

The Great Grid Upgrade

Chesterfield to High Marnham

Chesterfield to High Marnham

Environmental Appraisal Report – Part 7 of 8

October 2026

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Appendix F

Agricultural Land

Classification Report

The Great Grid Upgrade

Brinsworth to High Marnham

Chesterfield to High Marnham

Environmental Appraisal Report – Appendix F: Agricultural Land
Classification (ALC) Report

October 2026

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1. Introduction

1.1 Background

- 1.1.1 Arcadis Consulting (UK) Limited was instructed by National Grid to undertake an Agricultural Land Classification (ALC) survey on land near High Marnham ('the Site'), in relation to proposed overhead line "Tie-In" works ('the Scheme'). The Scheme forms part of the Chesterfield to High Marnham reinforcement project within the National Grid 'Great Grid Upgrade'.
- 1.1.2 The Site is located to the north of High Marnham, Nottinghamshire. The land required to construct the Scheme will be required for construction purposes, including temporary construction, access routes, laydown and welfare areas, and for the Scheme.
- 1.1.3 The ALC survey has been undertaken to support the Environmental Appraisal Report (EAR), which provides a summary of the environmental information submitted with the Section 37 consent application for the Scheme. This report focuses on the quality of agricultural land within areas potentially affected by both permanent infrastructure and temporary construction activities.
- 1.1.4 The ALC survey set out in this report was conducted 3-5 March 2025.

1.2 Scheme Description

- 1.2.1 The Scheme comprises overhead line ("Tie-In") works, which include the installation of new sections of overhead line, modification of existing infrastructure, removal of selected existing overhead lines, and associated temporary construction activities, including working areas and access.
- 1.2.2 The Scheme forms part of the wider Chesterfield to High Marnham reinforcement project, which will uprate the existing 275kV transmission system between Chesterfield and High Marnham to operate at 400kV. The reinforcement project includes the development of a new 400kV substation at High Marnham; however, this ALC assessment relates solely to the Tie-In works required to facilitate the connection of that infrastructure to the National Grid network.

1.3 Scope

- 1.3.1 The primary purpose of the ALC survey is to characterise the soils and assess the quality of the agricultural land in accordance with the ALC of England and Wales: Revised guidelines and criteria for grading the quality of agricultural land (Defra and Welsh Government (2025) (the 'ALC guidelines' hereafter).

1.4 Policy and Guidance

Policy

- 1.4.1 This ALC assessment is consistent with the direction given by paragraph 187, Section 15: Conserving and enhancing the natural environment, of the National

Planning Policy Framework (NPPF) (Ministry of Housing, Communities and Local Government, 2025) as follows:

“Planning policies and decisions should contribute to and enhance the natural and local environment by: [...] (b) recognising the intrinsic character and beauty of the countryside, and the wider benefits from natural capital and ecosystem services – including the economic and other benefits of the best and most versatile agricultural land, and of trees and woodland.”

- 1.4.2 Footnote 65 at paragraph 188 of the NPPF also states that ‘where significant development of agricultural land is demonstrated to be necessary, areas of poorer quality land should be preferred to those of a higher quality.’
- 1.4.3 The NPPF defines best and most versatile (BMV) agricultural land as land in grades 1, 2, and 3a under the ALC system.
- 1.4.4 The National Policy Statement (NPS) for Energy (EN-1) (Department for Energy Security and Net Zero, 2023) states that energy projects could have adverse effects on agriculture, and requires the following:
- Paragraph 5.11.12 states that ‘Applicants should seek to minimise impacts on the best and most versatile agricultural land (defined as land in grades 1, 2 and 3a of the Agricultural Land Classification) and preferably use land in areas of poorer quality (grades 3b, 4 and 5)’; and
 - Paragraph 5.11.34 states ‘The Secretary of State should ensure that applicants do not site their scheme on the best and most versatile agricultural land without justification. Where schemes are to be sited on best and most versatile agricultural land the Secretary of State should take into account the economic and other benefits of that land. Where development of agricultural land is demonstrated to be necessary, areas of poorer quality land should be preferred to those of a higher quality.’
- 1.4.5 The Bassetlaw Local Plan 2020-2038 (adopted May 2024) states in Policy ST1 Bassetlaw’s Spatial Strategy that sustainable development and growth would be managed by ‘seeking to minimise the use of the most versatile Grade 1-3 agricultural land’. Policy ST49 Renewable Energy Generation also states that ‘community energy schemes will be supported subject to the satisfactory resolution of all relevant site specific and cumulative impacts upon: ... e) the best and most versatile agricultural land...’.

Guidance

- 1.4.6 The MAFF ALC system (Defra and Welsh Government (2025)) for grading land quality for land use planning divides agricultural land into five grades (with Grade 3 land subdivided into Grades 3a and 3b). These grades divide land according to the degree of limitation imposed on land use by the inherent characteristics of climate, site and soils.
- 1.4.7 Protecting BMV agricultural land and the undertaking of ALC is supported by the Natural England Guide to assessing development proposals on agricultural land (Natural England, 2021).
- 1.4.8 A description of each grade is set out below based on the ALC guidelines.

Grade 1 – excellent quality agricultural land

- 1.4.9 Land with no or very minor limitations to agricultural use. A very wide range of agricultural and horticultural crops can be grown and commonly includes top fruit, soft fruit, salad crops and winter harvested vegetables. Yields are high and less variable than on land of lower quality.

Grade 2 – very good quality agricultural land

- 1.4.10 Land with minor limitations which affect crop yield, cultivations or harvesting. A wide range of agricultural and horticultural crops can usually be grown but on some land in the grade there may be reduced flexibility due to difficulties with the production of the more demanding crops, such as winter harvested vegetables and arable root crops. The level of yield is generally high but may be lower or more variable than Grade 1.

Grade 3 – good to moderate quality agricultural land

- 1.4.11 Land with moderate limitations which affect the choice of crops, timing and type of cultivation, harvesting or the level of yield. Where more demanding crops are grown the yields are generally lower or more variable than on land in Grades 1 and 2.

Subgrade 3a – good quality agricultural land

- 1.4.12 Land capable of consistently producing moderate to high yields of a narrow range of arable crops, especially cereals, or moderate yields of a wide range of crops including cereals, grass, oilseed rape, potatoes, sugar beet and the less demanding horticultural crops.

Subgrade 3b – moderate quality agricultural land

- 1.4.13 Land capable of producing moderate yields of a narrow range of crops, principally cereals and grass or lower yields of a wider range of crops or high yields of grass which can be grazed or harvested over most of the year.

Grade 4 – poor quality agricultural land

- 1.4.14 Land with severe limitations which significantly restrict the range of crops and/or level of yields. It is mainly suited to grass with occasional arable crops (e.g. cereals and forage crops) the yields of which are variable. In moist climates, yields of grass may be moderate to high, but there may be difficulties in utilisation. The grade also includes very droughty arable land.

Grade 5 – very poor-quality agricultural land.

- 1.4.15 Land with very severe limitations which restrict use to permanent pasture or rough grazing, except for occasional pioneer forage crops.

2. Methodology

- 2.1.1 A desk study to collate baseline information within the area of land required to construct the Scheme, such as geology, available ALC and soil information, was undertaken prior to the survey.
- 2.1.2 The ALC survey and assessment was undertaken in accordance with:
- Soil Survey Field Handbook (Hodgson, 2022);
 - ALC guidelines (Defra and Welsh Government (2025); and
 - Meteorological Office climatological data (Meteorological Office, 1989).
- 2.1.3 The detailed survey involved the examination of the physical soil properties at 80 auger bore locations. The survey was conducted 3-5 March 2025.
- 2.1.4 The survey was conducted at a density of 100m intervals along overhead lines, meeting the Guidance requirement of one auger bore examination per hectare. Auger bores (see Annex A, Annex B of this ALC Report) were set out prior to the field survey and were loaded with Google Earth app into smart phones to locate auger bore locations in the field along with paper map.
- 2.1.5 Soil profiles were examined up to a depth of 120cm by using a 5cm Dutch soil auger.
- 2.1.6 The following soil and site properties were examined/recorded:
- soil texture;
 - horizon depths;
 - stoniness;
 - calcareousness (using 10 per cent hydrochloric acid);
 - matrix colour (based on a Munsell Colour Chart (Munsell, 2010));
 - mottles (colour, size and number);
 - ped structure; and
 - slope (using a clinometer).
- 2.1.7 The auger bore logs are presented in Annex B of this ALC Report alongside the following parameters:
- site: gradient, micro-relief and flooding;
 - interactive factors: soil wetness class and soil droughtiness; and
 - most limiting factors and final ALC grade.
- 2.1.8 A Cable Avoidance Tool and Signal Generator was used to scan each auger bore to ensure avoidance of buried services before breaking ground. The soil profiles were examined to a depth of 120cm by using a 5cm Dutch soil auger and soils from each auger bore were reinstated after examination.
- 2.1.9 Three soil pit descriptions of representative soil types, obtained from the previous ALC survey conducted for the High Marnham Solar Farm Project by Kernon Countryside Consultants in April 2022 (Annex C), were utilised to inform and support this ALC assessment.

3. Baseline Information

- 3.1.1 This section provides baseline information collated from a desk study undertaken prior to ALC survey.

3.2 Land Use

- 3.2.1 Aerial imagery indicates that the land use across the land required to construct the Scheme is predominantly arable agriculture with hedgerows forming field boundaries. This was confirmed during the site visit, 3-5 March 2025 by Arcadis Consulting (UK) Limited in line with the Guide to assessing development proposals on agricultural land from Natural England (Natural England, 2021) and Professional Competency in Soil Science No. 2 – Agricultural Land Classification – England and Wales (British Society of Soil Science, 2018).

3.3 Topography and Relief

- 3.3.1 Available OS maps indicate that the land from the north to south east of the Scheme ranges between 6 and 11m AOD, sloping upwards towards the south west at 27m AOD.

3.4 Flooding

- 3.4.1 Government long-term flooding risk service information (Environment Agency, 2024) was consulted to assess the flood risk within the area of land required to construct the Scheme. Areas of low, medium and high flood risk have an annual probability of flooding of 0.1-1%, 1-3.3% and >3.3%, respectively.
- 3.4.2 The mapping indicates that the majority of the Scheme lies within Flood Zone 1, defined as land with a low probability of flooding from rivers and the sea (less than 0.1% annual probability). However, parts of the eastern extent of the land required to construct the Scheme, within agricultural fields adjoining the River Trent, extend into Flood Zones 2 and 3, where the annual probability of flooding is greater than 1% (1 in 100) or higher.
- 3.4.3 Agricultural fields north of the tree line bounding the northern edge of the existing High Marnham substation are mapped as being at low risk of fluvial flooding, consistent with their location within Flood Zone 1. A small area bounding a drainage ditch in the fields east of Skegby is mapped as being at high risk of flooding.
- 3.4.4 Flood risk from surface water and small watercourses varies across the area of land required to construct the Scheme from low to high. Higher-risk areas are generally associated with watercourses and in the fields immediately north of the tree line bounding the northern edge of the existing High Marnham substation and land surrounding Polly Taylor's Road. The remainder of the Scheme has very low flood risk.
- 3.4.5 The Scheme is generally at very low risk of surface water flooding (less than 0.1% annual probability), with localised areas of medium (1–3.3%) and high (>3.3%) risk present, particularly along the eastern boundary and in low-lying areas adjacent to drainage features.

- 3.4.6 The wider floodplain associated with the River Trent is located to the north, east and south of the Scheme, although the majority of the Scheme footprint remains outside of these higher-risk areas.

3.5 Geology

- 3.5.1 The BGS Geology Viewer (BGS, 2025) indicates that bedrock geology within the area of land required to construct the Scheme is mapped as the Mercia Mudstone Group. This is described as Triassic sedimentary mudstone bedrock of fluvial, lacustrine and marine origin, formed between approximately 247.1 and 201.3 million years ago.
- 3.5.2 Superficial deposits are mapped across parts of the land required to construct the Scheme. The Holme Pierrepont Sand and Gravel Member is mapped across parts of the north east of the land required to construct the Scheme towards Fledborough. These deposits comprise Quaternary-age sand and gravel of fluvial origin formed between 11,800 and 126,000 years ago.
- 3.5.3 Alluvium is mapped within fields adjoining the River Trent, with a small section extending east towards Skegby along watercourses at field margins. These deposits comprise Quaternary-age clay, silt, sand and gravel of fluvial origin.

3.6 Previous ALC

- 3.6.1 Predictive Agricultural Land Classification (ALC) mapping (Defra, 2026) at a scale of 1:250,000, indicates that land within the land required to construct the Scheme is predominantly mapped as Subgrade 3a, with smaller areas of Grade 2, Subgrade 3b, and small, localised areas of non-agricultural and urban land. Grade 2 (very good quality) and Subgrade 3a (good quality) are classified as Best and Most Versatile (BMV) agricultural land, whereas Subgrade 3b (moderate quality) is not.
- 3.6.2 Land to the north, east, south and south-west of the existing High Marnham substation, extending towards High Marnham, is predominantly mapped as Subgrade 3a, with some localised unclassified areas. Land extending north east from the existing High Marnham substation towards the land required to construct the Scheme near Fledborough is predominantly mapped as Grade 2. Fields adjoining the River Trent are mapped as Subgrade 3b.
- 3.6.3 Predictive ALC Mapping for the Scheme is shown in Figure 3.10.1 of the Chesterfield to High Marnham EAR.

3.7 Previous Soil Survey Data

- 3.7.1 Available national soil survey information (Cranfield, 2026) indicates that soils within the area of land required to construct the Scheme are predominantly characterised by the Whimple 3 Association across land north, south and east of the overhead line corridor around High Marnham. This association comprises deep reddish fine loamy or fine silty over clayey soils, developed in drift over Permo-Triassic and Carboniferous reddish mudstone, with slowly permeable subsoils and slight seasonal waterlogging.

- 3.7.2 Soils towards the north east of the land required to construct the Scheme, extending towards Fledborough, are characterised by the Blackwood Association. This association comprises seasonally wet, deep permeable sandy and coarse loamy soils developed in glaciofluvial drift. These soils are naturally wet, very acid and of very low fertility, with groundwater locally controlled by ditches.
- 3.7.3 Fields adjoining the River Trent are characterised by the Fladbury 2 Association. This association comprises seasonally wet, stoneless clayey soils, variably affected by groundwater, with some sandy subsoils. These soils are developed in river alluvium and are associated with flat land, naturally high groundwater and flood risk.
- 3.7.4 Small, localised pockets of the Worcester Association are present within the south-western part of the land required to construct the Scheme. This association comprises slowly permeable non-calcareous and calcareous reddish clayey soils developed over Permo-Triassic mudstone, locally with fine loamy soils over clay where superficial drift is present. These soils are typically seasonally waterlogged due to slowly permeable subsoils and have impeded drainage with seasonal waterlogging.
- 3.7.5 National Soil Associations Mapping for the Scheme is presented in Figure 3.10.2 of the Chesterfield to High Marnham EAR.

3.8 Climatological Data

- 3.8.1 The climate data required for the ALC assessment are provided for 5km intersections of the British National Grid by the Meteorological Office. Interpolated data for the land required to construct the Scheme is set out in Table 3.1. The climate data covers the centre of the Site.

Table 3.1 Climatological data of the Site

Parameter	Value
British National Grid Reference	SK 807 705
Altitude (m)	12
Average annual rainfall (AAR) (mm)	570
Accumulated temperature (AT0) (day degrees)	1421
Moisture deficit for wheat (mm)	117
Moisture deficit for potatoes (mm)	112
Field Capacity Days (FCD)	112

4. ALC Assessment

4.1 Soil Type

- 4.1.1 The ALC surveys identified variable, dominantly acidic loamy and clayey soils across the land required to construct the Scheme. The main soil types comprise deep clay, medium to heavy clay loam over clay, silty clay loam over clay and more silty soils, including silt clay, silty clay loam and silt loam.
- 4.1.2 Soil texture varies across the Site, with heavier clayey soils generally recorded around the existing High Marnham substation, the southern part of the land required to construct the Scheme and land adjoining the River Trent, while more silty soils are present locally to the west, northwest and northeast.
- 4.1.3 The southern part of the land required to construct the Scheme, covered by auger points HM1-HM39, is characterised by generally acidic medium to heavy clay loam over clay and deep clay, with localised pockets of sandy clay loam, silty clay loam and silty clay. It is also assumed that the small, unsurveyed area to the south-west of the land required to construct the Scheme has the same characteristics.
- 4.1.4 The area extending west from the existing High Marnham substation, covered by auger points HM68–HM80, is dominated by generally acidic deep clay and clay loam close to the existing High Marnham substation, becoming more silty to the west.
- 4.1.5 Land adjoining the River Trent, covered by auger points HM40-HM48, is characterised by generally acidic deep clay soils.
- 4.1.6 The area covered by auger points HM47-HM55 is characterised by generally acidic medium silt loam in the south east, becoming more silty clay loam and silty clay to the north west with localised pockets of sandy clay loam.
- 4.1.7 The area covered by auger points HM56-HM67 is characterised by generally acidic silty clay loam over clay close to the substation, becoming deep clay further north.
- 4.1.8 The un-surveyed area extending north east from the existing High Marnham substation is expected, based on professional judgement and adjacent survey findings, to comprise silty clay loam over clay close to the substation, becoming more silty towards the north east, including silt loam and silty clay.

4.2 Climatic Limitations

- 4.2.1 The main parameters used in the assessment of overall climatic limitation are AAR, as a measure of overall wetness, and AT0, as a measure of warmth in the growing season.
- 4.2.2 According to the AAR and AT0 values presented in Table 3.1, there are no climate limitations across the land required to construct the Scheme. The climatic Grade for the Site is Grade 1. As such, climatic conditions do not represent significant factors limiting crop production within the land required to construct the Scheme.

4.3 Site Limitations

Gradient and Microrelief

- 4.3.1 The west of the land required to construct the Scheme is either level (0-1 degrees) or gently sloping (1-2 degrees), with a moderately sloping (4-7 degrees) area around auger points HM38-HM39 and HM69. The north and east of the land required to construct the Scheme is predominantly level (0-1 degrees). As such, gradient and microrelief are not considered to represent limiting factors across the Scheme.

Flooding

- 4.3.2 Flooding from surface water and small watercourses varies across the land required to construct the Scheme from low to high risk. Auger points HM72 and HM73 are located in an area of high risk of flooding from surface water (1% to more than 3.3% each risk), where the grade is limited to Grade 3b.
- 4.3.3 Flooding from rivers and the sea is moderate/high risk (1% to more than 3.3% each year). In the east of the land required to construct the Scheme, auger points HM40-HM48 are within Flood Zone 3, where the grade is limited to Grade 3b as a result of flood risk. In the west of the land required to construct the Scheme, auger points HM20, HM79 and HM80 also lie within Flood Zone 3 and are limited by flood risk to Grade 3b.

4.4 Soil Limitations

Soil Depth

- 4.4.1 The depth of soils does not comprise a limiting factor across the land required to construct the Scheme, as the soils present are deep (i.e., greater than 60cm).

Stoniness

- 4.4.2 Topsoil across the land required to construct the Scheme mostly contained few hard stones (1-5%), with some topsoils to the west of the land required to construct the Scheme containing common hard stones (6-15%) (see Annex B of this ALC Report). The stone content of the topsoils does not represent a significant limiting factor across the land required to construct the Scheme.

Soil Texture

- 4.4.3 Topsoil texture is not a direct limiting factor across the land required to construct the Scheme, as the topsoils are loams, (medium, heavy or sandy clay loams), clays (including areas of sandy clay and silty clay), and with some medium sandy loams (see Annex B of this ALC Report).

4.5 Chemical Limitations

- 4.5.1 There was no chemical limitation on soil physical conditions, crop yield or growing observed from the on-site surveys. The surveys confirmed the land was predominately arable with some grass fields.

4.6 Interactive Limitations

- 4.6.1 Soil wetness class assessment and soil droughtiness calculations indicate that soil wetness and soil droughtiness are direct limiting factors, resulting in a mixture of Grade 2 and Grade 3a classifications across the land required to construct the Scheme.
- 4.6.2 Predominantly, the western and northern extents of the land required to construct the Scheme are limited by either soil wetness, soil droughtiness, or a combination of both. Wetness class was generally I or II, with wetness class III calculated for some auger bores in the northern extent of the land required to construct the Scheme.
- 4.6.3 Where soils were limited by soil wetness, with a wetness class of either II or III, gleying and slowly permeable layers were observed within 70cm (see Annex B of this ALC Report).
- 4.6.4 Were soil wetness and soil droughtiness were not primary limiting factors, the ALC grade was limited by flood risk, resulting in Grade 3b classification.
- 4.6.5 In some instances, certain auger points were mapped as having the same grade as adjacent boreholes. Adjustment to the ALC grade in these cases was attributed to isolation (a singular point with a different ALC grade compared to surrounding boreholes).

5. ALC Grade Distribution

5.1.1 Annex A of this ALC Report summarise the ALC distributions and grades of the land required to construct the Scheme. The ALC surveys revealed the land within the Site to be dominated by Subgrade 3a and Grade 2, with areas of Grade 3b and non-agricultural land.

- ALC Grade 2 (BMV land) accounts for 25.6ha (26.6%);
- ALC Grade 3a (BMV land) accounts for 41.5ha (43.1%);
- ALC Grade 3b (non-BMV land) accounts for 12.6ha (12.6%);
- Urban (non-agricultural) accounts for 9.9ha (10.3%); and
- Not surveyed 7.1ha (7.4%).

6. Conclusion and Recommendations

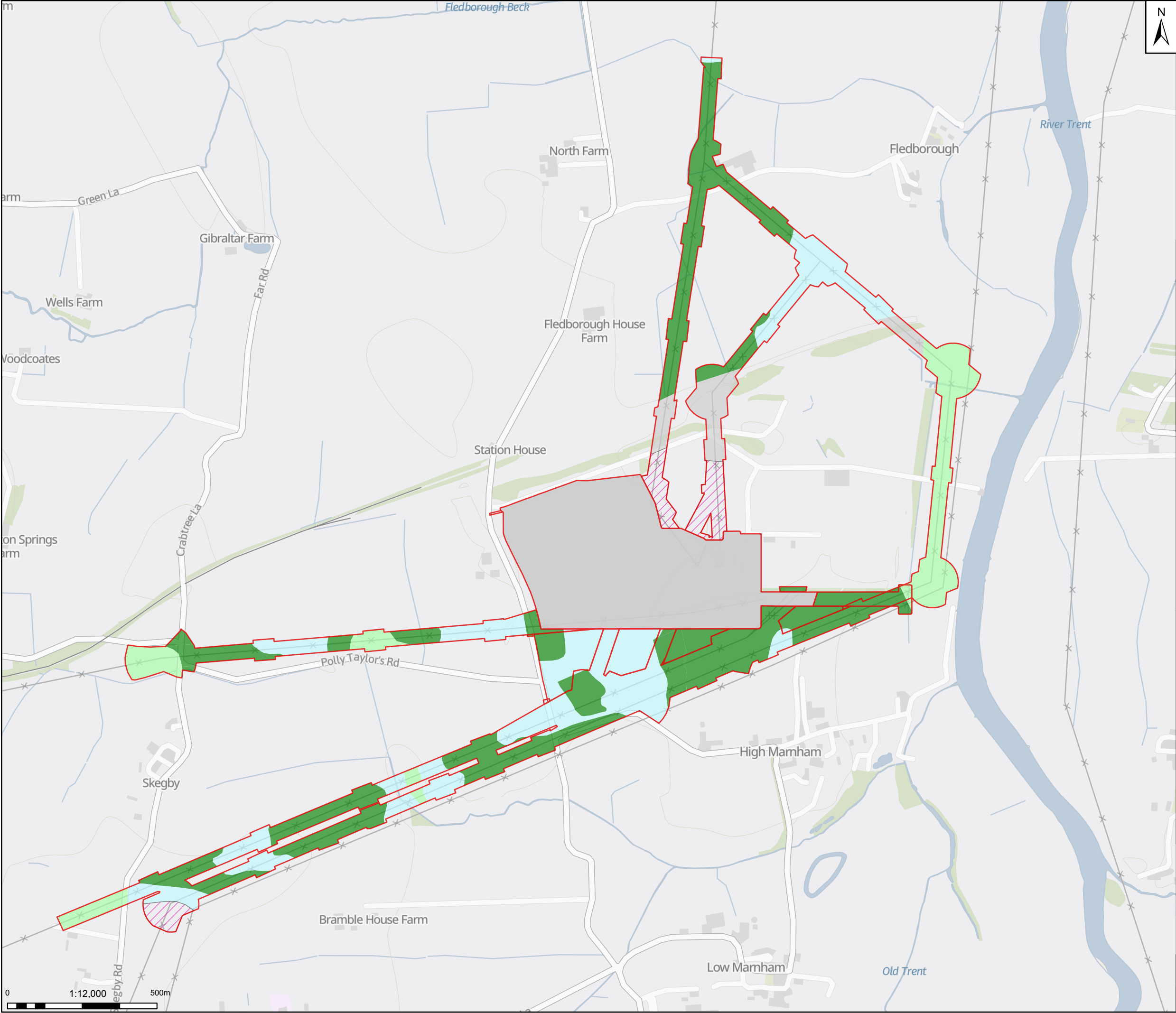
- 6.1.1 The majority of land across the land required to construct the Scheme, as shown in Annex A of this ALC Report, is BMV land (Grades 3a and 2), which accounts for 69.7% of the area surveyed (67.1ha). Grade 2 land is very good quality agricultural land and Grade 3a land is good quality agricultural land.
- 6.1.2 Grade 3b non-BMV land (moderate quality agricultural land), accounts for 12.6ha (12.6%). Grade 3b land was predominantly limited by flood risk.
- 6.1.3 It is recommended a detailed Soil Management Plan (SMP) is prepared post-planning consent and implemented during construction and operation to protect agricultural land quality and soil resources, ensuring that good practice measures are implemented for soil stripping, stockpiling and reinstatement. An OSMP (see Appendix G of the Chesterfield to High Marnham EAR) has been prepared and submitted alongside this report.

References

- Ref 1 Bassetlaw District Council (May 2024). Bassetlaw Local Plan 2020-2038. [online] Available at: <https://www.bassetlaw.gov.uk/media/gn1kjm1b/adopted-bassetlaw-local-plan-2020-2038.pdf> [accessed 5 May 2025].
- Ref 2 British Geological Survey Geology Viewer [online] Available at: <https://geologyviewer.bgs.ac.uk/> [accessed 5 May 2025].
- Ref 3 British Society of Soil Science (BSSS) (2022). Working with Soil Guidance Note on Assessing Agricultural Land Classification Surveys in England and Wales.
- Ref 4 Department for Environment, Food and Rural Affairs (Defra), and Welsh Government (2025). Agricultural Land Classification of England and Wales: Guidelines for grading the quality of agricultural land. (updated from MAFF, 1988).
- Ref 5 Department for Environment, Food and Rural Affairs (Defra), Magic Map Application. [online] Available at: <https://magic.defra.gov.uk/MagicMap.aspx> [accessed 5 May 2025].
- Ref 6 Department for Energy Security and Net Zero (2024). Overarching National Policy Statement for Energy (EN-1) .
- Ref 7 GOV.UK (2024). Check your long term flood risk. Where do you want to check? – Check your long term flood risk. [online] Available at: <https://check-long-term-flood-risk.service.gov.uk/postcode> [accessed 5 May 2025].
- Ref 8 Hodge, C.A.H (1984). Soils and their use in Midland and Western England.
- Ref 9 Hodgson, J.M. (2022). The Soil Survey Handbook. Soil Survey Technical Monograph No. 5, Cranfield.
- Ref 10 Meteorological Office (1989). Climatological Data for Agricultural Land Classification. London: The Meteorological Office.
- Ref 11 Ministry of Housing, Communities and Local Government (2024). National Planning Policy Framework (NPPF). [online] Available at: www.gov.uk [accessed 15 July 2025].
- Ref 12 Munsell (2022). Munsell Soil Colour Charts: with genuine Munsell colour chips.
- Ref 13 Natural England (2021). Guide to assessing development proposals on agricultural land Guide to assessing development proposals on agricultural land. [online] Available at: www.gov.uk [accessed 5 May 2025].

Annex A

Detailed Agricultural Land Classification (ALC) Map



N

Legend

Land required to construct the Scheme

Substation Purchase Areas

ALC Grade

2

3a

3b

Non-Agricultural

Not Surveyed

Notes

Contains OS data © Crown Copyright and database right 2026. Contains data from OS Zoomstack

01

07/05/26

INITIAL ISSUE

DDL

LH

BL

Rev

Date

Description

Drawn

Check

Approv

Client:

PROJECT:

CHESTERFIELD TO HIGH MARNHAM

nationalgrid

Site

High Marnham

Client

1-3 Strand
London
WC2N 5EH

ARCADIS

Registered office:
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EC3M 4BY
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Title:

Figure 3 -
Detailed Agricultural Land
Classification (ALC) Mapping

Designed

L. Hoyland

Date
07 May 26

Signed

Drawn

D. De Lange

Date
07 May 26

Signed

Checked

L. Hoyland

Date
07 May 26

Signed

Approved

B. Lascelles

Date
07 May 26

Signed

Scale:

1:12,000

Datum:

AOD

Original Size:

A3

Grid:

OS

Suitability Code:

S2

Project Number:

30184504

Suitability Description:

For Information

Drawing Number:
30184504-ARC-EGN-ZZ-DR-ZZ-00178

Revision:
P01

Print Date:

07-05-26 12:12:18

C:\Users\delanged9093\ARCADIS\30184504 - EDEU Lot 1 - 01 GDV Team\01 Apr\30184504-ARC-EGN-ZZ-DR-ZZ-00178-S2-P01-Figure 3 - Detailed Agricultural Land Classification (ALC) Mapping S37 High Marnham EAR.aprx

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Annex B

Auger Bore Log

[illegible]

Auger Bore No	Surveyor Initials	Horizon Top (cm)	Horizon Bottom (cm)	Texture	Matrix Colour	Mottle Colour	Mottle %	Mottle Size	Gley	Dedpth to Gley	CaCo3%	Slope	Hard Stone Content % >2mm	Hard Stone Content %>2cm	Hard Stone content %>6cm	Slowly permeable layer (SPL)	Depth to SPL	Wetness Class	Wetness Grade	Droughti-ness - MB Wheat	Droughti-ness - MB Potato	Droughti-ness Grade	Limiting Factor 1	Limiting Factor 2	Limiting Factor 3	Final ALC Grade
HM10	ZL	0	30	SCL	7.5YR4/3						non-calcareous	level	6	3	2			I	1	21.99	-1.88	2	DR			2
		30	40	SCL	7.5YR4/4						non-calcareous															
		40	53	SCL	7.5YR5/6						non-calcareous															
		53	85	SCL	2.5YR4/4						non-calcareous															
		85	120	ZC	2.5YR4/4	7.5YR7/1	2				non-calcareous															
HM11	JP	0	25	hCL	10YR4/2						non-calcareous	gently sloping	5	1	2			II	3a	17.33	3.68	2	WE	DR		3a
		25	62	C	5YR4/6	5TR6/1	40	coarse	Yes	43	non-calcareous		1													
		62	82	C	5YR4/6						non-calcareous		1													
		82	120	C	2.5TR4/4	5YR6/2	20	coarse			non-calcareous		0													
HM12	ZL	0	36	ZC	7.5YR6/4						non-calcareous	level	3	2	1			III	3b	9.64	-9.73	2	WE	DR		3b
		36	120	ZC	7.5YR6/1				Yes	36	non-calcareous															
HM13	LH	0	34	C	7.5YR3/2						non-calcareous	level	4	3	2			I	3a	20.52	2.16	2	WE	DR		3a
		34	120	C	2.5YR4/4	5Y6/2	15	medium			non-calcareous		1													
HM14	ZL	0	30	C	7.5YR4/3						non-calcareous	gently sloping	4	2	1			I	3a	8.14	-9.45	2	WE	DR		3a
		30	55	C	7.5YR4/4	7.5YR7/1	2				non-calcareous															
		55	120	C	2.5YR4/6	7.5YR7/1	2				non-calcareous															
HM15	JP	0	34	C	7.5YR4/3						non-calcareous	gently sloping	5	1	2			I	3a	8.43	0.00	2	WE	DR		3a
		34	85	C	5YR4/3	GLEY17/10Y	15	coarse			non-calcareous		2													
		85	110	C	GLEY17/10Y				Yes	85	non-calcareous															
		110	120	IMP																						
HM16	ZL	0	35	C	5YR4/3						non-calcareous	level	3	2	1			I	3a	7.55	-11.92	3a	WE/DR			3a
		35	65	ZC	2.5YR4/4	Mn	2				non-calcareous		2													
		65	120	C	2.5YR4/4	Mn	2				non-calcareous															
HM17	LH	0	37	C	5YR3/2						non-calcareous	gently sloping	4	2	1			I	3a	25.02	-2.94	2	WE	DR		3a
		37	68	SC	5YR4/4						non-calcareous		3													
		68	88	SCL	2.5YR4/4						non-calcareous		3													
		88	115	C	2.5YR4/4						non-calcareous		1													
		115	120	C	GLEY16/5G/1				Yes	115	non-calcareous		1													

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Auger Bore No	Surveyor Initials	Horizon Top (cm)	Horizon Bottom (cm)	Texture	Matrix Colour	Mottle Colour	Mottle %	Mottle Size	Gley	Dedpth to Gley	CaCo3%	Slope	Hard Stone Content % >2mm	Hard Stone Content %>2cm	Hard Stone content %>6cm	Slowly permeable layer (SPL)	Depth to SPL	Wetness Class	Wetness Grade	Droughti-ness - MB Wheat	Droughti-ness - MB Potato	Droughti-ness Grade	Limiting Factor 1	Limiting Factor 2	Limiting Factor 3	Final ALC Grade
HM35	LH	0	37	mCL	7.5YR3/2						non-calcareous	gently sloping	4	2	0			I	1	26.23	1.00	2	DR			2
		37	48	C	5YR4/4						non-calcareous		1													
		48	66	SCL	5YR4/3						non-calcareous		5													
		66	120	C	2.5YR4/4	7.5YR6/1	10	medium			non-calcareous		0													
HM36	ZL	0	29	mCL	7.5YR4/3								1					I	1	36.31	5.23	2	DR			2
		29	65	hCL	7.5YR4/4								1													
		65	105	hCL	7.5YR5/4								1													
		105	120	hCL	7.5YR5/4								4													
HM37	JP	0	36	SCL	7.5YRR/2						non-calcareous	gently sloping	3	1				I	1	24.71	0.25	2	DR			2
		36	56	cSL	7.5YR4/4						non-calcareous		2													
		56	115	SCL	5YR4/3						non-calcareous		0													
		115	120	C	5YR4/4						non-calcareous		0													
HM38	LH	0	38	C	7.5YR3/2						non-calcareous	moderately sloping	4	2	0			I	3a	20.07	1.43	2	WE	DR		3a
		38	110	C	5YR4/4						non-calcareous		1													
		110	120	C	5YR4/4	5YR5/1	10	fine			non-calcareous		1													
HM39	LH	0	32	C	7.5YR3/2						non-calcareous	moderately sloping	5	3	1			I	3a	19.40	0.61	2	WE	DR		3a
		32	62	C	7.5YR4/4	7.5YR7/1	15	coarse			non-calcareous		1													
		62	100	C	7.5YR4/4						non-calcareous		1													
		100	120	ZC	GLE16/10Y				Yes??		very calcareous		0													
HM40	LH	0	36	C	7.5YR4/2						non-calcareous	level	1	0				I	3a	21.80	2.80	2	Flood Risk	WE	DR	3b
		36	120	C	7.5YR4/3	7.5YR4/4;7.5YR4/1	5	fine			non-calcareous		0													
HM41	JP	0	37	C	10YR4/2						non-calcareous	level	1	0				I	3a	21.63	2.56	2	Flood Risk	WE		3b
		37	120	C	7.5YR4/3	7.5YR4/4;7.5YR4/1	3	fine			non-calcareous		0													
HM42	LH	0	34	C	10YR4/2						non-calcareous	level	1	0				I	3a	21.63	2.63	2	Flood Risk	WE	DR	3b
		34	120	C	7.5YR4/3	7.5YR4/4;7.5YR4/1	2	fine			non-calcareous		0													
HM43	JP	0	38	C	10YR4/2													I	3a	20.23	3.40	2	Flood Risk	WE	DR	3b
		38	100	C	7.5YR4/3	7.5YR4/4;7.5YR4/1	10	fine			non-calcareous	level	1	0												
		100	120	C	7.5YR4/3	7.5YR4/4;7.5YR4/1	40	fine	Yes	105	non-calcareous		0													

Auger Bore No	Surveyor Initials	Horizon Top (cm)	Horizon Bottom (cm)	Texture	Matrix Colour	Mottle Colour	Mottle %	Mottle Size	Gley	Dedpth to Gley	CaCo3%	Slope	Hard Stone Content % >2mm	Hard Stone Content %>2cm	Hard Stone content %>6cm	Slowly permeable layer (SPL)	Depth to SPL	Wetness Class	Wetness Grade	Droughti-ness - MB Wheat	Droughti-ness - MB Potato	Droughti-ness Grade	Limiting Factor 1	Limiting Factor 2	Limiting Factor 3	Final ALC Grade
HM44	LH	0	25	hCL	10YR4/2						non-calcareous	level	1	0				I	2	22.22	4.35	2	Flood Risk	WE/DR		3b
		25	37	C	10YR4/2						non-calcareous		0													
		37	90	C	7.5YR4/3	7.5YR4/4;7.5YR4/1	35	fine			non-calcareous		0													
		90	120	C	7.5YR4/3						non-calcareous		5													
HM45	ZL	0	35	hCL	10YR4/2						non-calcareous	level	0					I	2	14.27	-3.72	2	Flood Risk	WE/DR		3b
		35	55	C	10YR4/2						non-calcareous															
		55	120	C	7.5YR4/3	7.5YR4/4;7.5YR4/1	35				non-calcareous															
HM46	ZL	0	32	hCL	10YR4/2						non-calcareous	level	0					I	2	12.77	-5.22	2	Flood Risk	WE/DR		3b
		32	68	C	10YR4/2						non-calcareous															
		68	120	C	7.5YR4/3	7.5YR4/4;7.5YR4/1	25				non-calcareous															
HM47																							Flood Risk			3b
HM48																							Flood Risk			3b
HM49	ZL	0	29	mSL	7.5YR4/3						non-calcareous		5	3	1			I	1	34.39	-0.49	2	DR			2
		29	30	mSL	7.5YR4/4						non-calcareous		3													
		30	78	mSL	7.5YR5/4						non-calcareous		8													
		78	120	LmS	7.5YR7/8						non-calcareous		20													
HM50	ZL	0	30	mSL	7.5YR4/3						non-calcareous	level	2					I	1	42.84	6.04	2	DR			2
		30	45	mSL	7.5YR4/4						non-calcareous															
		45	87	mSL	5YR6/8						non-calcareous															
		87	120	LmS	5YR7/8						non-calcareous															
HM51	ZL	0	30	mSL	7.5YR5/3						non-calcareous	level	1					I	1	28.92	-4.48	2	DR			2
		30	48	mSL	7.5YR5/4						non-calcareous															
		48	67	LmS	7.5YR7/8						non-calcareous															
		67	85	LmS	7.5YR7/6						non-calcareous															
		85	120	LmS	5YR6/8																					

Auger Bore No	Surveyor Initials	Horizon Top (cm)	Horizon Bottom (cm)	Texture	Matrix Colour	Mottle Colour	Mottle %	Mottle Size	Gley	Dedpth to Gley	CaCo3%	Slope	Hard Stone Content % >2mm	Hard Stone Content %>2cm	Hard Stone content %>6cm	Slowly permeable layer (SPL)	Depth to SPL	Wetness Class	Wetness Grade	Droughti-ness - MB Wheat	Droughti-ness - MB Potato	Droughti-ness Grade	Limiting Factor 1	Limiting Factor 2	Limiting Factor 3	Final ALC Grade
HM52	ZL	0	35	mSL	7.5YR4/3						non-calcareous	gently sloping	1					I	1	48.44	6.44	2	DR			2
		35	56	mSL	7.5YR5/6						non-calcareous															
		56	95	mSL	7.5YR6/6						non-calcareous															
		95	120	LmS	7.5YR6/6						non-calcareous															
HM53	ZL	0	35	SCL	7.5YR3/4						non-calcareous	level	6	3	2			II	2	4.64	-12.86	3a	DR	WE		3a
		35	45	SCL	7.5YR4/3						non-calcareous															
		45	65	ZC	7.5YR6/1				Yes	45	non-calcareous															
		65	120	ZC	2.5YR4/6						non-calcareous															
											non-calcareous	level	5	3	2											
HM54	ZL	0	35	SCL	7.5YR3/4						non-calcareous							III	3b	9.50	-10.50	3a	WE	DR		3b
		35	95	ZC	7.5YR6/1				Yes	35	non-calcareous															
		95	120	ZC	2.5YR4/6						non-calcareous															
HM55	ZL	0	35	C	7.5YR3/3						non-calcareous	level	4	3	2			II	3a	6.96	-11.54	3a	WE/DR			3a
		35	47	C	7.5YR4/3						non-calcareous															
		47	65	ZC	2.5YR4/6	7.5YR7/1			Yes	47-59	non-calcareous															
		65	120	ZC	2.5YR4/6						non-calcareous															
HM56	LH	0	36	SCL	10YR3/2						non-calcareous	level	3	2	0			I	1	28.68	-2.09	2	DR			2
		36	78	SCL	10YR4/4	10YR5/8	10	fine			non-calcareous		1													
		78	95	cSL	10YR4/4						non-calcareous		5													
		95	120	C	2.5YR3/4						non-calcareous		0													
HM57	JP	0	32	C	10YR4/3						non-calcareous	level	1	0				II	3a	9.15	-8.79	2	WE	DR		3a
		32	62	C	7.5YR3/4	7.5YR4/6	10	medium			non-calcareous		0													
		62	93	C	7.5YR3/4	7.5YR4/6;7.5YR6/1	45	coarse	Yes	65	non-calcareous		0													
		93	117	C	2.5Y5/1				Yes		non-calcareous		0													
		117	120	C	2.5Y2.5/1																					
HM58	JP	0	27	C	7.5YR4/2						non-calcareous	level	5	1	0			II	3a	4.33	-13.58	3a	WE/DR			3a
		27	52	C	7.5YR4/4						non-calcareous		3													
		52	102	C	7.5YR4/3	7.5YR5/1;7.5YR4/6	45	coarse	Yes	55	non-calcareous		1													
		102	120	C	2.5YR4/4						non-calcareous															
HM59	LH	0	39	SC	10YR3/2						non-calcareous	level	6	3	1			II	3a	8.99	-11.09	3a	WE/DR			3a
		39	70	SC	10YR4/2	10YR5/1;7.5YR4/6	45	coarse	Yes	50	non-calcareous		5													
		70	100	C	10YR4/2	10YR5/1;7.5YR4/6	40	coarse			non-calcareous		1													
		100	120	C	GLEY16/5GY						non-calcareous		1													
HM60	LH	0	34	SC	10YR3/2						non-calcareous	level	8	5	2			III	3b	5.47	-12.27	3a	WE	DR		3b
		34	88	C	GLEY16/5GY	5YR4/6	45	coarse	Yes	35	non-calcareous		1													
		88	120	C	GLEY16/5GY	5YR4/6	40	coarse			non-calcareous		1													

Auger Bore No	Surveyor Initials	Horizon Top (cm)	Horizon Bottom (cm)	Texture	Matrix Colour	Mottle Colour	Mottle %	Mottle Size	Gley	Dedpth to Gley	CaCo3%	Slope	Hard Stone Content % >2mm	Hard Stone Content %>2cm	Hard Stone content %>6cm	Slowly permeable layer (SPL)	Depth to SPL	Wetness Class	Wetness Grade	Droughti-ness - MB Wheat	Droughti-ness - MB Potato	Droughti-ness Grade	Limiting Factor 1	Limiting Factor 2	Limiting Factor 3	Final ALC Grade
HM61	JP	0	27	C	10YR2/2						non-calcareous	level	5	2	1			I	3a	-0.41	-13.19	3a	WE/DR			3a
		27	38	C	10YR4/3						non-calcareous		6													
		38	52	C	10YR4/3	10YR6/8;10YR6/1	25	coarse			non-calcareous		1													
		52	100	C	7.5YR4/4						non-calcareous		0													
		100	120	SCL	7.5YR4/4						non-calcareous		0													
HM62	LH	0	34	SCL	7.5YR3/2						non-calcareous	level	4	2	1			I	1	8.15	-13.03	3a	DR			3a
		34	88	SCL	7.5YR4/4						non-calcareous		8													
		88	120	C	5YR4/4	5YR6/1	8	fine			non-calcareous		1													
HM63	ZL	0	32	C	7.5YR4/3						non-calcareous	level	3	2	1			II	3a	8.21	-9.73	2	WE	DR		3a
		32	55	C	5YR6/3	5YR6/8;			Yes	55	non-calcareous															
		55	120	C	5YR6/3						non-calcareous															
HM64	LH	0	38	SCL	7.5YR3/2													I	1	12.16	-6.38	2	DR			2
		38	55	SCL	7.5YR4/4						non-calcareous	level	2	1	0											
		55	80	SCL	5YR4/4						non-calcareous		1													
		80	105	C	5YR4/4	GLE16/10Y	25	coarse	Yes	80	non-calcareous		15													
		105	120	C	GLE16/10Y						non-calcareous		0													
HM65	ZL	0	27	SCL	7.5YR4/3						non-calcareous							II	2	2.95	-12.99	3a	DR	WE		3a
		27	42	SCL	7.5YR4/4						non-calcareous															
		42	67	ZC	5YR6/3	7.5YR7/1; 7.5YR6/8	20		Yes	67	non-calcareous															
		67	120	ZC	5YR6/1	7.5YR7/1; 7.5YR6/8					non-calcareous															
HM66	JP	0	37	SCL	10YR3/2						non-calcareous	level	7	5				II	2	7.71	-11.45	3a	DR	WE		3a
		37	62	SCL	10YR4/3	10YR5/8	20	medium	Yes	42	non-calcareous		2													
		62	92	C	5YR4/4						non-calcareous		1													
		92	120	C	5YR4/4	5YR6/1	40	coarse	Yes		non-calcareous		1													
HM67	LH	0	38	SCL	7.5YR4/2						non-calcareous	level	8	6	2			III	3a	6.68	-11.04	3a	WE/DR			3a
		38	70	C	7.5YR4/4	7.5YR7/1	25	coarse	Yes	40	non-calcareous		1													
		70	120	C	2.5YR4/4	7.5YR7/1	5	fine	No		non-calcareous		1													
HM68	JP	0	28	hCL	7.5YR4/3						non-calcareous	level	15	5	2			I	2	17.63	-1.10	2	WE/DR			2
		28	59	C	5YR4/4						non-calcareous		1													
		59	87	cSL	5YR4/4						non-calcareous		1													
		87	120	C	5YR4/4						non-calcareous															

Auger Bore No	Surveyor Initials	Horizon Top (cm)	Horizon Bottom (cm)	Texture	Matrix Colour	Mottle Colour	Mottle %	Mottle Size	Gley	Dedpth to Gley	CaCo3%	Slope	Hard Stone Content % >2mm	Hard Stone Content %>2cm	Hard Stone content %>6cm	Slowly permeable layer (SPL)	Depth to SPL	Wetness Class	Wetness Grade	Droughti-ness - MB Wheat	Droughti-ness - MB Potato	Droughti-ness Grade	Limiting Factor 1	Limiting Factor 2	Limiting Factor 3	Final ALC Grade
HM69	LH	0	34	hCL	7.5YR3/2						non-calcareous	moderately sloping	10	5	3			II	3a	8.00	-9.63	2	WE	DR		3a
		34	48	C	5YR4/4						non-calcareous		1													
		48	120	C	GLEY15/10Y	7.5YR4/4	35	coarse	Yes	48	non-calcareous		1													
HM70	LH	0	39	SCL	7.5YR3/2						non-calcareous	level	6	3	1			I	1	26.91	11.86	2	DR			2
		39	58	SCL	7.5YR4/4						non-calcareous		1													
		58	120	C	5YR4/4						non-calcareous		1													
HM71	JP	0	34	hCL	10YR4/2						non-calcareous	level	2	5	1			II	3a	12.61	-5.19	2	WE	DR		3a
		34	100	C	10YR4/2	10YR6/1;7/5YR4/6	40	medium	Yes	52	non-calcareous		1													
		100	120	C	7.5YR4/3						non-calcareous		0													
HM72	LH	0	32	C	7.5YR3/2						non-calcareous	level	5	3	1			I	3a	27.19	0.66	2	Flood Risk	WE	DR	3b
		32	60	C	7.5YR4/3						non-calcareous		1													
		60	68	hCL	GLEY15/10Y						non-calcareous		1													
		68	100	hCL	5YR4/6						non-calcareous		1													
		100	120	C	5YR4/6						non-calcareous		1													
HM73	LH	0	30	hCL	7.5YR3/2						non-calcareous	level	4	2	1			II	3a	30.64	3.95	2	Flood Risk	WE	DR	3b
		30	62	C	5YR4/4						non-calcareous		1													
		62	82	hCL	10YR5/4	2.5Y5/8	15	medium	Yes	62	non-calcareous		1													
		82	105	hCL	GLEY15/10Y	5YR4/6	20	medium			non-calcareous		3													
		105	120	C	GLEY15/10Y	5YR4/6	20	medium			non-calcareous		1													
HM74	JP	0	37	SCL	10YR4/2						non-calcareous	level	2	6	1			I	1	3.47	-11.84	3a	DR			3a
		37	120	C	5YR4/4	7.5YR6/1	15	medium			non-calcareous		12													
HM75	LH	0	29	hCL	7.5YR3/2						non-calcareous	gently sloping	3	1	0			I	2	39.14	1.22	2	WE/DR			2
		29	60	SCL	2.5YR4/4						non-calcareous		1													
		60	105	cSL	2.5YR4/4						non-calcareous		1													
		105	120	SC	2.5YR4/4						non-calcareous		1													
HM76	JP	0	37	SCL	7.5YR3/3						non-calcareous	gently sloping	5	1	0			I	1	12.88	-8.69	2	DR			2
		37	56	C	7.5YR3/4						non-calcareous		1													
		56	95	SC	2.5Y6/2						non-calcareous		1													
		95	120	C	5YR4/6						non-calcareous															
HM77	ZL	0	30	C	7.5YR5/4						non-calcareous	gently sloping	3	2	1			I	3a	8.17	-9.57	2	WE	DR		3a
		30	50	C	5YR4/6	7.5YR7/1	1				non-calcareous															
		50	120	C	2.5YR4/8	7.5YR7/1	2				non-calcareous															

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Annex C

Previous ALC Report

**HIGH MARNHAM SOLAR FARM
HIGH MARNHAM, NOTTS**

**AGRICULTURAL LAND
CLASSIFICATION
AND CIRCUMSTANCES**

April 2022





**HIGH MARNHAM, SOLAR FARM,
HIGH MARNHAM, NOTTS**

**AGRICULTURAL LAND
CLASSIFICATION
AND CIRCUMSTANCES**

April 2022

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Appendices

- KCC1 Natural England Technical Information Note TIN049
- KCC2 Agricultural Land Classification Report
- KCC3 Description of Solar Array Installation
- KCC4 Decommissioning and Removal of Solar Panels
- KCC5 ALC Surveys Nearby
- KCC6 Extracts from John Nix Farm Management Pocketbook

Plans

- KCC3211/01 Auger Point Plan
- KCC3211/02 Agricultural Land Classification

1 INTRODUCTION

- 1.1 This report considers the agricultural issues of relevance in respect of a proposal to install solar panels, and related works, over an area of up to approximately 56 ha at High Marnham, Nottinghamshire.
- 1.2 The Site comprises all or parts of a number of arable fields and is outlined in red on the Google Earth image below. The construction compound is not shown, but will be located on the old power station site and hence on non-agricultural land.

Insert 1: The Approximate Site Boundary (Google Earth)



- 1.3 The site lies to the south and west of the former High Marnham Power Station and is otherwise bordered by a railway to the north, a road to the west, and agricultural land to the south and east. Part of the site borders the settlement of High Marnham.

This Report

- 1.4 We have carried out a detailed Agricultural Land Classification (ALC) of the Site. This report considers the land quality in context with planning policy and guidance, and reviews the potential benefits for the soil resource.
- 1.5 This report is structured as follows:
- **section 2** sets out the national and local planning policy and guidance of relevance;
 - **section 3** describes the site and the land quality;
 - **section 4** assesses the implications of the findings;
 - and **section 5** ends with a summary and conclusions.

The Author

- 1.6 The ALC survey was carried out by an experienced soil surveyor. This policy review was carried out by a Chartered Surveyor and a Fellow of the British Institute of Agricultural Consultants.

2 PLANNING POLICY OF RELEVANCE

National Planning Policy

- 2.1 The National Planning Policy Framework (NPPF) was most recently revised in July 2021, and accordingly forms the starting point.
- 2.2 Paragraph 174 notes that planning policies and decisions should contribute to and enhance the natural and local environment by, inter alia, recognising **“the wider benefits from natural capital and ecosystem services – including the economic and other benefits of the best and most versatile agricultural land”**.
- 2.3 The best and most versatile (BMV) agricultural land is defined in Annex 2 of the NPPF as that in grades 1, 2 and 3a of the Agricultural Land Classification.
- 2.4 Paragraph 175 deals with plan making. It requires plans to, inter alia, allocate land with the least environmental or amenity value, where consistent with other policies in the Framework. Footnote 58 of the NPPF identifies that **“where significant development of agricultural land is demonstrated to be necessary, areas of poorer quality land should be preferred to those of a higher quality”**.
- 2.5 There is no definition of what constitutes “significant” development. However the “Guide to assessing development proposals on agricultural land” (Natural England, February 2021) advises local planning authorities to **“take account of smaller losses (under 20 hectares) if they’re significant when making your decision”**, suggesting that 20 ha is a suitable threshold for defining “significant” in many cases.
- 2.6 The Planning Practice Guidance suite paragraph 5-013-20150327 advises that relevant considerations for large-scale ground-mounted solar farms include:
- whether the use of agricultural land has been shown to be necessary and poorer quality land has been used in preference;
 - that the proposal allows for continued agricultural use where applicable;
 - that solar farms are normally temporary structures.

Local Policy

- 2.7 The Bassetlaw District Core Strategy and Development Management Policies DPD (December 2011) policy DM10 “Renewable and Low Carbon Energy” sets out that proposals for renewable energy will need to demonstrate compliance with a number of criteria. These include:

“(ii) will not lead to the loss or damage to high-grade agricultural land (Grades 1 & 2)”.

3 AGRICULTURAL LAND QUALITY

The ALC System

- 3.1 The Agricultural Land Classification (ALC) system provides a framework for classifying land according to the extent to which its physical or chemical characteristics impose long-term limitations on agricultural use. The ALC system divides agricultural land into five grades. Grade 1 of the ALC is described as being of excellent quality and Grade 5, at the other end of the scale, is described as being of very poor quality. The current guidelines and criteria for ALC were published by the Ministry of Agriculture, Fisheries and Food (MAFF) in 1988 ('Agricultural Land Classification of England and Wales: Revised Guidelines and Criteria for Grading the Quality of Agricultural Land'¹).
- 3.2 The ALC system is described in Natural England's Technical Information Note, reproduced in **Appendix KCC1**.

ALC Survey Results

- 3.3 The ALC survey of the site and adjacent land was carried out in March 2022. The survey covered a slightly wider area than the Site. 58 auger bore sites were examined over the site and graded in accordance with the revised methodology. Three soil pits were dug to better describe profiles, and three samples were sent for particle size analysis to validate the hand-texturing results.
- 3.4 The factors affecting the ALC are set out in the analysis in **Appendix KCC2**. There are no climatic, gradient or local micro-relief limitations to the quality of land.
- 3.5 The land quality across the site comprises a mixture of ALC Grades 1, 2, 3a and 3b, as set out in the table below.

Table 1: Results of Detailed ALC

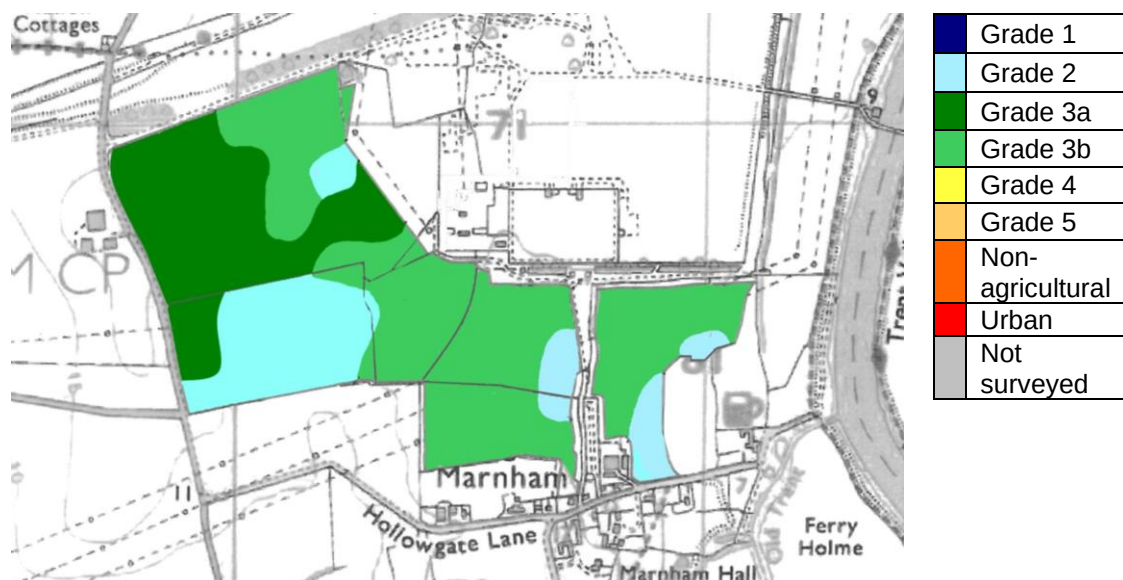
Grade	Description	Area (ha)	Proportion (%)
2	Very good	12	21
3a	Good	18	32
3b	Moderate	26	47
Total		56	100

¹ Agricultural Land Classification of England and Wales: Revised Guidelines and Criteria for Grading the Quality of Agricultural Land', October, 1988. The Ministry of Agriculture, Fisheries and Food (MAFF) was incorporated within the Department for Environment, Food and Rural Affairs (Defra) in June 2001

3.6 The detailed ALC report is set out in **Appendix KCC2**, and the distribution of grades is provided on **Plan KCC3211/02** at the back of this report.

3.7 The distribution is complex, as shown on the ALC plan (extract below).

Insert 2: Extract from ALC Plan (provisional results)



3.8 Accordingly the site is a mixture of land grades, and overall just half is of BMV quality, but in a dispersed pattern.

4 ASSESSMENT

- 4.1 Planning policy in the NPPF (2021) sets out that development management decisions should recognise the economic and other benefits of the best and most versatile agricultural land.
- 4.2 In the context of plan making the NPPF sets out that land should be allocated with the least environmental value. Footnote 58 to paragraph 175 advises that, where significant development of agricultural land is demonstrated to be necessary, poorer quality land should be used in preference.
- 4.3 The adopted Local Plan supports renewable energy development but seeks to avoid land of Grades 1 and 2. It does not seek to protect land of Subgrade 3a.
- 4.4 In this analysis I consider:
- whether the development adversely affects agricultural land quality and soils;
 - land quality in the area generally and whether poorer quality land is available;
 - the implications of the development on a wider basis;
 - what the economic benefits are and the effects on farm viability;
 - and the weight to be given to the loss of agricultural land in this context.

Is Agricultural Land “Lost”

- 4.5 The development proposed is the installation of solar panels. As noted in the Planning Practice Guidance, it is generally accepted that such development is normally temporary.
- 4.6 The installation of solar panels does not result in the loss of agricultural land, nor does it result in the downgrading of agricultural land as graded under the ALC methodology.
- 4.7 It is appropriate to differentiate between soils and agricultural land quality. There can be effects on soils and their structure that do not affect the agricultural land quality.
- 4.8 A description of the installation process is set out in **Appendix KCC3**. The installation process, if done properly, causes minimal damage to the soils. The installation process, even if done poorly, will have no discernible impact on the agricultural land quality (which is measured at a sampling density of one auger per hectare).
- 4.9 The following two photographs show installation having caused no damage to agricultural soils.

Inserts 3 and 4: Photos During Construction



- 4.10 Trenching works involve narrow slits, but with the soil put back in the same order these recover very quickly and affect neither soil structure nor land quality.

Inserts 5 and 6: Cabling Installation



- 4.11 The access tracks involve removing circa 200mm of topsoil, which is stored in a low bund to the side of the track. A membrane is added and 300mm of crushed stone is then added. The tracks generally follow the field edges.
- 4.12 Each transformer will be built onto a concrete plinth, built onto a stone base following the stripping of the topsoil. Each base will be a maximum of 80 sqm.

- 4.13 As described in **Appendix KCC4**, the tracks and plinths are recoverable, and in any event are small areas of land. Track restoration to similar quality is easy, concrete plinth restoration to BMV is more difficult and may not always be successful for the 80 sqm – 100 sqm involved.
- 4.14 Accordingly the only impact on agricultural land quality relates to the small areas of fixed infrastructure. The wider ALC resource is neither lost nor adversely affected.
- 4.15 There are 12 transformers proposed, hence a total area of circa 1200 sqm (0.12 hectares collectively). Even if that land could not be restored to BMV quality, it could still be farmed post decommissioning. Even if it could not be farmed, those small areas would be no more difficult to avoid with farm machinery than National Grid pylons, of which there are a number already across the site.
- 4.16 The areas considered to be potentially downgraded are identified by grade and area in the table below.

Table 2: Areas Considered to be Potentially Downgraded

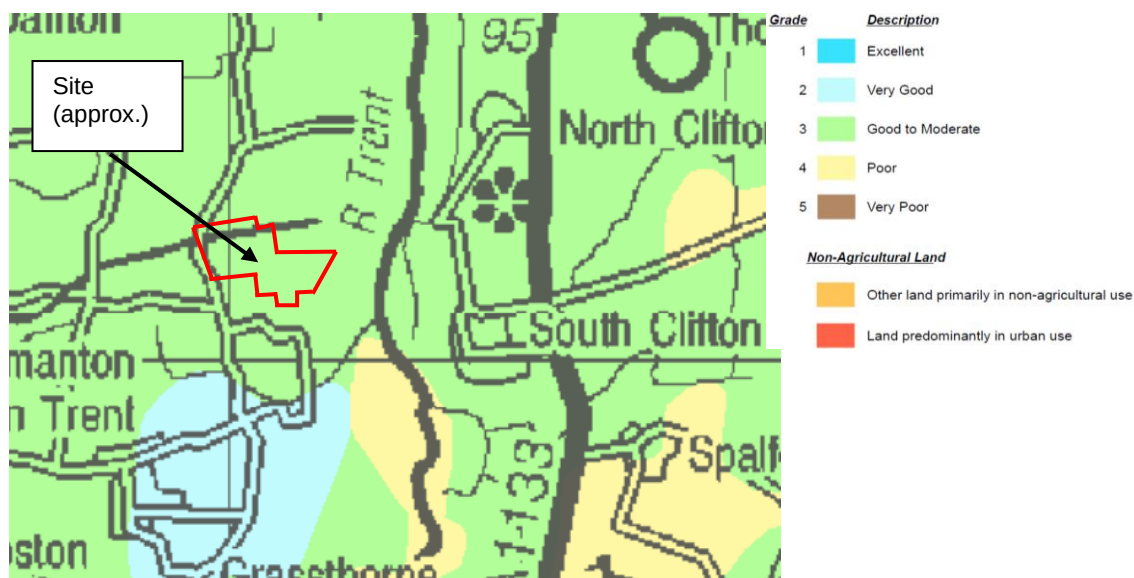
ALC Grade		Areas (ha)	Areas (%)
2	(2 transformers)	0.02	0.04
3a	(6 transformers)	0.06	0.11
3b	(4 transformers, 1 substation, 1 container)	0.06	0.11
Total		0.14	0.26

- 4.17 Therefore the long term impact on BMV land is negligible and the impact on the use of the rest of the field is also negligible.

Land Quality in the Area Generally and Whether Poorer Quality Land is Available

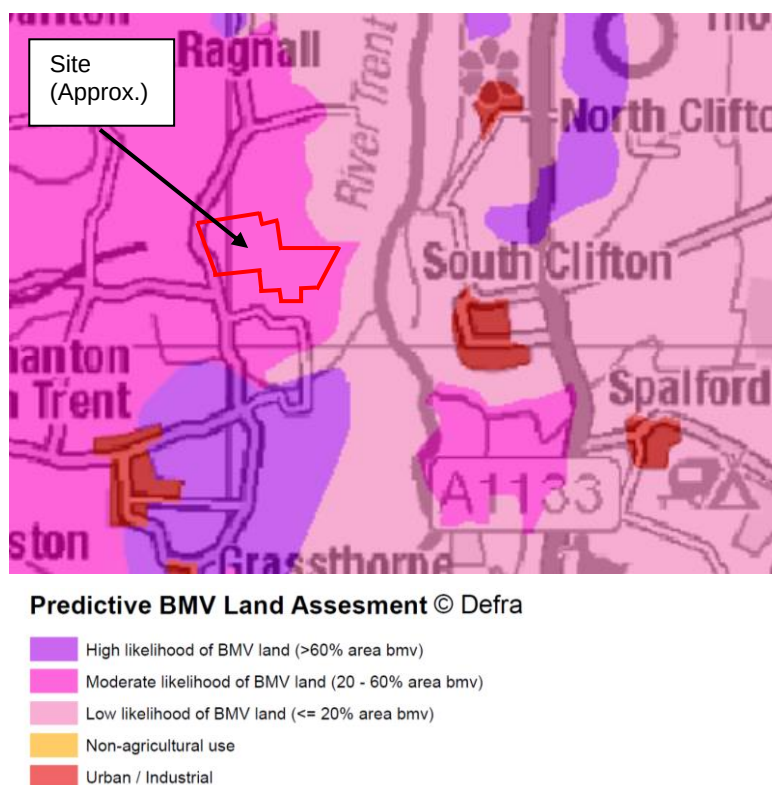
- 4.18 Any assessment of the significance of losing agricultural land needs to be made in context. Across England an estimated 42% of all farmland is within Grades 1, 2 and 3a (see TIN049, **Appendix KCC 1**). Accordingly BMVAL is not a rare resource.
- 4.19 Statistically about 40% of Grade 3 land falls within Sub-grade 3a. However, in parts of the country the proportion of subgrade 3a is expected to be much higher.
- 4.20 The “provisional” ALC map from the 1970’s shows the Site as undifferentiated Grade 3. This is indicated below.

Insert 7: The Provisional ALC Site Marked Approx.



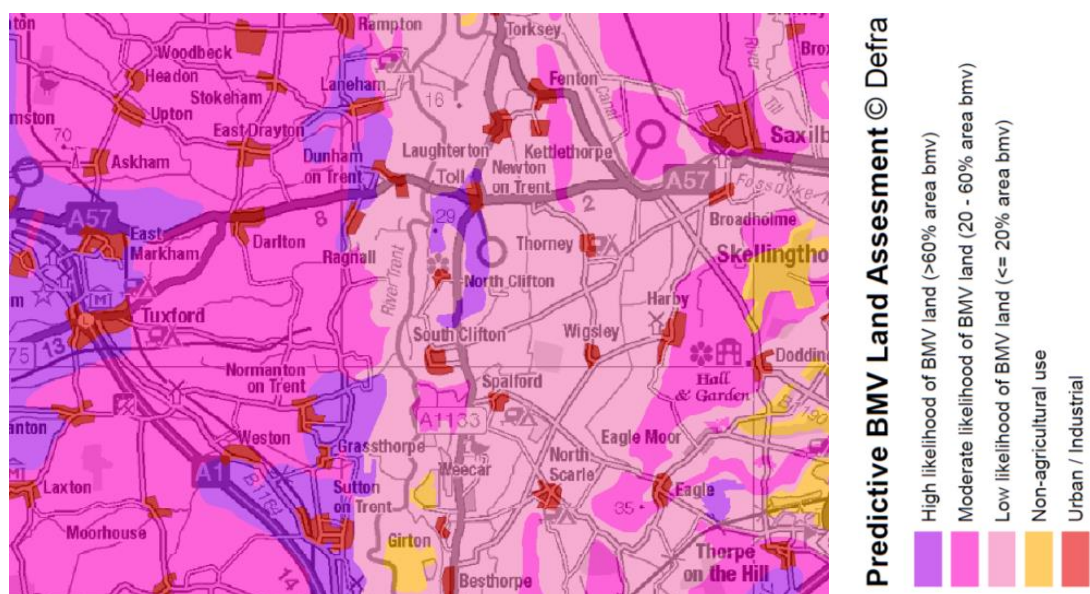
- 4.21 Recognising the limitations of the “provisional” maps from the 1970s, as described in TIN049 (**Appendix KCC1**) Natural England has now produced predictive “**likelihood of best and most versatile**” land quality maps. These estimate the proportion of land within an area that is of BMV quality. There are three categories: low (<20% area bmv), moderate (20-60% area bmv), and high (>60% area bmv). For this area the map shows the site, and most of the land in the area, as falling into the moderate (20-60% area) BMV category.

Insert 8: Predictive BMV Land Assessment Site Marked Approx.



- 4.22 The BMV likelihood maps show this area as on the border between generally moderate likelihood of BMV, with a low likelihood to the east mostly on the east side of the River Trent, as shown below. Within Nottinghamshire, on the western side of the River Trent, the land shown as low likelihood of BMV is generally affected by floodwater².

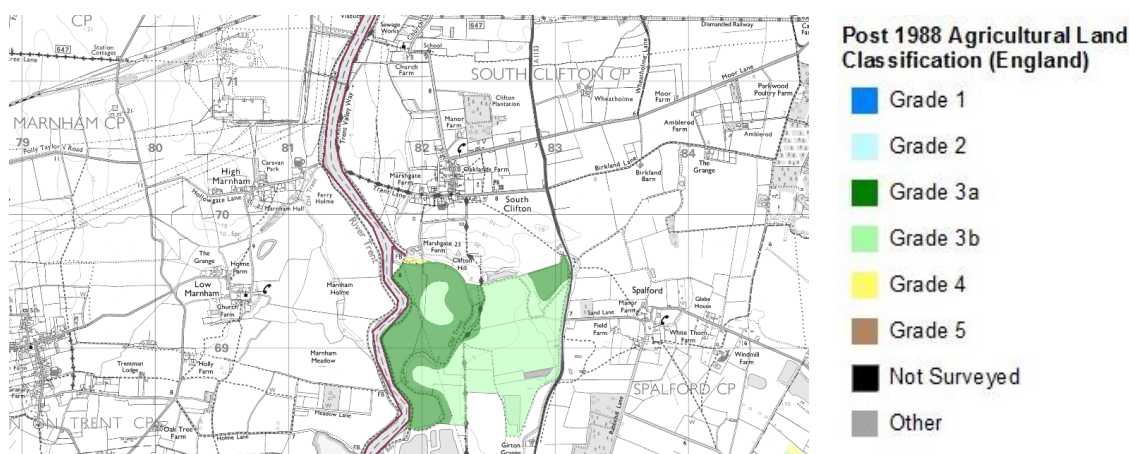
Insert 9: Predictive BMV Likelihood Map



- 4.23 These maps show that this general area is predicted to contain a moderate proportion of BMV land (20-60% area bmv). Development in the wider area within the District is likely to involve BMV land. Indeed, it seems unlikely to be possible to avoid BMV except in small areas.

- 4.24 There is limited detailed ALC survey data available for this area, as reproduced in **Appendix KCC5**. An extract from the survey data available from www.magic.gov.uk, is shown below. A survey to the south of South Clifton showed a mixture of subgrades 3a (west of the Old Trent) and subgrade 3b.

Insert 10: Extract Available Detailed ALC



² <https://flood-map-for-planning.service.gov.uk>, accessed 7th April 2022.

- 4.25 Therefore it can be concluded that, in terms of land quality in the local area:
- most is predicted to be 20 - 60% area bmv on the BMV likelihood maps;
 - there is a narrow strip alongside the River Trent that is shown to be of low likelihood of BMV, but this is mostly affected by flooding;
 - such that of non-flood-plain farmland the Site lies in the lowest category of BMV likelihood available;
 - the Site, comprising a mix of BMV and non-BMV, falls within the predicted BMV likelihood category and is thus the lowest available.

Volumes in the Wider Consideration

- 4.26 The Site involves 56 ha of land, of which 30 ha is BMV.
- 4.27 The Site lies on the border of two counties. Based on the provisional map from the 1970s (and hence to be considered cautiously given their limitations), and with a crude estimate of 40% of Grade 3 land being of Subgrade 3b, the areas and proportions of agricultural land locally are as follows.

Table 3: ALC Areas and Proportions

ALC Grade	Bassetlaw		Nottinghamshire		Lincolnshire	
	Ha	%	Ha	%	Ha	%
1	554	0.9	554	0.3	75,757	13.4
2	12,010	20.4	37,908	20.7	186,752	33.0
3a	17,802	30.3	53,455	29.2	118,497	20.9
3b	26,704	45.6	80,183	43.9	177,746	31.4
4	1,666	2.8	10,719	5.9	7,447	1.3
5	0	0	0	0	0	0
Total	58,736	100.0	182,819	100.0	566,199	100.0

- 4.28 Taking the BMV land by area and proportion, the analysis is shown below.

Table 4: BMV Comparison

BMV area	Area (ha)	Proportion (%)
England	4,719,520	41.3
Bassetlaw	30,366	51.6
Nottinghamshire	91,917	50.2
Lincolnshire	381,006	67.3

- 4.29 This area has an above-average proportion of land of BMV quality and the site is below the District and County average.

- 4.30 It is noted that the Secretary of State permitted Little Crow Solar Farm on 5th April 2022. In so doing he agreed with the Examining Authority that the solar panels “**did not amount to a permanent loss of farmland**” (SoS 4.50) and did not have a significant effect on agricultural productivity in North Lincolnshire. Some 36.6 ha of Subgrade 3a were included within that approved solar farm development (National Infrastructure Planning EN 010101).

Economic and Other Benefits

- 4.31 There is no research that we are aware of that seeks to analyse the productive or economic advantages of BMV to non-BMV land. Grade 2 land is described in the ALC as capable of growing a wide range of crops. Subgrade 3b is described as producing moderate yields of a narrow range of crops, principally cereals or grass, or lower yields of a wider range of crops.
- 4.32 In the absence of any empirical data, any economic assessment is inevitably crude. Taking standard budgeting textbooks, such as the John Nix Farm Management Pocketbook (extracts from which are reproduced in **Appendix KCC6**), it is possible to show the difference between moderate and high yields, as an illustration, between crops.
- 4.33 Taking that crude measure for winter wheat and oilseed rape, the differences are shown below.

Table 5: Assessment of Economics of Farmed Land

Item	Winter Wheat		Oilseed Rape	
	Average	High	Average	High
Yield (t/ha)	8.6t/ha	9.75t/ha	3.5t/ha	4.0t/ha
Output (£)	1,376	1,560	1,330	1,520
Gross Margin (£)	833	1,017	822	1012
Uplift (£)	-	184	-	190

John Nix Pocketbook for Farm Management, September 2021

- 4.34 For this 56 ha site, of which 30 ha are BMV, the economic benefits of BMV land to non-BMV land would be £5,520 to £5,700. Hence the economic benefits are fairly limited.
- 4.35 The land comprises only part of a larger farm.
- 4.36 There are no buildings owned within the site.
- 4.37 The Proposed Development will consequently not have a significant adverse effect on a full-time farm business, nor will it result in any other agricultural land being affected or becoming unfarmable. Other land can continue to be managed as it is now.

The Planning Balance

- 4.38 The NPPF requires the economic and other benefits of BMV land to be considered. In plan making, where development is necessary poorer quality land should be used in preference.
- 4.39 The local plan seeks to protect the loss of land of Grades 1 and 2. Grade 2 forms only a fifth of the site.
- 4.40 In this case the economic benefits of BMV land are limited. There is no research to determine the crop advantages of BMV land over non-BMV land, but taking high and average yields figures from farm management budget books the benefits across the site could potentially be around £5,700 per annum.
- 4.41 If non-agricultural development for solar in this general area is needed, then the land is all generally of equal grading, being a mix of mostly 20 – 60% BMV land. Some sites may be more of a mix of different grades, but all will be at least partially BMV, as is this site.
- 4.42 Therefore there are no areas of poorer quality land locally to which development could otherwise be directed.
- 4.43 In such circumstances non-agricultural development accords with planning policy.

5 SUMMARY AND CONCLUSIONS

- 5.1 This report considers the agricultural land quality of land to the north of High Marnham and then assesses the planning considerations relevant to the non-agricultural development of that site.

Land Quality

- 5.2 The land was surveyed in March 2022. This identified the site to comprise a mixture of Grade 2 (12 ha or 21%), Subgrade 3a (18 ha or 32%) and Subgrade 3b (26 ha or 47%).

Planning Policy

- 5.3 Planning policy requires that the economic and other benefits of best and most versatile land be recognised. In plan making the Framework advises that where significant development of agricultural land is necessary, poorer quality land should be used in preference.
- 5.4 In respect of renewable energy, the core strategy seeks to prevent the loss only of Grades 1 and 2. 21% of the site, 12 ha, in five separate patches, is of Grade 2. There is one 7 ha patch, otherwise all the Grade 2 is in small parcels of land distributed around the site.
- 5.5 The site comprises BMV agricultural land mixed with an area of poorer quality land.
- 5.6 Against the Core Strategy, only 12 ha (21%) of the Site is Grade 2. This land will not be lost or damaged. Therefore there is no conflict with the Local Plan.
- 5.7 The installation of solar panels will not affect the ALC grade. The soil resource (as distinct from ALC grade) should also not be damaged if good practice is followed.
- 5.8 This was recently accepted in the National Infrastructure Planning decision at Little Crow Solar Farm, where 36.6 ha of Subgrade 3a was included. The ALC resource will not be affected, except for localised small areas for inverters or fixed equipment. Those amount to a maximum of under 1,200 sqm of BMV land in 12 inverter locations. Of this about 800 sqm is on BMV agricultural land.
- 5.9 Predictive likelihood of BMV maps show most of the land in this general area likely to comprise 20 - 60% or less of BMV land. Available ALC data for nearby areas confirms that the land quality is partly BMV. This site is a very small proportion of BMV agricultural land locally and contains below the local average of BMV.

- 5.10 The NPPF requires that the economic and other benefits of BMV land be considered. In this case the economic benefits are estimated to be less than £6,000 per annum. This is a fairly modest sum, therefore.
- 5.11 There are no adverse effects on any active farming business. There is no knock-on implication for any other land farmed.
- 5.12 In the circumstances, the land is not lost and the ALC resource is retained, should it be needed in the future. The land has a limited economic benefit. It is likely that any solar installations in this general area will involve land of BMV quality. There is no large area of poorer quality land available in preference.
- 5.13 Therefore the economic benefits of the land have been considered, and poorer quality land is not available. In those circumstances the non-agricultural development of the area is in accordance with the planning policy.

Appendix KCC1
Natural England Technical Information
Note TIN049

Agricultural Land Classification: protecting the best and most versatile agricultural land

Most of our land area is in agricultural use. How this important natural resource is used is vital to sustainable development. This includes taking the right decisions about protecting it from inappropriate development.

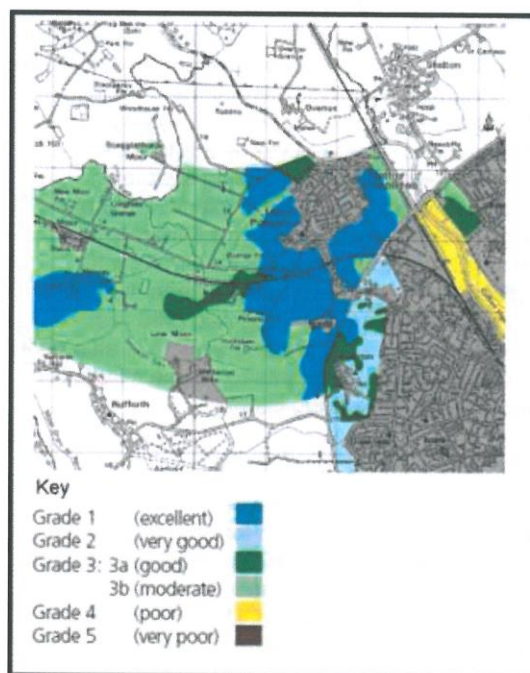
Policy to protect agricultural land

Government policy for England is set out in the National Planning Policy Framework (NPPF) published in March 2012 (paragraph 112). Decisions rest with the relevant planning authorities who should take into account the economic and other benefits of the best and most versatile agricultural land. Where significant development of agricultural land is demonstrated to be necessary, local planning authorities should seek to use areas of poorer quality land in preference to that of higher quality. The Government has also re-affirmed the importance of protecting our soils and the services they provide in the Natural Environment White Paper *The Natural Choice: securing the value of nature* (June 2011), including the protection of best and most versatile agricultural land (paragraph 2.35).

The ALC system: purpose & uses

Land quality varies from place to place. The Agricultural Land Classification (ALC) provides a method for assessing the quality of farmland to enable informed choices to be made about its future use within the planning system. It helps

underpin the principles of sustainable development.



Agricultural Land Classification - map and key

Agricultural Land Classification: protecting the best and most versatile agricultural land

The ALC system classifies land into five grades, with Grade 3 subdivided into Subgrades 3a and 3b. The best and most versatile land is defined as Grades 1, 2 and 3a by policy guidance (see Annex 2 of NPPF). This is the land which is most flexible, productive and efficient in response to inputs and which can best deliver future crops for food and non food uses such as biomass, fibres and pharmaceuticals. Current estimates are that Grades 1 and 2 together form about 21% of all farmland in England; Subgrade 3a also covers about 21%.

The ALC system is used by Natural England and others to give advice to planning authorities, developers and the public if development is proposed on agricultural land or other greenfield sites that could potentially grow crops. The Town and Country Planning (Development Management Procedure) (England) Order 2010 (as amended) refers to the best and most versatile land policy in requiring statutory consultations with Natural England. Natural England is also responsible for Minerals and Waste Consultations where reclamation to agriculture is proposed under Schedule 5 of the Town and Country Planning Act 1990 (as amended). The ALC grading system is also used by commercial consultants to advise clients on land uses and planning issues.

Criteria and guidelines

The Classification is based on the long term physical limitations of land for agricultural use. Factors affecting the grade are climate, site and soil characteristics, and the important interactions between them. Detailed guidance for classifying land can be found in: *Agricultural Land Classification of England and Wales: revised guidelines and criteria for grading the quality of agricultural land* (MAFF, 1988):

- **Climate:** temperature and rainfall, aspect, exposure and frost risk.
- **Site:** gradient, micro-relief and flood risk.
- **Soil:** texture, structure, depth and stoniness, chemical properties which cannot be corrected.

The combination of climate and soil factors determines soil wetness and droughtiness.

Wetness and droughtiness influence the choice of crops grown and the level and consistency of yields, as well as use of land for grazing livestock. The Classification is concerned with the inherent potential of land under a range of farming systems. The current agricultural use, or intensity of use, does not affect the ALC grade.

Versatility and yield

The physical limitations of land have four main effects on the way land is farmed. These are:

- the range of crops which can be grown;
- the level of yield;
- the consistency of yield; and
- the cost of obtaining the crop.

The ALC gives a high grading to land which allows more flexibility in the range of crops that can be grown (its 'versatility') and which requires lower inputs, but also takes into account ability to produce consistently high yields of a narrower range of crops.

Availability of ALC information

After the introduction of the ALC system in 1966 the whole of England and Wales was mapped from reconnaissance field surveys, to provide general strategic guidance on land quality for planners. This Provisional Series of maps was published on an Ordnance Survey base at a scale of One Inch to One Mile in the period 1967 to 1974. These maps are not sufficiently accurate for use in assessment of individual fields or development sites, and should not be used other than as general guidance. They show only five grades: their preparation preceded the subdivision of Grade 3 and the refinement of criteria, which occurred after 1976. They have not been updated and are out of print. A 1:250 000 scale map series based on the same information is available. These are more appropriate for the strategic use originally intended and can be downloaded from the Natural England [website](http://www.naturalengland.org.uk). This data is also available on 'Magic', an interactive, geographical information website <http://magic.defra.gov.uk/>.

Since 1976, selected areas have been re-surveyed in greater detail and to revised

Agricultural Land Classification: protecting the best and most versatile agricultural land

guidelines and criteria. Information based on detailed ALC field surveys in accordance with current guidelines (MAFF, 1988) is the most definitive source. Data from the former Ministry of Agriculture, Fisheries and Food (MAFF) archive of more detailed ALC survey information (from 1988) is also available on <http://magic.defra.gov.uk/>. Revisions to the ALC guidelines and criteria have been limited and kept to the original principles, but some assessments made prior to the most recent revision in 1988 need to be checked against current criteria. More recently, strategic scale maps showing the likely occurrence of best and most versatile land have been prepared. Mapped information of all types is available from Natural England (see *Further information* below).

New field survey

Digital mapping and geographical information systems have been introduced to facilitate the provision of up-to-date information. ALC surveys are undertaken, according to the published Guidelines, by field surveyors using handheld augers to examine soils to a depth of 1.2 metres, at a frequency of one boring per hectare for a detailed assessment. This is usually supplemented by digging occasional small pits (usually by hand) to inspect the soil profile. Information obtained by these methods is combined with climatic and other data to produce an ALC map and report. ALC maps are normally produced on an Ordnance Survey base at varying scales from 1:10,000 for detailed work to 1:50 000 for reconnaissance survey.

There is no comprehensive programme to survey all areas in detail. Private consultants may survey land where it is under consideration for development, especially around the edge of towns, to allow comparisons between areas and to inform environmental assessments. ALC field surveys are usually time consuming and should be initiated well in advance of planning decisions. Planning authorities should ensure that sufficient detailed site specific ALC survey data is available to inform decision making.

Consultations

Natural England is consulted by planning authorities on the preparation of all development

plans as part of its remit for the natural environment. For planning applications, specific consultations with Natural England are required under the Development Management Procedure Order in relation to best and most versatile agricultural land. These are for non agricultural development proposals that are not consistent with an adopted local plan and involve the loss of twenty hectares or more of the best and most versatile land. The land protection policy is relevant to all planning applications, including those on smaller areas, but it is for the planning authority to decide how significant the agricultural land issues are, and the need for field information. The planning authority may contact Natural England if it needs technical information or advice.

Consultations with Natural England are required on all applications for mineral working or waste disposal if the proposed afteruse is for agriculture or where the loss of best and most versatile agricultural land will be 20 ha or more. Non-agricultural afteruse, for example for nature conservation or amenity, can be acceptable even on better quality land if soil resources are conserved and the long term potential of best and most versatile land is safeguarded by careful land restoration and aftercare.

Other factors

The ALC is a basis for assessing how development proposals affect agricultural land within the planning system, but it is not the sole consideration. Planning authorities are guided by the National Planning Policy Framework to protect and enhance soils more widely. This could include, for example, conserving soil resources during mineral working or construction, not granting permission for peat extraction from new or extended mineral sites, or preventing soil from being adversely affected by pollution. For information on the application of ALC in Wales, please see below.

Agricultural Land Classification: protecting the best and most versatile agricultural land

Further information

Details of the system of grading can be found in: *Agricultural Land Classification of England and Wales: revised guidelines and criteria for grading the quality of agricultural land* (MAFF, 1988).

Please note that planning authorities should send all planning related consultations and enquiries to Natural England by e-mail to consultations@naturalengland.org.uk. If it is not possible to consult us electronically then consultations should be sent to the following postal address:

Natural England
Consultation Service
Hornbeam House
Electra Way
Crewe Business Park
CREWE
Cheshire
CW1 6GJ

ALC information for Wales is held by Welsh Government. Detailed information and advice is available on request from Ian Rugg (ian.rugg@wales.gsi.gov.uk) or David Martyn (david.martyn@wales.gsi.gov.uk). If it is not possible to consult us electronically then consultations should be sent to the following postal address:

Welsh Government
Rhodfa Padarn
Llanbadarn Fawr
Aberystwyth
Ceredigion
SY23 3UR

Natural England publications are available to download from the Natural England website: www.naturalengland.org.uk.

For further information contact the Natural England Enquiry Service on 0300 060 0863 or e-mail enquiries@naturalengland.org.uk.

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Appendix KCC2
Agricultural Land Classification

AGRICULTURAL LAND CLASSIFICATION

Background

- 1 This section of the report sets out the findings of a detailed Agricultural Land Classification (ALC). It is based on a desktop study of relevant published information on climate, topography, geology and soil, in conjunction with a soil survey. The ALC covered a wider area than is reported below.

Methodology

- 2 The work has been carried out by a Chartered Scientist (CSci), who is a Fellow (F. I. Soil Sci) of the British Society of Soil Science (BSSS). This ALC survey has been carried out by a soil scientist who meets the requirements of the BSSS Professional Competency Standard (PSC) scheme for ALC (see BSSS PCS Document 2 '*Agricultural Land Classification of England and Wales*'³). The BSSS PSC scheme is endorsed, amongst others, by the Department for Environment, Food and Rural Affairs (Defra), Natural England, the Science Council, and the Institute of Environmental Assessment and Management (IEMA).
- 3 This assessment is based upon the findings of a study of published information on climate, geology and soil in combination with a soil investigation carried out in accordance with the Ministry of Agriculture, Fisheries and Food (MAFF)⁴ '*Agricultural Land Classification of England and Wales: Revised Guidelines and Criteria for Grading the Quality of Agricultural Land*', October 1988 (henceforth referred to as the 'the ALC Guidelines').
- 4 The ALC system provides a framework for classifying land according to the extent to which its physical or chemical characteristics impose long-term limitations on agricultural use. The ALC system divides agricultural land into five grades (Grade 1 'Excellent' to Grade 5 'Very Poor'), with Grade 3 subdivided into Subgrade 3a 'Good' and Subgrade 3b 'Moderate'. Agricultural land classified as Grade 1, 2 and Subgrade 3a falls in the '*best and most versatile*' category in Paragraphs 174 and 175 of the National Planning Policy Framework (NPPF), revised on 20th July 2021. Further details of the ALC system and national planning policy implications are set out by Natural England in its Technical Information Note 049⁵.

³ British Society of Soil Science. Professional Competency Scheme Document 2 '*Agricultural Land Classification of England and Wales*'. Available online @ <https://www.soils.org.uk/sites/default/files/events/flyers/ipss-competency-doc2.pdf> Last accessed April 2022

⁴ The Ministry of Agriculture, Fisheries and Food (MAFF) was incorporated within the Department for Environment, Food and Rural Affairs (Defra) in November 2001

⁵ Natural England (December, 2012). '*Agricultural Land Classification: protecting the best and most versatile agricultural land (TIN049)*'. Available online @ <http://publications.naturalengland.org.uk/publication/35012> Last accessed April 2022

- 5 A detailed ALC survey was carried out in March 2022. The survey involved examination of the soil's physical properties at 58 auger bore locations on a 100m by 100m grid, as shown on **Plan KCC3211/01**. Three soil pits (at auger locations 3, 28 and 56) were excavated with a spade to examine certain soil physical properties, such as stone content and subsoil structure, in more detail. Topsoil samples were sent for analysis for auger locations 15, 47 and 67
- 6 The sample locations were located using a hand-held Garmin E-Trec Geographic Information System (GIS) to enable the sample locations to be relocated for verification, if necessary.
- 7 The soil profile was examined at each sample location to a maximum depth of approximately 1.2 m by hand with the use of a 5 cm diameter Dutch (Edleman) soil auger. The soil profile at each sample location was described using the '*Soil Survey Field Handbook: Describing and Sampling Soil Profiles*' (Ed. J.M. Hodgson, Cranfield University, 1997). Each soil profile was ascribed a grade following the ALC Guidelines.
- 8 As described in the ALC Guidelines, the main physical factors influencing agricultural land quality are:
 - climate;
 - site;
 - soil; and
 - interactive limitations.
- 9 These factors are considered in turn below.

Climate

- 10 Interpolated climate data relevant to the determination of the ALC grade of land at the Site is given in Table 1 below.

Table 1: ALC Climate Data for High Marnham, Nottinghamshire

Climate Parameter	Grid Ref: SK 80577 70537
Average Altitude (m)	14
Average Annual Rainfall (mm)	571
Accumulated Temperature above 0°C (January – June)	1419
Moisture Deficit (mm) Wheat	117
Moisture Deficit (mm) Potatoes	112
Field Capacity Days (FCD)	112
Grade according to climate	1

- 11 Agricultural land quality at the Site is not limited by climate with reference to Figure 1 'Grade according to climate' on page 6 of the ALC Guidelines. In this case, agricultural land at the Site could be Grade 1 in the absence of any site or soil limitations, as described below.
- 12 The soil profiles across the Site are predicted to be at field capacity (i.e., the amount of soil moisture or water content held in the soil after excess water has drained away) for approximately 112 Field Capacity Days (FCD) per year, mainly over the late autumn, winter and early spring. The climate interacts with soil physical properties, i.e., soil texture and wetness class, and can limit agricultural land quality due to soil wetness as per Table 6 of the ALC Guideline 'Grade according to soil wetness'. It should be noted that the number of FCD at this Site just falls in the FCD category <126 for determining the grade according to wetness.

Site

- 13 The Site is located to the north of High Marnham, Nottinghamshire. The Site is mainly surrounded by agricultural land, with the River Trent to the east. The approximate centre of the Site is located at British National Grid (BNG) reference National Grid Reference (Centre of Site) SK 80577 70537.
- 14 With regard to the ALC Guidelines, agricultural land quality can be limited by one or more of three main site factors as follows:
- gradient;
 - micro-relief (i.e., complex change in slope angle over short distances); and
 - risk of flooding.
- 15 **Gradient and Micro-relief.** The Site is located on a hill which is approximately 21 metres (m) Above Ordnance Datum (AOD) at the highest point in the south of the Site, to approximately 7 mAOD in the east. The quality of agricultural land over the Site is not limited by gradient, which does not exceed 7°.
- 16 **Risk of Flooding.** From the Government Flood Map for Planning website⁶, the Site is located in Flood Zone 1, with Flood Zone 2 and 3 in the east of the Site bordering the River Trent. There is no evidence to determine agricultural land at the Site is at a risk of flooding, when assessed against the criteria for frequency and/or duration in Table 2 'Grade according to flood risk in summer' and/or Table 3 'Grade according to flood risk in winter' of the ALC Guidelines.

⁶ Government Flood Map for Planning website. Available online @ <https://flood-map-for-planning.service.gov.uk/> Last accessed April 2022

Soil

- 17 **Geology/Soil Parent Material.** From British Geological Survey (BGS) maps at 1:50,000 scale, the land at the Site is underlain by Mercia Mudstone Group (mudstone). The bedrock is largely uncovered by superficial deposits, with regions of Alluvium (clay, silt, sand and gravel) in the east of the Site.
- 18 **Published Information on Soil.** Soil information is available only at a small scale (1:250,000) on the National Soil Map published by the Soil Survey of England and Wales (SSEW) in 1983. This provisional soil map indicates that land at the Site is covered with soils grouped in the Whimple 3 and Fladbury 2 Association.
- 19 As described by the SSEW, the soils of the Whimple 3 Association comprise reddish fine loamy or fine silty over clayey soils, developed mainly on moderate slopes. It also includes reddish clayey soils developed directly in the mudstone on gently sloping ground. These soils suffer slight seasonal waterlogging (Wetness Class III) in many districts but in the drier parts of the region, these soils can have a better water regime (Wetness Class II)
- 20 The Fladbury 2 Association is developed in greyish and brownish alluvium, and consists of mottled clayey soils. It occurs on the flat floodplains of the River Trent and its tributaries and along several smaller rivers and streams in Lincolnshire. These soils have slowly permeable subsoils and are waterlogged for long periods of the winter (Wetness Class IV), and waterlogging can occur during the growing season (Wetness Class V) in low-lying sites.
- 21 **Soil Survey.** The soil profiles recorded at each auger-bore location are given as **Attachment 1**. A detailed description the three soil pits is given as **Attachment 2**.

Interactive Limitations

- 22 From the information above, together with the findings of the detailed soil survey (see Soil Profile Log given as **Attachment 1**), it has been determined that the quality of agricultural land in many soil profiles over the Site is limited mainly by soil wetness.
- 23 Some of the profiles which are only slightly seasonally waterlogged (Wetness Class II) during the wettest months of the year in the Autumn, Winter and early Spring are also limited by slight soil droughtiness during the growing season, as described below.
- 24 **Soil Wetness.** From the ALC Guidelines, a soil wetness limitation exists where *'the soil water regime adversely affects plant growth or imposes restrictions on cultivations or grazing by livestock'*. Agricultural land quality at the Site is limited by soil wetness as per

Table 2 below (based on Table 6 'Grade According to Soil Wetness – Mineral Soils' in the ALC Guidelines).

Table 2: ALC Grade According to Soil Wetness

Wetness Class	Texture of the Top 25 cm	<126 Field Capacity Days
I	Sand, Loamy Sand, Sandy Loam, Sandy Silt Loam Sandy Clay Loam/Medium Silty Clay Loam /Medium Clay Loam* Heavy Silty Clay Loam/Heavy Clay Loam** Sandy Clay/Silty Clay/Clay	1 1 2 3a (2)
II	Sand, Loamy Sand, Sandy Loam, Sandy Silt Loam Sandy Clay Loam/Medium Silty Clay Loam /Medium Clay Loam* Heavy Silty Clay Loam/Heavy Clay Loam** Sandy Clay/Silty Clay/Clay	1 2 3a (2) 3a (2)
III	Sand, Loamy Sand, Sandy Loam, Sandy Silt Loam Sandy Clay Loam/Medium Silty Clay Loam /Medium Clay Loam* Heavy Silty Clay Loam/Heavy Clay Loam** Sandy Clay/Silty Clay/Clay	2 3a (2) 3b (3a) 3b (3a)
Key * 18% to <27% clay; and ** 27% to 35% clay () brackets show grade uplift for naturally calcareous soils with more than 1% calcium carbonate and between 18%-50% clay in the top 25cm of soil		

- 25 In a climate area with 112 FCD, profiles which are well drained (Wetness Class I) are limited by slight soil wetness (workability) where the topsoil is heavy clay loam.
- 26 Where the soil profiles are slightly seasonally waterlogged (Wetness Class II), they are limited by soil wetness to Grade 2 where the topsoil is sandy clay loam or medium clay loam.
- 27 Where the soil profiles are slowly permeable and seasonally waterlogged (Wetness Class III), they are limited to Subgrade 3a where the topsoil is sandy clay loam or medium clay loam. Where the topsoil is heavy clay loam, the profiles in Wetness Class III are limited by soil wetness to Subgrade 3b.
- 28 **Soil Droughtiness.** From the ALC Guidelines, a soil droughtiness limitation exists '*in areas with relatively low rainfall or high evapotranspiration, or where the soil holds only small reserves of moisture available to plant roots.*' The ALC grade according to soil droughtiness is shown in Table 3 below (based on Table 8 'Grade According to Droughtiness' in the ALC Guidelines). To be eligible for Grades 1 to 3b the moisture

balances (MBs) must be equal to, or exceed, the stated minimum values for both wheat and potatoes. If the MB for either crop is less (i.e., more negative) than that shown for Subgrade 3b, the soil is Grade 4 on droughtiness.

Table 3: ALC Grade According to Soil Droughtiness

Grade/Subgrade	Moisture Balance (MB) Limits (mm)	
	Wheat	Potatoes
1	+30	+10
2	+5	-10
3a	-20	-30
3b	-50	-55
4	<-50	<-55

- 29 The grade according to soil droughtiness per auger-bore is shown in **Attachment 1**. It has been determined that soil droughtiness at this Site is sufficient to slightly limit the quality of agricultural land in some well drained profiles (Wetness Class I) to Grade 2.

ALC Grading at the Site

- 30 By detailed ALC survey, it has been determined that the quality of agricultural land at the Site is limited mainly by soil wetness to Grade 2, Subgrade 3a and Subgrade 3b during the wetter months of the year (i.e., late autumn, winter, and early spring). Some well drained profiles Wetness Class I are also limited by slight soil droughtiness to Grade 2 during the growing season.

- 31 The area and proportion of agricultural land in each ALC grade has been measured from an ALC map given as **Plan KCC3211/02**. The findings are reported in Table 4 below.

Table 4: Agricultural Land Classification – High Marnham, Nottinghamshire

ALC Grade	Area (Ha)	Area (% of Total Site)
Grade 1 (Excellent)	0	0
Grade 2 (Very Good)	12	21
Subgrade 3a (Good)	18	32
Subgrade 3b (Moderate)	26	47
Grade 4 (Poor)	0	0
Grade 5 (Very Poor)	0	0
Non-agricultural / Other land	0	0
Total	56	100

Attachment 1

Soil Profile Logs

(Please note that some of these are outwith the site boundary and are not included in the ALC report and have been redacted)

Project Number	Project Name	Parcel
C857A	KCC3211 High Marnham, Notts	A

Date of Survey	Survey Type	Surveyor(s)	Company
23/03/2022	Detailed ALC	AR	

Weather	Relief	Land use and vegetation
Dry, sunny	Level	CER (Cereals)

Grid Reference	Postcode	Altitude	Area
SK805705	NG23 6SH	14	67

MAFF prov	MAFF detailed	Flooding
Grade 3	None	Flood Zone 2 and 3 in East near River Trent

AAR	AT0	MDw	MDp	FCD	Climate grade
571	1419	117	112	112	1

Bedrock	Superficial deposits
Mercia Mudstone	Some alluvium in East near River Trent

Soil association(s) 1:250,000	Detailed soil information
Mainly Whimple 3, Faldbury 2 in East	None

Revision Number	Date Revised
1	22/03/2022

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Project Number	Project Name	Parcel
C857B	KCC3211 High Marbham, Notts	B

Date of Survey	Survey Type	Surveyor(s)	Company
14/03/2022	Detailed ALC	AR	

Weather	Relief	Land use and vegetation
Dry, sunny	Level	CER (Cereals)

Grid Reference	Postcode	Altitude	Area
SK805705	NG23 6SH	14	67

MAFF prov	MAFF detailed	Flooding
Grade 3	None	Flood Zpne 2 and 3 in East near River Trent

AAR	AT0	MDw	MDp	FCD	Climate grade
571	1419	117	112	112	1

Bedrock	Superficial deposits
Mercia Mudstone	Some alluvium in East near River Trent

Soil association(s) 1:250,000	Detailed soil information
Mainly Whimple 3, with Faldbury 2 in East near River Trent	None

Revision Number	Date Revised
1	22/03/2022

[illegible]

36	SK 80200 70500	480200	370500	11	≤7	N/A		0	30	30	7.5YR4/2					MSL - Me	2			HR - All hard rocks or stones (i.e. those which cannot be scratched with a fi	NON - Non-calcar	25	-3	2	WC I	1	Droughtiness		2
								30	85	55	7.5YR4/3					No	MSL - Me	2		HR - All hard rocks or stones (i.e. those which cannot be scratche	Moderate	NON -	No	No					
								85	120	35	5YR5/4					No	C - Clay	0		HR - All hard rocks or stones (i.e. those which cannot be scratche	Poor	NON -	Yes	No					
37	SK 80300 70500	480300	370500	11	≤7	N/A		0	25	25	5YR4/2						C - Clay	0		HR - All hard rocks or stones (i.e. those which cannot be scratched with a fi	NON - Non-calcar	7	-11	3a	WC III	3b	Wetness		3b
								25	120	95	2.5YR4/4	FD - F	2.5Y5/2			No	C - Clay	0		HR - All hard rocks or stones (i.e. those which cannot be scratche	Poor	NON -	No	Yes					
38	SK 80400 70500	480400	370500	12	≤7	N/A		0	30	30	10YR4/1						C - Clay	1		HR - All hard rocks or stones (i.e. those which cannot be scratched with a fi	NON - Non-calcar	6	-14	3a	WC III	3b	Wetness		3b
								30	58	28	5Y6/2					No	ZC - Silty	2		HR - All hard rocks or stones (i.e. those which cannot be scratche	Poor	NON -	No	Yes					
								58	120	62	5YR4/6					No	ZC - Silty	0		HR - All hard rocks or stones (i.e. those which cannot be scratche	Poor	NON -	No	Yes					
39	SK 79900 70400	479900	370400	18	≤7	N/A		0	25	25	7.5YR4/2						MSL - Me	2		HR - All hard rocks or stones (i.e. those which cannot be scratched with a fi	NON - Non-calcar	12	-7	2	WC III	2	Droughtines	Wetness	2
								25	55	30	7.5YR5/3	CD - C	7.5YR5/6			Yes	MSL - Me	2		HR - All hard rocks or stones (i.e. those which cannot be scratche	Moderate	NON -	No	No					
								55	120	65	5YR5/3	CD - C	2.5Y5/2			Yes	C - Clay	0		HR - All hard rocks or stones (i.e. those which cannot be scratche	Poor	NON -	Yes	No					
	END																												

Project Number	Project Name	Parcel
C857C	KCC3211 High Marnham, Nottinghamshire	C

Date of Survey	Survey Type	Surveyor(s)	Company
15/03/2022	Detailed ALC	AR	

Weather	Relief	Land use and vegetation
Dry, sunny	Level	CER (Cereals)

Grid Reference	Postcode	Altitude	Area
SK805705	NG232 6SH	14	67

MAFF prov	MAFF detailed	Flooding
Grade 3	None	Flood Zone 2 and 3 in East, near River Trent

AAR	AT0	MDw	MDp	FCD	Climate grade
571	1419	117	112	112	1

Bedrock	Superficial deposits
Mercia Mudstone	Seom alluvium in the East near River Trent

Soil association(s) 1:250,000	Detailed soil information
Manily Whimple 3, with some Fladbury 2 in the East near River Trent	None

Revision Number	Date Revised
1	22/03/2022

Point	Grid ref.			Alt (m)	Slope °	Aspect	Land use	Depth (cm)			Matrix	Ochreous Mottles		Grey Mottles		Gley	Texture	Stones - type 1			Stones - type 2			Ped			SUBS STR	CaCO3	Mn C	SPL	Drought			Wet		Final ALC			
	NGR	X	Y					Top	Bttm	Thick	Munsell colour	Form	Munsell colour	Form	Munsell colour			%	> 2cm	> 6cm	Type	%	> 2cm	> 6cm	Type	Strength					Size	Shape	MBw	MBp	Gd	WC	Gw	Limitation 1	Limitation 2
40	SK 80500 70600	480500	370600	14	≤7	N/A		0	35	35	7.5YR3/2						C - Clay	2										NON -	Non-calcar	10	-8	2	WC III	3b	Wetness				3b
								35	55	20	2.5Y6/2		CP - C 7.5YR5/6				C - Clay	0									Poor	NON -	No	Yes									
								55	120	65	2.5YR5/4						C - Clay	0									Poor	NON -	Yes	Yes									
41	SK 80600 70600	480600	370600	14	≤7	N/A		0	30	30	7.5YR3/2						C - Clay	2										NON -	Non-calcar	8	-10	2	WC III	3b	Wetness				3b
								30	120	90	2.5Y6/2						C - Clay	0									Poor	NON -	Yes	Yes									
42	SK 80700 70600	480700	370600	13	≤7	N/A		0	30	30	10YR3/1						C - Clay	2										NON -	Non-calcar	8	-10	2	WC III	3b	Wetness				3b
								30	120	90	5Y5/1		CP - C 10YR5/6				C - Clay	0									Poor	NON -	No	Yes									
43	SK 80500 70500	480500	370500	14	≤7	N/A		0	35	35	7.5YR3/2						SCL - Sar	2										NON -	Non-calcar	10	-8	2	WC III	3a	Wetness				3a
								35	45	10	10YR5/3		CD - C 10YR5/6				C - Clay	0										NON -	Yes	Yes									
								45	120	75	5YR5/3		CP - C 5Y6/2				C - Clay	0										NON -	Yes	Yes									
44	SK 80600 70500	480600	370500	14	≤7	N/A		0	30	30	7.5YR4/2						C - Clay	2										NON -	Non-calcar	7	-11	3a	WC III	3b	Wetness				3b
								30	120	90	5YR5/4		CP - C 2.5Y6/2				C - Clay	2										NON -	Yes	Yes									
45	SK 80700 70500	480700	370500	13	≤7	N/A		0	28	28	7.5YR3/2						MSL - Me	2										NON -	Non-calcar	11	-7	2	WC III	2	Droughtiness	Wetness			2
								28	44	16	7.5YR5/3		CD - C 7.5YR5/6				MSL - Me	0										NON -	No	No									
								44	120	76	5Y6/1		CP - C 5YR4/6				C - Clay	0										NON -	Yes	Yes									
46	SK 80400 70400	480400	370400	19	≤7	N/A		0	27	27	7.5YR4/2						C - Clay	2										NON -	Non-calcar	7	-11	3a	WC III	3b	Wetness				3b
								27	47	20	2.5YR5/4						C - Clay	0										NON -	Yes	Yes									
								47	120	73	5Y6/1						C - Clay	0										NON -	Yes	Yes									
47	SK 80500 70400	480500	370400	18	≤7	N/A		0	35	35	7.5YR4/2						HCL - Cla	3										NON -	Non-calcar	13	-5	2	WC III	3b	Wetness				3b
								35	120	85	5YR5/3		CP - C 2.5Y6/2				C - Clay	0										NON -	Yes	Yes									
48	SK 80600 70400	480600	370400	18	≤7	N/A		0	30	30	7.5YR4/2						SCL - Sar	2										NON -	Non-calcar	14	-5	2	WC III	3a	Wetness				3a
								30	45	15	7.5YR4/3						SCL - Sar	0										NON -	No	No									
								45	55	10	7.5YR5/5						SCL - Sar	0										NON -	No	No									
								55	120	65	2.5YR5/4						C - Clay											NON -	Yes	Yes									
49	SK 80700 70400	480700	370400	15	≤7	N/A		0	35	35	7.5YR4/2						MSL - Me	2										NON -	Non-calcar	31	-1	2	WC I	1	Droughtiness				2
								35	45	10	7.5YR4/3						MSL - Me	0										NON -	No	No									
								45	95	50	7.5YR5/3		CD - C 7.5YR4/6				MSL - Me	0										NON -	Yes	No									
								95	120	25	5YR5/3		CD - C 2.5Y6/2		CD - C 7.5YR5/6		C - Clay	0										NON -	Yes	Yes									

[illegible]

Project Number	Project Name	Parcel
C857D	KCC3211 High Marham, Notts	D

Date of Survey	Survey Type	Surveyor(s)	Company
23/03/2022	Detailed ALC	AR	

Weather	Relief	Land use and vegetation
Dry, sunny	Level	CER (Cereals)

Grid Reference	Postcode	Altitude	Area
SK805705	NG23 6SH	14	67

MAFF prov	MAFF detailed	Flooding
Grade 3	None	Flood zones 2 and 3 in East near River Trent

AAR	AT0	MDw	MDp	FCD	Climate grade
571	1419	117	112	112	1

Bedrock	Superficial deposits
Mercia Mudstone	Some alluvium in East near River Trent

Soil association(s) 1:250,000	Detailed soil information
Mainly Whimple 3, with Fladbury 2 in East near River Trent	None

Revision Number	Date Revised
1	22/03/2022

Point	Grid ref.			Alt (m)	Slope °	Aspect	Land use	Depth (cm)			Matrix	Ochreous Mottles		Grey Mottles		Gley	Texture	Stones - type 1				Stones - type 2				Ped			SUBS STR	CaCO3	Mn C	SPL	Drought			Wet		Final ALC																															
	NGR	X	Y					Top	Bttm	Thick	Munsell colour	Form	Munsell colour	Form	Munsell colour			%	> 2cm	> 6cm	Type	%	> 2cm	> 6cm	Type	Strength	Size	Shape					MBw	MBp	Gd	WC	Gw	Limitation 1	Limitation 2	Limitation 3	Grade																												
55	SK 80800	70600	480800	370600	12	≤7	N/A		0	28	28	7.5YR4/2					C - Clay	1										NON - Non-calcar	8	-10	3a	WC III	3b	Wetness					3b																														
								28	120	92	5YR4/4					No	C - Clay	0										NON - Non-calcar	8	-10	3a	WC III	3b	Wetness																																			
56	SK 80900	70600	480900	370600	12	≤7	N/A		0	37	37	7.5YR4/2					C - Clay	1										NON - Non-calcar	11	-7	2	WC III	3b	Wetness					3b																														
								37	120	83	5YR4/4					No	C - Clay	0										NON - Non-calcar	11	-7	2	WC III	3b	Wetness																																			
57	SK 81000	70600	481000	370600	12	≤7	N/A		0	30	30	7.5YR3/2					C - Clay	1										NON - Non-calcar	9	-9	2	WC III	3b	Wetness					3b																														
								30	120	90	5YR4/4					No	C - Clay	0										NON - Non-calcar	9	-9	2	WC III	3b	Wetness																																			
59	SK 80800	70500	480800	370500	12	≤7	N/A		0	35	35	10YR3/2					C - Clay	2										NON - Non-calcar	9	-9	2	WC III	3b	Wetness					3b																														
								35	120	85	2.5Y6/2		CP - C 10YR4/6			Yes	C - Clay	2										NON - Non-calcar	9	-9	2	WC III	3b	Wetness																																			
60	SK 80900	70500	480900	370500	12	≤7	N/A		0	30	30	7.5YR4/2					HCL - Clay	1										NON - Non-calcar	11	-7	2	WC III	3b	Wetness					3b																														
								30	58	28	2.5Y6/2		CP - C 10YR5/6			Yes	C - Clay	0										NON - Non-calcar	11	-7	2	WC III	3b	Wetness																																			
								58	120	62	5YR5/3		CD - C 2.5Y6/2			Yes	C - Clay	0										NON - Non-calcar	11	-7	2	WC III	3b	Wetness																																			
61	SK 81000	70500	481000	370500	12	≤7	N/A		0	35	35	10YR4/2					SCL - Sand	1									NON - Non-calcar	27	-1	2	WC II	2	Wetness		Droughtiness			2																															
								35	95	60	10YR5/3		CD - C 10YR5/6			Yes	SCL - Sand	0									NON - Non-calcar	27	-1	2	WC II	2	Wetness		Droughtiness																																		
								95	120	25	5YR5/4					Yes	C - Clay	0									NON - Non-calcar	27	-1	2	WC II	2	Wetness		Droughtiness																																		
63	SK 80800	70400	480800	370400	11	≤7	N/A		0	35	35	7.5YR4/2					C - Clay	1										NON - Non-calcar	31	-4	2	WC III	3b	Wetness					3b																														
								35	50	15	2.5Y6/2		CP - C 5YR5/6			Yes	C - Clay	0										NON - Non-calcar	31	-4	2	WC III	3b	Wetness																																			
								50	120	70	5YR4/4					No	SC - Sand	0										NON - Non-calcar	31	-4	2	WC III	3b	Wetness																																			
64	SK 80900	70400	480900	370400	11	≤7	N/A		0	32	32	10YR3/2					MSL - Medium	2										NON - Non-calcar	20	-2	2	WC II	1	Droughtiness					2																														
								32	70	38	7.5YR5/2		CP - C 7.5YR5/6			Yes	MSL - Medium	0										NON - Non-calcar	20	-2	2	WC II	1	Droughtiness																																			
								70	120	50	5YR5/2		CD - C 5YR5/6			Yes	C - Clay	0										NON - Non-calcar	20	-2	2	WC II	1	Droughtiness																																			

[illegible]

Attachment 2
Soil Pit Description

Project	Location	Date	Surveyor(s)	Company
C857	KCC3211 High Marnham, Notts	24-Mar-22	AR	

Pit	WC	Grade	Limitation(s)	Notes
At AB3	III	3b	Wetness and Workability	Pit confirms that 'plastic' reddish clay SS is SPL.

Grid Ref.			Altitude	Nearest point	Topography				Flora		Weather and conditions			
Square	East	North			Gradient	Aspect	Slope form	Surface	Cultivation type	Vegetation types	Temp	Sky	Wind	Precipitation
SK	79999	71001	10	At AB3	2o	NE	flat		Probably min-till	Winter cereal				

Horizon	Depth		Matrix			Gleying			Mottles			Stone content				Calc.	Mn	C	Ped/soil structure				Horizon boundary		Biopores	SPL
	Top	Bttm	Texture	Colour	Munsell	Gley	Colour	Munsell	Form	Colour	Munsell	%	H	Type	S				Type	Dev.	Size	Structure	Strength	Distinct		
1	0	28	Clay		7.5YR4/2							1		HR			NC					Clear	Wavy			
2	28	55	Clay		2.5YR5/4, with 5/3 ped						5Y6/1	0		HR			NC	No	Weak	Coarse and very coarse	Angular Blocky	Firm			<0.5%	Yes

Pit	WC	Grade	Limitation(s)	Notes

Grid Ref.			Altitude	Nearest point	Topography				Flora		Weather and conditions			
Square	East	North			Gradient	Aspect	Slope form	Surface	Cultivation type	Vegetation types	Temp	Sky	Wind	Precipitation

Horizon	Depth		Matrix			Gleying			Mottles			Stone content					Calc.	Mn	C	Ped/soil structure				Horizon boundary		Biopores	SPL
	Top	Bttm	Texture	Colour	Munsell	Gley	Colour	Munsell	Form	Colour	Munsell	%	H	Type	S	Type				Dev.	Size	Structure	Strength	Distinct	Form		
		Augere																									

Project	Location	Date	Surveyor(s)	Company
C857	KCC3211 - High Marnham, Notts	01-Mar-22	AR	

Pit	WC	Grade	Limitation(s)	Notes
At AB28	I	1/2 Drought?	Drought?	Pit to confirm Mod structural condition in MSL SS

Grid Ref.			Altitude	Nearest point	Topography				Flora		Weather and conditions			
Square	East	North			Gradient	Aspect	Slope form	Surface	Cultivation type	Vegetation types	Temp	Sky	Wind	Precipitation
SK	80000	70602	15m	At AB28	2o	NE	Flat		Min till?	Winter cereal				

Horizon	Depth		Matrix			Gleying			Mottles			Stone content					Calc.	Mn	C	Ped/soil structure				Horizon boundary		Biopores	SPL
	Top	Bttm	Texture	Colour	Munsell	Gley	Colour	Munsell	Form	Colour	Munsell	%	H	Type	S	Type				Dev.	Size	Structure	Strength	Distinct	Form		
1	0	35	MSL		7.5YR4/2							3		HR			NC					Clear	Wavy				
2	35	55	MSL		7.5YR4/5	No						2		HR			NC	No	Mod	Coarse	Angular Blocky	Friable			>0.5	No	

Pit	WC	Grade	Limitation(s)	Notes

Grid Ref.			Altitude	Nearest point	Topography				Flora		Weather and conditions			
Square	East	North			Gradient	Aspect	Slope form	Surface	Cultivation type	Vegetation types	Temp	Sky	Wind	Precipitation

Horizon	Depth		Matrix			Gleying			Mottles			Stone content				Calc.	Mn	C	Ped/soil structure				Horizon boundary		Biopores	SPL
	Top	Bttm	Texture	Colour	Munsell	Gley	Colour	Munsell	Form	Colour	Munsell	%	H	Type	S				Type	Dev.	Size	Structure	Strength	Distinct		

Project	Location	Date	Surveyor(s)	Company
C857	KCC3211 High Marnham, Notts	01-Mar-22	AR	

Pit	WC	Grade	Limitation(s)	Notes
At AB56	III	3b	Wetness and Workability	Pit confirms that reddish clay subsoil, even where not 'plastic' and where not mottled, does have gleyed ped faces and is SPL

Grid Ref.			Altitude	Nearest point	Topography				Flora		Weather and conditions			
Square	East	North			Gradient	Aspect	Slope form	Surface	Cultivation type	Vegetation types	Temp	Sky	Wind	Precipitation
SK	80901	70601	9m	At AB56	Level	N/A	flat		Probably min-till	Winter cereal	18oC			

Horizon	Depth		Matrix			Gleying			Mottles			Stone content					Calc.	Mn C	Ped/soil structure				Horizon boundary		Biopores	SP
	Top	Bttm	Texture	Colour	Munsell	Gley	Colour	Munsell	Form	Colour	Munsell	%	H	Type	S	Type			Dev.	Size	Structure	Strength	Distinct	Form		
1	0	37	Clay		7.5YR4/2							1		HR			NC	No					Clear	Wavy		
2	37	55	Clay		5YR4/4	No						0		HR			NC	No	Weak	Coarse	Angular Blocky	Firm			<0.5%	Yes

Pit	WC	Grade	Limitation(s)	Notes
At AB60	III	3b	Wetness and Workability	Pit confirms that gleyed, non-reddish, not 'plastic' subsoil clay is SPL

Grid Ref.			Altitude	Nearest point	Topography				Flora		Weather and conditions			
Square	East	North			Gradient	Aspect	Slope form	Surface	Cultivation type	Vegetation types	Temp	Sky	Wind	Precipitation
SK	80903	70501	10m	At AB60	Level	N/A	flat		Probably min-till	Winter cereal	18oC			

Horizon	Depth		Matrix			Gleying			Mottles			Stone content					Calc.	Mn C	Ped/soil structure				Horizon boundary		Biopores	SP
	Top	Bttm	Texture	Colour	Munsell	Gley	Colour	Munsell	Form	Colour	Munsell	%	H	Type	S	Type			Dev.	Size	Structure	Strength	Distinct	Form		
1	0	30	HCL		7.5YR4/2							2		HR			NC					Clear	Wavy			
2	30	55	C		2.5Y6/2	yes					10YR5/6	0		HR			NC	yes	Weak	Coarse	Angular Blocky	Firm			<0.5%	Yes

Attachment 3
Laboratory Analysis



TEST REPORT
ISSUED BY SOIL PROPERTY TESTING LTD
DATE ISSUED: 06/04/2022



Contract	High Marnham, Notts		
Serial No.	40529_1		
Client: Kernon Countryside Consultants Limited Greenacres Barn, Stoke Common Lane, Purton Stoke, Swindon SN5 4LL		Soil Property Testing Ltd 15, 16, 18 Halcyon Court, St Margaret's Way, Stukeley Meadows, Huntingdon, Cambridgeshire, PE29 6DG Tel: 01480 455579 Email: enquiries@soilpropertytesting.com Website: www.soilpropertytesting.com	
Samples Submitted By: Kernon Countryside Consultants Limited Samples Labelled: High Marnham, Notts		Approved Signatories: ☒ J.C. Garner B.Eng (Hons) FGS Technical Director & Quality Manager ☐ W. Johnstone Materials Lab Manager 	
Date Received: 01/04/2022		Samples Tested Between: 01/04/2022 and 06/04/2022	
Remarks: For the attention of Sarah Kernon Your Reference No: KCC3211			
Notes: <ol style="list-style-type: none">1 All remaining samples or remnants from this contract will be disposed of after 21 days from today, unless we are notified to the contrary.2 Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.3 Tests marked "NOT UKAS ACCREDITED" in this test report are not included in the UKAS Accreditation Schedule for this testing laboratory.4 This test report may not be reproduced other than in full except with the prior written approval of the issuing laboratory.5 The results within this report only relate to the items tested or sampled.			



TEST REPORT
ISSUED BY SOIL PROPERTY TESTING LTD
DATE ISSUED: 06/04/2022



0998

Contract		High Marnham, Notts														
Serial No.		40529_1										Target Date		15/04/2022		
Scheduled By		Kernon Countryside Consultants Limited														
Schedule Remarks																
Bore Hole No.	Type	Sample Ref.	Top Depth	Particle Size Distribution (BS1377)												Sample Remarks
KCC3211	AB	15	0.00	1												
KCC3211	AB	47	0.00	1												
KCC3211	AB	67	0.00	1												
Totals				3											End of Schedule	



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0998

Contract	High Marnham, Notts																																																																																															
Serial No.	40529_1																																																																																															
DETERMINATION OF PARTICLE SIZE DISTRIBUTION																																																																																																
Borehole / Pit No.	Depth (m)	Sample		Description	Remarks																																																																																											
Type	Reference																																																																																															
KCC3211	0.00 - 0.25	AB	15	Dark brown sandy silty CLAY with occasional recently active roots and rare fine gravel	Material greater than 2mm removed before test																																																																																											
Method of Test:		Hydrometer + Pre-sieve		Method of Pretreatment:	Not required																																																																																											
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Hydrometer	Particle Size (mm)	Passing (%)	Silt by Dry Mass (%)	Sieve	Sieve Size (mm)		Passing (%)	Sand By Dry Mass (%)	Sieve		Sieve Size (mm)	Passing (%)	2mm+ By Dry Mass (%)																																																																																			
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Method of Preparation: BS1377: Part 1: 2016: 8.3 & 8.4.5 Method of test: BS1377: Part 2: 1990: 9.2,9.5 Type of Sample Key: U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter Comments:																																																																																																



TEST REPORT

ISSUED BY SOIL PROPERTY TESTING LTD
DATE ISSUED: 06/04/2022



0998

Contract	High Marnham, Notts				
Serial No.	40529_1				
DETERMINATION OF PARTICLE SIZE DISTRIBUTION					
Borehole / Pit No.	Depth (m)	Sample		Description	Remarks
		Type	Reference		
KCC3211	0.00 - 0.25	AB	47	Dark brown sandy silty CLAY with rare recently active roots	Material greater than 2mm removed before test
Method of Test:		Hydrometer + Pre-sieve		Method of Pretreatment:	Not required

CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES	BOULDERS
	SILT			SAND			GRAVEL				

H Y D R O M E T E R	Particle Size (mm)	Passing (%)	Silt by Dry Mass (%)	Sieve Size (mm)	Passing (%)	Sand By Dry Mass (%)	Sieve Size (mm)	Passing (%)	2mm+ By Dry Mass (%)
	0.0355	53	33		2.00	100		40	300
0.0253	49	1.18		99	125				
0.0180	47	0.600		98	90				
0.0095	40	0.425		95	63				
0.0068	36	Clay by Dry Mass (%)	0.300	87	50				
0.0048	35		0.212	77	37.5				
0.0031	31		0.150	70	28				
0.0015	25		0.063	60	20				
		27	Fines By Dry Mass (%)			14			
			<0.063mm			10			
			60			6.3			
						5			

Method of Preparation:	BS1377: Part 1: 2016: 8.3 & 8.4.5
Method of test:	BS1377: Part 2: 1990: 9.2,9.5
Type of Sample Key:	U=Undisturbed, B=Bulk, D=Disturbed, J=Jar, W=Water, SPT=Split Spoon Sample, C=Core Cutter
Comments:	



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Borehole / Pit No.	Depth (m)	Sample Type	Sample Reference	Description	Remarks																																																																																														
KCC3211	0.00 - 0.25	AB	67	Dark brown sandy clayey SILT with occasional fine and medium gravel	Material greater than 2mm removed before test																																																																																														
Method of Test:		Hydrometer + Pre-sieve		Method of Pretreatment:	Not required																																																																																														
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Appendix KCC3
Description of Solar Array Installation

INSTALLATION OF SOLAR PANELS

The Stages Involved

- 1 The proposal involves the following key stages:
 - (i) pre-entry condition surveys, Construction Environment Management Plans and Soil Management Plans, and related training of key staff;
 - (ii) entry to insert the legs to the panels, which will involve multiple teams installing the legs, followed by the panels;
 - (iii) in parallel and following the installation of the panels the site will be cabled to connect the panels. This will involve excavations of narrow trenches and reinstatement once cables are inserted;
 - (iv) construction of the fixed infrastructure and inverters etc;
 - (v) security fencing of the site, installation of security features and CCTV;
 - (vi) connection of the site to the National Grid, involving off-site cabling along verges to the public highway;
 - (vii) commissioning and activation of the site.
- 2 This report focuses on stages (i) to (v), as these involve access across or around the agricultural land.

CEMP and Soil Management Plan

- 3 The solar farm can be installed, and dismantled (should that ever be necessary), without damage to soils. It can be installed and dismantled without affecting agricultural land quality except for any areas of fixed infrastructure (described below). The success in not damaging soils or soil structure, however, depends upon following good practice. The likelihood of causing a downgrading or loss of agricultural land quality is unlikely.
- 4 A Soil Management Plan (SMP) could be prepared. A detailed SMP is often required by condition. The SMP demonstrates how the development can avoid damaging soils, and directs the construction of different parts of the site to suitable times of year.

Construction Methodology: Panels

- 5 Panels are installed rapidly. The process involves marking out the grid on the grass and laying out the steel stanchions. This stage is non-intrusive. It does involve machinery carrying the legs, however, and should take place when soils are suitably dry.
- 6 Typically the machinery used is an agricultural loadall or, as per the example below, a smaller loadall in this case with tracks to spread the weight.

Photo 1: Loadall Delivering Legs



- 7 A team of workers then arrives to knock the stanchions / legs in. From operations we have observed it takes a little over a minute per pole to knock the pole into the ground and move the machine to the next pole⁷. This operation is shown in the photograph below. This was inserting legs into a clay soil.

Photo 2: Inserting a Stanchion



⁷ This observation was made on clay soils at the Purton Solar Farm, Wiltshire, in 2015. Ground conditions will inevitably affect installation speed.

- 8 Typically there will be two or more teams working simultaneously.

Photo 3: Team Installing Panels



- 9 The details vary slightly, but the panels will normally have a taller and shorter stanchion, as shown below. The lack of damage or disturbance to the grassland and ground conditions from this operation is evident in this photograph.

Photo 4: Stanchions Inserted



- 10 The next task is to construct the subframe, which is bolted onto the panels. This does not affect the soil. A loadall machine carries in the subframe and so as long as ground conditions are suitable there is no damage. The assembly team then lift the frame off the loadall and assemble the frame by hand.

Photos 5 and 6: Constructing the Frame





- 11 The panels are then attached to the frame. This stage is also non-intrusive to the ground and the only impact is from vehicular access, carrying in the panels. It can be seen that if ground conditions are dry, there is no damage.

Photo 7: Panels Added



Construction Methodology: Cabling

- 12 Cabling needs to be connected once the panels are constructed. This is done mostly with either a mini digger or a trenching machine. Trenches will mostly be at depths of 0.8 – 0.9m where soil depth permits, although the CCTV trenching around the periphery could be shallower. An example trench, with the topsoil placed one side (0-20/25cm) and subsoil on the other (below 20-25cm), is shown below, and with the soil put back after cable installation.

Photos 8 and 9: Cable Installation



- 13 The type of machinery used for trenching is shown below, taken from the BRE National Solar Centre “Agricultural Good Practice Guidance for Solar Farms” (2013).

Insert 1: Machinery Used



Cable trenching, showing topsoil stripped and set to one side, with subsoil placed on the other side ready for reinstatement (photo courtesy of British Solar Renewables)

- 14 The installation of cables is one of the few operations that involves digging whereby the soil structure could potentially be affected. The trenches are always narrow, but soil does have to be dug up to install the cable. In this country we have been burying services (water, oil, gas, telecomms) for many years. In areas where there is a clear subsoil and topsoil distinction, the topsoil should be placed on one side of the trench, and the subsoil on the other. Then once the cable has been laid the subsoil can be added back first, then the topsoil second, to reinstate the soil structure to its original order and state.
- 15 This methodology means that soils are restored and settle within days, and return to grass growth rapidly. The area shown open and immediately after backfilling in Inserts 3 and 4, is shown below two weeks later.

Photo 10: The Area Two Weeks Later



This photo was taken 14 days after photo 8.

- 16 This particular set of panels is set with the lower edge low to the ground, and so the site is not grazed. The photo below shows that there is no evidence of differentiated forage growth over the trench.

Photo 11: Panels After Five Years



Ongoing Mangement

- 17 The area under some of the panels will be managed by a combination of mowing (where designated for wildflowers) and grazing by sheep.
- 18 The following three photographs are of solar panels just north of Caernarfon and show sheep grazing around and under the solar panels.

Photos 12 - 14: Sheep Grazing, North of Caernarfon



- 19 The management of the farming operations around and under the panels will remain the responsibility of the farmers under the direction of the solar farm operator. Some will likely choose to allow the sheep to graze for long periods, others might move larger numbers of sheep into an area of panels for a shorter period of weeks so that they graze it down tightly. Such paddock rotations or ranging is a typical variation of ordinary farm management anyway, irrespective of whether there are panels there.
- 20 As can be seen in the photographs above, the grass covering is good where, as is proposed here, the panels are sufficiently high to allow free passage beneath by sheep. It is noted that the proposed panels will be mounted with at least 0.9m clearance at the lower end, providing conditions suitable for sheep to graze and grass to grow.

Appendix KCC4
Decommissioning and Removal of
Solar Panels

DECOMMISSIONING AND REMOVAL OF SOLAR PANELS

The Stages Involved

- 1 The components of the solar farm that will need to be removed or treated are as follows:
 - (i) the panels and their frames;
 - (ii) the fixed switch gear and bases;
 - (iii) the cabling
 - (iv) fencing.

Panels

- 2 The panels will need to be removed in the following order:
 - (i) all cabling will need to be disconnected;
 - (ii) the panels will need to be unbolted and lifted off with machinery, loaded onto trailers and removed from the site;
 - (iii) the majority of the frame will need to be dismantled and removed on trailers.
- 3 The posts were simply rammed into the ground at installation using machinery such as the post rammers shown below.

Photo 1: Post Rammers at Installation Stage



- 4 To remove the legs it should be possible to pull them out in a reverse operation of how they were inserted. It is not known for certain, as new machinery may come along, but at present a similar type of machine to that used in the piling process, capable of removing the piled legs mechanically with a series of sharp upward tugs, would be used. It is important that such machinery has low-ground-pressure tyres or tracks to spread the load.
- 5 It may also be possible to pull the legs out by attaching chains to the legs, or around the frame, and lifting the legs upwards. There can be expected to be an initial resistance due to friction, but once the legs break free from the attached soil the removal should be smooth.

Photo 2: The Frame



- 6 There will be holes left where the legs have come out. These should be left, as they will fill naturally when the soils become saturated and swell in the autumn.

Fixed Switchgear and Bases

- 7 Switchgear, such as that shown below, will need to be removed.

Insert 1: Switchgear



- 8 Low ground pressure vehicles, and cranes, will be needed to lift the decommissioned units onto trailers, and removed from site. An example is shown below.

Insert 2: Low Ground Pressure Vehicle



Case Steiger Quadtrac used to deliver inverters and other heavy equipment to site under soft ground conditions (photo courtesy of British Solar Renewables)

- 9 The concrete bases will need to be broken up. This will most likely involve breaking with a pneumatic drill to crack the concrete, after which it can be dug up and loaded onto trailers and removed.
- 10 The ground beneath the base may then benefit from being subsoiled, to break any compaction. This can be done by standard tractor-mounted equipment, such as the following examples.

Inserts 3 and 4: Tractor Mounted Equipment



- 11 The topsoil will have been stored in a bund to the side of the switchgear area. About 4 weeks before restoration takes place the bunds should be strimmed and the grass and weed growth removed, and the remaining vegetation should be killed with a weedkiller. This will aid restoration and prevent weed spread.

- 12 The soil can then be spread over the subsoiled base, and made good with standard spring-tine harrow or power harrow machinery.

Cabling

- 13 Not all the cabling will need to be removed. Most cabling will have been laid at depths of 60-80cm, and in this land that is comfortably below any agricultural machinery depth.
- 14 At the time of this report the deepest arable tractor-mounted subsoilers can reach depths of about 60cm. The soils in this area will not benefit from being subsoiled to anywhere close to this depth, nor would any agricultural vehicles be able to work a subsoiler at that depth. Accordingly the cabling can be left in the ground without any effect on agricultural use or agricultural land quality.

Fencing

- 15 Fencing is removed and replaced as a regular and common agricultural activity. The wire will be removed from the posts and disposed of by recycling. The posts will then be loosened and removed.

Timing and Supervision

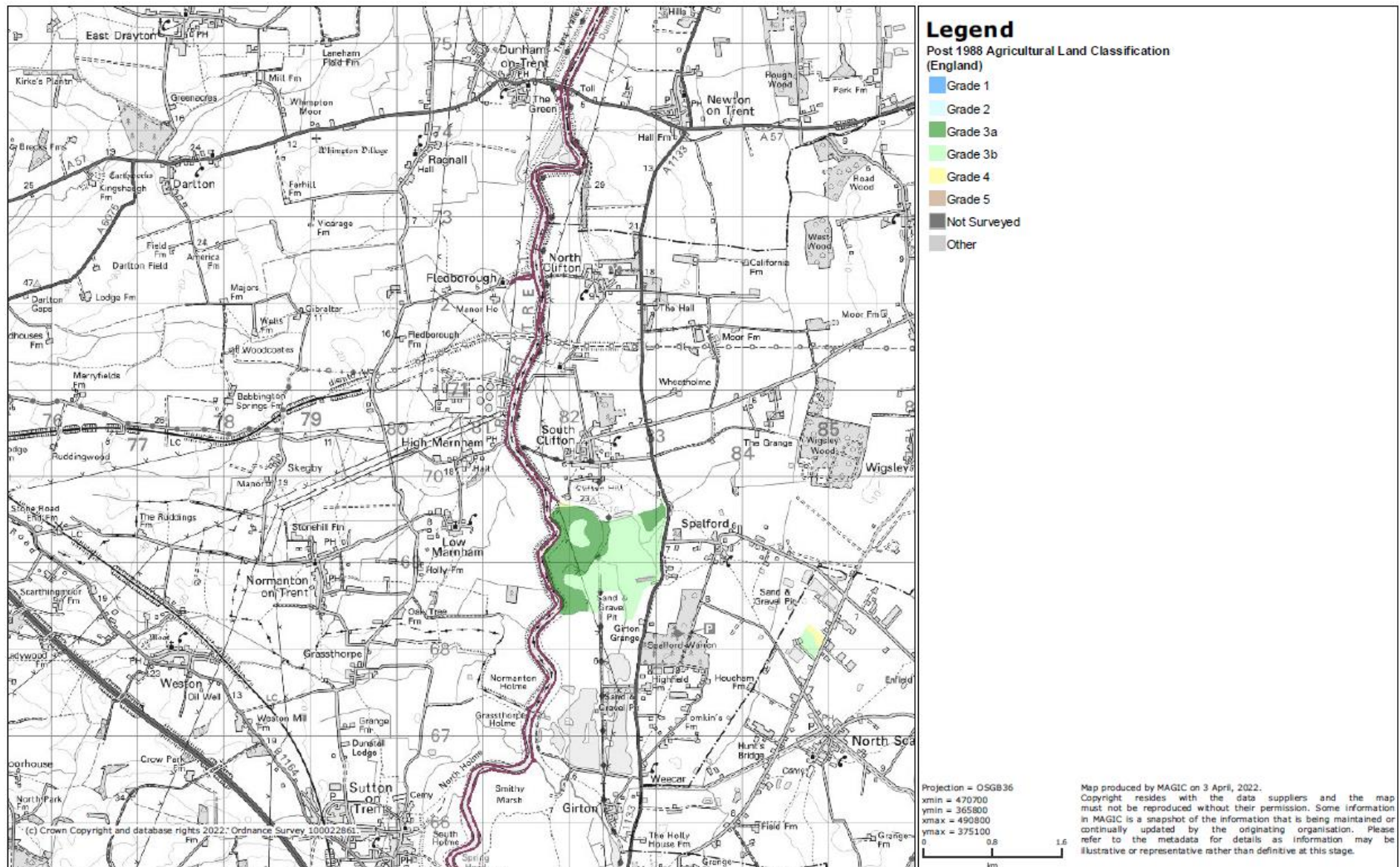
- 16 Work to remove the panels, fences, switchgear etc, and return the land to unencumbered agricultural use, should take place when the soils are sufficiently dry not to be significantly damaged. This is likely to mean working within defined seasonal periods.
- 17 A competent soil scientist or advisor shall be employed to confirm that the soils are suitable for work to begin. He or she should make that assessment within a period of no more than two weeks before work starts.
- 18 All of the land is grassland. This will be maintained during construction, and this should be retained for the decommissioning stage.
- 19 Inevitably rain will change soil conditions during deconstruction. If tyre marks from vehicles make marks deeper than those shown below, the soil advisor will be called out to confirm whether work can continue, or whether there are areas within the site that need to be avoided until they dry. This is not likely to result in a delay of more than 48 hours, but obviously that depends on the rainfall experienced.

Photo 3: Track Marks



- 20 Areas of banded soil for restoration should be stripped (and the arisings removed) and sprayed off 2-4 weeks before work on moving them commences.

Appendix KCC5
Available ALC Nearby



Appendix KCC6
Extracts from Farm Management
Pocketbook



John Nix Pocketbook

FOR FARM MANAGEMENT



2022 52ND
EDITION

The most comprehensive business information in British agriculture

Graham Redman

II. ENTERPRISE DATA

1. CROPS

WHEAT

Feed Winter Wheat

	Low	Average	High	
Production level				
Yield: t/ha (t/ac)	7.25 (2.9)	8.60 (3.5)	9.75 (3.9)	
	£	£	£	£/t
Output at £160/t	1,160 (470)	1,376 (557)	1,560 (632)	160
Variable Costs £/ha (£/ac):				
Seed.....		68 (28)		8
Fertiliser.....		220 (89)		26
Sprays.....		255 (103)		30
Total Variable Costs		543 (220)		63
Gross Margin £/ha (ac)	617 (250)	833 (337)	1,017 (412)	97

Fertiliser Basis 8.6t/ha				Seed:	Sprays £/ha:		
Nutrient	Kg/t	Kg/Ha	£/Ha	£/t C2	£430	Herbicides	£103
N	22	190	£151	Kg/Ha	175	Fungicides	£121
P	6.5	56	£49	% HSS	30%	Insecticides	£8
K	5.5	47	£20	£/t HSS	£301	PGRs	£18
						Other	£6

1. *Yields.* The average yield is for all winter feed wheat, i.e. all varieties and 1st and subsequent wheats. See over for more on First and Second Wheats. The overall yield used for feed and milling wheats including spring varieties calculates as 8.4t/ha, the national average all-wheat yield (ex-2020).
2. *Straw* is costed as incorporated. Average yield and price are approximately 4.2 tonnes per hectare at £55/tonne (£5 more in small bales); variable costs (string) approx. £3.70 per tonne. Unbaled straw (sold for baling): anything from £50/ha (£20/acre) to £100/ha (£40/acre), national average around £85/ha (£34/acre). Account for minerals and organic matter taken from soil if removing straw.
3. *Seed* is costed with a single purpose dressing. Up to a third of growers require additional seed treatments, specifically to suppress BYDV. This can add £140 per tonne of seed (£24.80/ha). This has not been added in the gross margins so should be considered.
4. This schedule does not account for severe *grass weed infestations* such as Black Grass or Sterile Brome. Costs associated with managing such problems can amount to up to £160/hectare additional agrochemical costs. Yield losses increase as infestation rises:

Yield losses from Black Grass Infestations

Grass plants/m ²	Yield loss t/ha	% yield loss	References:
8-12	0.2-0.4	2-5%	Roebuck, J.F. (1987).
12-25	0.4-0.8	5-15%	B.C.P.C. and
100	1-2	15-25%	Blair A, Cussans J,
>300	+3	37%	Lutman P (1999).

OILSEED RAPE

Winter Oilseed Rape

Production level	Low	Average	High	
Yield: t/ha (t/ac)	3.00 (1.2)	3.50 (1.4)	4.00 (1.6)	
	£	£	£	£/t
Output at £380/t	1140 (462)	1,330 (539)	1,520 (616)	380
Variable Costs £/ha (£/ac):				
Seed.....		64 (26)		18
Fertiliser.....		210 (85)		60
Sprays.....		234 (95)		67
Total Variable Costs		508 (206)		145
Gross Margin £/ha (ac)	632 (256)	822 (333)	1,012 (410)	235

Fertiliser Basis 3.5t/ha				Seed:		Sprays:	
Nutrient	Kg/t	Kg/Ha	£/Ha	£/Ha C	60	Herbicides	£113
N	54	190	£151	£/Ha Hy	80	Fungicides	£80
P	14	49	£43	£/Ha HSS	20	Insecticides	£8
K	11	39	£16	C:Hy:HSS	25:25:50	PGRs	£18
	Seed write-off	7%	Kg/Ha	5.5		Other	£15

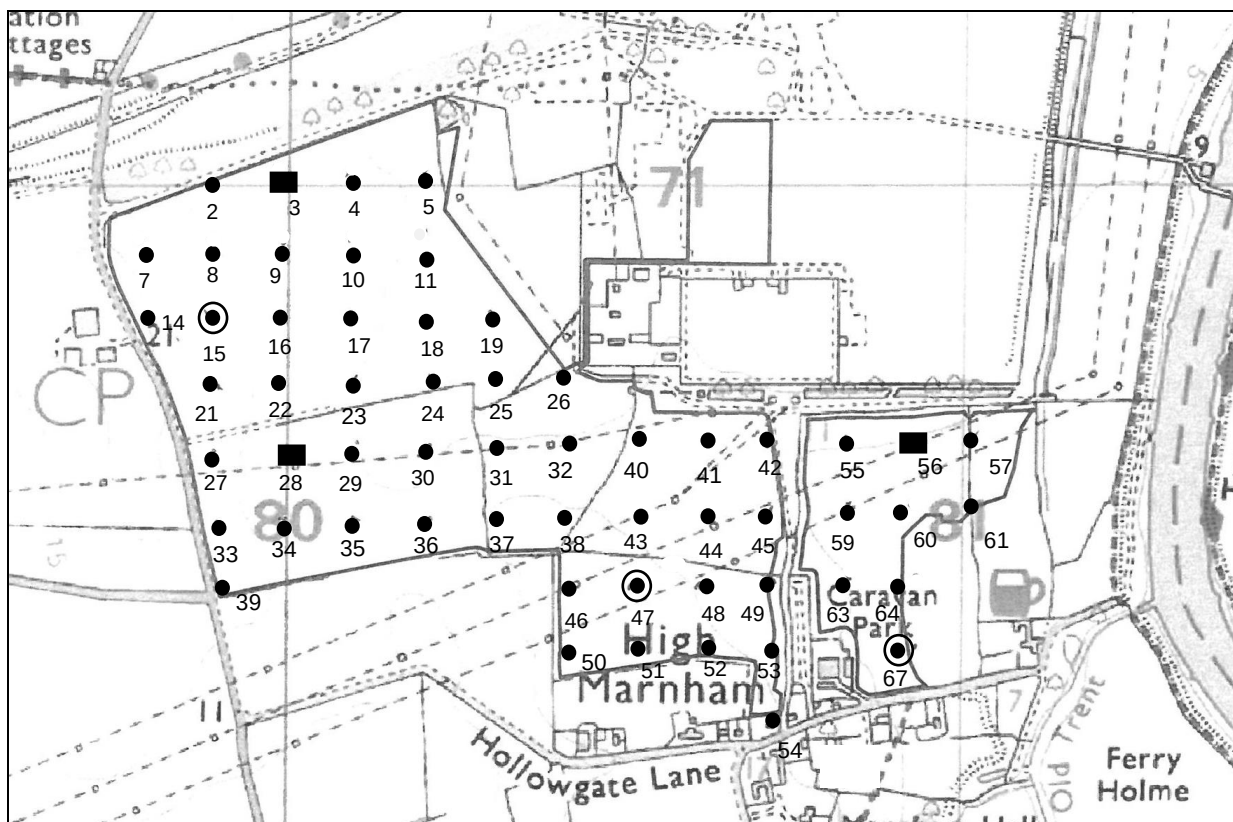
1. *Prices.* The price used for the 2022 crop is £385/tonne plus oil bonuses at 44% oil content. The bonus is paid on the percentage of oil over 40 percent, at 1.5 times the sale value of the crop and an equal but opposite penalty below 40%. For example, in this case, the bonus is on 4% oil x £385 x 1.5 = £23. (Figures are rounded to the nearest £5.00 in the margin)

Spring Oilseed Rape

Production level	Low	Average	High	
Yield: t/ha (t/ac)	2.00 (0.8)	2.28 (0.9)	2.50 (1.0)	
	£	£	£	£/t
Output at £380/t	760 (308)	865 (350)	950 (385)	380
Variable Costs £/ha (£/ac):				
Seed.....		68 (28)		30
Fertiliser.....		102 (41)		45
Sprays.....		152 (61)		67
Total Variable Costs		322 (130)		141
Gross Margin £/ha (ac)	438 (177)	543 (220)	628 (254)	239

2. *Inputs:* Seed as per WOSR, but 45% conventional, 5% HSS, 50% hybrid. *Fertiliser:* N/P/K at 80/32/25 kg/ha. *Sprays,* Herbicides. £54, Fungicides, £57, Insecticides £8, PGRs £18 and Others £15/ha
3. *Winter Versus Spring:* As little as 8,000 hectares of spring OSR are grown in the UK which is 2.5% of the entire crop. As can be seen, the financial reward is slim compared with other combinable crops.

Plan KCC3211/01
Auger Point Plan

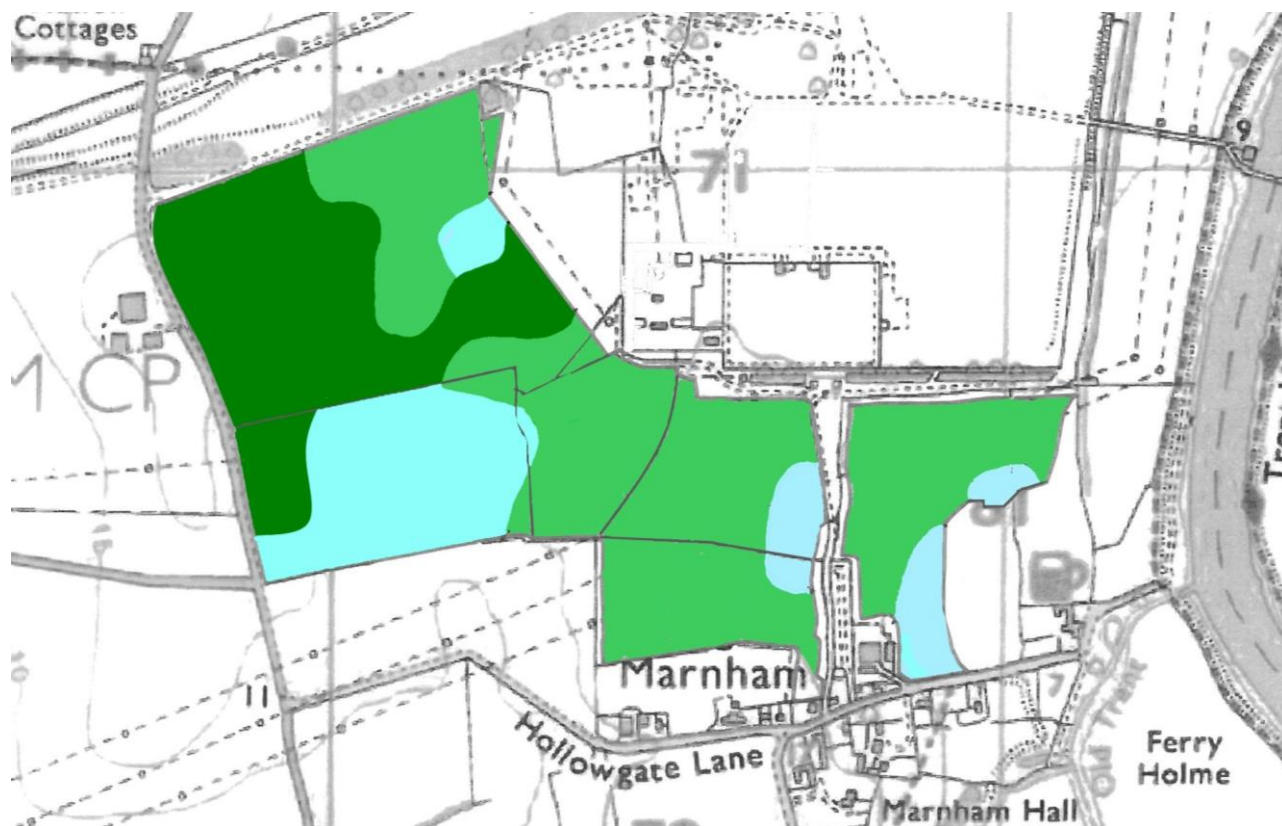


KEY

- Auger sample location
- Topsoil texture sample
- Soil Pit

PLAN	KCC3211/01		
TITLE	Auger Points Plan		
SITE	High Marnham, Nottinghamshire		
CLIENT	JG Pears Property		
NUMBER	KCC3211/01 04/22hr		
DATE	April 2022	SCALE	NTS
<p>KERNON COUNTRYSIDE CONSULTANTS LTD GREENACRES BARN, PURTON STOKE, SWINDON, WILTSHIRE SN5 4LL Tel 01793 771 333 Email: info@kernon.co.uk This plan is reproduced from the Ordnance Survey under copyright license 100015226</p>			

Plan KCC3211/02
Agricultural Land Classification Plan



KEY		Ha	%	PLAN	KCC3211/02			
	Grade 1			TITLE	Agricultural Land Classification Plan			
	Grade 2	12	21	SITE	High Marnham, Nottinghamshire			
	Grade 3a	18	32	CLIENT	JG Pears Property Ltd			
	Grade 3b	26	47	NUMBER	KCC3211/02 04/22hr			
	Grade 4			DATE	April 2022	SCALE	NTS	
	Grade 5			<div>KERNON COUNTRYSIDE CONSULTANTS LTD GREENACRES BARN, PURTON STOKE, SWINDON, WILTSHIRE, SN5 4LL Tel 01793 771 333 Email: info@kernon.co.uk This plan is reproduced from the Ordnance Survey under copyright license 100015226</div>				
	Non-agricultural							
	Urban							
	Not surveyed							



Greenacres Barn, Stoke Common Lane, Purton Stoke, Swindon, Wiltshire SN5 4LL
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Appendix G

Outline Soil

Management Plan

The Great Grid Upgrade

Chesterfield to High Marnham

Chesterfield to High Marnham

Environmental Appraisal Report – Appendix G: Outline Soil
Management Plan

October 2026

nationalgrid

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Annex A	British Society of Soil Science Competency Standards
Annex B	Field Assessment of Soil Plasticity
Annex C	Soil Stripping Method
Annex D	Soil Stockpiling Methodology
Annex E	Soil Reconditioning Methodology
Annex F	Soil Placement Methodology

1. Introduction

- 1.1.1 This Outline Soil Management Plan (OSMP) provides strategy, guidance and methods to protect soil resources during construction. The OSMP outlines the soil mitigation measures needed to ensure, where required, the land can be restored to its previous condition following the completion of the construction phase and any required aftercare period, and any surplus soil resources can effectively be re-used.
- 1.1.2 This OSMP will be developed into a detailed Soil Management Plan (SMP) by the Main Works Contractor(s) prior to construction commencing. The detailed SMP will take account of, for example, detailed construction approaches and project programme, with more site-specific soil measures added as required. The SMP will be informed by the detailed Agricultural Land Classification (ALC) surveys (see Appendix F of the Chesterfield to High Marnham Environmental Appraisal Report).
- 1.1.3 The OSMP will not be used in its current form for soil management during construction. However, it will define the principles of soil handling and inform the development of the detailed SMP, which will be implemented during construction.

1.2 Scheme Description

- 1.2.1 The Scheme comprises overhead line (“Tie-In”) works, which include the installation of new sections of overhead line (OHL), modification of existing infrastructure, removal of selected existing OHL, and associated temporary construction activities, including working areas and access.
- 1.2.2 The Scheme forms part of the wider Chesterfield to High Marnham reinforcement project, which will uprate the existing 275kV transmission system between Chesterfield and High Marnham to operate at 400kV. The reinforcement project includes the development of a new 400kV substation at High Marnham; however, this ALC assessment relates solely to the Tie-In works required to facilitate the connection of that infrastructure to the National Grid network.

1.3 Guidance and Methodology

- 1.3.1 This section sets out the guidance and methodology used to inform the development of this OSMP.
- 1.3.2 The guidance which has been followed in developing the requirements set out in this document is as follows:
 - Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (Defra, 2009a);
 - Safeguarding our Soils: A Strategy for England (Defra, 2009b);
 - Good Practice Guide for Handling Soils in Mineral Workings (Institute of Quarrying, 2021);
 - BS 3882 Specification for topsoil (British Standards Institution, 2015); and

- BS 8601 Specification for subsoil and requirements for use (British Standards Institution, 2013).

1.3.3 The development of the OSMF is supported by the findings of the ALC surveys, providing baseline information on the soil resources present and the grade of the agricultural land.

1.4 Soil Protection Strategy

1.4.1 Since soil is a vulnerable and non-renewable resource, care must be taken throughout all handling, transporting, and stockpiling activities to protect and conserve the soil resources for future use. Many construction activities have the potential to damage soils. The following sections of this OSMF describe how the management of soils would be controlled and how soils would be protected, and their quality conserved throughout all stages of the work.

1.4.2 Failure to protect soils during soil handling can lead to their degradation with consequential environmental impacts, both on-site and off-site, such as:

- soil erosion, reducing soil volume, rooting depth and nutrient availability and increasing sediment loading to adjacent watercourses;
- loss of soil organic matter, leading to a loss of nutrients, a reduction in soil moisture holding capacity and a decline in soil fertility, potentially resulting in poor establishment and long-term survival of vegetation;
- soil compaction leading to loss of soil structure, reduced permeability to water (leading to waterlogging) and restricted aeration and rooting potential; and
- loss of soil biological activity.

1.4.3 These impacts on soils can have wider environmental consequences, including:

- alteration to hydrology;
- increased sediment loading to adjacent watercourses;
- poor establishment and long-term growth of vegetation; and
- visual impact of slope failure or soil erosion leading to bare soil surfaces.

1.4.4 Measures provided in this OSMF on how soils on-site will be stripped, handled, and stored appropriately for reuse (where relevant) will be further developed in the detailed SMP.

1.5 Roles and Responsibilities

1.5.1 The effective implementation of the soil management measures will be the responsibility of the Environmental Manager(s) of the Main Works Contractor(s). This individual(s) will have sufficient training and expertise in assessing soils, soil conditions and soil handling operations to ensure the measures outlined within this OSMF can be implemented, supervised, and monitored effectively.

1.5.2 The Soil Scientist appointed by the Main Works Contractor(s) will provide any training required and will undertake monitoring visits and audits. The qualified Soil Scientist will have the necessary training, qualifications, and experience, having achieved the Soil Professional Competence Standards No. 1 (Foundation skills in field soil

investigation, description, and interpretation) as set out by the British Society of Soil Science (BSSS, 2018a) and No. 4 (Soil science in soil handling and restoration) (BSSS, 2018b) (see Annex A of this OSMP).

1.5.3 Further details of the responsibilities of these roles are set out below.

Environmental Manager(s)

1.5.4 The Environmental Manager(s), in collaboration with the technical teams, will be responsible for planning, over-seeing and carrying out routine inspections of soil management activities to ensure these are undertaken in line with the requirements of the detailed SMP.

1.5.5 The Environment Manager(s) will be responsible for ensuring:

- adherence to defined access/haul route alignments with no off-route access throughout the works;
- vegetation and foreign matter clearance prior to soil stripping commencing;
- soil plasticity testing is undertaken ahead of soil stripping commencing, with additional checks undertaken if rainfall results in works having to be stopped/recommenced due to rainfall/wet ground conditions;
- effective separation of soil types and layers during stripping and in stockpiles;
- effective stockpile construction and monthly inspections of stockpile condition; and
- effective backfilling of each layer in the correct sequence (where backfilling is required).

1.5.6 The Environmental Manager(s) will be responsible for reporting on all soil stripping and stockpiling activities by recording the following:

- confirmation of effective vegetation clearance and the removal of arisings;
- confirmation that topsoil and subsoil resources have been correctly identified;
- records of soil plasticity test results;
- data relating to the volume and type of topsoil and subsoil excavated transported and stockpiled;
- stockpile location and condition with reference to finalised site and landscaping plans; and
- thickness of each layer replaced where soil reinstatement is required with reference to finalised site and landscaping plans.

1.5.7 The Environmental Manager(s) may delegate these activities to individuals with sufficient training and expertise, where required. The Environmental Manager(s) and anyone with delegated responsibility will undertake training provided by the appointed Soil Scientist.

Soil Scientist

- 1.5.8 The appointed Soil Scientist will be responsible for the provision of expert and technical advice on soils throughout the earthworks and the subsequent site restoration activities. The role includes the following:
- liaison with the Site Manager and any other personnel/ organisations as relevant to works affecting soils, including undertaking monitoring and audit visits;
 - train key site staff in the identification of topsoil and subsoil resources which are suitable for re-use so that accurate segregation of topsoil and subsoil resources can be achieved; and
 - Provide training on the assessment of soil plasticity status based on the field technique provided in Annex B of this OSMP.

Roles and Responsibilities Checklist

- 1.5.9 Table 1.1 summarises the split of responsibilities across the above two roles.

Table 1.1 Roles and responsibilities matrix

Role	Sub-activities	Frequency	Responsible	Qualifications
Training	Presentation of key aspects of soil management	Once, at start of site preparation works	Soil Scientist	An individual with the necessary “Foundation Skills”, having achieved the soil professional competence standards set out by the British Society of Soil Science (BSSS, 2018a).
	Identification of topsoil and subsoil resources	Once, at start of site preparation works		
	Soil plasticity assessment	Once, at start of site preparation works		
	Toolbox talks	To be agreed with Environmental Manager(s)		
Inspections and monitoring	Adherence to defined access/haul route alignments and no off-route access.	Continuous until soil stripping complete	Environmental Manager(s) (can be delegated to individuals with sufficient training and expertise where required)	In-house training provided by qualified Soils Scientist (with monitoring by the Soil Scientist to check works).
	Vegetation and foreign matter clearance	Ahead of soil stripping		
	Soil plasticity	Ahead of soil stripping for each stripping unit. Additional checks required if rainfall results in works having to be stopped prior to soil stripping recommencing within that stripping unit		
	Appropriate separation of soil layers as required (topsoil, upper subsoil, lower subsoil) and accurate documentation of depths stripped, and volumes transported from each stripping unit	Continuous until soil stripping complete		
	Appropriate segregation of soil materials in stockpiles by stripping	Continuous until soil stockpiling complete		

Role	Sub-activities	Frequency	Responsible	Qualifications
	unit, layer and plasticity, and accurate documentation of material source and stockpile location			
	Stockpile construction	Continuous until soil stockpiling complete, and stockpiles prepared for storage period		
	Inspection of soil storage stockpiles	Monthly		
	Assessment of soil condition (including plasticity) within stockpiles prior to re-use	Prior to re-use from each stockpile	Soil Scientist	An individual with the necessary "Foundation Skills", having achieved the soil professional competence standards set out by the British Society of Soil Science.
	Inspection of soil reconditioning windrows (where required)	Continuous until soil reconditioning complete		
	Inspections of restored soil profiles	Continuous until soil placement complete. Checks should be undertaken as each layer is placed		
Reporting	Condition reports detailing works undertaken and replaced soil conditions (in relation to target)	On completion of soil replacement activities for each asset	Soil Scientist	
Monitoring	All the above activities will be monitored and recorded	Weekly checks of soil handling operations (either combined with site visit or through review of reporting documentation)	Soil Scientist	
Auditing	All above activities will be audited	Monthly audits will be undertaken of activities which have taken place in the preceding month Annual audits of all activities will be undertaken	Soil Scientist	

1.6 Soil Baseline

- 1.6.1 The ALC survey has established the soil baseline across the Site, detailing the soil's physical properties. This information was used to guide decisions regarding outline approaches to manage soil handling, the sustainable reuse of soil (i.e. supporting landscape design and planting) and soil export, if required.
- 1.6.2 The ALC surveys identified three principal soil types across the survey area: deep clay, clay loam over clay (including medium to heavy and silty variants), and silty soils (including silt loam, silty clay loam and silty clay), with heavier clayey soils generally concentrated in the south and near the River Trent, and more silty soils occurring towards the west and north.
- 1.6.3 The land required to construct the Scheme was determined to be predominantly Grade 3a and Grade 2, which accounts for 69.7% of the area surveyed (67.1ha), with Grade 3b land accounting for 12.6ha (12.6%). The remainder of the land required to construct the Scheme was either non-agricultural or not surveyed due to access constraints at the time of survey. Soil resource surveys will be undertaken post consent/preconstruction in areas which were not covered by the detailed ALC surveys.
- 1.6.4 The soil baseline will be incorporated into the SMP, including the soil data from the ALC survey. The soil baseline will include (but not be limited to) the following:
- soil types (including soil textures and the main soil types present onsite);
 - soil type map of the different topsoil and subsoil resources;
 - soil depths of topsoil and subsoil;
 - soil depth map;
 - potential site-won soil volume; and
 - soil balance.

1.7 Soil Protection Measures

- 1.7.1 This OSMP describes procedures for soil stripping, handling, transporting, storing, and restoring soils, to maintain, as far as practicable, their soil quality and viability as required for the proposed end uses. There will be a number of control measures at each stage of the works.
- 1.7.2 A summary of these measures is outlined below and described in more detail in the following sections.
- 1.7.3 Early soil protection measures:
- measures for in situ soil protection during early site clearance activities;
 - soil recovery and storage (soil stripping and stockpiling);
 - in-situ soil protection ahead of stripping;
 - pre-treatment of existing vegetation;
 - measures for handling and stockpiling;

- measures to ensure correct segregation of different topsoil and subsoil resources;
- measures for separate storage of different soil types; and
- method and locations of stockpiling.

1.7.4 Soil reconditioning (for use where required):

- measures to recondition wet and plastic soil resources before reuse;
- measures to ensure correct segregation of different topsoil and subsoil resources; and
- measures for handling and to optimise soil drying and re-aeration.

1.7.5 Soil restoration methods:

- soil prescriptions for each different land use;
- soil handling/replacement methods;
- in situ soil treatments for each different land use; and
- clear re-use strategy for all soil resources taken off-site.

1.7.6 Monitoring:

- monitoring programme; soil assessment procedures for (a) soil stripping and storage (b) soil reconditioning and (c) restoration activities;
- acceptability criteria for soil storage, reconditioning and soil replacement activities; and
- failures of acceptability criteria and corrective actions.

1.7.7 Quality control and auditing measures:

- quality control, auditing procedures and plans; criteria for cessation of works;
- non-compliances and corrective actions; and
- use of toolbox talks for staff training.

1.8 Wet Weather Working and Cessation of Works

- 1.8.1 Soils shall be tracked over and handled when they are in a reasonably dry and friable state, or where they have passed the test for soil plasticity (as described in Annex B of this OSMP). This is when soil structural units are least susceptible to damage by compaction and smearing.
- 1.8.2 The soil plasticity tests shall apply to all soil materials that are to be tracked over and handled (to include stripping, stockpiling and reinstatement). All soil plasticity tests shall be carried out by a competent Soil Scientist or practitioner, or an individual who has been trained by the appointed Soil Scientist. The results of the soil plasticity tests are to be recorded.
- 1.8.3 Soil stripping operations must be suspended under the following conditions and not restarted until the ground has had at least a full dry day, or the soil moisture criteria set out in Annex B of this OSMP have been met to allow the restarting of soil handling operations:

- sustained heavy rainfall (>10mm in 24 hours) which leads to waterlogged soils or pools or water on the ground surface; and
- the ground surface is frozen or covered by snow.

- 1.8.4 The Environmental Manager(s) and Soil Scientist will ensure there is continuous awareness of ground conditions as weather patterns change and take pro-active decisions regarding whether soil handling operations should be suspended/restarted. Where soil handling operations continue when soils have become plastic the soil materials will be clearly tracked as plastic so that effective reconditioning measures can be implemented at the appropriate time.
- 1.8.5 In some exceptional cases, it may be necessary to handle soils when they are in a plastic or frozen state, for example due to engineering constraints, where delays may give rise to other environmental impacts or due to the specific nature of the soil. In these cases, location-specific methods will be agreed with the Environmental Manager(s) and Soil Scientist with approval for the recommendation being required from the Project Manager/Senior Project Manager prior to works commencing and with the decision form completed to record the recommendation, actions and approval.

1.9 Use of Toolbox Talks

- 1.9.1 Toolbox talks will be used so that all site personnel are aware of the SMP and applicable soil handling and soil protection procedures. The toolbox talks will be site- and task-specific, discussing soil conditions and approaches to soil handling at the Site.
- 1.9.2 Toolbox talks must include at least the following topics:
- key aspects of the SMP;
 - identification of topsoil and subsoil resources (to ensure accurate soil stripping and prevention of topsoil/subsoil mixing);
 - stockpile creation;
 - assessment of soil plasticity using the techniques set out in Annex B of the OSMP; and
 - soil reinstatement approach (where required).
- 1.9.3 The suite of toolbox talks will be developed by the Soil Scientist in collaboration with the Environmental Manager(s).

1.10 Soil Management Measures

General Soil Protection Measures

- 1.10.1 Plant and other site vehicles will be managed so that they do not directly traffic across in situ topsoil. Where required, trackway will be used if vehicle access is required over unstripped soils and the access could result in compaction/rutting (based on the soil plasticity test set out in Annex B of this OSMP). If site access arrangements change as works progress, all personnel should be made aware of the new arrangements through a toolbox talk.

- 1.10.2 There will be no lay-down of materials outside of designated storage areas, except for those materials required for specific on-going construction activities.
- 1.10.3 Subject to ground conditions and confirmation from the Environmental Manager(s) and/or Soil Scientist, materials can be temporarily stored on topsoil if it is considered this will not be detrimental to soil quality.

Clearance of Existing Vegetation

- 1.10.4 Prior to soil stripping commencing, any vegetation would be cleared, and arisings removed. This is to ensure large quantities of green vegetative material do not get mixed with the stockpiled soils.
- 1.10.5 The method used will depend on the nature of the vegetation present. The clearance operation should ensure the vegetation is removed to ground level and all arisings (including chipped wood material) are removed. Vegetation clearance would be undertaken by best practicable methods. Blading off vegetation using a bulldozer will not be permitted.
- 1.10.6 All vegetation clearance works would ensure, where practicable, that the soils are not damaged through the creation of ruts or mixing or compaction of topsoil and subsoil resources. This is particularly important where the soils are of a heavier texture and more prone to compaction and smearing (i.e. the compression and smoothing of clay-rich materials, removing structural units and drainage routes through the soil).
- 1.10.7 The potential risks from vegetation clearance will be identified by the Soil Scientist (or suitably briefed delegate) in a toolbox talk prior to the works commencing. Soil plasticity tests will be undertaken as detailed in Annex B of this OSMP to minimise the risk of soil damage (as vegetation clearance would require tracking over unstripped topsoil).

Subsoil stabilisation

- 1.10.8 Subsoil stabilisation techniques may be used in appropriate locations (as determined by the Soil Scientist) where arrangements can be agreed with landowners. These techniques have the potential to reduce the depth of stone required for the haul roads by approximately a third in ideal conditions, with the benefit of reducing vehicle movements. After the stripping of topsoil (to be stored in a separate bund to the side of the haul roads), and potentially the excavation of some subsoil material, one of a number of different treatments would be applied/mixed with the subsoil. The treatments use various means to bind the subsoil material together to form the base for the road and are then topped by imported stone (which may also be treated) to provide a running surface. Once any treated roads are no longer required, and after removal and recycling of the upper layers of stone surfacing, further treatments (chemical and/or mechanical) would be used to unbind the subsoil.
- 1.10.9 Any excavated material would be reused and replaced where practicable (ensuring topsoil is replaced above subsoil), with the site returned to its prior use and handed back to the landowner. Subsoil stabilisation would only be adopted where it would result in no materially different effects to those assessed in the Environmental Statement (ES). The Soil Scientist would develop an appropriate testing schedule to confirm the suitability of any soil stabilisation approach.

Soil Stripping

- 1.10.10 Before any soil stripping activities take place, the proposed works and phasing will be detailed by the Main Work Contractor(s) in the Contractor Pre-start Information Pack (to include method statements, drawings and specifications) and issued to National Grid Electricity Transmission plc (National Grid) for acceptance. The Main Works Contractor Pre-start Information Pack will provide timescales and sequencing of soil stripping the proposed haul routes.
- 1.10.11 The earthworks will be phased to ensure that the topsoil is stripped in each part of the site ahead of subsoil materials, and that all soils are stripped from a designated area prior to bulk excavation and earthwork activities within that area.
- 1.10.12 To ensure that the correct soil depths are stripped to avoid the mixing of topsoil and subsoil resources, all personnel involved in the works will attend a toolbox talk to gain general awareness on the identification of topsoil and subsoil resources. Specific instructions regarding soil depths to be stripped will be provided during Daily Activity Briefings (DABs).
- 1.10.13 All stripped materials will be logged, tracked and labelled, in line with the movement and tracking systems detailed in the Site Waste Management Plan (SWMP).
- 1.10.14 All stripped soils will be free from significant quantities of foreign matter or other materials which would make the soils unsuitable for their intended re-use.
- 1.10.15 Immediately prior to stripping, the soil shall be tested for plasticity using the methodology presented in Annex B of this OSMP.
- 1.10.16 Soil will be stripped using a hydraulic excavator or tracked dozer following the methodology set out in Annex C of this OSMP to minimise the risk of compaction of either topsoil or subsoil materials.
- 1.10.17 Prior to soil stripping commencing, a toolbox talk will be provided by a Soil Scientist (or suitably briefed delegate) in conjunction with the construction lead, to set out how topsoil and subsoil resources will be stripped and stockpiled separately. This will ensure that any differences between the topsoil/subsoil boundary is understood.
- 1.10.18 Dump trucks will be used to transport the soils to the landscape bund or stockpile locations.

Soil Stockpiling

- 1.10.19 Key issues for soil handling, storage and eventual re-use are soil moisture content and soil consistency (plasticity). During the works, soil plasticity status will be determined in situ prior to stripping (see Annex C of this OSMP) and the test results recorded.

Stockpile Formation

- 1.10.20 Locations of stockpiles will be determined by the Environmental Manager(s) and/or Soil Scientist when pre-construction information is available and will be decided in line with the detailed SMP.
- 1.10.21 Appropriate stockpile heights should be used for topsoil that can be stripped and stockpiled in a dry state, but heights may need to be greater where storage space is limited. Good practice recommends that topsoil stockpiles should be no higher than

3m and subsoil no higher than 5m (Defra, 2009a). The precise size and height of the stockpile should be determined by the Environmental Manager(s) and/or Soil Scientist taking into account the amount of space available, the nature and composition of the soil, the prevailing weather conditions at the time of stripping and planning conditions associated with the works, in line with the detailed SMP.

1.10.22 The following principles will be followed for all stockpiled materials, following the methodology presented in Annex D of this OSMP:

- Topsoil and subsoil materials will not be mixed; separate stockpiles will be created for topsoil, upper subsoil and lower subsoil (if subsoil stripping is required).
- Stockpiles within each soil horizon layer (i.e. topsoil, upper subsoil, lower subsoil) should be separated based on soil texture. There will be no mixing of soil textural groups (i.e. light textured sandy topsoil would not be stockpiled with heavy textured clay topsoil).
- Documentation and physical control measures (such as signing of stockpiles) will be put in place to prevent accidental mixing, to ensure soils are segregated according to source location, and to protect soils from being trafficked by plant or vehicles.
- Where there are spatial constraints, soils may need to be stockpiled against each other. Physical separation may be achieved by means of a marker layer (such as straw or clear recording of ground level information) so that no mixing occurs, and the different materials can be effectively separated.
- Soil materials will also be stored on like for like i.e. topsoil can be stockpiled on topsoil but subsoil should only be stockpiled on subsoil. A suitable marker layer (such as straw or clear recording of ground level information) will be used where topsoil is stockpiled in topsoil to ensure the in situ soils are not disturbed on stockpile removal.
- Stockpiles will not be positioned adjacent to ditches and not within 10m of a watercourse.
- Soil resources will be loose tipped.
- The sides of stockpiles will be smoothed using the back of an excavator bucket to ensure they shed water and to reduce the risk of waterlogging within the core of the stockpile.
- Measures to manage and treat site runoff and prevent erosion and dust generation during soil stripping and stockpiling works will be set in place through a series of specific control measures, as set out in the detailed SMP.

Stockpile Maintenance

1.10.23 Soil stockpiles will be managed and monitored throughout their lifetime so that they can be maintained in relation to stability and integrity. Measures to manage stockpiles are as follows:

- Soil stockpiles will be seeded with a grassland seed mix to maintain slope stability and to prevent erosion or dust generation if they will be used in place for longer than 6 months.

- Stockpiles without vegetation cover should be sprayed with water where necessary to firm the surface of the stockpile and create a crust to prevent the generation of dust.
- Soil stockpiles will be managed and monitored throughout their lifetime so that they can be maintained in relation to stability and integrity, and any weed growth can be managed in a timely manner.

Stockpile Reconditioning

- 1.10.24 Prior to restoration activities taking place, soil resources may have been stored in stockpiles for extended periods and in some exceptional cases, soils may have been handled and stockpiled in a plastic state. To confirm the suitability of stockpiled soils for restoration, they should be visually inspected, and assessments carried out before their reinstatement (see Section 1.11 - Monitoring). If any soil is found to be plastic or display excessive anaerobic conditions, the materials should be reconditioned as detailed below. It will be the responsibility of the Soil Scientist to assess soil in each stockpile and to recommend and record appropriate pre-treatment prior to soil placement, should it be required.
- 1.10.25 Soils which are plastic in consistency shall be reconditioned using the methodology presented in Annex E of this OSMP.

Soil Reinstatement

- 1.10.26 The works required to effectively reinstate a soil profile suitable for the proposed end use and to ensure the required soil structure is present and that there is no compaction, will depend on what soil layers have been stripped and the extent of the trafficking over the exposed surface that has occurred.
- 1.10.27 The sequence required to reinstate the soil profile will be detailed by the Environmental Manager(s) and/or Soil Scientist and will be briefed to all personnel involved in the works during the DABs.
- 1.10.28 Subsoil and topsoil re-use will aim to achieve the following:
- creation of the required combination of topsoil and/or subsoil to create a soil profile with the characteristics required for the proposed use, or re-create the soil profile in line with pre-existing soils where restoration to previous land use and land quality is required; and
 - ensure, through careful handling and placement of soils, no compaction within the restored soil profiles that may limit vegetation establishment and growth or restrict water infiltration.
- 1.10.29 The approach for the checks required and the methodology to be used to reinstate the land at the end of the construction phase will depend on the thickness of soils stripped and the results of compaction testing. The approaches set out will be in line with published guidance and will ensure the following:
- deep ripping of the overburden where required prior to the placement of subsoil; and
 - the soil profile created will be checked by suitably qualified personnel to ensure it is suitable for the proposed end use (Table 1.1).

- 1.10.30 Where soils stripped during the construction phase will not be reinstated and cannot be re-used on site, they will be removed off-site. Prior to any removal off-site, the quantity and characteristics of available soil materials will be assessed.
- 1.10.31 The soil profiles being reinstated will be designed to maximise re-use (ensuring placing more soil does not have any detrimental effects). For example, it will be assessed whether a thicker topsoil layer can be placed. The final soil profile requirements will be detailed within the final landscape plans and a soil re-use summary report produced by the Environmental Manager(s) and/or Soil Scientist to demonstrate how off-site disposal has been minimised.
- 1.10.32 During the placement of soil resources in their final location the methods outlined above will be followed. This will include, but not be limited to, the implementation of an access and egress plan for vehicles and plant to prevent unnecessary trafficking of restored areas, use of appropriate scale plant, avoidance of double handling and avoidance of mixing topsoil and subsoil where these materials are required for the restoration of agricultural land. Soil replacement will be undertaken in accordance with the methodology set out in Annex F of this OSMP.

Aftercare

- 1.10.33 There will be a requirement for an aftercare period where soils are being reinstated to ensure they are returned to their previous condition, or the condition required for their end use.
- 1.10.34 An Aftercare Management Plan will be produced by the Main Works Contractor(s), which would define:
- Purpose and scope of the Aftercare Management Plan, including the aftercare parcels and their intended end uses. End uses may include (but are not limited to) agriculture, landscaping, habitat, biodiversity net gain (BNG) and this information would be used to inform appropriate soil aftercare;
 - Links to other management plans (e.g. Landscape and Ecology Management Plan, BNG) as required;
 - Aftercare stages and duration: duration should be up to 5 years, with scope for early completion if success criteria are met. The Aftercare Plan should set out in tabular format activities for each year/season;
 - Success criteria (including anticipated timeframe) for each area/land use;
 - Roles and responsibilities: who delivers aftercare measures (e.g. contractor/ operator/ landowner) and who oversees it (e.g. soils specialist);
 - Management commitments: controls on trafficking, timing of operations, vegetation establishment/management, and access controls (e.g. fencing);
 - Monitoring programme: soil parameters (e.g. structure, depths/mixing, compaction, drainage/wetness, debris/contamination, vegetation performance, fertility) and frequency/timing of monitoring (to include post-reinstatement and periodic checks);
 - Methods: e.g. Visual evaluation of soil structure (VESS)/soil pits, augering and sampling, penetrometer testing, visual drainage/erosion checks;

- Triggers and remedial actions: define how issues would be identified and required corrective measures (e.g. cultivation/subsoiling, drainage repairs, amendments, targeted imports as last resort);
- Reporting and sign-off criteria, including requirements for aftercare monitoring reports, records of interventions, and completion criteria. Completion criteria would include post-reinstatement soil profile checks, and ALC verification. The timing of these is likely to be after 1-3 seasons as a minimum where land returns to agriculture; and
- Success criteria would be based on the soil baseline information, along with pre-entry condition surveys, photograph logs and landowner/occupier engagement.

1.11 Monitoring

- 1.11.1 To ensure that the quality of the soil materials is not detrimentally affected during the soil stripping, stockpiling and re-use/restoration works, monitoring by the Soil Scientist will be undertaken as detailed in Table 1.2.
- 1.11.2 Responsibility for some repeated tasks, as indicated in the table below, can be delegated to a suitable experienced and trained person following the initial monitoring. Training will be provided by the Soil Scientist.

Table 1.2 Monitoring requirements

	Monitoring Requirement	Responsible
1	Effective clearance of vegetation and arisings from the soil surface – once prior to soil stripping commencing	Soil Scientist (can be delegated)
2	Soil plasticity state – prior to soil stripping commencing with additional tests following rainfall events	Soil Scientist (can be delegated)
3	Topsoil stripping – correct identification of base of topsoil and minimisation of subsoil incorporation throughout the soil stripping operations	Soil Scientist (can be delegated)
4	Subsoil stripping (if required) - correct identification of base of subsoil and minimisation of overburden incorporation throughout the soil stripping operations	Soil Scientist (can be delegated)
5	Stockpile construction to ensure no mixing of topsoil and subsoil – throughout the stockpile construction period	Soil Scientist (can be delegated)
6	Stockpile condition – checks to record signs of vehicle tracking, erosion, and weed growth and set out remedial measures should issues be identified	Soil Scientist (can be delegated)

	Monitoring Requirement	Responsible
7	General monitoring of soil handling operations	Soil Scientist
8	Reinstated soil profiles – check to confirm profile and soil condition is suitable for the proposed end use	Soil Scientist

1.11.3 A record of monitoring visits will be created to include those listed in Table 1.3.

Table 1.3 Items for monitoring records

No. Information to be Recorded	
1	Confirm successful treatment of vegetation
2	Confirmation of soil type (topsoil or subsoil)
3	Soil depth stripped
4	Soil plasticity (determined as 'plastic' or 'non-plastic')
5	Date(s) stripped, weather conditions during stripping, equipment/plant used for stripping.
6	Stockpile location. Designate each stockpile or stockpile portion as 'plastic' or 'non-plastic'
7	Record any stockpile non-compliance from stockpile inspections. Detail, date, and stockpile location code (refer to Stockpile Inspection Checklist and Stockpile Plan)
8	Reinstated soil profiles characteristics and condition
9	Sign off for each stage

1.12 Reporting of Findings

1.12.1 The findings of all examinations and assessments will be recorded and held by the Main Works Contractor(s) for record keeping and to enable actioning of any necessary corrective actions.

1.13 Failures of Acceptability Criteria and Corrective Actions

1.13.1 Where the soils are found to be non-compliant in any respect, an appropriate means of remediation will be proposed by the Main Works Contractor(s) for acceptance by National Grid. Guidance will be provided by the Soil Scientist. Once the affected area has been treated, it will be reassessed before sign-off.

Bibliography

British Society of Soil Science (2018a). *Foundation skills in field soil investigation, description and interpretation*. Available at: <https://soils.org.uk/wp-content/uploads/2021/02/WWS-1-Foundation-Skills.pdf> [accessed 15 May 2025]

British Society of Soil Science (2018b). *Soil science in soil handling and restoration*. Available at: <https://soils.org.uk/wp-content/uploads/2021/02/WWS-4-Soil-Handling-and-Restoration.pdf> [accessed 15 May 2025]

British Standards Institute (2013). *BS 8601:2013 British Standard Specification for Subsoil and Requirements for Use*. London: British Standards Institution.

British Standards Institute (2015). *BS 3882:2015 British Standard Specification for Topsoil and Requirements for Use*. London: British Standards Institution.

Department for Environment, Food and Rural Affairs (Defra) (2009a). *Construction Code of Practice for the Sustainable Use of Soils on Construction Sites*. Available at: <https://assets.publishing.service.gov.uk/media/5b2264ff40f0b634cfb50650/pb13298-code-of-practice-090910.pdf> [accessed 15 May 2025]

Department for Environment, Food and Rural Affairs (Defra) (2009b) *Safeguarding our Soils - A Strategy for England*.

Institute of Quarrying (2021). *Good Practice Guide for Handling Soils in Mineral Workings*. Available at: <https://www.quarrying.org/soils-guidance> [accessed 15 May 2025]

Annex A

British Society of Soil Science Competency Standards

Foundation skills in field soil investigation, description and interpretation



Background

The investigation of soils in the field, their consistent description according to a recognised scheme, and the interpretation of soil profiles, properties and conditions are generic foundation skills for professional scientists and engineers employed on tasks that relate to the use and/or management of land. This document identifies the minimum qualifications, skills and knowledge which the British Society of Soil Science (BSSS) considers to be required of scientists and engineers conducting field soil investigations.

Qualifications

Professional soil scientists with competence in these foundation skills are likely to have graduated in a relevant science subject. They will also have a number of years of relevant, regular field soil-based experience and will have, or be adequately qualified for, membership of a relevant professional body such as the BSSS.

Minimum competencies

Skills:

- 1 The ability to dig and/or auger a soil, or to instruct others to do this, so as to **expose a soil profile** to a relevant depth and to then accurately **identify the sequence of horizons** that comprise the soil profile (natural or manmade) using standard reference documents such as The Soil Survey Field Handbook¹
- 2 The **design and development of a soil investigation strategy** that is appropriate to the site or landscape to be investigated, and will generate representative soil information at an appropriate scale. This should be based upon the objectives and context of the study, and an understanding of the likely patterns of soil variability
- 3 The ability to **read and interpret maps/spatial data** of topography, geology, soil and aerial photography in relation to the interpretation of soil conditions; where and when appropriate, conversance with the use of GIS, GPS and mobile technology

Foundation skills in field soil investigation, description and interpretation

- 4 The application of a relevant scheme of **field soil description** (such as Soil Survey Field Handbook) and the production and recording of accurate, consistent descriptions of soil profiles or materials. This should normally include the ability to describe soil colour (e.g. using a Munsell soil colour chart²) including mottling, soil texture, the properties of the soil surface, soil structure, consistence and porosity
- 5 The consistent **hand texturing** of particle size distribution in the fine earth, and the description of stones by their frequency, size, shape and rock type
- 6 The ability to **interpret soil horizons, features and materials** and whole profile descriptions to develop an understanding of the soil environment and its variability within a landscape
- 7 The ability and understanding required to **sample a soil or the soils of a site** for one or more relevant determinands representative of the soil or site and relevant to the objectives of the study. This may involve the collection of aggregated topsoil samples or horizon bag or tin samples
- 8 The ability and knowledge required to interpret the results of any soil chemical, physical or microbial analysis
- 9 The ability to **interpret the relationships between soil and landscape, land use and climate**
- 10 The ability to **produce accurate and understandable verbal and written reports** of the soil conditions (text and map information as appropriate) at or across the investigation site, with an interpretation of these in a way that is relevant to the context of the investigation (this is amplified by other BSSS PCSS documents in this series)

1 Hodgson, J M (1997) Soil Survey Field Handbook. Soil Survey Technical Monograph No 5, Silsoe
 2 Munsell Soil Colour Book, Munsell Colour (2009)

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Knowledge:

- 1 An understanding of **soil development processes** and of the influence of relief, geology, climate, vegetation and soil organisms on soil development
- 2 A basic knowledge of world and European soils and their taxonomy, and a more detailed knowledge of soil development and taxonomy within the United Kingdom
- 3 An understanding of the potential for **soil heterogeneity** in space and time, and of the factors that cause and influence variability
- 4 Knowledge of **soil horizon notation** and, where appropriate, of a relevant scheme for soil classification including the identification of diagnostic horizons, features and materials
- 5 Knowledge of **local soils and land use history affecting the soils** and of the range of soils developed across the UK and Europe, and of information sources for more detailed information
- 6 Knowledge of **natural soil properties and conditions** that is sufficient to set soil conditions at an investigation site within the context of natural variability
- 7 Knowledge and application of relevant **Health and Safety, Environmental and Biosecurity regulations**, including any animal or plant health restrictions in force and all relevant safe working practices
- 8 Knowledge of the **potential impacts of human activity and of land management** on soil properties and processes
- 9 Particular specialist knowledge of soil and crop nutrition, soil hydrology, and of the influence of soil on plant and animal ecology may be required in particular circumstances and these are detailed in related PCSS competency documents

Soil science in soil handling and restoration



Background

Large amounts of soil are disturbed during the development of land for urban, industrial/retail and transport uses, for installation of energy networks and for the quarrying of aggregates and minerals. In addition, previously excavated soils are re-instated after mineral working and in the restoration of previously despoiled land to green after-use and to create parks, gardens and landscaped areas within the built environment. Professional soil science has an important role to play in ensuring a successful outcome. Professional competence in managing the restoration of land after soil disturbance builds upon foundation skills in field soil investigation, description and interpretation (BSSS PCSS Document 1). The competencies outlined in BSSS PCSS Documents 6 (Soil science in the establishment, management and/or conservation of natural habitats and ecosystems) and 8 (Soil science in landscape design and construction) will also be relevant depending on the intended after-use of a site.

Qualifications

Professional soil scientists and engineers with competence in soil handling and land restoration will have graduated in a relevant science subject. They will also have a second degree and/or a number

of years relevant field experience and will have or be adequately qualified for full membership of a relevant professional body such as the British Society of Soil Science (BSSS).

Minimum competencies

Skills and knowledge:

These are described under a number of sub-headings that relate to different tasks. A professionally-competent scientist or engineer should have the skills and knowledge identified under the **General heading** and **all other headings that are relevant** to the tasks required. Professional soil scientists and engineers working in this sector should be familiar with the Defra Construction Code of Practice for the Sustainable use of Soils on Construction Sites (Defra 2009).

General

- 1 The ability to investigate, sample, describe and interpret soils in the field in a consistent manner and to professional standards (BSSS PCSS Document 1)
- 2 The ability and knowledge required to interpret the results of any soil chemical, physical or microbiological analyses

Soil science in soil handling and restoration



- 3 Knowledge of relevant European and national regulations and policies, including national and local land use planning policy and guidance, and soil protection policy
- 4 A working knowledge of the industry being advised, whether quarrying, development, infrastructure installation or landscaping
- 5 The ability to effectively communicate soil information in a simple and relevant form to developers, planners, landscape architects and earthmoving contractors with clear statements as to the reliability and certainty of the results
- 6 The ability to write accurate reports and/or method statements, written in clear terms, that communicate the relevant information to site planners, site managers, site personnel and eventual users of restored land
- 7 An awareness of the importance of systems of quality assurance and control in all aspects of professional work

The characterisation of soil resources

- 1 The know-how to select appropriate survey and sampling densities to characterise *in situ* and stockpiled soil resources to required levels of certainty
- 2 Understanding of Health and Safety requirements on site and the ability to compile a risk assessment when requested
- 3 Familiarity with the use and limitations of GPS for determining sampling locations on site
- 4 Proficiency in fieldwork practices and procedures such as soil texturing, soil description and the delineation of soil resource units (see BSSS PCSS Document 1)

The provision of advice on soil handling

- 1 A knowledge of the machines used for handling soils, their capabilities and limitations
- 2 An awareness of methods of soil handling that minimise physical damage to soils and guidance¹ that describes such methods, including management of stockpiled soil
- 3 An understanding of soil hydrology and physical and engineering properties such as plastic limit, and their relevance to soil handling

- 4 The ability to calculate volumes of *in situ* soil layers to be moved as well as soil stored in stockpiles
- 5 A knowledge and understanding of waste management and/or contaminated land regulations that might restrict the export of soil materials off-site or their management within site
- 6 Familiarity with British Standards relevant to characterising soil materials already on site or being imported to site²
- 7 The ability to prepare a Soil Management Strategy/Soil Resource Plan³ and simple method statements for site personnel

The restoration of land

- 1 The ability to characterise existing substrates on site and make best use of them, including chemical or physical amelioration where necessary
- 2 Knowledge and experience of the uses of manufactured soils and the use of organic materials for soil creation where natural soils are in short supply
- 3 Understanding of the specific soil chemical and physical conditions (including the principles of soil engineering) necessary for various restored after uses and landforms, such as woodland, Best and Most Versatile agricultural land, wet meadow, species-rich grassland, commercial landscaping, etc.

The aftercare and assessment of restored land

- 1 The ability to prepare and/or interpret aftercare plans (for those restored land uses where one is required)⁴
- 2 The ability to assess soil physical quality and make any recommendations for amelioration to create a 'fit-for-purpose' soil profile²
- 3 The ability to take representative soil samples for chemical analysis and to interpret the results to make recommendations for the use of fertilisers⁴, lime or other chemical ameliorants³

- 1 for example the MAFF (2000) Good Practice Guide for Handling Soils
- 2 e.g. BS3882:2007 Specification for Topsoil and Requirements for Use
- 3 Defra (2009) Construction Code of Practice for the Sustainable Use of Soils on Construction Sites
- 4 Might necessitate a FACTS qualification where the use is agricultural; see BSSS PCSS Document 10 Soil science in crop and livestock production

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Annex B

Field Assessment of Soil Plasticity

This annex presents the method for assessing the plasticity (consistency) of soils in the field. This method is to be used to assess soil plasticity at all pertinent stages of the earthworks programme including:

- in situ before/during soil stripping;
- storage stockpiles (non-plastic soils only);
- reconditioning windrows; and
- during soil re-spreading and decompaction/cultivation operations.

The procedure is outlined as:

- walkover/visual examination;
- soil sampling; and
- sample assessment.

Walkover/Visual Examination

The assessor shall first walk over or along the area/field or stockpile/windrow to be assessed to identify any apparent significant variability (e.g., evidence of poaching incidents, surface water ponding, saturated soils, or distribution of moisture loving plant species such as *Juncus*) and to identify suitable locations for sampling.

Any locations likely to display varying plasticity to the majority (such as low-lying spots and the base of stockpiles/windrows) shall also be accounted for when sampling.

Site observations relating to soil moisture content, soil plasticity and the distribution of any significant variability shall be recorded.

Soil Sampling

For undisturbed areas, the topsoil and upper subsoil shall be sampled at several locations using an Edelman soil auger. Separate samples from each soil layer shall be taken from their full depth.

For stockpiles and windrows, the soil shall be sampled at representative locations using an Edelman soil auger at a range of depths depending on the stockpile size. Where deemed necessary by the Soil Scientist, samples from greater depths shall be obtained using a suitably sized mechanical excavator.

For each layer, approximately a double handful of soil shall be collected and mixed up in a suitable container.

A minimum of five locations shall be sampled and assessed per field or stockpile/windrow.

Sample Assessment

The test sample (small handful) shall be taken from the collected sample and prepared for assessment by removing stones and vegetation including all roots greater than 1mm. Any significant quantity of very fine roots (<1mm) shall be removed.

The test sample shall be kneaded to break down its structure and ensure the mass has a uniform moisture content. It will be assessed in accordance with Table B.1 below.

Table B.1 Sample assessment for dry and friable soils

Examination	Assessment
If the soil sample is wet, films of water are visible on the surfaces of grains and aggregates and/or when a soil sample is squeezed in the hand, and it readily deforms into a cohesive 'ball'.	Handling not recommended – if handled, stockpiled material to be recorded as plastic
Peds (structures) break up/crumble readily when squeezed in the hand rather than forming into a ball.	Handling ok
If the sample is moist, there is a slight dampness when squeezed between the fingers, but it does not significantly change colour (darken) on further wetting.	No handling by dozers but may be handled by tracked excavators if consistency test is passed
If the sample is dry and brittle it will look dry and change colour (darken) if water is added.	Handling ok if consistency test is passed

Consistency Test

Attempt to mould a soil sample into a ball by hand:

Table B.2 First consistency test for dry and friable soils

Examination	Assessment
Impossible because the soil is too hard (dry)	Handling ok
Impossible because the soil is too loose (dry)	Handling ok
Impossible because the soil is too loose (wet)	Handling not recommended – if handled, stockpiled material to be recorded as plastic
Possible	Go to table below

Attempt to roll the ball into a thread of 3mm diameter on a flat non-adhesive surface using light pressure from the flat of the hand:

Table B.3 Second consistency test for dry and friable soils

Examination	Assessment
Impossible; the soil crumbles or disintegrates	Handling ok
Possible	Handling not recommended – if handled, stockpiled material to be recorded as plastic

Annex C

Soil Stripping Method

This annex sets out the approach to be followed for soil stripping.

Existing Vegetation

Woodlands/hedges shall be pre-treated before soil stripping, in two stages:

- each tree shall be felled and removed from site, including all branches/brash; and
- tree stumps and associated large roots (>20mm diameter) shall be lifted using a suitable excavator.

All woody materials (tree trunks, stumps, branches and brash) including wood chippings shall be removed from the area being stripped and will be managed in accordance with the SWMP. Excessive amounts of woody material will not be incorporated with the stripped soils. The only exception would be where deadwood forms a component of the surface features; in such circumstances a proportion of existing dead wood would be salvaged and used to recreate this habitat.

Any temporary stockpiles of woody materials shall be constructed with a small 'core' to minimise the risk of spontaneous combustion and monitored as appropriate.

Other vegetation will be cleared using an appropriate method. All arisings will be removed prior to the start of soil stripping. This will ensure that significant quantities of green materials are not incorporated with the stripped topsoil, which can lead to the development of anaerobic conditions within the stockpiled soil.

Access Routes

Access to each area/compartiment to be stripped shall be created by stripping the topsoil, followed by subsoil, to expose the 'basal layer'. The intention is that the receiving dump truck for the rest of the area/compartiment shall run on the basal layer to prevent damage to the topsoil or subsoil.

Access shall be created wide enough for the dump trucks to transport the stripped soils to the storage area.

Topsoil Stripping

In advance of stripping, the topsoil shall be cleared of all foreign matter or waste materials such as building rubble and fill materials.

All topsoil shall be stripped using hydraulic excavators and tracked dozers and transported using dump trucks, unless being stockpiled to one side of the construction area in accordance with the Good Practice Guide for Handling Soils in Mineral Workings (Institute of Quarrying, 2021), as shown in the figures below.

The tracked dozer shall run on the surface of the subsoil and push up the topsoil in a single pass into a temporary row at the end of its run. Using a hydraulic excavator, the stripped topsoil shall be loaded onto a dump truck for transportation to the designated stockpile location.

Figure C.1 Soil stripping with bulldozers and dump trucks: the bed and segment system

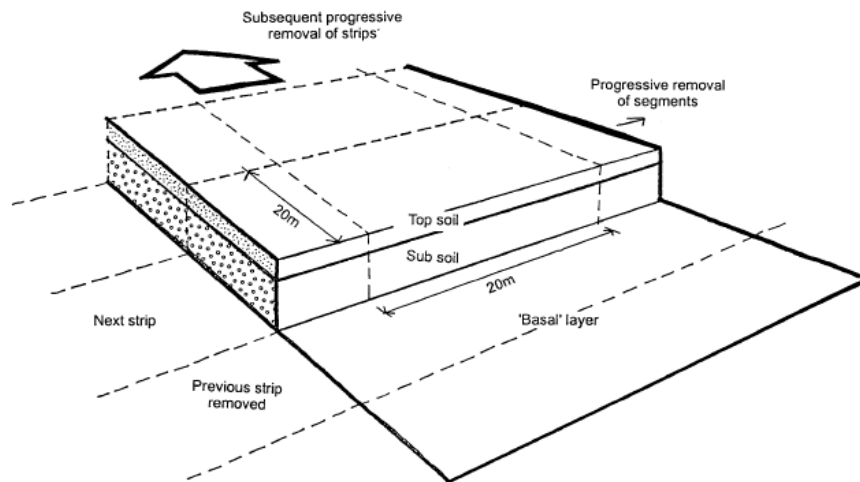
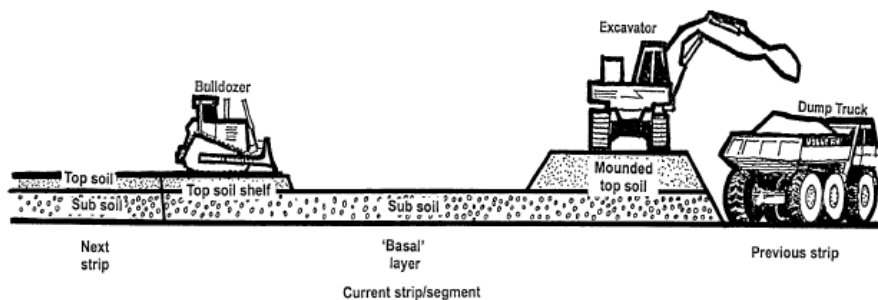


Figure C.2 Soil stripping with bulldozers and dump trucks: Topsoil



The depth of strip shall be as set out in the Soil Stripping Plan. The aim of the topsoil strip is to enable the majority of the topsoil to be recovered without the inclusion of significant quantities of underlying subsoil. Since topsoil depths will vary, the machine operator will use their best judgement (based on soil colour and/or firmness) during the topsoil strip to maximise topsoil recovery without compromising the quality of the soil resource.

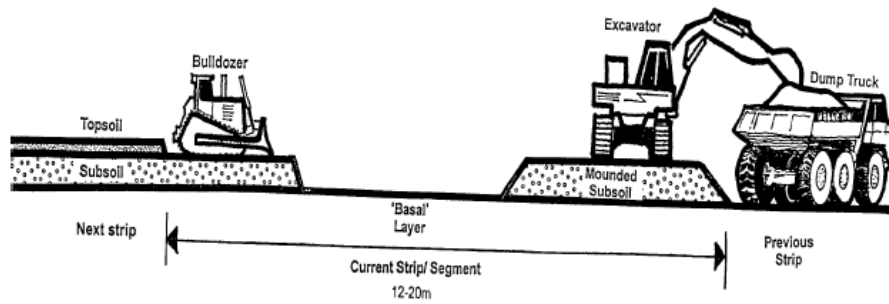
Once loaded, the dump truck shall transport the topsoil along the pre-designated access route to the desired stockpile location.

These operations shall be closely monitored to ensure that the correct soil type is recovered without the inclusion of other soils or wastes. Cross contamination with subsoil could significantly degrade the quality of the topsoil.

Subsoil Stripping

Subsoil shall be stripped (where required) using hydraulic excavators and tracked dozers and transported using dump trucks.

Figure C.3 Soil stripping with bulldozers and dump trucks: Subsoil



The tracked dozer shall run on the surface of the basal layer and push up the subsoil in a single pass into a temporary row at the end of its run. Using a hydraulic excavator fitted with a toothed bucket, the stripped subsoil shall be loaded onto a dump truck for transportation.

Once loaded, the dump truck shall transport the subsoil along the pre-designated access route to the desired stockpile location.

These operations shall be closely monitored to ensure that the correct soil type is recovered without the inclusion of other soils or wastes. Cross contamination with deeper subsoil/parent material could significantly degrade the quality of the subsoil.

Annex D

Soil Stockpiling Methodology

Introduction

This annex sets out the approach for the storage (stockpiling) of soils.

Stockpiling will ensure that topsoil and subsoil resources are stored separately. Where required, soil resources with differing characteristics shall also be stockpiled separately.

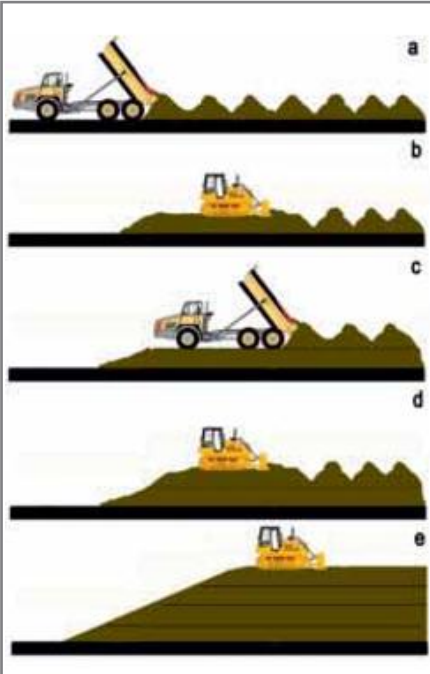
Stockpile locations will be identified in advance and clearly shown on relevant plans to ensure they do not interfere with other site operations, minimising the risk of stockpiled soil resources becoming contaminated or tracked over.

The area(s) designated for soil storage shall be cleared of vegetation and stripped, where required ahead of stockpile construction. Topsoil will be stored on top of in situ topsoil, with a marker layer of straw placed first to ensure, at the time of soil recovery, it is clear where the base of the stockpiled material lies. Subsoil will only be stored on subsoil (i.e. in an area where topsoil has been stripped).

Stockpiling Method

The approach illustrated in the graphic below will be used to stockpile non-plastic soils. Ideally, plastic soils will be reconditioned as shown in Annex E of the OSMP prior to final stockpile creation.

Stockpiling Method

	<p>The process requires the soil to be transported to the storage area in a dump truck, and 'loose tipped' in a line of heaps to form a windrow (a).</p> <p>Once the heaps cover the storage area, a tracked dozer (e.g. D6 Caterpillar) shall level the heaps to form a level, stable platform for dump trucks to travel across to tip a second layer of topsoil. (b and c) This sequence shall be repeated until the maximum stockpile height is achieved (d).</p> <p>Assuming that the topsoil is reasonably dry and friable during the stripping and storage operation, it shall be heaped to its maximum permitted height for this site.</p> <p>To protect from wet weather once the final height is achieved, the excavator or blade shall regrade the sides and top of the stockpile to firm the surface by tracking across it to form a smooth gradient. The aim is to seal in the dry topsoil and reduce rainfall/infiltration and stabilise the surface (e).</p> <p>Once the stockpile has been completed, the area shall be cordoned off to prevent any disturbance or contamination by other construction activities.</p> <p>Any emergent vegetation shall be managed to a maximum height of 300mm and not allowed to 'set seed'.</p>
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Annex E

Soil Reconditioning Methodology

Introduction

This annex presents the approach to be used for reconditioning plastic soils. This OSMP requires all soils to be handled when non-plastic but should this not happen or plastic soils be identified in stockpiles prior to re-use, reconditioning will be required.

Reconditioning will be undertaken in area(s) of the site where it will not interfere with other site operations to minimise the risk of soils that are being reconditioned becoming contaminated or tracked over.

The area(s) designated for soil reconditioning shall be cleared of vegetation. Soil materials will only be windrowed on compatible soil types/layers. Where possible reconditioning at the re-use location will reduce the amount of handling required.

Soil Reconditioning Method

The approach illustrated in the graphic below shall be applied, through placing the plastic soils into windrows and allowing the soil to dry over a period of several weeks (assuming suitable weather conditions). The reconditioned soil can then be used to reinstate areas or be re-stockpiled in a non-plastic state, as shown in the graphic below.

Conditioning prior to stockpiling

	a Excavate soil from existing stockpile using a hydraulic excavator fitted with a toothed bucket. Load into dump truck and move to reconditioning area.
	b The soil is tipped in a line of heaps to form a 'windrow', starting at the furthest point in the storage area and working back toward the access point (a).
	c Any additional windrows are spaced sufficiently apart to allow tracked plant to gain access between them so that the soil can be heaped up (b). To avoid compaction no machinery including tracked plant, traverses the windrow.
	d Once the soil has dried out and is non-plastic in consistency (this usually requires several weeks of dry and windy or warm weather and for the windrows to be turned at least once), (c) the windrows are combined to form large stockpiles to the maximum height for this Site using a tracked excavator (d).
	e The surface of the stockpile is then regraded and compacted (e) by a tracked machine (dozer or excavator) to reduce rainwater infiltration.

Annex F

Soil Placement Methodology

This annex presents the methods for the placement of the soils. It comprises the following:

- soil handling considerations;
- placement and treatment of overburden;
- subsoil and topsoil placement and spreading; and
- cultivations and monitoring.

Soil Handling Considerations

To avoid further physical degradation during all phases of soil placement and handling (e.g. re-spreading/placement, overburden ripping/subsoiling and topsoil cultivation), these operations will be carried out when soil is non-plastic in consistency. As such, soil handling will be stopped during and after heavy rainfall, and not continue until the soil is again non-plastic in consistency.

Monitoring of the soil placement will be undertaken to ensure the placed soil is not structurally damaged and so any required remedial measures can be implemented as the works progress.

Placement and Treatment of Overburden

The finished surface, prior to the placement of subsoil and topsoil materials, will be loosened through the use of appropriate plant, such as a heavy duty subsoiler/ripper fixed to a tracked dozer. If access is limited, a single rigid tine fitted to a hydraulic excavator will be used to undertake this operation.

The depth of ripping of the overburden will be to 0.4m, with tine spacing at a maximum of 1m centres. Any oversized rocks (greater than 0.2m diameter) that are uplifted to the soil surface during ripping will be picked and removed for use as infill elsewhere.

To ensure effective drainage, ripping shall include a straight run across the width of the area being reinstated at an angle of approximately 45° to any slope followed by a subsequent oblique pass. If assessed as necessary by the Soil Scientist, a third pass shall be run at an angle of 90° to the first pass to ensure that there are no remaining blocks of unbroken compacted soil.

As the areas being reinstated are generally narrow linear corridors, ripping will be undertaken to ensure tie in with adjacent, non-worked land parcels such that the ripping does not result in subsequent drainage issues on those land parcels.

Subsoil and Topsoil Placement

A sequential approach to subsoil and topsoil placement will be undertaken as outlined below:

Subsoil Placement

- using a hydraulic excavator fitted with toothed bucket (to avoid smearing), remove subsoil from stockpiles;
- transport with dump truck to the appropriate re-use location;

- tip subsoil in a line of heaps at the edge of the ripped/subsoiled area to avoid re-compaction of the overburden;
- spread the subsoil using either a tracked dozer or tracked excavator; and
- Soil Scientist to check and ensure correct subsoil depth is achieved across the reinstatement area.

Topsoil Spreading

Once satisfactory subsoil placement has been achieved, topsoil shall be removed from stockpiles and spread following the same procedures for the subsoil above, ensuring that placed and loosened subsoil and overburden is not tracked over.

Topsoil depths shall be checked by the Soil Scientist to ensure correct topsoil depth is achieved.

Cultivations and Monitoring

Once the soil profile has been formed, final cultivation will be undertaken. Cultivation will only be undertaken when the soils are dry and friable to the full depth of working to avoid the risk of smearing the soil.

An appropriate tracked machine or tractor fitted with a wing-tine subsoiler will be used for loosening the subsoil (subsoiling). For inaccessible areas, a suitable tracked excavator, fitted with a single rigid tine (ripper tooth) will be used. Loosening will be undertaken to a minimum depth of 0.6m below surface level at maximum 0.6m centres.

To ensure good drainage, subsoiling will include a straight run across the width of the reinstatement area at an angle of approximately 45° to any slope followed by a subsequent oblique pass. If assessed as necessary by the Soil Scientist, a third pass shall be run at an angle of 90° to the first pass to ensure that there are no remaining blocks of unbroken compacted soil.

After subsoiling, the Soil Scientist shall assess the subsoil layer to check the effectiveness of the operation. If compaction is still recorded, the above process will be repeated until this is removed.

Once subsoiling has been undertaken successfully, the topsoil will then be cultivated (with repeat cultivations as required) to its full depth using appropriate tillage equipment (e.g. chisel plough, power harrow or set of discs) to produce a suitable tilth. This operation will also help to re-aerate the topsoil after storage (if applicable).

Where access is limited, the topsoil may be cultivated using a landscape rake attachment fitted to a suitable hydraulic excavator.

Any undesirable material brought to the surface during this exercise shall be removed by picking or raking. For example, stones, fill materials and coarse vegetation larger than 50mm in any dimension.

After topsoil cultivation, the Soil Scientist shall assess the topsoil horizon to check the effectiveness of the operation and to confirm that the condition of the topsoil is suitable for the intended end use.

Appendix H Copy of Appendix O Noise Impact Assessment

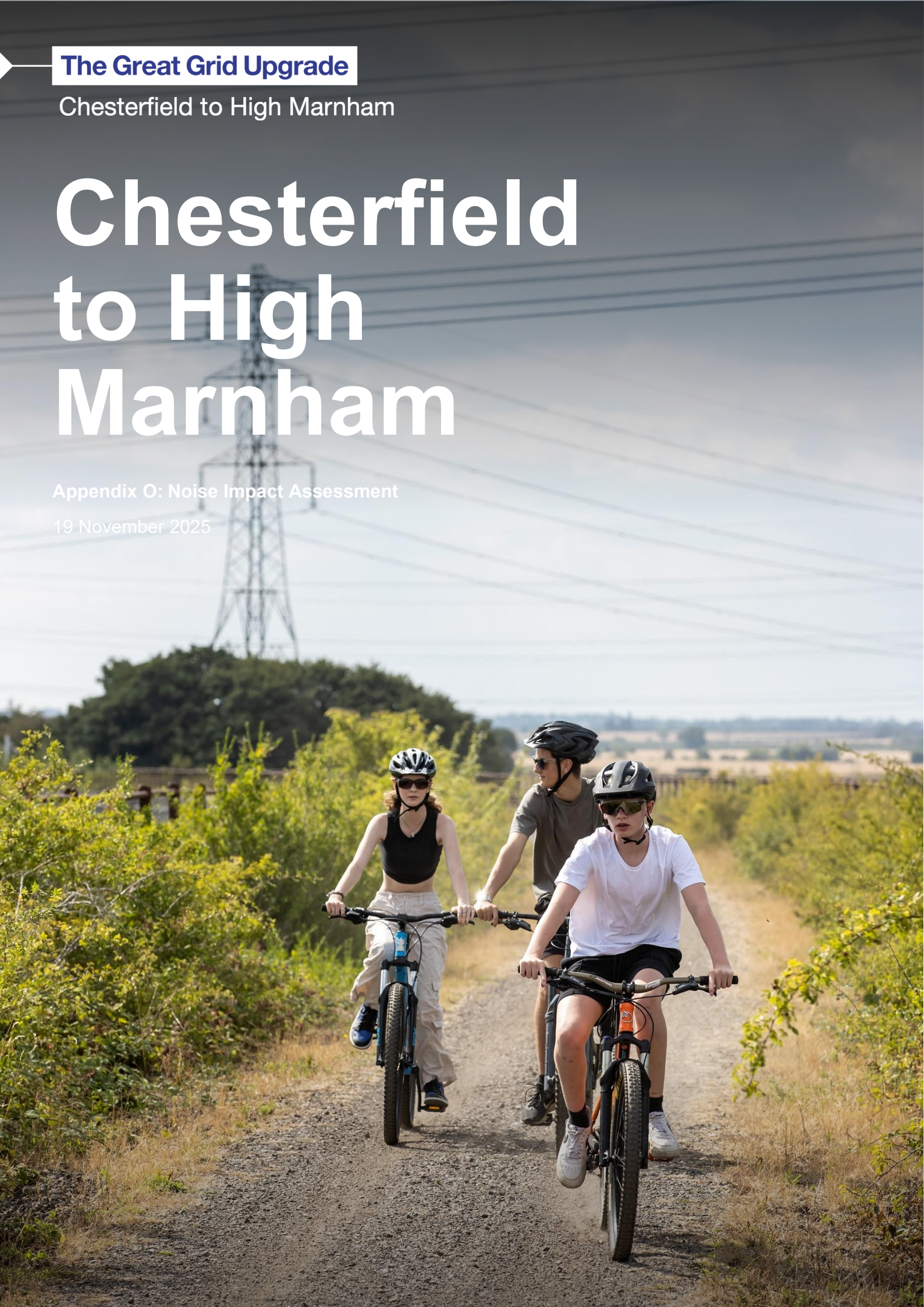
The Great Grid Upgrade

Chesterfield to High Marnham

Chesterfield to High Marnham

Appendix O: Noise Impact Assessment

19 November 2025



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1. Introduction

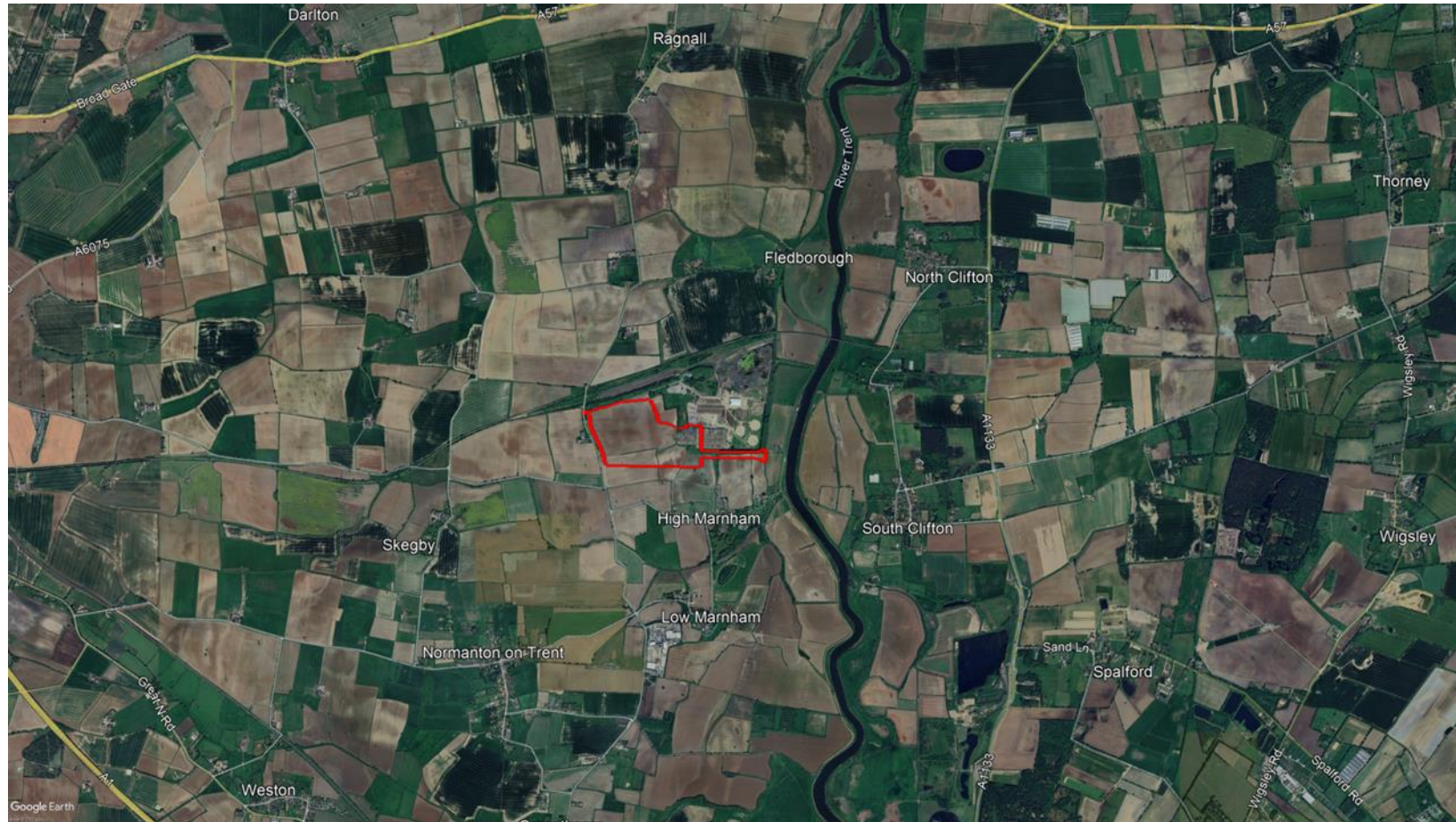
1.1 Statement of Purpose

- 1.1.1 This noise impact assessment report, prepared by National Grid Electricity Transmission's Environmental Engineering Team, accompanies the full planning application for the development of a new 400kV National Grid (NG) substation to replace the existing 400kV & 275kV High Marnham Substations. The purpose of this Report is to assess the possible impacts of the operational stage of the proposed development.
- 1.1.2 The Scheme is part of the National Grid 'Great Grid Upgrade', which aims to provide additional resilience within the electricity network. The Great Grid Upgrade will enable the electricity grid to carry more clean energy from renewable sources to communities, homes and businesses in every part of England and Wales, helping the UK to reach net zero. The proposals will also increase the security and resilience of the UK's electricity network.
- 1.1.3 The Scheme will reinforce the network and also assist in rationalising this part of the transmission system to improve operational flexibility, meet localised demand and address anticipated customer connections in this location.
- 1.1.4 The proposed redevelopment will include the installation of new reactive plant which has the potential to create an adverse noise impact on nearby noise sensitive receptors (NSRs). This Noise Impact Assessment (NIA) has therefore been completed to identify, address, and consider any mitigation measures (if required), to ensure operational noise from the Scheme will not give rise to an adverse effect to NSRs.

1.2 Site and Surrounding Environment Description

- 1.2.1 The Scheme is centred at approximately 53.228074, -0.79311311 longitude and latitude, north of High Marnham village, located to the west of the existing High Marnham Substations, approximate postcode NG23 6SH.
- 1.2.2 The site is predominantly surrounded by agricultural fields, with the decommissioned High Marnham Power Station brownfield site to the northeast, which is currently occupied by High Marnham Green Energy Business Park. The landscape is flat and open, with few trees or hedges. The existing and proposed substation is accessed off Fledborough Road to the west, and is predominantly surrounded by rural roads. The nearest main roads are the A57 approximately 3.25 km to the north, and the A1 5 km to the west.
- 1.2.3 Figure 1.1 below, shows aerial imagery of the local area with the proposed red line boundary.

Figure 1.1 Aerial view showing location of the Scheme (red area) - Source © Google Earth



1.3 Existing Substation Location and Description

- 1.3.1 The existing High Marnham substation was constructed in the 1960s, and operates at voltages up to 400kV, with equipment including a National Grid owned Supergrid Transformer (SGT), one customer own SGT, one Quad Booster, circuit breakers, disconnectors, relay room and a control building.

Existing Operational Noise Sources

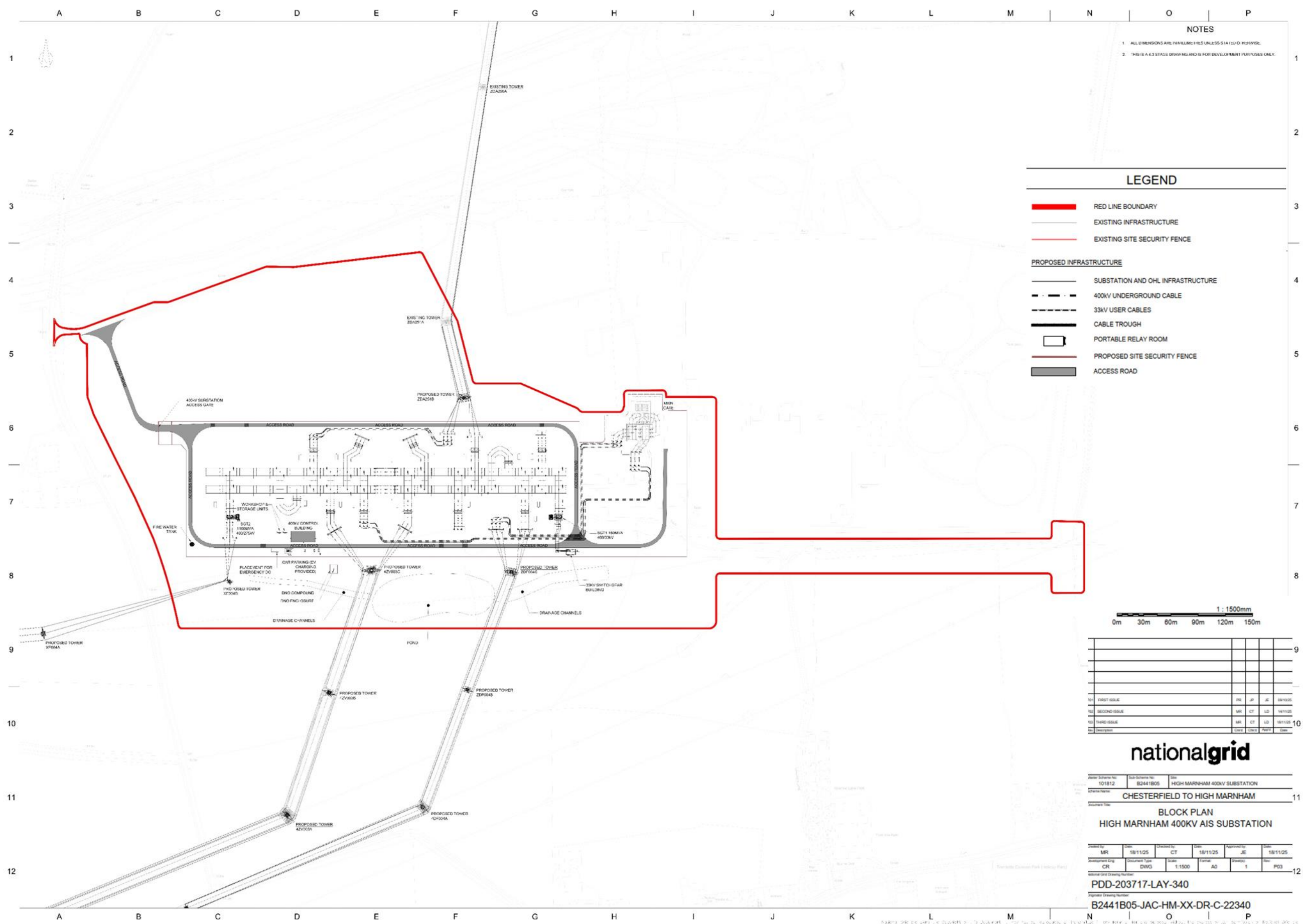
Reactive Equipment

- 1.3.2 Items of equipment generally termed 'reactive plant', in most cases are the significant sources of noise on high voltage substations. Reactive plant, such as SGTs and Quad Boosters, are predominantly responsible for the tonal 'hum' associated with substations. There is currently 1 x 1000 MVA 400kV/275kV SGT, 1 x 30 MVA 275kV/33kV, and 1 x 2750MVA Quad Booster at the High Marnham 400kV and 275kV Substations.
- 1.3.3 The substation also comprises circuit breakers, disconnectors/isolators, and current/voltage transformers often termed as and high voltage plant equipment. Switchgear noise is generated by the operation of circuit breakers and isolators. Switchgears operate very infrequently, typically only a few times a year for outages and maintenance, and in emergencies to protect the substation and electricity network infrastructure from lightning strikes or faults. Noise from switchgear is impulsive in character (i.e. of very short duration). Switchgear generally operates with a dull 'thud' while isolators would operate with a 'click'. No significant effects on noise sensitive receptors are anticipated from the existing equipment due to the low noise level, infrequency of operation, and the fact that the equipment is located within a building that provides acoustic attenuation.
- 1.3.4 Overhead Lines outside of the substation and Energised / Passive Equipment within the substation
- 1.3.5 A variety of 400kV and 275kV overhead lines (OHL) pass into the substation. The 275kV 4ZV and XE lines come into the substation from the south, and the 400kV ZDF / ZDA line circles around the substation anti clockwise from the southwest and comes into the substation from the west.
- 1.3.6 The existing energised air insulated switchgear (AIS) substation includes the short circuit connections from the OHLs, and the terminal OHL spans into the substation. Insulators and busbars, will under certain conditions 'crackle' or 'fizz' due to the occurrence of a phenomenon called corona discharge.
- 1.3.7 Corona discharge occurs when the voltage gradient (or electrical stress) on the surface of energised components and fittings exceeds the corona inception level, which is a function of the insulating properties of the surrounding air. Energised components are designed to operate below this level, however in certain conditions such as damp or wet weather and following long dry spells when surface contamination may build up, the corona inception level may be exceeded, meaning corona discharge may occur. Corona discharge may be audible when close to the substation, but it is not continuous and not considered significant.

1.4 Development Proposals

- 1.4.1 The Scheme includes the installation of a new 400kV Air Insulated switchgear (AIS) substation, two SGTs, and the required switchgear for the operation and connections within the substation buildings. As part of the project, works will also include modification works to the existing OHL conductors to connect the Scheme to the grid. The 400/275kV 1000 MVA SGT in the existing substation will be decommissioned.
- 1.4.2 The new SGTs are proposed to be 1 x 400/275kV 1100 MVA and 1 x 400/33kV 150 MVA units. At the time of writing, the manufacturer of the units is Hyosung.
- 1.4.3 Figure 1.2 below presents the proposed site layout, also presented in Appendix A.

Figure 1.2 Proposed site layout – Proposed High Marnham 400kV Substation with the two new SGTs located in the south east and south west corners of the substation. Existing High Marnham 400kV & 275kV Substation to the east proposed to be removed – Source National Grid



1.5 Proposed Operational Noise Sources Subject to Assessment

- 1.5.1 The main noise sources of the Scheme are the two SGTs. Unmitigated transformer noise is heard as a highly tonal 'hum', consisting of exact acoustic harmonics of the UK electricity supply frequency. The fundamental acoustic frequency is 100 Hz (Hertz or cycles per second) accompanied by harmonics of 200 Hz, 300 Hz and 400 Hz etc. The tonality is considered an 'acoustic feature' according to BS 4142:2014+A1:2019.
- 1.5.2 The proposed transformers will be procured under a contract with one of National Grid's suppliers and made to registered designs. These designs will undergo factory tests to ensure the sound power of the transformers comply or are below the maximum permitted sound power level outlined in National Grid's Technical Specification.
- 1.5.3 Once energised, the SGTs will be in continuous operation 24/7.

Operational Noise Sources Scoped out of Assessment

SGT Cooling System

- 1.5.4 Under normal operating conditions, the cooling systems of the SGTs will rarely operate. Cooling systems may operate during emergency conditions and during times of unusually high demand, typically where the transformer is required to operate above 75% of designs full load. Such conditions usually occur only during exceptional events, (i.e. extreme weather combined with faults elsewhere on the system, requiring an SGT to carry a higher than normal load). These conditions would usually persist for a short duration and as such cooler operation can typically be regarded as an exceptional event. Therefore SGT cooling system noise is excluded from this assessment.

Auxiliary Substation Equipment

- 1.5.5 Circuit breakers, disconnectors and switches are also a potential source of noise. Their purpose is to disconnect the site from the high voltage transmission system in response to a fault or external event such as a lightning strike, and to isolate and earth parts of the site for maintenance.
- 1.5.6 The sound from a circuit breaker is impulsive and sounds like a car door slam, similar in level and duration, and the sound of disconnectors and switches is less impulsive and sounds like a 'click' or 'clack', this equipment would operate very rarely.
- 1.5.7 The majority of breaker activations would take place during commissioning when there may be 10 or 20 activations during working hours only. Once commissioned, they may typically operate just a few times a year and in some years, they may never operate at all. Whilst the sound of this equipment when operating may be audible just beyond the site boundary, it is unlikely to be noticeable even in a quiet rural environment.
- 1.5.8 Other items of equipment form part of this development but do not produce noise, or produce very low-level noise that would generally not be audible beyond the site

boundary. These items of auxiliary equipment include small current transformers, voltage transformers, low voltage site supplies, control kiosks, battery rooms and site lighting. Therefore auxiliary substation equipment noise is excluded from this assessment.

Operational Traffic

- 1.5.9 Once a substation is operating and the substation is proposed to be unmanned, operational traffic noise is considered to be unnoticeable against normal traffic. Therefore operational traffic noise is excluded from this assessment.

Operational Vibration

- 1.5.10 The installation of the SGTs typically employs measures to minimise vibrations from its operation, such as antivibration pads, therefore operational vibration is excluded from the scope of the assessment.

Noise Sensitive Receptors

- 1.5.11 Residential properties surrounding the Scheme are considered to be the most exposed NSRs that could be affected by the Scheme. These are:
- Sparrow Lane Park Home Estate – Hospitality land located to the southeast of the site;
 - Hill Farm – Residential property located to the south of the site;
 - Station House – Residential property to the north west of the site; and,
 - Fledborough Farm House – Residential property to the north west of the site.
- 1.5.12 There are a number of other residential properties in the surrounding area to the south of the site in High Marnham, however, the NSRs listed above are considered the most sensitive due to their proximity to the Scheme.
- 1.5.13 Figure 1.3 below, shows an aerial photograph of the Scheme and NSRs.

Figure 1.3 Aerial view of Scheme red line boundary and identified NSRs – Source © Google Earth



2. Assessment Methodology and Scope of Works

2.1 Planning Policy and Guidance on Noise

- 2.1.1 This acoustic report has been prepared to be submitted in support of a proposed planning application.
- 2.1.2 Reference to the planning guidance documentation is presented in this report:
- National Planning Policy Framework (NPPF), 2024;
 - Noise Policy Statement for England (NPSE), 2010; and,
 - Planning Practice Guidance – Noise, 2019.
 - BS 4142:2014+A1:2019 – ‘Methods for Rating and Assessing Industrial and Commercial Sound’
- 2.1.3 A summary of the relevant information with respect to noise contained within the planning documentation listed above is presented below.

2.2 National Planning Policy Framework (NPPF) – 2024

- 2.2.1 The National Planning Policy Framework (NPPF) sets out the Government’s planning policies for England and how these should be applied. It provides a framework within which locally prepared plans for housing and other development can be produced.
- 2.2.2 The NPPF was first published on 27 March 2012 and last updated on 12 December 2024.
- 2.2.3 With respect to noise, the NPPF states in Section 15, Paragraph 187:
- Planning policies and decisions should contribute to and enhance the natural and local environment by:*
- e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans;*
- 2.2.4 Additionally, the NPPF document states in Section 15, Paragraph 198:
- Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:*

a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;

b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason;

2.3 Noise Policy Statement for England (NPSE) – 2010

2.3.1 The Noise Policy Statement for England (NPSE) was published on 15th March 2010. It sets out the long-term vision of government noise policy, to promote good health and a good quality of life through the management of noise.

2.3.2 The NPSE should apply to all forms of noise including environmental noise, neighbour noise and neighbourhood noise. The NPSE does not apply to noise in the workplace (occupational noise).

2.3.3 The NPSE sets out the long-term vision of Government noise policy which is to:

Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.

2.3.4 This long-term vision is supported by the following aims, through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- avoid significant adverse impacts on health and quality of life;
- mitigate and minimise adverse impacts on health and quality of life; and,
- where possible, contribute to the improvement of health and quality of life.

2.3.5 The aim of the NPSE is to provide clarity regarding policies and practices to enable noise management decisions to be made within the wider context, at the most appropriate level, in a cost-effective manner and in a timely fashion.

2.3.6 There are established concepts being applied to noise impacts and which are presented in the NPSE. They are:

- NOEL – No Observed Effect Level:
 - This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.
- LOAEL – Lowest Observed Adverse Effect Level:
 - This is the level above which adverse effects on health and quality of life can be detected.
- SOAEL – Significant Observed Adverse Effect Level
 - This is the level above which significant adverse effects on health and quality of life occur.

- 2.3.7 The first aim of the NPSE states:
- Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.*
- 2.3.8 The second aim of the NPSE states:
- Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.*
- 2.3.9 The first aim of the NPSE states that significant adverse effects on health and quality of life should be avoided while also considering the guiding principles of sustainable development.
- 2.3.10 The second aim of the NPSE refers to the situation where the impact lies somewhere between LOAEL and SOAEL. It requires that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also considering the guiding principles of sustainable development. This does not mean that such adverse effects cannot occur.
- 2.3.11 The third aim of the NPSE states:
- Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.*
- 2.3.12 This aim seeks, where possible, to improve health and quality of life through the proactive management of noise while also considering the guiding principles of sustainable development, recognising that there will be opportunities for such measures to be taken and that they will deliver potential benefits to society. The protection of quiet places and quiet times as well as the enhancement of the acoustic environment will assist with delivering this aim.

2.4 Planning Practice Guidance – Noise, 2019

- 2.4.1 The Planning Practice Guidance (PPG) in noise was published by the Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government in March 2014 and updated in July 2019.
- 2.4.2 Noise needs to be considered when development may create additional noise or would be sensitive to the prevailing acoustic environment, including any anticipated changes to that environment from activities that are permitted but not yet commenced.
- 2.4.3 Regarding whether noise is likely to be a concern, the PPG states:
- At the lowest extreme, when noise is not perceived to be present, there is by definition no effect. As the noise exposure increases, it will cross the 'no observed effect' level. However, the noise has no adverse effect so long as the exposure does not cause any change in behaviour, attitude or other physiological responses of those affected by it. [...]. If the noise exposure is at this level no specific measures are required to manage the acoustic environment.*
- As the exposure increases further, it crosses the 'lowest observed adverse effect' level boundary above which the noise starts to cause small changes in behaviour*

and attitude, [...]. The noise therefore starts to have an adverse effect and consideration needs to be given to mitigating and minimising those effects (taking account of the economic and social benefits being derived from the activity causing the noise).

Increasing noise exposure will at some point cause the 'significant observed adverse effect' level boundary to be crossed. Above this level the noise causes a material change in behaviour [...] during periods when the noise is present. If the exposure is predicted to be above this level the planning process should be used to avoid this effect occurring, [...]. While such decisions must be made taking account of the economic and social benefit of the activity causing or affected by the noise, it is undesirable for such exposure to be caused.

At the highest extreme, noise exposure would cause extensive and sustained adverse changes in behaviour and / or health without an ability to mitigate the effect of the noise. The impacts on health and quality of life are such that regardless of the benefits of the activity causing the noise, this situation should be avoided.

2.4.4 Table 2.1, below, summarises the noise exposure hierarchy presented in the PPG:

Table 2.1 National Planning Practice Guidance noise exposure hierarchy

Response	Examples of outcomes	Increasing effect level	Action
No Observed Effect Level (NOEL)			
Not present	No effect	No observed effect	No specific measure required
No Observed Adverse Effect Level (NOAEL)			
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	No Observed Adverse Effect	No specific measure required
Lowest Observed Adverse Effect Level (LOAEL)			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g., turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum

Response	Examples of outcomes	Increasing effect level	Action
Significant Observed Adverse Effect Level (SOAEL)			
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, e.g., avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Present and very disruptive.	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g., regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect.	Prevent

2.5 BS 4142:2014+A1:2019 – ‘Methods for Rating and Assessing Industrial and Commercial Sound’

- 2.5.1 BS 4142 describes methods for rating and assessing sound of an industrial and / or commercial nature.
- 2.5.2 This includes sound from industrial and manufacturing processes, including sound from fixed installations comprising mechanical and electrical plant and equipment.
- 2.5.3 The methods described in BS 4142 use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident.
- 2.5.4 BS 4142 assesses the likelihood of any adverse impact from proposed or existing industrial / commercial activities on existing or proposed NSRs.
- 2.5.5 To assess the potential impact, the measured background sound level at the closest NSR or at a representative location, is arithmetically subtracted from the rating level. This is the specific sound source level of the assessed source corrected for acoustical characteristics that may make the sound more subjectively noticeable to the NSRs.
- 2.5.6 The method in BS 4142 is based on the difference between the measured background sound level, without the influence of any industrial noise source assessed, and the rating level of the industrial source assessed, at the receiver location.

- 2.5.7 The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs.
- 2.5.8 Typically, the greater the difference between the background sound level and the rating level, the greater the magnitude of the impact.
- 2.5.9 A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- 2.5.10 A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.
- 2.5.11 The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.
- 2.5.12 Regarding the context, BS 4142 states the following:
An effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs/will occur. When making assessments and arriving at decisions, therefore, it is essential to place the sound in context.
- 2.5.13 Main specific terms used in BS 4142 are presented below:
- **Ambient sound level, $L_a = L_{Aeq,T}$** – equivalent continuous A-weighted sound pressure level, L_{Aeq} , of the totally encompassing sound in a given situation at a given time, usually from many sources near and far, at the assessment location over a given time interval, T. The ambient sound level is a measure of the residual sound and the specific sound when present.
 - **Background sound level, $L_{A90,T}$** – A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time weighting, F, and quoted to the nearest whole number of decibels.
 - **Residual sound level, $L_r = L_{Aeq,T}$** – ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound.
 - **Specific sound level, $L_s = L_{Aeq,Tr}$** – equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T_r .
 - **Rating level, $L_{ar,Tr}$** – specific sound level plus any adjustment for the characteristic features of the sound.
- 2.5.14 The background sound level is an underlying level of sound over a period, T, and might in part be an indication of relative quietness at a given location. It does not reflect the occurrence of transient and/or higher sound level events and is generally governed by continuous or semi-continuous sounds.
- 2.5.15 The background sound level should be measured at the assessment location(s), where possible. Where this is not possible, an alternative location, representative of the assessment locations, can be used.

- 2.5.16 The measurement time interval should be sufficient to obtain a representative value of the background sound level for the period of interest. This should comprise continuous measurements of normally not less than 15 min intervals, which can be contiguous or disaggregated.
- 2.5.17 The specific sound level needs to be determined at the assessment location(s) as a discrete entity, distinct and free of other influences contributing to the ambient sound. BS 4142 suggests that the specific sound needs to be evaluated over an appropriate reference time interval, 1 hour during daytime and 15 minutes during night-time.
- 2.5.18 The daytime period is defined as the hours ranging from 07:00 to 23:00. The night-time period comprises the hours from 23:00 to 07:00.
- 2.5.19 BS 4142 states that, where possible, the specific sound level by measurement of the ambient sound level and the residual sound level needs to be determined at the assessment location(s).
- 2.5.20 Where determining the specific sound level by direct measurement is not practicable, for example in the case of a source not yet in operation, the method of calculation has to be reported and justified in detail.
- 2.5.21 The rating level in BS 4142 depends on certain acoustic features that can increase the significance of impact over that expected from a basic comparison between the specific sound level and the background sound level.
- 2.5.22 Where such features are present at the assessment location, a character correction is added to the specific sound level to obtain the rating level.
- 2.5.23 BS 4142 states that it is typically feasible to undertake a subjective assessment of characteristics, based on the correction guidelines, as follows:
- **Tonality:** +2 dB for a 'just perceptible' tone, +4 dB for 'clearly perceptible', +6 dB for 'highly perceptible' tones;
 - **Impulsivity:** +3 dB for 'just perceptible' impulsivity, +6 dB for 'clearly perceptible', rising to +9 dB for 'highly perceptible' impulsivity;
 - **Intermittency:** if the on / off-time of the specific sound is readily distinctive at the NSRs, a +3 dB character correction is added; and,
 - **Other sound characteristics:** where the noise source features characteristics that are neither tonal nor impulsive, nor intermittent, though otherwise are readily distinctive against the residual acoustic environment, a penalty of +3 dB can be applied.
- 2.5.24 If characteristics likely to affect perception and response are present in the specific sound, within the same reference period, then the applicable corrections ought normally to be added arithmetically.
- 2.5.25 However, if any single feature is dominant to the exclusion of the others, then it might be appropriate to apply a reduced or even zero correction for the minor characteristics.

2.6 Local Planning Policy, Bassetlaw District Council Local Plan

- 2.6.1 The Bassetlaw Local Plan, adopted in May 2024, sets out the framework for the growth and development of the area. It identifies how and where new development and regeneration should take place and thereby promotes and manages the future development of the District Council.
- 2.6.2 The Local Plan includes a number of strategic policies said to guide the amount, form and location of new development, and local policies that should guide the consideration of Planning Applications for new development.
- 2.6.3 The following development policies are relevant to noise:

Policy 46: Protecting Amenity

“1. Proposals for development should be designed and constructed to avoid and minimise impacts on the amenity of existing and future users, individually and cumulatively, within the development and close to it. As such, proposals will be expected to:

...

b) not generate a level of activity, noise, light, air quality, odour, vibration or other pollution which cannot be mitigated to an appropriate standard.”

Policy ST49: Renewable Energy Generation

“1. Development that generates, shares, transmits and/or stores zero carbon and/or low carbon renewable energy including community energy schemes will be supported subject to the satisfactory resolution of all relevant site specific and cumulative impacts upon:

...

g) noise, light, glare, smell, dust, emissions or flicker;”

2.7 Assessment Methodology

- 2.7.1 Based on the above and given that transformers are industrial noise sources in nature, it is therefore considered that the methodology based on BS 4142:2014+A1:2019, ‘Methods for rating and assessing industrial and commercial sound’ is the most appropriate and consequently has been adopted for the assessment of the potential noise breakout from the site at the identified NSRs, with the intention to design rating levels at or below background sound levels at NSRs.

3. Acoustic Survey

3.1 Measurement Locations and Equipment

3.1.1 Baseline sound levels at the site have been established by means of an automated noise survey completed between 30th April 2024 to 13th May 2024 at two monitoring locations, considered representative of the closest NSRs, presented as ML1 and ML2 in Figure 3.1 below.

Figure 3.1 Aerial view showing locations of the Scheme red line boundary, noise monitoring locations ML1 and ML2 (yellow circles), and NSRs (white circles) – Source © Google Earth



3.1.2 Measurements are considered representative of the NSRs shown in Table 3.1 below:

Table 3.1 Measurement locations and representative receptors

Measurement Location	Receptors
ML1	Station House, Fledborough Farm House
ML2	Sparrow Lane Park Home Estate, Hill Farm

3.1.3 Class 1 sound level meters (SLMs) were used and calibrated as per the requirements presented in Section 5.2 of BS 4142. A field calibration check was carried out before and after every measurement session and the drift noted was less than 0.1 dB in each case. The details of the SLMs used in this NIA are presented in Table 3.2 below.

Table 3.2 Sound level meter details

Monitoring Location	Description	Manufacturer	Type	Serial Number	Laboratory Calibration Date
ML1	Sound Level Meter	Brüel & Kjær	2250	3007834	21/03/2023
	Microphone		4952	2993521	
	Pre-amplifier				
ML1	Sound Level Meter	Brüel & Kjær	2250	3007673	01/02/2024
	Microphone		4952	2775412	
	Pre-amplifier				
All	Calibrator	Brüel & Kjær	4231	3001377	30/01/2024

3.2 Weather Conditions

3.2.1 The weather conditions during the installation and collection of ML1 and ML2 were noted, which are presented in Table 3.3 below.

Table 3.3 Weather conditions during the commissioning and decommissioning of the fixed position noise monitoring

Weather Parameter	Start of monitoring 13 th August 2024	End of monitoring 23 rd August 2024
Temperature (°C)	18	17
Humidity (%)	42	77
Wind Speed Max Gusts (m/s)	7	1
Precipitation (Dry / Wet)	Dry	Dry
Cloud Cover (%)	<10%	20%

- 3.2.2 The weather conditions were also recorded during the unattended monitoring period at ML1 using a weather station Vaisala Weather Transmitter WXT530. Following the guidance presented within BS 4142, measurement periods affected by adverse weather conditions (15 minute periods with wind speeds higher than 5 m/s and periods where rainfall occurred) have been excluded from all tabulated numbers and calculations presented later in the report.

3.3 Acoustic Survey Observations

- 3.3.1 During installation and collection of the equipment the acoustic environment was dominated by local traffic noise, including HGVs along Fledborough Road and along the substation access road to the JG Pears animal by-product processors. Distant transformer / humming sound from the existing National Grid High Marnham Substation was also noted at ML2.

3.4 Survey Procedure

- 3.4.1 The sound level meters were configured to measure the A-weighted equivalent sound pressure level, L_{Aeq} , the A-weighted level exceeded for 90% of the time, considered to be representative of the background or ambient level of a noise environment (L_{A90}), and the L_{Amax} noise indices at high resolution 0.100ms as per the requirements of BS 4142:2014+A1:2019. This data has been post-processed to obtain 15-minute period noise levels.

3.5 Automated Noise Monitoring Results

- 3.5.1 Detailed time history graphs showing the A-weighted L_{Aeq} , L_{A90} , and L_{Amax} sound levels measured during each consecutive 15-minute period of the survey are presented in Figure 3.2 and Figure 3.3 for ML1 and ML2 respectively.

Figure 3.2 Time history graph of ML1

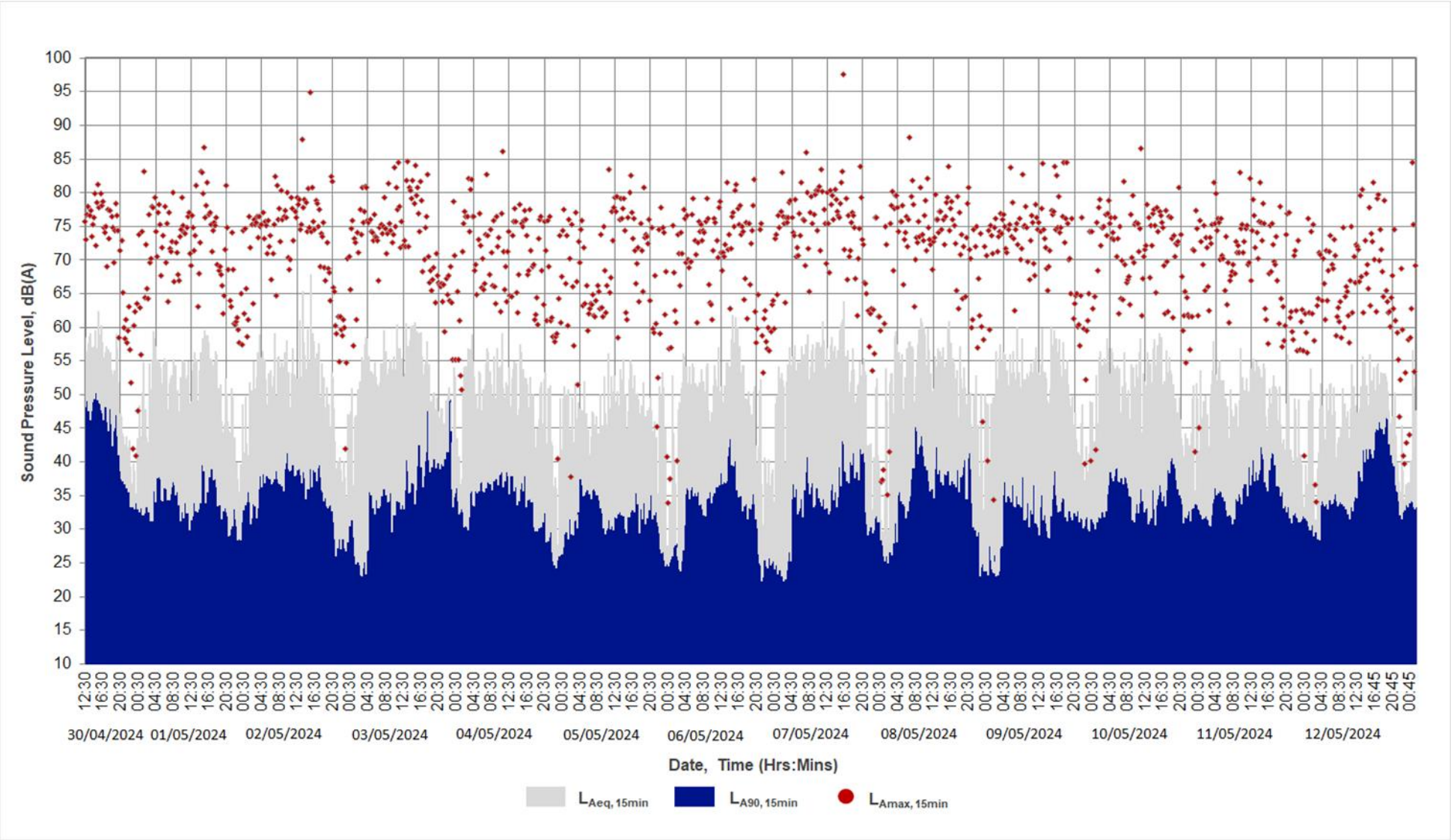
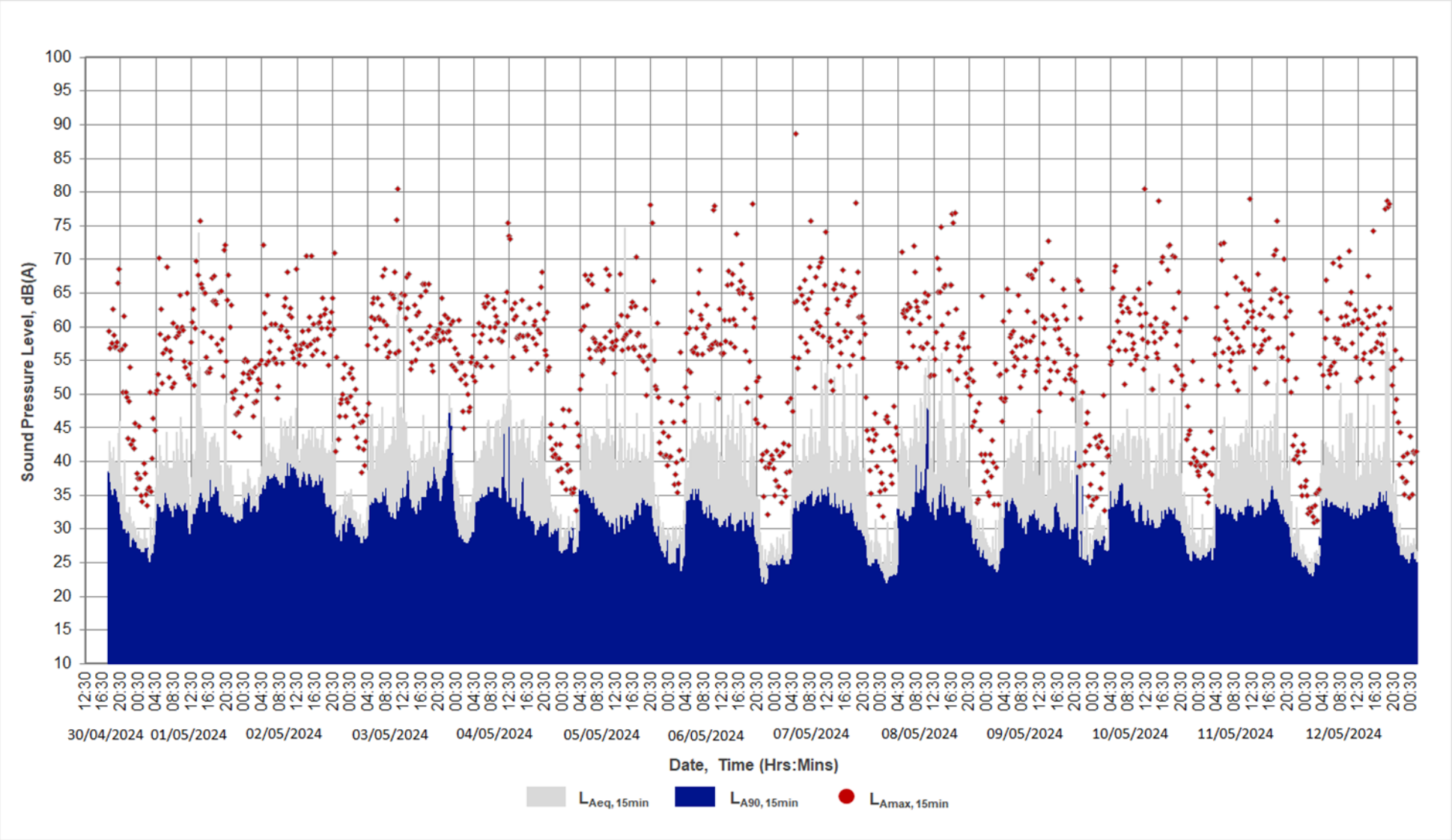


Figure 3.3 Time history graph of ML2



3.5.2 The measurement data has also been processed to determine the typical ambient daytime ($L_{Aeq,16hour}$) and night-time ($L_{Aeq,8hour}$) levels, presented in Table 3.4 and Table 3.5 below.

Table 3.4 ML1 Ambient Noise Levels

Date	Daytime sound level ($L_{Aeq,16hour}$, dB)	Night-time sound level ($L_{Aeq,8hour}$, dB)
Tuesday 30/04/2024	54*	52
Wednesday 01/05/2024	54	52
Thursday 02/05/2024	56	52
Friday 03/05/2024	56	52
Saturday 04/05/2024	52	47
Sunday 05/05/2024	49	51
Monday 06/05/2024	53	53
Tuesday 07/05/2024	56	53
Wednesday 08/05/2024	56	53
Thursday 09/05/2024	54	53
Friday 10/05/2024	53	51
Saturday 11/05/2024	50	47
Sunday 12/05/2024	49	48
* Data does not represent full period		

Table 3.5 ML2 Ambient Noise Levels

Date	Daytime sound level (L _{Aeq,16hour} , dB)	Night-time sound level (L _{Aeq,8hour} , dB)
Tuesday 30/04/2024	42*	35
Wednesday 01/05/2024	56	40
Thursday 02/05/2024	43	39
Friday 03/05/2024	51	38
Saturday 04/05/2024	45	38
Sunday 05/05/2024	57	37
Monday 06/05/2024	43	40
Tuesday 07/05/2024	46	37
Wednesday 08/05/2024	47	36
Thursday 09/05/2024	42	38
Friday 10/05/2024	44	38
Saturday 11/05/2024	44	37
Sunday 12/05/2024	43	28

* Data does not represent full period

3.5.3 The ambient sound levels at each location have been logarithmically averaged to determine the typical daytime and night-time ambient sound levels, presented in Table 3.6 below.

Table 3.6 Typical Ambient Sound Levels

Measurement Location	Typical Daytime sound level (L _{Aeq,16hour} , dB)	Typical Night-time sound level (L _{Aeq,8hour} , dB)
ML1	54	51
ML2	50	38

3.6 Background Sound Levels

- 3.6.1 Statistical analysis of the background sound levels has also been carried out to determine a representative background sound level for the monitoring locations.
- 3.6.2 Figure 3.4, Figure 3.5, Figure 3.6, and Figure 3.7 present histograms of the daytime and night-time background sound levels for ML1 and ML2.

Figure 3.4 ML1 Daytime background sound level histogram

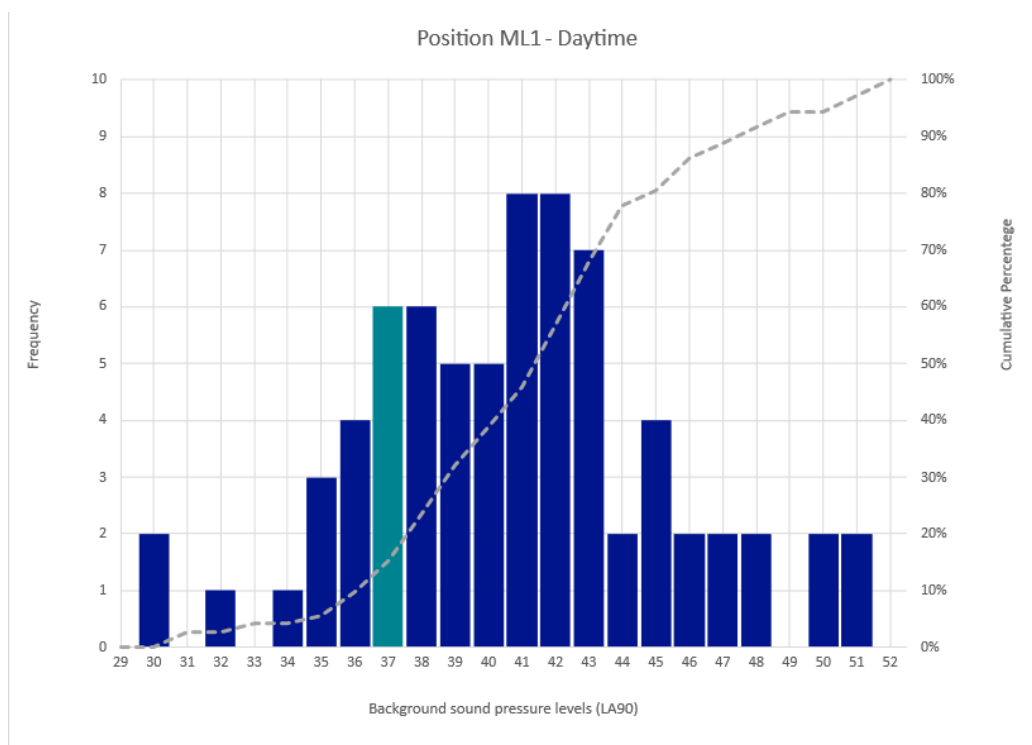


Figure 3.5 ML1 Night-time background sound level histogram

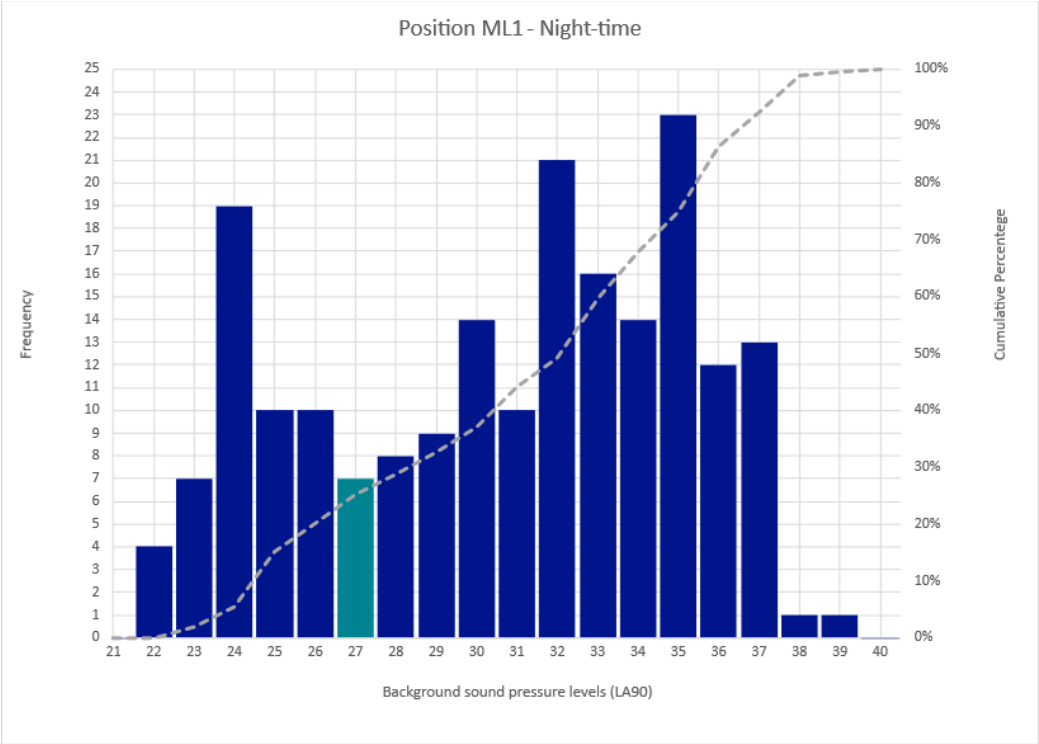


Figure 3.6 ML2 Daytime background sound level histogram

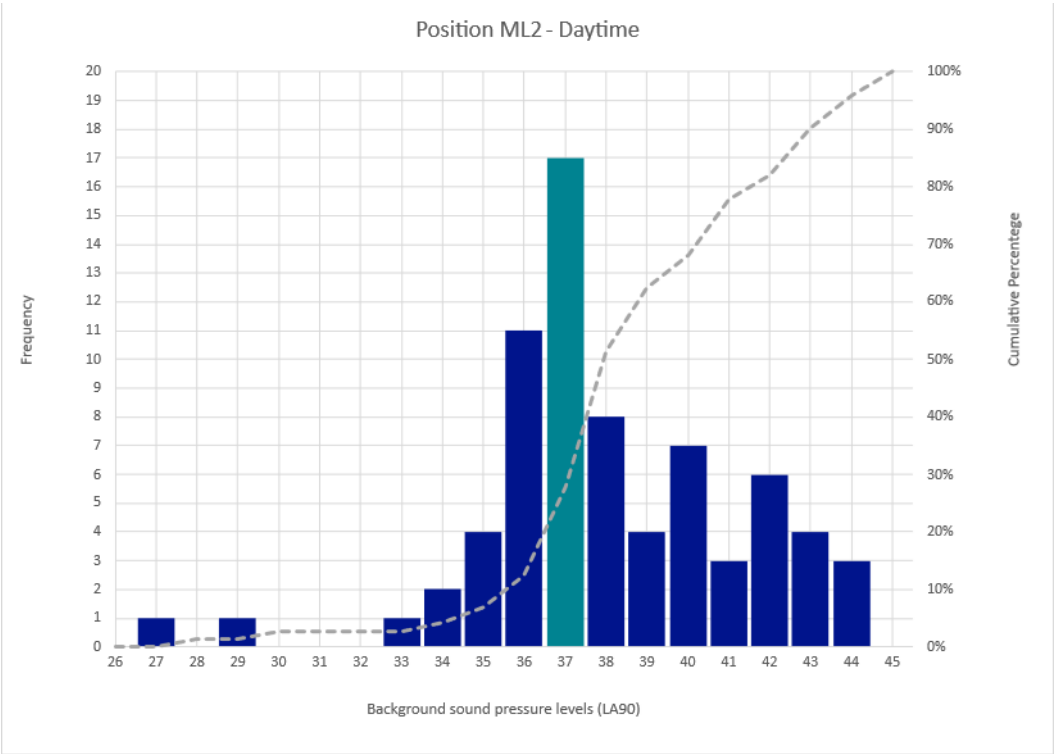
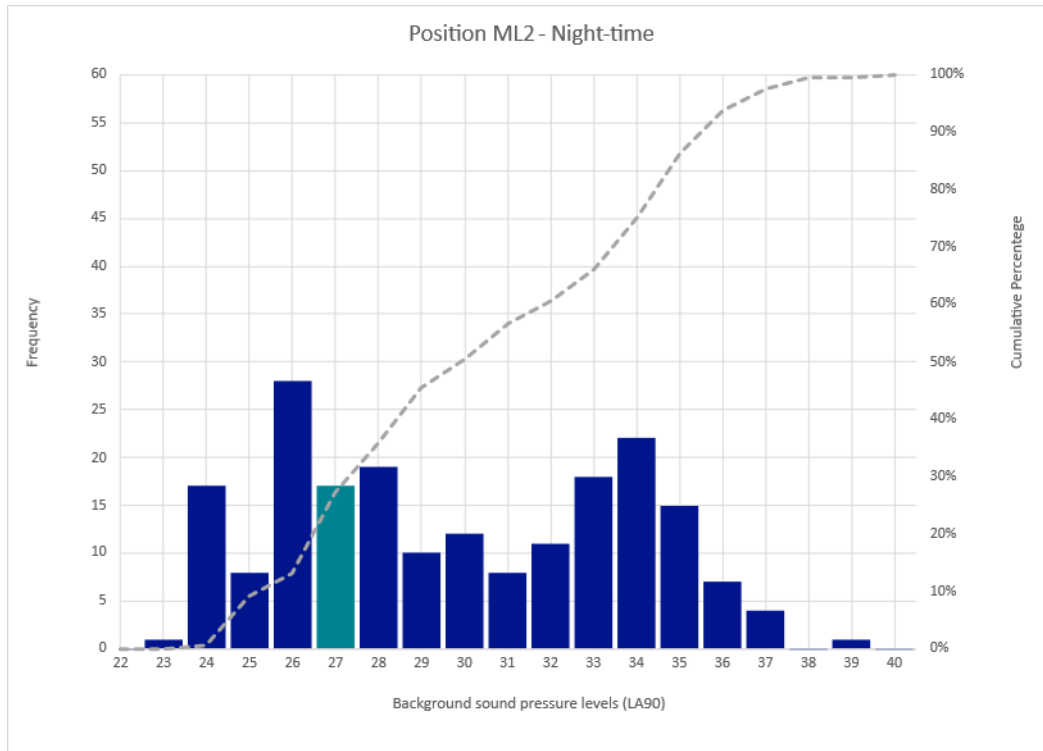


Figure 3.7 ML2 night-time background sound level histogram



- 3.6.3 During night-time periods, the background sound levels ($L_{A90,15min}$) are lower than the daytime background sound levels, and as the SGTs operate 24/7. This makes the night-time period a more onerous assessment. Therefore, only the night-time assessment is presented in this NIA.
- 3.6.4 Based on the analysis of the background levels presented above, a representative background sound level of **27 dB(A)** has been selected for all NSRs.
- 3.6.5 In line with BS 4142:2014+A1:2019, a typical background sound level should be selected and should not automatically be assumed to be the minimum value. The typical background sound levels presented above have been carefully selected based on the statistical cumulative percentage analysis, which indicates that background sound levels will typically exceed the chosen representative sound levels approximately 70-75% of the time.
- 3.6.6 In light of the above it is considered that the selected background sound levels are conservative and will aid in providing a robust assessment.

4. Noise Impact Assessment

4.1 SGT Sound Power Levels

- 4.1.1 Sound power levels SGTs are specified within National Grids Technical Specification 2.03, TS 2.03, Power Transformers and Reactors, Issue 7, June 2021. and from manufacturer Factory Acceptance Testing (FAT) reports.
- 4.1.2 National Grids Technical Specification 2.03, Power Transformers and Reactors, Issue 7, June 2021 (TS2.03) specifies the maximum sound power level for transformer units under specific operating conditions, in accordance with IEC 60076-10, Power transformers - Part 10: Determination of sound levels.
- 4.1.3 The limits for transformers are presented in Table 2a of the document and reproduced in Table 4.1 below.

Table 4.1: Table 2a from TS 2.03 – Maximum Sound Power Levels – Transformers.

Equivalent Double Wound Rated Power (MVA)	Maximum Sound Power Level of Main Unit at 50% Load and 102.5% excitation voltage (Log sum of measured 50% Load noise and measured 102.5% excitation voltage No Load noise) dB(A)	Maximum Sound Power Level of Cooler dB(A)
<100	72	n/a
100 to 199	92	84
200 to 350	95	87
>350	According to site specific requirements	87 (at reduced capacity stage) and 93 (maximum)

- 4.1.4 The rated power of the proposed SGTs are 150 and 1100 MVA. According to Table 4.1, the maximum sound power level of the main unit at 50% load and 102.5% excitation voltage is **92 dB(A)** for the 150 MVA SGT. From experience of previous schemes with SGTs greater than 350 MVA, the sound power level of these transformers can be up to **97 dB(A)**.
- 4.1.5 Once an SGT has been manufactured it undergoes FAT to demonstrate conformance with National Grid's Technical Specifications. The sound power levels of transformers are often below the maximum allowable sound power level outlined in the Technical Specifications. Information provided by Hyosung, the nominated manufacturer of the SGTs, include the FAT report for sister units of the 150 and 1100 MVA SGTs, under the same conditions of at 50% load and 102.5% excitation voltage. This results in a sound power level of **82 dB(A)** for the 150 MVA SGT, and

91 dB(A) for the 1100 MVA SGT. Copies of the sections within the FAT reports relating to the derivations of the sound power levels is presented in **Appendix B**.

4.1.6 Once energised, the SGTs will be in continuous operation 24/7.

4.2 Noise Model Parameters

4.2.1 The specific sound level at the NSRs have been calculated using a 3D sound model using acoustic modelling software Datakustik CadnaA. This software’s calculation method is based on ISO 9613-2:1996 and considers the distance between source and receiver including reflection or screening effects from buildings. Details of the noise model parameters are presented in Table 4.2.

Table 4.2 Noise model parameter details

Parameter	Detail
Software Version	Datakustic CadnaA, Version 2025 MR 2 (64Bit) build 209.5501
Calculation Methodology	ISO 9613-2 (2024) Reflection Order of 3 used
Mapping	OpenStreetMap and proposed layout drawing reference: PDD-203717-LAY-342
Topography	Height point taken form LIDAR composite digital terrain model, available at: https://environment.data.gov.uk/survey
Ground Absorption	Partially absorptive (G = 0.8)
Building Heights	Assumed 5 m for single storey buildings, 8 m for two storey buildings
Noise Contours	The model has been set to a 1 m x 1 m spacing. Grid height of 4 m used for first floor, night-time assessments
Noise Levels	The model produces “free-field” data

4.2.2 The 3D sound model includes the following noise sources, as shown in Table 4.3.

Table 4.3 Description of sound sources used in unmitigated noise model

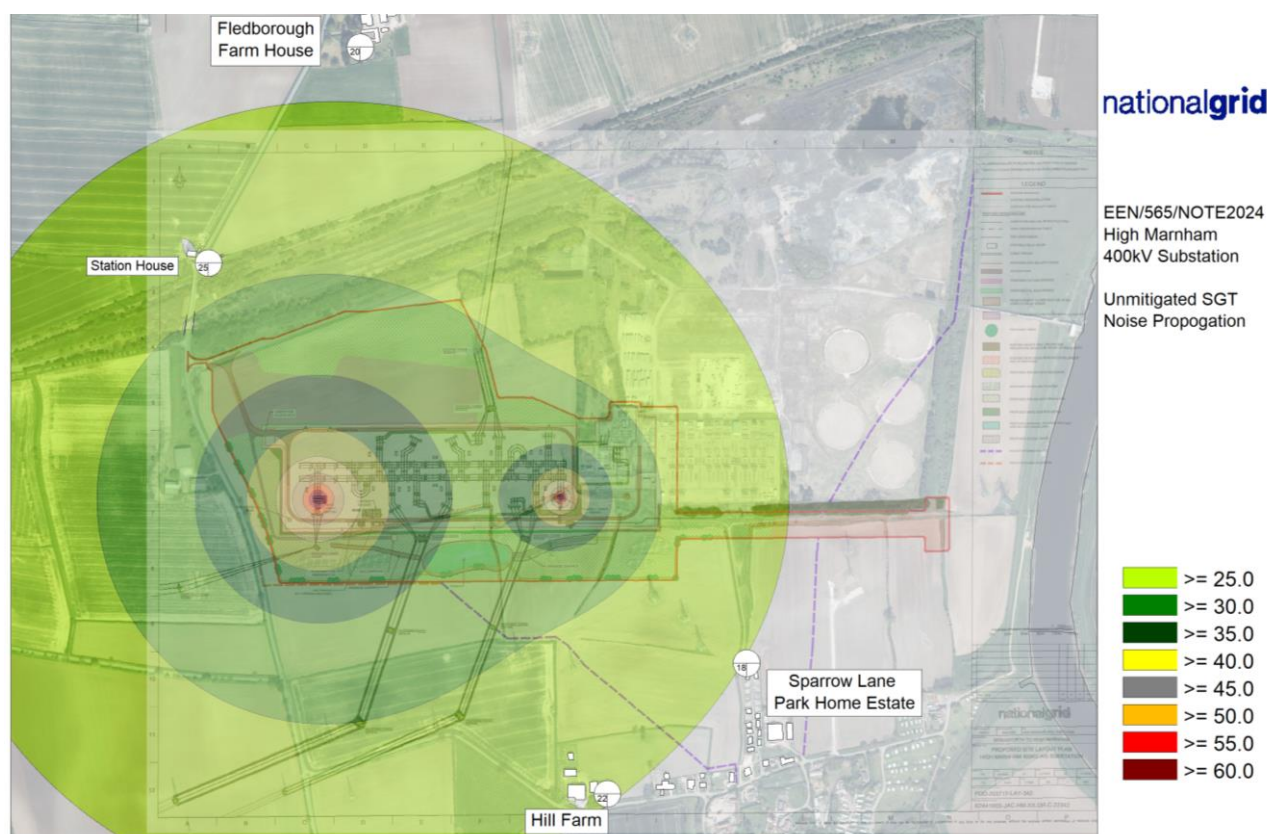
Name	Description	Type of Source	A-Weighted Sound Power Level L_{WA} of Main Tank dB(A)
SGT1 Tank	Omnidirectional source located at the proposed SGT location. Main tank emitting at 200 Hz at 4 m above ground level.	Point source	82 dB(A)
SGT2 Tank	Omnidirectional source located at the proposed SGT location. Main tank emitting at 200 Hz at 4 m above ground level.	Point source	91 dB(A)

- 4.2.3 In the United Kingdom with electrical mains frequency of 50 Hz, the fundamental frequency is 100 Hz and its harmonics, i.e., 200 Hz, 300 Hz, 400 Hz, etc. The emitting frequency of 200 Hz has been selected for the transformer tank sources in the 3D sound model. Modelling all the acoustic energy at 200 Hz presents a conservative approach to the assessment, as this is typically the most audible frequency, as a proportion of the acoustic energy will occur at higher order harmonics, e.g., 300, 400Hz etc..., which are attenuated to a greater extent with distance from the noise source. Calculations using 100 Hz also resulted in lower values, therefore it is considered that the 200 Hz values are a suitable conservative assessment.

4.3 Unmitigated SGT Assessment

- 4.3.1 A specific sound contour plot showing the propagation of sound from the proposed transformers at the proposed site and NSRs is presented in Figure 4.1, below.

Figure 4.1 Proposed unmitigated specific sound, L_s, propagation



- 4.3.2 Predicted specific sound levels at each receptor location are presented in Table 4.4, below.

Table 4.4 Predicted unmitigated specific sound levels at NSRs

Description	Predicted specific sound level, dB(A)
Sparrow Lane Park Home Estate	18
Hill Farm	22
Station House	25
Fledborough Farm House	20

- 4.3.3 The rating level is calculated from the specific sound level and the addition of character corrections, applied using the subjective method outlined in BS 4142, presented in Table 4.5 below.

Table 4.5 BS 4142 character corrections

Acoustically Distinguishing Characteristic	Description	Correction
Tonality	Transformer noise is heard as a highly tonal 'hum', consisting of exact acoustic harmonics of the UK electricity supply frequency. It is considered that a character correction should be applied for tonality.	+6 (highly perceptible) at all receptors as the current substation operation is noted to be audible during the survey
Impulsivity	The nature of the operation of transformers does not present any impulsivity characteristics as these operate constantly with similar load with no peaks in their operation that could create impulsive sounds. Therefore, no impulsivity corrections have been applied.	0
Intermittency	The nature of the operation of transformers does not present any intermittency characteristics as these operate constantly on a 24/7 basis. No intermittency correction has been applied.	0

- 4.3.4 Based on the character corrections and background level presented above and the predicted sound levels at the different NSRs, Table 4.6 presents the rating level initial assessment for the Scheme.

Table 4.6 BS 4142 initial assessment – SGTs Operation

Receiver	Specific Sound Level dB(A)	Background Sound Level dB(A)	Character Corrections			Rating Level dB(A)	Excess Rating Level Over Background dB(A)
			Tonality	Intermittency	Impulsivity		
Sparrow Lane Park Home Estate	18	27	6	0	0	24	-3
Hill Farm	22	27	6	0	0	28	1
Station House	25	27	6	0	0	31	4
Fledborough Farm House	20	27	6	0	0	26	-1

- 4.3.5 Based on the results presented above, there is potential to create an adverse impact at one of the NSRs, Station House. It is therefore considered that acoustic mitigation on the SGTs is recommended and its consequential potential impact on the NSRs needs to be further assessed.

4.4 Mitigated SGTs

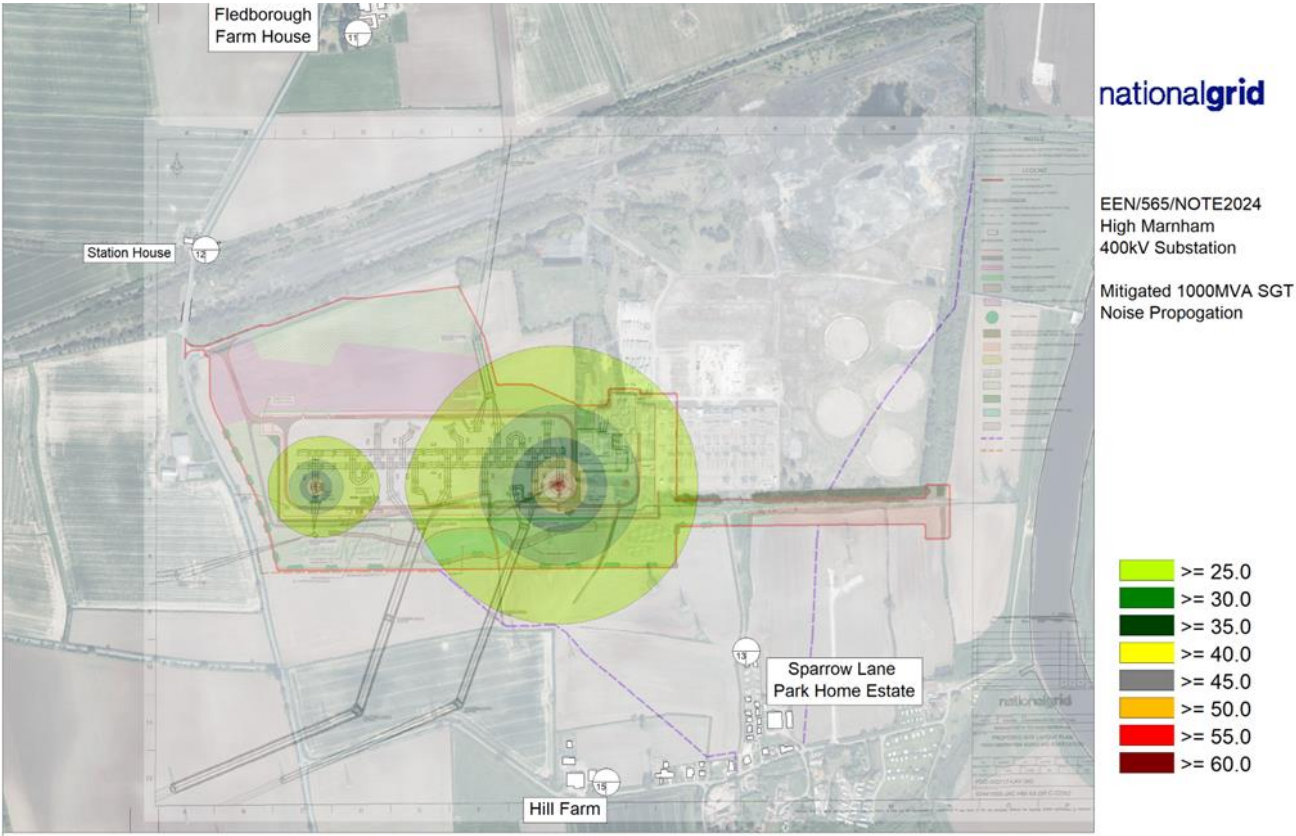
- 4.4.1 An additional acoustic model has been created where the sound power levels of the SGTs have been adjusted with the use of acoustic enclosures. Transformer noise can be mitigated through the use of acoustic enclosures. The effect of installing acoustic enclosures offers a 20 dB(A) reduction at 100 Hz (potentially greater at 200 Hz) to the SGTs, and enclosure suppliers are contractually obliged to achieve this. Assessing the potential impact of the effectiveness of enclosures for the Scheme resulted in the need for only 1 SGT recommended to be enclosed, SGT2., the 1100 MVA SGT. This results in the sound power level of the mitigated SGT scenario is shown in Table 4.7.

Table 4.7 Description of sound sources used in mitigated noise model

Name	Description	Type of Source	A-Weighted Sound Power Level L_{WA} dB(A)
SGT1 Tank	Omnidirectional source located at the proposed SGT location. Main tank emitting at 200 Hz at 4 m above ground level.	Point source	82 dB(A)
SGT2 Tank	Omnidirectional source located at the proposed SGT location. Main tank emitting at 200 Hz at 4 m above ground level.	Point source	71 dB(A)

4.4.2 A noise contour plot showing the propagation of sound from the proposed transformers inside the acoustic enclosures at the proposed site and identified NSRs ($L_{Aeq,T}$) is presented in Figure 4.2, below.

Figure 4.2 Proposed mitigated specific sound, L_s , propagation



4.4.3 Predicted specific sound levels for the model with enclosed SGT2 is presented in Table 4.8, below.

Table 4.8 Predicted sound levels at the identified NSRs – Enclosed SGT2 Tank

Description	Predicted specific sound level, dB(A)
Sparrow Lane Park Home Estate	13
Hill Farm	15
Station House	12
Fledborough Farm House	11

4.4.4 For the determination of the rating level, acoustic corrections using the subjective method and based on the predicted sound level from BS 4142 have been applied and are presented in Table 4.9 below.

Table 4.9 BS 4142 character corrections for enclosed SGT2 assessment

Acoustically Distinguishing Characteristic	Description	Correction
Tonality	The calculated specific sound level at NSRs is low, below the representative background sound levels, and considered unlikely to be perceptible. Therefore, corrections for tonality are not applied for mitigated SGTs.	0
Impulsivity	N/A	0
Intermittency	N/A	0

4.4.5 Based on the character corrections and background level presented above and the predicted sound levels at the different NSRs, Table 4.10 presents the BS 4142 initial assessment for the enclosed SGT2 assessment.

Table 4.10 BS 4142 initial assessment – Mitigated SGTs Operation

Receiver	Specific Sound Level dB(A)	Background Sound Level dB(A)	Character Corrections			Rating Level dB(A)	Excess Rating Level Over Background dB(A)
			Tonality	Intermittency	Impulsivity		
Sparrow Lane Park Home Estate	13	27	0	0	0	13	-14
Hill Farm	15	27	0	0	0	15	-12
Station House	12	27	0	0	0	12	-15
Fledborough Farm House	11	27	0	0	0	11	-16

4.4.6 Based on the results presented above, impacts are anticipated to be negligible to all NSRs. Therefore, acoustic mitigation for SGT2 is considered suitable to reduce potential noise impacts from the Scheme.

4.5 Context

- 4.5.1 Assessments indicate that acoustic mitigation is recommended in the form of an acoustic enclosure for SGT2, to reduce possible adverse impacts to NSRs.
- 4.5.2 The predicted specific levels at NSRs range from -16 to -12 dB below representative background noise levels. As specific levels are lower than the background sound level, it is unlikely that tonal noise would be audible, and no character corrections have been applied.
- 4.5.3 The following contextual matters are also considered noteworthy:
- The specific sound level used in this assessment for the SGTs is based on 102.5% voltage and 50% load. Typically, the transformers will operate at a lower voltage and load and, subsequently, with a lower sound power level.
 - Moderately conservative background sound levels have been used in the assessment. This is considered robust, as background sound levels throughout the survey regularly exceed the chosen representative background sound level.
 - The absolute predicted noise levels are low and would not, in their own right, be expected to have a material adverse impact to NSRs.
 - The Scheme will replace the existing older substation. All significant noise sources will be mitigated by best practicable means through the use of an acoustic enclosure.

4.6 Uncertainty

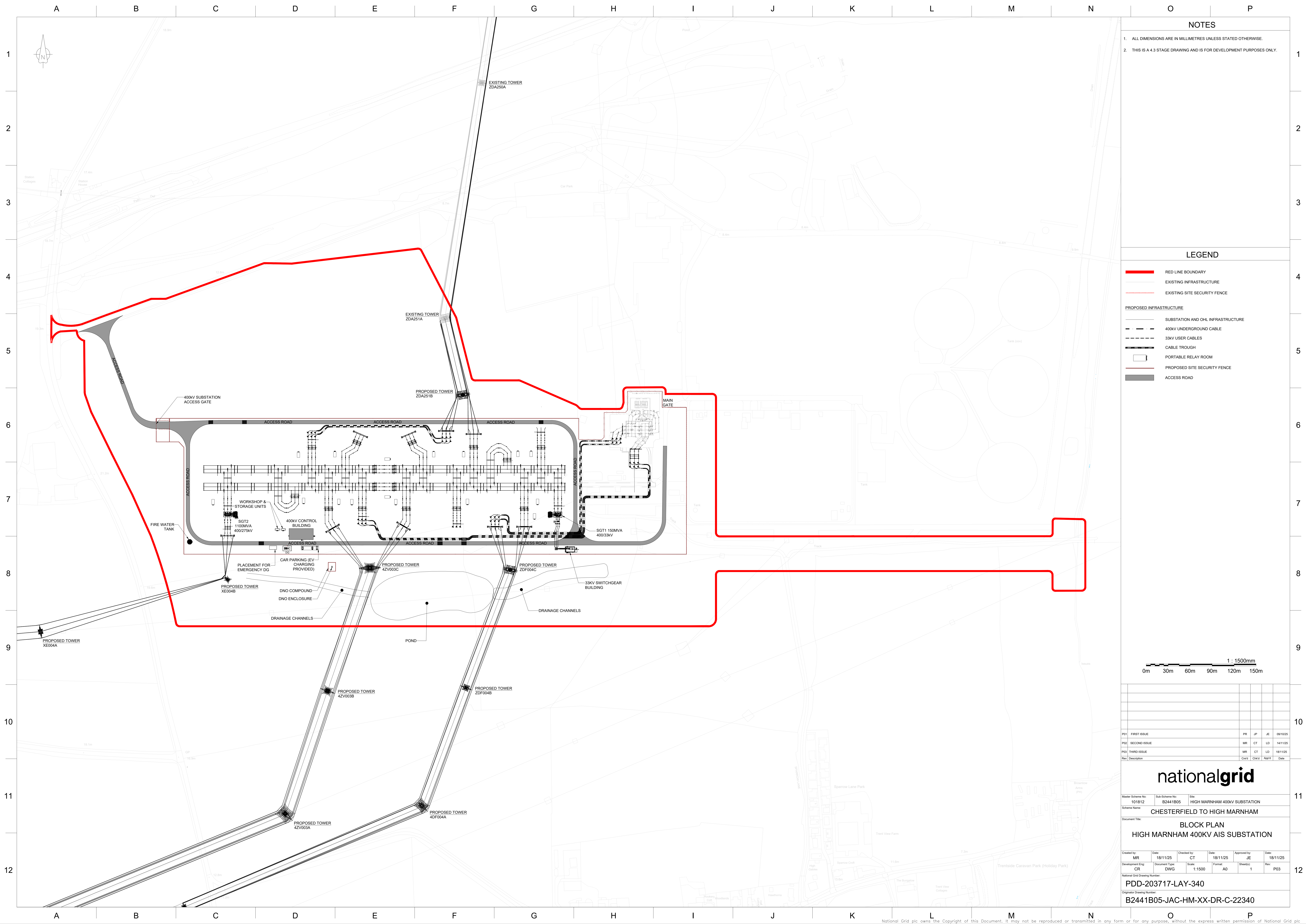
- 4.6.1 The background sound levels derived from the acoustic survey for the assessment are considered to be suitably representative for surrounding NSRs. The weather conditions were continuously monitored during the unattended measurement using a weather station and those periods with wind speeds higher than 5 m/s, and/or rainfall as discussed in BS 4142 were discarded from the dataset for the assessment.
- 4.6.2 Source sound power levels have been based on higher voltages and loads than would typically occur, at 102.5% voltage and 50% load from the National Grid Technical Specification document.
- 4.6.3 Specific noise levels have been calculated using a 3D sound model and rated noise levels have considered character corrections.
- 4.6.4 Based on the aforementioned, it is considered that the uncertainty of the measurements, the determination of the background levels, and calculations for this NIA have minimal influence on the outcome of the assessment.

5. Conclusions

- 5.1.1 The National Grid Electricity Transmission Environmental Engineering Team have undertaken a Noise Impact Assessment for operational noise to accompany a full planning application for the proposed development of the new High Marnham 400kV Substation, to the west of the existing High Marnham Substation. The main noise sources of the Scheme are two SGTs. Additional substation elements, such as circuit breakers, disconnectors or switches have been scoped-out of this assessment.
- 5.1.2 An unattended noise survey was undertaken at two locations considered representative of the closest NSRs, between 30th April 2024 to 13th May 2024.
- 5.1.3 Two 3D noise models, with and without acoustic mitigation, have been created to predict the potential noise levels from the operation of the proposed development to NSRs. The assessment is considered in general accordance with BS 4142, to evaluate the potential impact.
- 5.1.4 Without mitigation, an adverse impact is predicted at one of the NSRs. With mitigation, consisting of enclosing SGT2, negligible impacts are predicted for all NSRs, as all rating levels are below the representative background level. **It is therefore recommended that SGT2 is enclosed within an acoustic enclosure.**
- 5.1.5 Given the context in which the negative rating level over background sound level calculated from the BS 4142 assessment at all NSRs is predicted, **it is considered that an adverse impact from the site is not likely for any of the identified NSRs.**

Appendix A

Drawings



Appendix B

SGT FAT Sound

Power Levels

Appendix B

SGT FAT Sound Power Levels

Note - Sound Power Levels are derived from the logarithmic addition of the SGT's 50% load sound power level and the SGT's 102.5% excitation voltage (during no load) sound power. This have been highlighted to help with referencing.

This calculation is provided within the 150 MVA SGT FAT report and is highlight in orange to help reference. The 1100 MVA SGT calculation is as followed:

$$10 * \log(10^{0.1*89.7} + 10^{0.1*84.1}) = 90.8 = 91 \text{ dBA}$$

HYOSUNG HEAVY INDUSTRIES	TEST REPORT 시험성적서	Customer or Project
	Product No. 10131436_0001	NG/Didcot (T7479)
		Number of Sheets 50

Audible Sound Measurement(소음측정)

Measurement conditions

Height H (m)		Contour length Lm (m)		Surface area of measurement S (m ²)		Surface area of laboratory Sv (m ²)	Acoustic absorption coefficient α	Ambient correction K (dB)	
Main	Cooler	Main	Cooler	Main	Cooler			Main	Cooler
4.2	6.8	d=0.3m	d=2.0m	d=0.3m	d=2.0m	4898.0	0.166	d=0.3m	d=2.0m
		23	29	120.75	255.20			2.025	3.532

$$S = 1.25 \times H \times Lm, (d = 0.3m)$$

$$S = (H + 2) \times Lm, (d = 2.0m)$$

d ; Distance from the transformer

$$A = \alpha \times Sv$$

$$K = 10 \log (1 + 4 \times S / A)$$

Test result

1. Main Tank

No load	Measured average sound pressure level LpA0	Measured ambient sound LbgA	Corrected average sound pressure level LpA	Sound power level LWA
100%E [402.2kV]	61.2	53.8	58.3	79.1
102.5%E [412.25kV]	62.6		60.0	80.8
105%E [422.3kV]	64.3		61.9	82.7

2. Cooler

Fan on	Measured average sound pressure level LpA0	Measured ambient sound LbgA	Corrected average sound pressure level LpA	Sound power level LWA
ONAF	56.7	53.8	50.0	74.1

$$\text{Sound pressure level (LpA)} : 10 \log(10^{0.1LpA0} - 10^{0.1LbgA}) - K$$

$$\text{Sound power level (LWA)} = LpA + 10 \log (S/S_0) \quad S_0 = 1m^2$$

3. Combined Sound Level (Sound power level LWA)

No load Main Tank at 102.5% Voltage 80.8 dB

Load Main Tank at Current 50% 74.6 dB

$$\text{Log Sum} = 10 \log(10^{(0.1 \times 80.8)} + 10^{(0.1 \times 74.6)}) = 81.7 \text{ dB}$$

Test Date : 2020-03-19	Acceptance Criteria
Tested By : D.H.SONG	
Used Instrument : Sound Level Meter : 160502-0035	Result : Accepted

양식 HS-CP-66-0028-1A4

HYOSUNG HEAVY INDUSTRIES	TEST REPORT 시험성적서	Customer or Project NG/Didcot (T7479)
	Product No. 10131436_0001	Number of Sheets 52

Audible Sound Measurement(소음측정)

Measurement conditions

Height H (m)	Contour length Lm (m)	Surface area of measurement S (m ²)	Surface area of laboratory Sv (m ²)	Acoustic absorption coefficient α	Ambient correction K (dB)
Main	Main	Main			Main
4.2	d=0.3m	d=0.3m	4898.0	0.166	d=0.3m
	23	120.75			2.025

$$S = 1.25 \times H \times Lm, (d = 0.3m)$$

$$S = (H + 2) \times Lm, (d = 2.0m)$$

d ; Distance from the transformer

$$A = \alpha \times Sv$$

$$K = 10 \log (1 + 4 \times S / A)$$

Test result

1. Main Tank

Load	Measured average sound pressure level LpA0	Measured ambient sound LbgA	Corrected average sound pressure level LpA	Sound power level LWA
Current 25%	53.8		46.4	67.2
Current 50%	57.4	52.3	53.8	74.6
Current 75%	66.3		64.1	84.9
Current 100%	71.0		70.9	91.8

$$\text{Sound pressure level (LpA)} : 10 \log(10^{0.1LpA0} - 10^{0.1LbgA}) - K$$

$$\text{Sound power level (LWA)} = LpA + 10 \log (S/S_0) \quad S_0 = 1m^2$$

Test Date : 2020-03-21	Acceptance Criteria
Tested By : W.N.HAN	
Used Instrument : Sound Level Meter : 160502-0035	Result : Reference Value

양식 HS-CP-66-0028-1A4

HYOSUNG HEAVY INDUSTRIES		TEST REPORT 시험성적서		Customer/Project NG/Iver SGT6B	
		Product No.	10223238_0018	Number of Sheets	87
Audible Sound Measurement(소음 측정)					
Measurement Conditions					
Height H[m]		Contour Length Lm[m]	Surface Area of Measurement S[m²]	Surface Area of Laboratory Sv[m²]	Acoustic Absorption Coefficient α
		x=0.3	x=0.3		x=0.3
Tank	4.03	24.0	103.9	4989.0	0.166
S = (H + x) x Lm A = α x Sv K = 10 x log(1 + 4 x S / A)					
Test Result					unit : dB
	Pressure LpA0	Ambient Noise LbgA	Corrected Sound LpA	Sound Power LWA	
NO LOAD 100%	68.8	59.7	66.5	86.6	
NO LOAD 102.5%	71.6	59.7	69.5	89.7	
NO LOAD 105%	74.3	59.7	72.4	92.5	
Corrected Sound(LpA) = 10 x log(10 ^{0.1LpA0} - 10 ^{0.1LbgA}) - K Sound Power(LWA) = LpA x 10 x log(S)					
Test Date		2023-04-05		Acceptance Criteria	
Tested By		D.H.SONG		- Main unit ≤91dB at rated voltage - Cooler ≤87dB at ODAF	
Used Instruments		Sound Level Analyzer 160505-0002		Result Accepted	

양식 HS-CP-66-0028-1A4

HYOSUNG HEAVY INDUSTRIES		TEST REPORT 시험성적서		Customer/Project NG/Iver SGT6B	
		Product No.	10223238_0018	Number of Sheets	91
Audible Sound Measurement(소음 측정)					
Measurement Conditions					
Height H[m]		Contour Length Lm[m]	Surface Area of Measurement S[m²]	Surface Area of Laboratory Sv[m²]	Acoustic Absorption Coefficient α
Tank		4.03	x=0.3 23.0	x=0.3 99.6	0.166
				4989.0	1.706
$S = (H + x) \times Lm$ $A = \alpha \times Sv$ $K = 10 \times \log(1 + 4 \times S / A)$					
Test Result					
unit : dB					
	Pressure LpA0	Ambient Noise LbgA	Corrected Sound LpA	Sound Power LWA	
LOAD 25%	61.3	57.8	57.0	77.0	
LOAD 50%	66.5	57.8	64.2	84.1	
LOAD 75%	73.0	57.8	71.2	91.1	
$Corrected\ Sound(LpA) = 10 \times \log(10^{0.1LpA0} - 10^{0.1LbgA}) - K$ $Sound\ Power(LWA) = LpA \times 10 \times \log(S)$					
Test Date 2023-04-06					
Tested By S.H.SON					
Used Instruments Sound Level Analyzer 160505-0002					
Acceptance Criteria					
Result Reference Value					

양식 HS-CP-66-0028-1A4

Appendix I

Construction Dust

Assessment

The Great Grid Upgrade

Brinsworth to High Marnham

Chesterfield to High Marnham

Environmental Appraisal Report – Appendix I: Construction Dust
Assessment

October 2026

nationalgrid

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1. Construction Dust Assessment and Methodology

1.1 Methodology

- 1.1.1 The construction dust assessment has been carried out in accordance with the Institute of Air Quality Management (IAQM) construction dust guidance (IAQM, 2024).
- 1.1.2 The steps for assessing dust emissions in accordance with the IAQM construction dust guidance (IAQM, 2024) are detailed in the following sections.

Step 1

- 1.1.3 Step 1 screens the requirement for a more detailed assessment. Should human receptors be identified within 250 m of a site boundary or 50 m from the construction vehicle route up to 250 m from the proposed site access, then the assessment proceeds to Step 2. Additionally, should ecological receptors be identified within 50 m of a site boundary or 50 m from the construction vehicle route up to 250 m from the proposed site access, then the assessment also proceeds to Step 2.
- 1.1.4 Should sensitive receptors not be present within the relevant distances then negligible impacts would be expected and further assessment is not necessary.

Step 2

- 1.1.5 Step 2 assesses the risk of potential dust impacts. A site is allocated a risk category based on two factors:
- The scale and nature of the works, which determines the potential dust emission magnitude as: small, medium, or large (Step 2A); and,
 - The sensitivity of the area to dust impacts, which can be defined as low, medium, or high sensitivity (Step 2B).
- 1.1.6 The two factors are combined in Step 2C to determine the risk of dust impacts without mitigation applied.
- 1.1.7 Step 2A defines the potential magnitude of dust emission through the construction phase. The relevant criteria are summarised in Table 1.1.

Table 1.1 Construction dust magnitude of emissions

Magnitude	Activity	Criteria
Large	Demolition	Total building volume greater than 75,000 m ³ Potentially dusty construction material (e.g. concrete) On-site crushing and screening

Magnitude	Activity	Criteria
		Demolition activities greater than 12 m above ground level
	Earthworks	Total site area greater than 110,000 m ² Potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size) More than 10 heavy earth moving vehicles active at any one time Formation of bunds greater than 6 m in height
	Construction	Total building volume greater than 75,000 m ³ On site concrete batching Sandblasting
	Trackout	More than 50 Heavy Duty Vehicle (HDV) outward trips per day Potentially dusty surface material (e.g. high clay content) Unpaved road length greater than 100 m
Medium	Demolition	Total building volume 12,000 m ³ to 75,000 m ³ Potentially dusty construction material Demolition activities 6 m to 12 m above ground level
	Earthworks	Total site area 18,000 m ² to 110,000 m ² Moderately dusty soil type (e.g. silt) 5 to 10 heavy earth moving vehicles active at any one time Formation of bunds 3 m to 6 m in height
	Construction	Total building volume 12,000 m ³ to 75,000 m ³ Potentially dusty construction material (e.g. concrete) On site concrete batching
	Trackout	20 to 50 HDV outward trips per day Moderately dusty surface material (e.g. high clay content) Unpaved road length 50 m to 100 m
Small	Demolition	Total building volume under 12,000 m ³ Construction material with low potential for dust release (e.g. metal cladding or timber) Demolition activities less than 6 m above ground level Demolition during wetter months
	Earthworks	Total site area less than 18,000 m ² Soil type with large grain size (e.g. sand) Less than 5 heavy earth moving vehicles active at any one time Formation of bunds less than 3 m in height
	Construction	Total building volume less than 12,000 m ³ Construction material with low potential for dust release (e.g. metal cladding or timber)
	Trackout	Less than 20 HDV outward trips per day Surface material with low potential for dust release Unpaved road length less than 50 m

- 1.1.8 Step 2B defines the sensitivity of the area around the site to potential dust impacts. The influencing factors are shown in Table 1.2.

Table 1.2 Examples of factors defining sensitivity of an area

Receptor Sensitivity	Examples	
	Human Receptors	Ecological Receptors
High	<p>Users expect high levels of amenity.</p> <p>High aesthetic or value property.</p> <p>People expected to be present continuously for extended periods of time.</p> <p>Locations where members of the public are exposed over a time period relevant to the air quality objective for PM₁₀ e.g. residential properties, hospitals, schools and residential care homes.</p>	<p>Internationally or nationally designated site e.g. Special Area of Conservation, and the designated features may be affected by dust soiling.</p> <p>Locations where there is a community of a particular dust sensitive species such as vascular species included in the Red Data List for Great Britain.</p>
Medium	<p>Users would expect to enjoy a reasonable level of amenity.</p> <p>Aesthetics or value of their property could be diminished by soiling.</p> <p>People or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land e.g. parks and places of work.</p>	<p>Nationally designated site e.g. Sites of Special Scientific Interest (SSSIs) with dust sensitive features.</p> <p>Locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown.</p>
Low	<p>Enjoyment of amenity would not reasonably be expected.</p> <p>Property would not be expected to be diminished in appearance.</p> <p>Transient exposure, where people would only be expected to be present for limited periods. e.g. public footpaths, playing fields, shopping streets, playing fields, farmland, footpaths, short term car park and roads.</p>	<p>Locally designated site e.g. Local Nature Reserve (LNR) where the features may be affected by dust deposition.</p>

- 1.1.9 The guidance also provides the following factors to consider when determining the sensitivity of an area to potential dust impacts:
- Any history of dust generating activities in the area;
 - The likelihood of concurrent dust generating activity on nearby sites;
 - Any pre-existing screening between the source and receptors;
 - Any conclusions drawn from analysing local meteorological data which accurately represent the area;
 - The season during which works will take place;

- Any conclusions drawn from local topography;
- Duration of the potential impact, as a receptor may become more sensitive over time; and
- Any known specific receptor sensitivities which go beyond the classifications given in the document.

1.1.10 These factors were considered when undertaking the assessment.

1.1.11 The criteria for determining the sensitivity of the area to dust soiling effects on people and property is summarised in Table 1.3.

Table 1.3 Sensitivity of the area to dust soiling effects on people and property

Receptor Sensitivity	Bandings of receptor number	Distance from the Source (m)			
		Less than 20	Less than 50	Less than 100	Less than 250
High	More than 100	High	High	Medium	Low
	10 - 100	High	Medium	Low	Low
	1 - 10	Medium	Low	Low	Low
Medium	More than 1	Medium	Low	Low	Low
Low	More than 1	Low	Low	Low	Low

1.1.12 Table 1.4 outlines the criteria for determining the sensitivity of the area to human health impacts.

Table 1.4 Sensitivity of the area to human health impacts

Receptor Sensitivity	Annual Mean PM ₁₀ Concentration	Bandings of receptor number	Distance from the Source (m)			
			Less than 20	Less than 50	Less than 100	Less than 250
High	Greater than 32µg/m ³	More than 100	High	High	High	Medium
		10 - 100	High	High	Medium	Low
		1 - 10	High	Medium	Low	Low
	28-32µg/m ³	More than 100	High	High	Medium	Low
		10 - 100	High	Medium	Low	Low
		1 - 10	High	Medium	Low	Low
	24-28µg/m ³	More than 100	High	Medium	Low	Low
		10 - 100	High	Medium	Low	Low
		1 - 10	Medium	Low	Low	Low

Receptor Sensitivity	Annual Mean PM ₁₀ Concentration	Bandings of receptor number	Distance from the Source (m)			
			Less than 20	Less than 50	Less than 100	Less than 250
Medium	Less than 24µg/m ³	More than 100	Medium	Low	Low	Low
		10 - 100	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low
	Greater than 32µg/m ³	More than 10	High	Medium	Low	Low
		1 - 10	Medium	Low	Low	Low
	28-32µg/m ³	More than 10	Medium	Low	Low	Low
		1 - 10	Low	Low	Low	Low
	24-28µg/m ³	More than 10	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low
Low	Less than 24µg/m ³	More than 10	Low	Low	Low	Low
		1 - 10	Low	Low	Low	Low
	-	More than 1	Low	Low	Low	Low

1.1.13 Table 1.5 outlines the criteria for determining the sensitivity of the area to ecological impacts.

Table 1.5 Sensitivity of the area to ecological impacts

Receptor Sensitivity	Distance from the Source	
	Less than 20 m	Less than 50 m
High	High	Medium
Medium	Medium	Low
Low	Low	Low

1.1.14 Step 2C combines the dust emission magnitude with the sensitivity of the area to determine the risk of unmitigated impacts.

1.1.15 Table 1.6 outlines the risk category from demolition activities.

Table 1.6 Dust risk category from demolition activities

Receptor Sensitivity	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible

1.1.16 Table 1.7 outlines the risk category from earthworks and construction activities.

Table 1.7 Dust risk category from construction and earthwork activities

Receptor Sensitivity	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

1.1.17 Table 1.8 outlines the risk category from trackout activities.

Table 1.8 Dust risk category from trackout activities

Receptor Sensitivity	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Step 3

- 1.1.18 Step 3 requires the identification of site-specific mitigation measures within the guidance to reduce potential dust impacts based upon the relevant risk categories identified in Step 2. For sites with negligible risk, mitigation measures beyond those required by legislation are not required. However, additional controls may be applied as part of good practice.

Step 4

- 1.1.19 Once the risk of dust impacts has been determined and the appropriate mitigation measures identified, the final step is to determine the significance of any residual impacts. For almost all construction activity, the aim should be to control effects using effective mitigation. Experience shows that this is normally possible, hence the residual effect will normally not be significant.

1.2 Assessment

Step 1

- 1.2.1 The undertaking of activities such as excavation, ground works, cutting, construction and storage of materials has the potential to result in fugitive dust emissions throughout the construction phase. Vehicle movements both on-site and on the local road network also have the potential to result in the re-suspension of dust from highway surfaces. This construction dust assessment has been carried out to assess the risk associated with dust emissions from construction related activities associated with the Scheme.
- 1.2.2 The potential for impacts at sensitive locations depends significantly on local meteorology during the undertaking of dust generating activities, with the most potential significant effects likely to occur during dry and windy conditions.
- 1.2.3 A desk-study identified several sensitive human receptors within 250 m of the land required to construct the Scheme, with the surrounding area being mostly farms and a few residential properties.
- 1.2.4 There are no ecological sites identified within 50 m of the land required to construct the Scheme.

Step 2A

Demolition

- 1.2.5 The total building volume to be demolished is less than 12,000m³. The material being demolished is mostly metal, which is unlikely to be dusty and demolition activities are likely to occur greater than 12m above ground level. As such the potential dust emission magnitude for demolition is considered to be **medium**.

Earthworks

- 1.2.6 The total site area is less than 18,000m². The soil type for the site consists of clay which can be dusty when disturbed. The number of heavy earth moving vehicles active at any one time is less than five and the formation of bunds are expected to be less than 3m in height. As such the potential dust emission magnitude for construction is considered to be **medium**.

Construction

- 1.2.7 The total building volume is likely to be less than 12,000m³ and construction materials would include concrete, which can be relatively dusty compared to other materials. As such the potential dust emission magnitude for construction is considered to be **medium**.

Trackout

- 1.2.8 The maximum number of outward HDV movements per day is expected to be less than 20 HDVs. The access tracks for construction HDVs are expected to be stoned and would be greater than 100 m in length. As such the magnitude of potential dust emissions from trackout is considered to be **medium**.

- 1.2.9 The dust emission magnitude for each dust generating activity for the Scheme is summarised in Table 1.9 below.

Table 1.9 Dust emission magnitude summary

Activity	Dust emission magnitude
Demolition	Medium
Earthworks	Medium
Construction	Medium
Trackout	Medium

Step 2B

- 1.2.10 Receptors sensitive to potential dust impacts during earthworks and construction activities were approximated from a desktop study of the area up to 250 m from the land required to construct the Scheme. These are summarised in Table 1.10.

Table 1.10 Earthworks and construction dust sensitive receptors

Distance from Sites (m)	Approximate Number of Human Receptors	Approximate Number of Ecological Receptors
Less than 20	1 to 10	0
Less than 50	1 to 10	0
Less than 100	1 to 10	Outside of 50m study area for ecological sites
Less than 250	10 to 100	

- 1.2.11 Receptors sensitive to potential dust impacts from trackout were approximated from a desktop study of the area up to 50 m from the road network within 250 m of the land required to construct the Scheme. These are summarised in Table 1.11.

Table 1.11 Trackout dust sensitive receptors

Distance from Sites (m)	Approximate Number of Human Receptors	Approximate Number of Ecological Receptors
Less than 20	10 to 100	0
Less than 50	10 to 100	0

- 1.2.12 In accordance with the IAQM construction dust guidance (IAQM, 2024), the highest level of sensitivity should be recorded from the criteria outlined in the guidance.
- 1.2.13 The IAQM construction dust guidance (IAQM, 2024) defines residential properties as being high sensitivity receptors to dust soiling impacts and therefore the sensitivity of the surrounding area for dust soiling impacts has been determined based on the

number of high sensitivity receptors and the distance of the receptor from the source (Table 1.3).

- 1.2.14 To determine the sensitivity of the receiving environment for human health effects, the maximum 2026 PM₁₀ background concentration across the Scheme was obtained from the Defra website (Defra, 2026) and identified as being 13.6 µg/m³ (grid square: 480500, 370500). Therefore, in accordance with the IAQM construction dust guidance (IAQM, 2024), health impacts should be determined based on the criteria within the less than 24 µg/m³ category (refer to Table 1.4). As the human receptors include residential properties, the sensitivity of the receptor is considered to be high and therefore the sensitivity of the surrounding area for human health impacts has been determined based on the number of high sensitivity receptors within the less than 24 µg/m³ background PM₁₀ category and the distance of the receptors from the source (refer to Table 1.4).
- 1.2.15 The sensitivity of the receiving environment to specific dust impacts is summarised in Table 1.12.

Table 1.12 Summary of the sensitivity of the area

Potential Impact	Sensitivity of the surrounding area			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Medium	Medium	Medium	High
Human Health	Low	Low	Low	Low

Step 2C

- 1.2.16 The risk of effects in the absence of environmental measures was then defined based upon the interaction between the magnitude of emission and the highest level of area sensitivity (determined in Steps 2A and 2B, respectively) for each dust generating activity. The risk of dust effects was determined, as presented in Table 1.13.

Table 1.13 Summary of the risk of dust effects

Potential Impact	Risk			
	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Medium	Medium Risk	Medium Risk	Medium Risk
Human Health	Low Risk	Low Risk	Low Risk	Low Risk

- 1.2.17 As indicated in Table 1.13, the potential risk for dust soiling is medium risk for demolition, earthworks, construction and trackout. The potential risk of human health impacts is low risk for demolition, earthworks, construction and trackout. The potential risk of dust impacts on designated ecological sites has been screened out as there are no ecological receptors within the study area. The assessment has indicated that the risk of dust effects is medium as a worst case for the Scheme.

- 1.2.18 It should be noted that the potential for impacts depends significantly on the distance between the dust generating activity and receptor location. Risk was predicted based on a worst-case scenario of works being undertaken at the edge of the land required to construct the Scheme. Therefore, actual risk is likely to be lower than that predicted during the majority of the construction phase.

Step 3

- 1.2.19 The IAQM construction dust guidance (IAQM, 2024) provides potential mitigation measures to reduce impacts as a result of fugitive dust emissions during the construction phase. These have been adapted for the Scheme based on the risk of dust effects (Table 1.13) and are summarised in Table 1.14.
- 1.2.20 It should be noted that where construction activities are undertaken within 200 m of local designated sites (LWSs and CWSs), the sensitivity of the area to ecological impacts is considered as low sensitivity and therefore less stringent mitigation measures to those summarised in Table 1.14 would apply. The below mitigation measures would be reviewed as part of the Dust Management Plan (DMP).

Table 1.14 Proposed dust mitigation measures based on IAQM guidance

Mitigation Measure	Medium Risk Measures. H=Highly Recommended. D=Desirable
Communications	
Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.	H
Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.	H
Display the head or regional office contact information.	H
Dust Management	
Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority.	H
Site Management	
Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.	H
Make the complaints log available to the local authority when asked.	H
Record any exceptional incidents that cause dust and/or air emissions, either on- or off-site, and the action taken to resolve the situation in the log book.	H

Mitigation Measure	Medium Risk Measures. H=Highly Recommended. D=Desirable
Monitoring	
Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the Local Authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100m of site boundary, with cleaning to be provided if necessary.	D
Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked.	H
Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.	H
Agree dust deposition, dust flux, or real-time PM ₁₀ continuous monitoring locations with the Local Authority. Where possible, commence baseline monitoring at least three months before work commences on site or, if it a large site, before work on a phase commences. Further guidance is provided by IAQM on monitoring during demolition, earthworks and construction.	H
Preparing and maintaining the site	
Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.	H
Erect solid screens or barriers around dusty activities or the site boundary so that are at least as high as any stockpiles on site.	H
Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period.	H
Avoid site runoff of water or mud.	H
Keep site fencing, barriers and scaffolding clean using wet methods.	H
Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site, cover as described below.	H
Cover, seed or fence stockpiles to prevent wind whipping.	H
Operating vehicle/machinery and sustainable travel	
Ensure all on-road vehicles comply with the requirements of the London Low Emission Zone and the London NRMM standards, where applicable	H

Mitigation Measure	Medium Risk Measures. H=Highly Recommended. D=Desirable
Ensure all vehicles switch off engines when stationary - no idling vehicles.	H
Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.	H
Impose and signpost a maximum-speed-limit of 15mph on surfaced and 10mph on unsurfaced haul roads and work areas (if long haul routes are required, these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the Local Authority, where appropriate).	D
Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing).	D
Operations	
Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.	H
Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.	H
Use enclosed chutes and conveyors and covered skips.	H
Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.	H
Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.	H
Waste Management	
Avoid bonfires and burning of waste materials.	H
Demolition	
Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).	D
Ensure effective water suppression is used during demolition operations. Hand held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground.	H
Avoid explosive blasting, using appropriate manual or mechanical alternatives.	H

Mitigation Measure	Medium Risk Measures. H=Highly Recommended. D=Desirable
Bag and remove any biological debris or damp down such material before demolition.	H
Earthworks	
Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.	D
Use Hessian, mulches or tackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.	D
Only remove the cover in small areas during work and not all at once.	D
Construction	
Avoid scabbling (roughening of concrete surfaces) if possible.	H
Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.	H
Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.	D
For smaller supplies of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust.	D
Trackout	
Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use.	H
Avoid dry sweeping of large areas.	H
Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.	H
Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.	H
Record all inspections of haul routes and any subsequent action in a site log book.	H
Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.	H

Mitigation Measure	Medium Risk Measures. H=Highly Recommended. D=Desirable
Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).	H
Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.	H
Access gates to be located at least 10m from receptors where possible.	H

Step 4

- 1.2.21 Assuming the relevant mitigation measures outlined in Table 1.14 are implemented, the residual effect from all dust generating activities is predicted to be not significant.

References

Ref 1 IAQM, 2024 Institute of Air Quality Management (IAQM) Guidance on the Assessment of Dust from Demolition and Construction Version 2.2 (2024).

Ref 2 Defra, 2026 Department of Agriculture and Rural Affairs UK Air (2026). [Online]. Available at: <https://uk-air.defra.gov.uk> [Accessed June 2026].

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