et al.,* (2009)) outlines recommendations for dealing with the potential risk associated with the legacy of Unexploded Ordnance Risk, largely relating to WWII bombing and military sites.

43 Study Area 8 is in an area of known military history, relating to the proximity of the Second World War Ossington Airfield.

44 A detailed desk based UXO Risk Assessment was undertaken by Tetra Tech RPS Energy for The Development dated 28th August 2024. The findings of

[8] CIRIA (2009). Unexploded Ordnance C681: A Guide for the Construction Industry. Available at: https://www.ciria.org/CIRIA/CIRIA/Item_Detail.aspx?iProductcode=C681 (accessed on 21.05.2025).

the assessment identifies that Study Area 8 is in a low risk UXO area. No further measures are considered necessary other than provision of tool box talks during site inductions for construction staff and inclusion of UXO in Risk Assessments and emergency plans at pre-construction stage. The Tetra Tech RPS Energy UXO Risk Assessment report is presented in Volume 4 TA A10.10 – Detailed Desk Study (Stage 2) for Potential UXO Contamination [EN010162/APP/6.4.10.10].

A10.8.3. OUTLINE CONCEPTUAL SITE MODEL

A10.8.3.1. BACKGROUND

45 An outline conceptual site model (CSM) consists of an appraisal of the source-pathway-receptor ‘contaminant linkages' which is central to the approach used to determine the existence of ‘contaminated land' according to the definition set out under Part 2A of the Environmental Protection Act, 1990. For a risk to exist (under Part 2A), all three of the following components must be present to facilitate a potential 'pollutant linkage'.

- **Source** referring to the source of contamination (Hazard).
- **Pathway** for the contaminant to move/migrate to receptor(s).
- **Receptor** (Target) that could be affected by the contaminant(s).

46 Receptors include human beings, controlled waters and buildings / structures. The National Planning Policy Framework, used to address contaminated land through the planning process, follows the same principles as those set out under Part 2A.

47 As part of the assessment, the potential risks to receptors from potential sources, are given one of the following classifications:

- **Low risk** - it is considered unlikely that issues within the category will give rise to significant harm to identified receptors.
- **Moderate risk** - it is possible, but not certain that issues within the category will give rise to significant harm to receptors.
- **High risk** - there is a high potential that issues within the category will give rise to significant harm to identified receptors.

A10.8.3.2. POTENTIAL POLLUTION LINKAGES

48 Each stage of the potential pollutant linkage sequence has been assessed individually based on information obtained during the site reconnaissance, and desk study exercise and are discussed in the following section.

A10.8.3.2.1. Potential Contaminant Sources

Onsite Current

49 Study Area 8 currently comprises predominantly agricultural fields. Whilst there is potential for contaminants such as pesticides, herbicides and insecticides to have been used onsite and in its proximity, these chemicals typically have a low residency time in soils and they degrade rapidly in compliance with the requirements for crops and grazing prior to products being used for human consumption. Therefore, agricultural uses are not considered a potential significant source of contamination.

Onsite Historical

50 Historical Maps indicate the presence of a backfilled former gravel pit (field No 96) from 1899-1920 which may have been filled with a variety of (potentially unlicensed) waste materials including asbestos-containing materials (ACMs), heavy metals, hydrocarbons and may also represent a source of ground gas. This location is within an area allocated for PV panel construction.

51 No other historical potential sources of contamination have been identified across the Study Area.

Offsite Current

52 No potentially significant current offsite contaminant sources have been identified that could impact on Study Area 8.

Offsite Historical

53 Former gravel pit to the north-west, seemingly backfilled by 1975. Potential contaminants are as indicated above.

54 Former windmill 174 m west. It is noted that this has since been converted to a residential property and the contamination potential for this location is considered to be low and is subsequently discounted from further assessment.

55 Historical Maps indicate RAF Ossington, a World War 2 airfield, was present immediately to the north-east operational from 1941-1950, after which it was disused. Based upon Building Research Establishment (2008): Guidance for the Safe Development of Housing on Land Affected by Contamination. R&D Publication 66, potential contaminants associated with airfields include hydrocarbons (aviation fuel, lubricating oils etc), cyanide, Asbestos Containing Materials (ACMs), and heavy metals. Due to the former use as a military airfield, the potential for presence of unexploded ordnance or Radium 226 from aircraft dismantling cannot be discounted.

A10.8.3.2.2. Potential Pathways

56 The southern and central sections of Study Area 8 have superficial cover deposits of Alluvium and Glaciofluvial Deposits that are predominantly granular within which there is potential for mobilisation of gaseous or leachable contaminants of concern via granular horizons or via shallow groundwater. These may impact on controlled waters receptors or human

heath receptors via the dermal contact, ingestion and vapour inhalation pathways.

57 The superficial deposits on Study Area 8 are indicated to be underlain by mudstone strata belonging to the Mercia Mudstone Group (MMG), which also outcrops across the majority of this Study Area. This stratum is considered to be relatively impermeable and is likely to retard the downward or lateral migration of contaminants of concern via shallow groundwater (where present) or as gases or vapours. This would indicate a low risk of mobilisation of contaminants through shallow groundwater from the former brick works location to the north-west or from the former airfield to the north-east.

58 The topography of the Study Area indicates a drop in elevation from west to east across the former airfield of approximately 12 m. It is anticipated that shallow groundwater, if present within the MMG, is likely to have a similar flow direction and any airfield derived contaminants are unlikely to impact on Study Area 8.

59 For future site users (maintenance workers), pathways for direct contact/ingestion with residual soils or inhalation of airborne dust may exist in areas of soft landscaping.

60 It should be noted that pathways may be modified or exacerbated by disturbance.

A10.8.3.2.3. Potential Receptors

61 The Glaciofluvial Deposits and Alluvium are classed as Secondary A Aquifers and Mercia Mudstone Group bedrock is classed as a Secondary B Aquifer. Study Area 8 is not within an SPZ and there are not any identified licensed abstractions within the Study Area therefore groundwater is considered to be a low risk receptor for this assessment.

62 The main surface water feature identified on Study Area 8 is The Beck. This feature is considered to represent a potentially sensitive controlled waters receptor; however, the limited lateral migration potential of the bedrock geology between the source and receptor would indicate a low risk of impact from any disturbance of the backfilled former gravel pit identified on Study Area 8 by The Development.

63 During operation of The Development it is not envisaged that there would be any full-time occupancy, however it is expected that there would be periodic requirements for maintenance work/checks. The risks posed to maintenance workers are considered to be limited to any works in the vicinity of the identified potential contamination source where there may be short-term direct contact, inhalation or ingestion of contaminated soil or vapours albeit the adoption of best working practises is likely to minimise the risk presented.

64 Offsite users are considered to be the nearest residential developments of Kersall Lodge and Kneesall Lodge approximately 300 m to the west and north-east respectively.

65 The assessment does not consider the risk to construction workers. These risks would be managed through appropriate Health & Safety legislation via

the H&S At Work Act (1974) and in accordance with Construction Design and Management (CDM, 2015) regulations.

66 Based on the identified potential sources and the site setting there is not considered to be a significant risk to ecological receptors, crops/vegetation or archaeological receptors from contamination.

A10.8.3.3. OUTLINE CONCEPTUAL SITE MODEL

67 An outline CSM has been developed on the basis of the desk study. The CSM is used to identify potential sources, pathways and receptors (i.e. potential pollutant linkages) post development and is summarised in the table below.

Table A10.8.9: Outline Conceptual Site Model

Potential Source	**Contaminants Of Concern**	**Via**	**Potential Pathways**	**Linkage Potentially Active?**	**Receptors**	**Qualitative Risk Assessment**	**Notes**
Onsite Infilled gravel pit	Methane and Carbon dioxide	Ground gas	Inhalation of ground gas	Yes	Offsite users	Low	Low risk potential for creation of new gas migration pathways cannot be entirely discounted. Low risk of residual soil exposure to maintenance workers in soft landscaping.
	ACMs, hydrocarbons, heavy metals	Soil	Inhalation of volatiles, dust or fibres	Yes	Future site users	Low	
Offsite Historical: Airfield	ACMs, hydrocarbons, fuels, oils, heavy metals, radioactive materials	Groundwater	Inhalation of volatiles, shallow groundwater	No	Future site users, Secondary B Aquifer	N/A	Low permeability bedrock with limited shallow groundwater potential and limited period of exposure to groundwater by maintenance workers. Groundwater flow direction unlikely to coincide with Study Area 8. Conclusion that this linkage can be considered inactive

N.B. If a Moderate or High Qualitative Risk Rating is identified further assessment is recommended

A10.8.4. CONCLUSIONS AND RECOMMENDATIONS

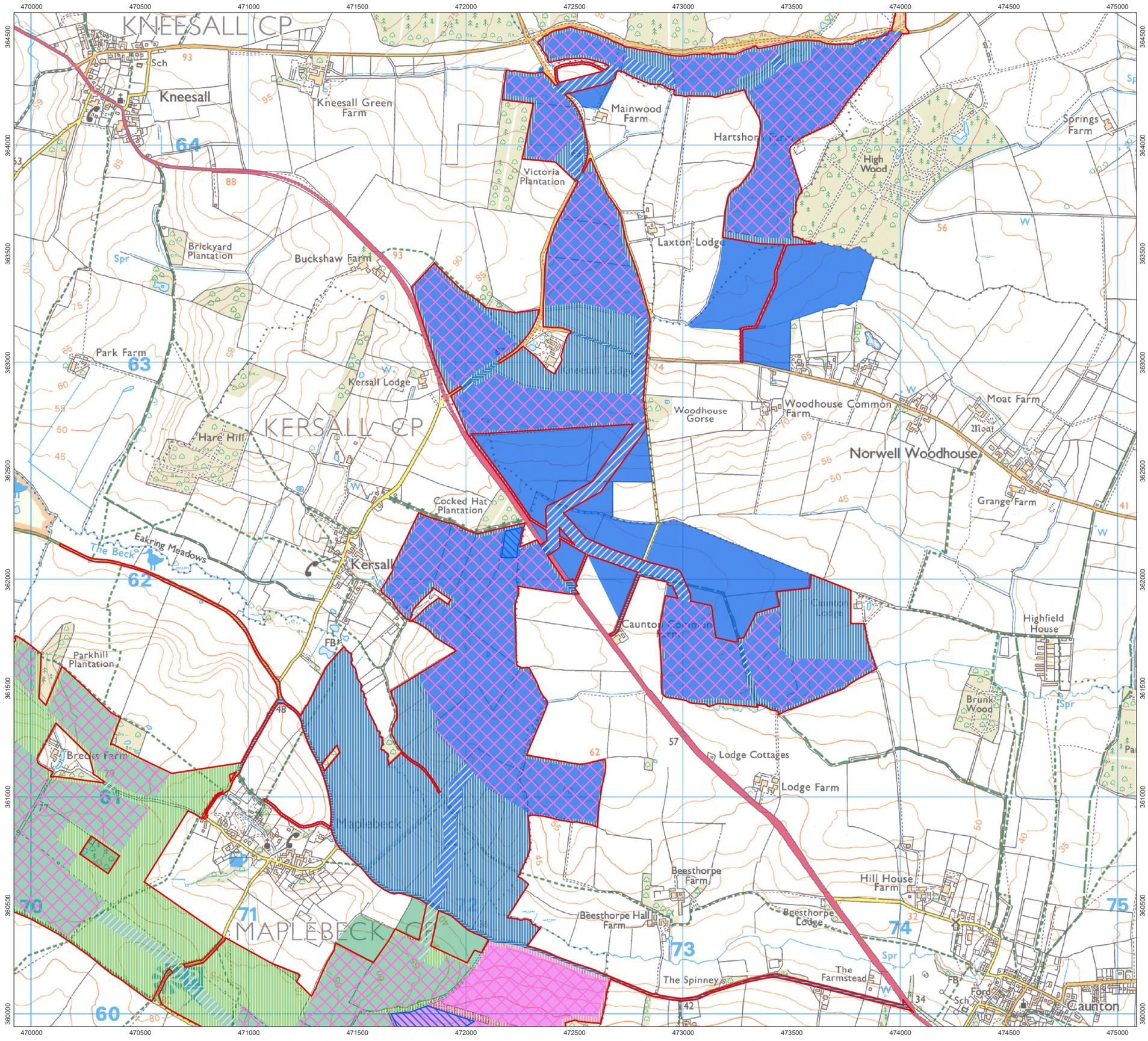
A10.8.4.1. PRELIMINARY GEO-ENVIRONMENTAL CONCLUSIONS

68 No significant potential contaminative sources or pathways have been identified for Study Area 8 that could impact on the potential receptors established in the PRA. Therefore, it is considered that no further works, in the form or intrusive ground investigations, are required relating to ground conditions / contamination for this Study Area, based on its current use and form.

A10.8.4.2. OTHER CONSIDERATIONS

69 The recommendations of the desk based UXO assessment should be taken into consideration during design for this area of the Development, full details included within Volume 4 TA A10.10 – Detailed Desk Study (Stage 2) for Potential UXO Contamination [EN010162/APP/6.4.10.10].

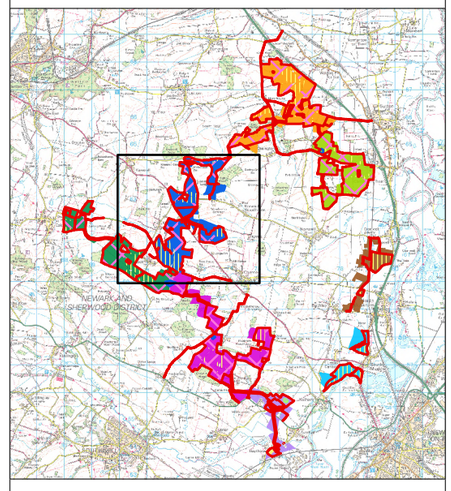
ANNEX A – FIGURES



- Order Limits
- Study Area 8
- Study Area 1
- Study Area 2
- Study Area 7

Works Areas

- Works Area 1 Solar PV
- Works Area 2 Cable
- Works Area 3 Mitigation
- Works Area 4 Substations
- Works Area 8 Access



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0 0.15 0.3 0.6 km

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Study Area 8
Figure A10.8.1

Great North Solar and Biodiversity Park
Environmental Statement

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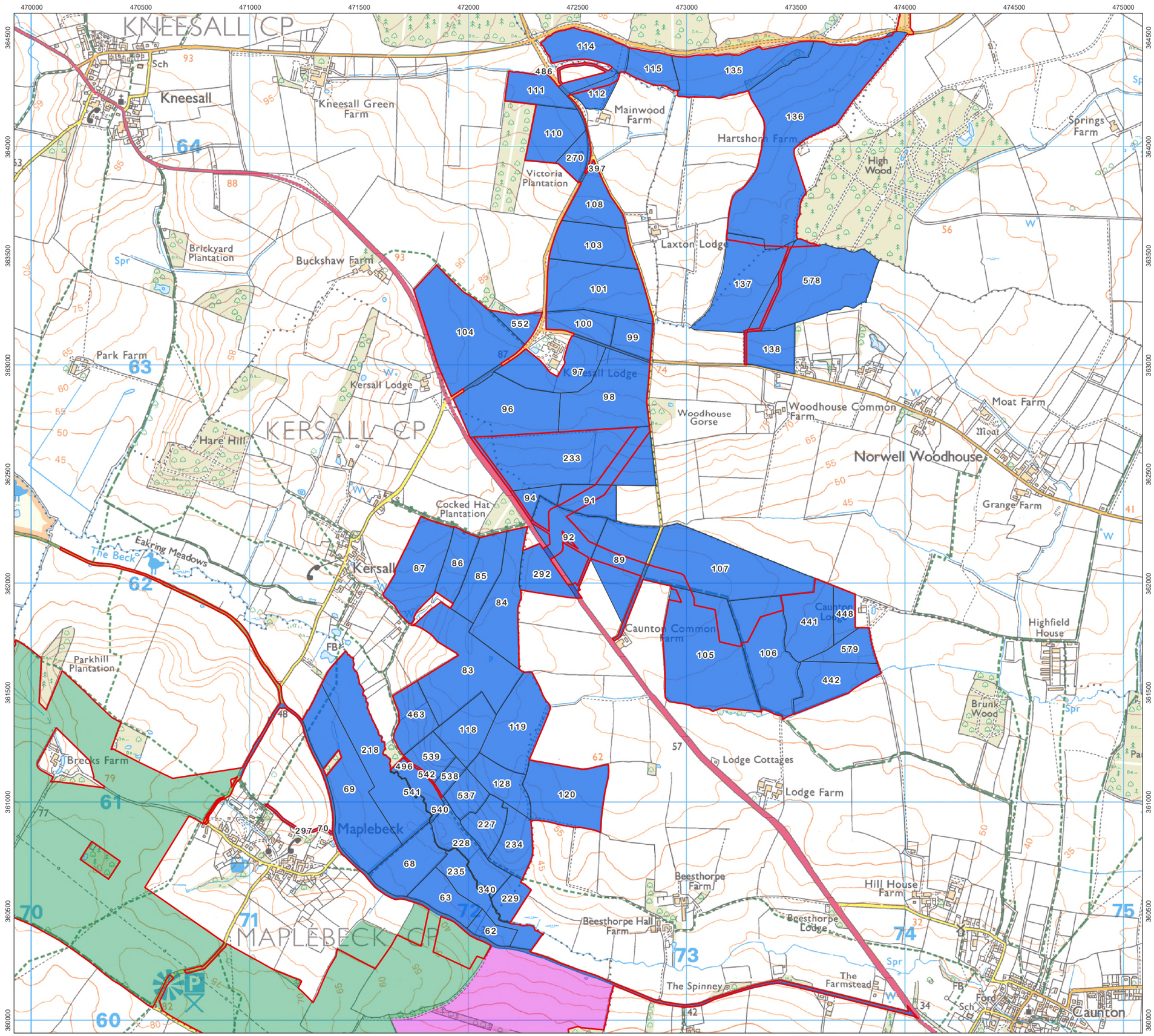
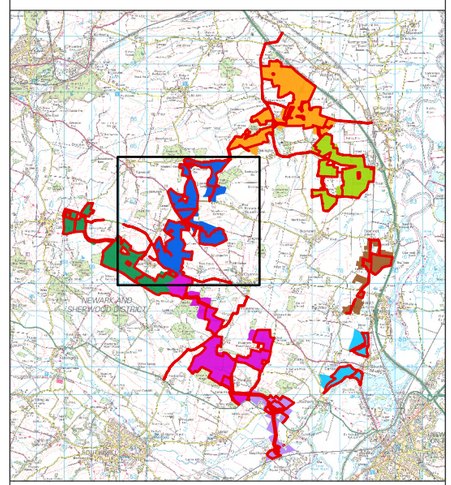


Order Limits
Field Boundaries
Study Area 8
Study Area 1
Study Area 2
Study Area 7



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0 0.15 0.3 0.6 km

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Study Area 8 Field Boundaries
Figure A10.8.2

Great North Solar and Biodiversity Park
Environmental Statement

ANNEX B - PRA METHODOLOGY

Introduction

70 This report provides available factual data for the site obtained only from the sources described below and related to the site on the basis of the location provided by the Applicant. The desk study information is not necessarily exhaustive and further information relevant to the site may be available from other sources.

71 This report is written in the context of an agreed scope of work and should not be used in a different context. Furthermore, new information and changes in legislation may necessitate a re-interpretation of the report in whole or in part after its original submission. The report is provided for sole use by the client and is confidential to them and their professional advisors. No reliance whatsoever is provided to any party other than the Applicant unless otherwise agreed.

Information Sources

Current and Historical Land Use

72 This section establishes the former and current uses of the Study Area and within a 250 m data search radius, which could have caused contamination. Details of the Development including current land use and location provided by the Applicant.

73 Information about the history of the Study Area and a 250 m radius, has been obtained through an inspection of historical maps at 1:10,000, 1:10,560, 1:2,500 and 1:1,250 scales and historical aerial photographs (where available). The accuracy of maps cannot be guaranteed, and it should be recognised that different conditions on-site may have existed between, and subsequent to, the map survey dates.

Regulatory Records

74 Regulatory records including landfills, pollution incidents (‘major’ and ‘significant’ only), industry authorisations and licensed water abstractions are derived from information purchased from Groundsure Ltd (unless otherwise specified).

Environmental Setting

75 The geological sequence underlying the Study Area and the approximate depths of strata are provided by maps published by the British Geological Survey (BGS) 1:50,000 scale and available borehole records held by the BGS.

76 The hydrogeological classification is obtained from Groundwater Vulnerability mapping by the BGS/EA/National Resources Wales (NRW). The vulnerability of groundwater is determined from this mapping and geological information.

77 The location of surface watercourses has been obtained from an inspection of current OS maps. Flood risk details and information on groundwater Source Protection Zones were obtained from readily available EA/NRW information published on-line and supplied by Groundsure Ltd.

78 Details of sensitive ecosystems/habitats and coal mining areas were supplied by Natural England and the Coal Authority respectively via Groundsure Ltd and inspection of the MAGIC website.

79 Radon is a radioactive gas produced naturally by certain types of geology. This report uses the Indicative Atlas of Radon in England and Wales (2007) produced by the Health Protection Agency (HPA) and the British Geological Survey (BGS) to determine whether the Study Area is located in an area at risk from radon gas. Where potential issues are identified, a site-specific radon report is obtained from the HPA and BGS to provide a more accurate estimate of the probability of the site being affected by radon gas ingress.

ANNEX C – ASSUMPTIONS AND LIMITATIONS

80 A "desk study" means that no site visits have been carried out as part of an assessment, unless otherwise specified.

81 This report provides available factual data for the Study Area obtained only from the sources described in the text and related to the Study Area and a 250 m radius, where relevant, on the basis of the location information provided by the Applicant.

82 The desk study information is not necessarily exhaustive and further information relevant to the Study Area may be available from other sources.

83 The accuracy of maps cannot be guaranteed, and it should be recognised that different conditions within the Study Area may have existed between and subsequent to the various map surveys.

84 No sampling or analysis has been undertaken in relation to this desk study.

85 Any borehole data from British Geological Survey sources is included on the basis that: "The British Geological Survey accept no responsibility for omissions or misinterpretation of the data from their Data Bank as this may be old or obtained from non-BGS sources and may not represent current interpretation".

86 Where any data supplied by the Applicant or from other sources, including that from previous site investigations, have been used it has been assumed that the information is correct. No responsibility can be accepted by RPS for inaccuracies in the data supplied by any other party.

87 This report is prepared and written in the context of an agreed scope of work and should not be used in a different context. Furthermore, new information, improved practices and changes in legislation may necessitate a re-interpretation of the report in whole or in part after its original submission.