YG-DCO-039-5.3.10C

Yorkshire Green Energy Enablement (GREEN) Project

Volume 5

Document 5.3.10C ES Chapter 10 Appendix 10C - Extracts from Unexploded Ordnance (UXO) Reports

Final Issue A

November 2022

Planning Inspectorate Reference: EN020024

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 Regulation 5(2)(a)

nationalgrid

Appendix 10C
Unexploded Ordnance Reports

Note: These reports relate to the Overton and Monk Fryston substation sites only.

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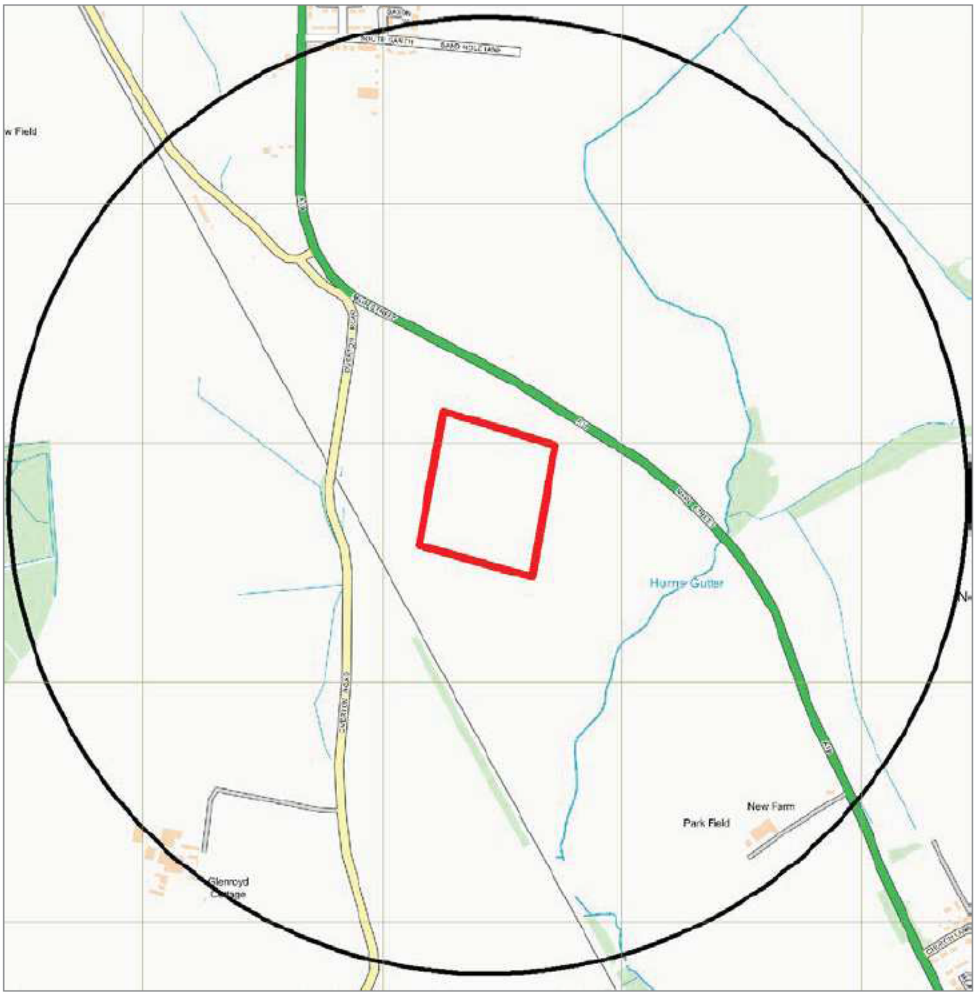
Imperium, Imperial Way
Reading, Berkshire
RG2 0TD,
United Kingdom
[redacted]

special risks consultancy

PRELIMINARY UNEXPLODED ORDNANCE (UXO) THREAT ASSESSMENT

Meeting the requirements of *CIRIA* C681 'Unexploded Ordnance (UXO) – A guide for the Construction Industry' Risk Management Framework



6 ALPHA PROJECT NUMBER	8973	ORIGINATOR	M. Stott
LANDMARK ORDER NUMBER	278803566_1	REVIEWED BY	L. Gregory (19th May 2021)
CLIENT REFERENCE	100102545 SS03	RELEASED BY	L. Gregory (19th May 2021)
STUDY SITE	York North 275kV, Shipton, North Yorkshire		
RECOMMENDATION	No further action is required to address the UXO risk at this Study Site		

UNEXPLODED ORDNANCE THREAT ASSESSMENT

STUDY SITE

The Study Site is described as "York North 275kV, Shipton, North Yorkshire", and it is centred on National Grid Reference 455720, 457390.

THREAT POTENTIAL AND RECOMMENDATIONS

The potential for a UXO hazard to occur, and more specifically, the potential for unexploded WWI and WWII ordnance to exist at this site is assessed as being UNLIKELY (*Figure 2*).

In accordance with *CIRIA* C681 Chapter 5 on managing UXO risks, *6 Alpha* concludes that **NO FURTHER ACTION** is required to address the UXO risk at this Study Site. Should you have any queries, please contact *Envirocheck*.

[redacted]

REPORT SUMMARY

During WWII, the Study Site was situated within *Easingwold Rural District*, which recorded one High Explosive (HE) bomb strike per 100 hectares; a very low level of bombing.

Luftwaffe aerial reconnaissance photography associated with the Study Site did not identify any primary bombing targets on-site or within 1,000m of the Study Site boundary.

Neither *Air Raid Precaution* (ARP) records nor official bomb damage mapping were not available. Nonetheless, neither an analysis of post-war mapping nor further *6 Alpha* research identified any evidence of WWII bombing or bomb damage on-site or within 1,000m of the Study Site boundary.

A WWII-era bombing decoy was recorded approximately 695m to the north-north-east of the Study Site. Such sites were designed to mimic important industrial/urban areas and or military facilities such as airfields in order to draw *Luftwaffe* bombing away from their real intended target. Accurate record keeping surrounding such sites did not often survive the post-war period (where they were kept at all) and so the success of the decoy site in attracting *Luftwaffe* bombing and its precise extents could not be corroborated.

As there was no bombing or bomb damage recorded in the Study Site's vicinity during WWII, there is no evidence to suggest that further investigation into UXO is warranted.

USING THIS REPORT

This Preliminary Assessment is designed to inform environmental and construction professionals of the potential threat of military related explosives and/or ordnance on, or in, the vicinity of the Study Site.

This assessment is designed to be employed as a site-screening tool to meet with the requirement of Phase One of the *CIRIA UXO Risk Management Framework*; there are two broad prospective outcomes; either the threat level requires a detailed threat & risk assessment; or no further action is required. In the former instance we can provide a report within 10 working days (or more quickly upon application).

Two figures accompany the report, the *Second World War* (WWII) High Explosive (HE) Bomb Density and the final Probability of UXO Encounter. The purpose of this approach is to demonstrate that whilst bomb density statistics give an indication for WWII bombing, they should not be relied upon exclusively to generate a holistic assessment.

For further information, please contact *Envirocheck*:
Website: [redacted]
Telephone: [redacted]
Email: customerservice@envirocheck.co.uk

DATA FINDINGS

Threat Source (within 1,000m)	Detail: Identified	Detail: Comments
Airfields/Military Facilities	✓	*X0IP Shipton* was potentially used as a grass airfield during WWI (1,100m north-west).
Ordnance Manufacture/Storage	✗	None recorded within 1,000m.
WWII Decoy Bombing Sites	✓	A decoy site was located 695m north-north-east.
WWII Defensive Features	✗	None recorded within 1,000m.
WWII *Luftwaffe* Designated Bombing Targets	✗	*Luftwaffe* aerial photography did not identify any primary bombing targets on-site or within 1,000m of the Study Site boundary.
WWII Bomb Strikes Within Study Site Boundary	✗	ARP records were not available.
WWII Bomb Strikes Near Study Site Boundary	✗	ARP records were not available.
WWII Bomb Damage	✗	Official bomb damage mapping was not available.
Abandoned Bomb Register	✗	The official abandoned bomb list did not identify any abandoned bombs located on-site or within 1,000m of the Study Site boundary.
Potential Threat Sources	✗	Further research has not uncovered any potential UXO threat sources associated with the Study Site.
WWII Bombing Density Per 100 Hectares	✓	The Study Site was located within *Easingwold Rural District*, which recorded one HE bomb strike per 100 hectares.

IMPORTANT NOTES

1. The term 'Preliminary UXO Threat Assessment' has been used to describe this report, to fall in line with the *CIRIA* C681 guidelines. Whilst the term 'Risk' can be justifiably used at this stage, the reader should note that the 'Consequence' function of 'Risk' is not considered. Should it be required, this would be addressed in the 'Detailed UXO Threat & Risk Assessment' (Stages 2 and 3).
2. This report is accurate and up to date at the time of writing.
3. The assessment levels have been generated from historical data and third-party sources. Where possible *6 Alpha* have sought to verify the accuracy of such data, but cannot be held accountable for inherent errors that may be in third party data sets (e.g. *National Archives* or library sources).
4. *6 Alpha* have exercised all reasonable care, skill and due diligence in producing this service.
5. Whilst every effort has been used to identify all potential UXO/explosive threats, there were a number of private facilities, which may not have released privately recorded information concerning UXO/explosive threats into the public domain. It is therefore possible that some of the aforementioned sites may not be included within the database.

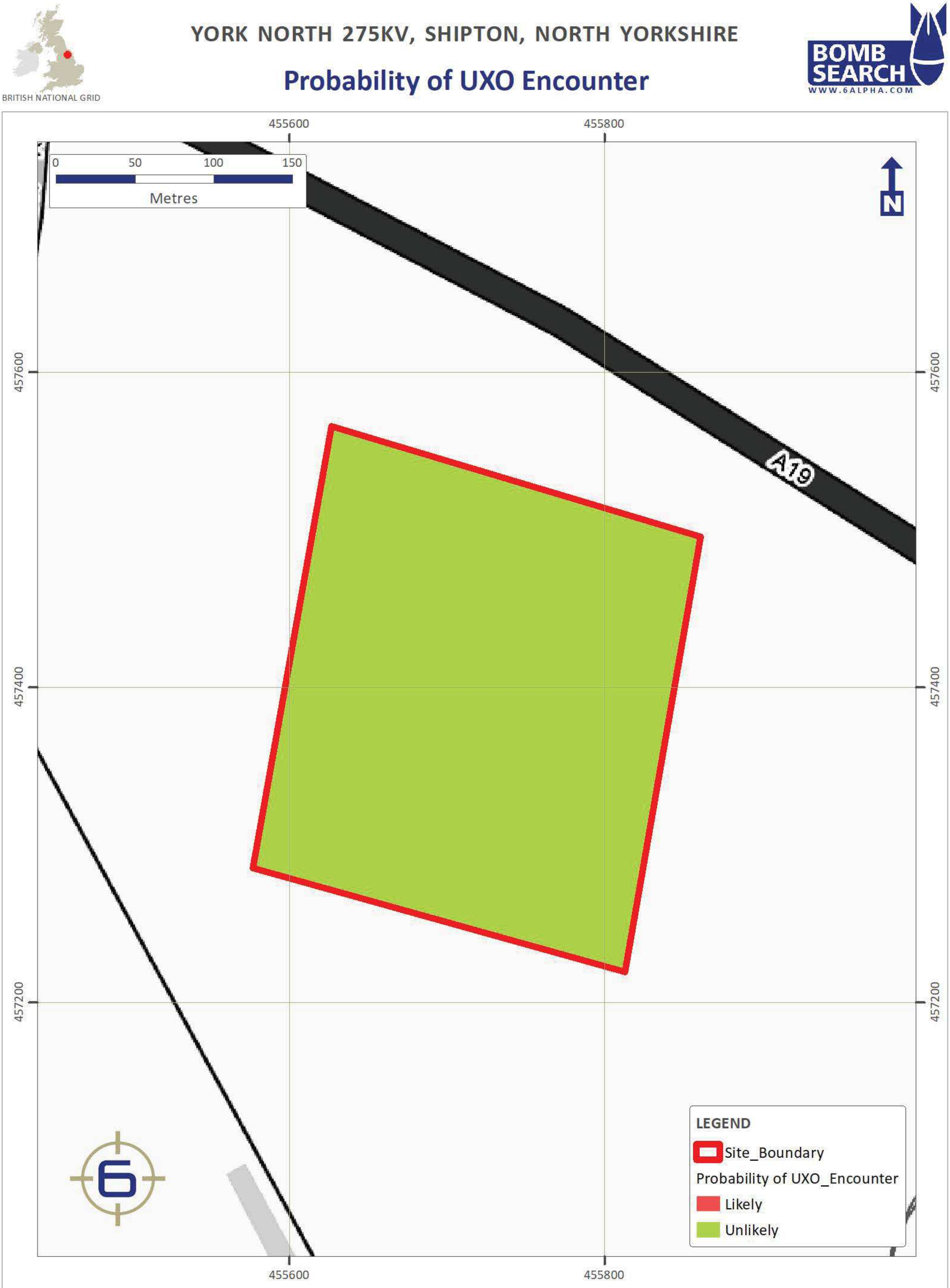
YORK NORTH 275KV, SHIPTON, NORTH YORKSHIRE

WWII High Explosive Bomb Density

PROJECT NO.	FIGURE	DRAWN	CHECKED	DATE		
8973	1	CC	LG	18 May 2021	Contains Ordnance Survey data © Crown copyright and database right 2017	Produced by and Copyright to 6 Alpha Associates Ltd. Users noting any errors please notify 6 Alpha.

YORK NORTH 275KV, SHIPTON, NORTH YORKSHIRE

Probability of UXO Encounter



PROJECT NO.	FIGURE	DRAWN	CHECKED	DATE			
8973	2	CC	LG	18 May 2021	Contains Ordnance Survey data © Crown copyright and database right 2017	Produced by and Copyright to 6 Alpha Associates Ltd. Users noting any errors please notify 6 Alpha.	

zeticaUXO

Pre-Desk Study Assessment

Site:	York North Substation, Shipton, North Yorkshire
Client:	Mott MacDonald
Contact:	Louise Gelder
Date:	23rd April 2021
Pre-WWI Military Activity on or Affecting the Site	None identified.
WWI Military Activity on or Affecting the Site	None identified.
WWI Strategic Targets (within 5km of Site)	The following strategic targets were located in the vicinity of the Site: ■ Transport infrastructure and public utilities.
WWI Bombing	None identified on the Site.
Interwar Military Activity on or Affecting the Site	None identified.
WWII Military Activity on or Affecting the Site	None identified.
WWII Strategic Targets (within 5km of Site)	The following strategic targets were located in the vicinity of the Site: ■ Transport infrastructure and public utilities. ■ RoyaL Air Force (RAF) Shipton and RAF Clifton. ■ Military camps and training areas.
WWII Bombing Decoys (within 5km of Site)	3No. The nearest was located approximately 2.3km southwest of the Site.
WWII Bombing	During WWII the Site was located in the Rural District (RD) of Easingwold, which officially recorded 234No. High Explosive (HE) bombs with a bombing density of 3.1 bombs per 405 hectares (ha). No readily available records have been found to indicate that the Site was bombed.
Post-WWII Military Activity on or Affecting the Site	None identified.
Recommendation	A detailed desk study, whilst always prudent, is not considered essential in this instance.

This summary is based on a cursory review of readily available records. Caution is advised if you plan to action work based on this summary.

It should be noted that where a potentially significant source of UXO hazard has been identified on the Site, the requirement for a detailed desk study and risk assessment has been confirmed and no further research will be undertaken at this stage. It is possible that further in-depth research as part of a detailed UXO desk study and risk assessment may identify other potential sources of UXO hazard on the Site.

UNEXPLODED BOMB RISK MAP

zeticaUXO

SITE LOCATION

Map Centre: 455709,457411

LEGEND

High: Areas indicated as having a bombing density of 50 bombs per 1000acre or higher.

Moderate: Areas indicated as having a bombing density of 15 to 49 bombs per 1000acre.

Low: Areas indicated as having 15 bombs per 1000acre or less.

miltary	industry	UXO find
transport	dock	Luftwaffe targets
utilities	Bombing decoy	other

How to use your Unexploded Bomb (UXB) risk map?
The map indicates the potential for Unexploded Bombs (UXB) to be present as a result of World War Two (WWII) bombing.

You can incorporate the map into your preliminary risk assessment* for potential Unexploded Ordnance (UXO) for a site. Using this map, you can make an informed decision as to whether more in-depth detailed risk assessment* is necessary.

What do I do if my site is in a moderate or high risk area?
Generally, we recommend that a detailed UXO desk study and risk assessment is undertaken for sites in a moderate or high UXB risk area.

Similarly, if your site is near to a designated Luftwaffe target or bombing decoy then additional detailed research is recommended.

More often than not, this further detailed research will conclude that the potential for a significant UXO hazard to be present on your site is actually low.

Never plan site work or undertake a risk assessment using these maps alone. More detail is required, particularly where there may be a source of UXO from other military operations which are not reflected on these maps.

If my site is in a low risk area, do I need to do anything?
If both the map and other research confirms that there is a low potential for UXO to be present on your site then, subject to your own comfort and risk tolerance, works can proceed with no special precautions.

A low risk really means that there is no greater probability of encountering UXO than anywhere else in the UK.

If you are unsure whether other sources of UXO may be present, you can ask for one of our **pre-desk study assessments (PDSA)**

If I have any questions, who do I contact?

tel: [redacted]

email: [redacted]

web: [redacted]

The information in this UXB risk map is derived from a number of sources and should be used in conjunction with the accompanying notes on our website: **(https://zeticauxo.com/downloads-and-resources/risk-maps/)**

Zetica cannot guarantee the accuracy or completeness of the information or data used and cannot accept any liability for any use of the maps. These maps can be used as part of a technical report or similar publication, subject to acknowledgment. The copyright remains with Zetica Ltd.

It is important to note that this map is not a UXO risk assessment and should not be reported as such when reproduced.

*Preliminary and detailed UXO risk assessments are advocated as good practice by industry guidance such as CIRIA C681 'Unexploded Ordnance (UXO), a guide for the construction industry'.

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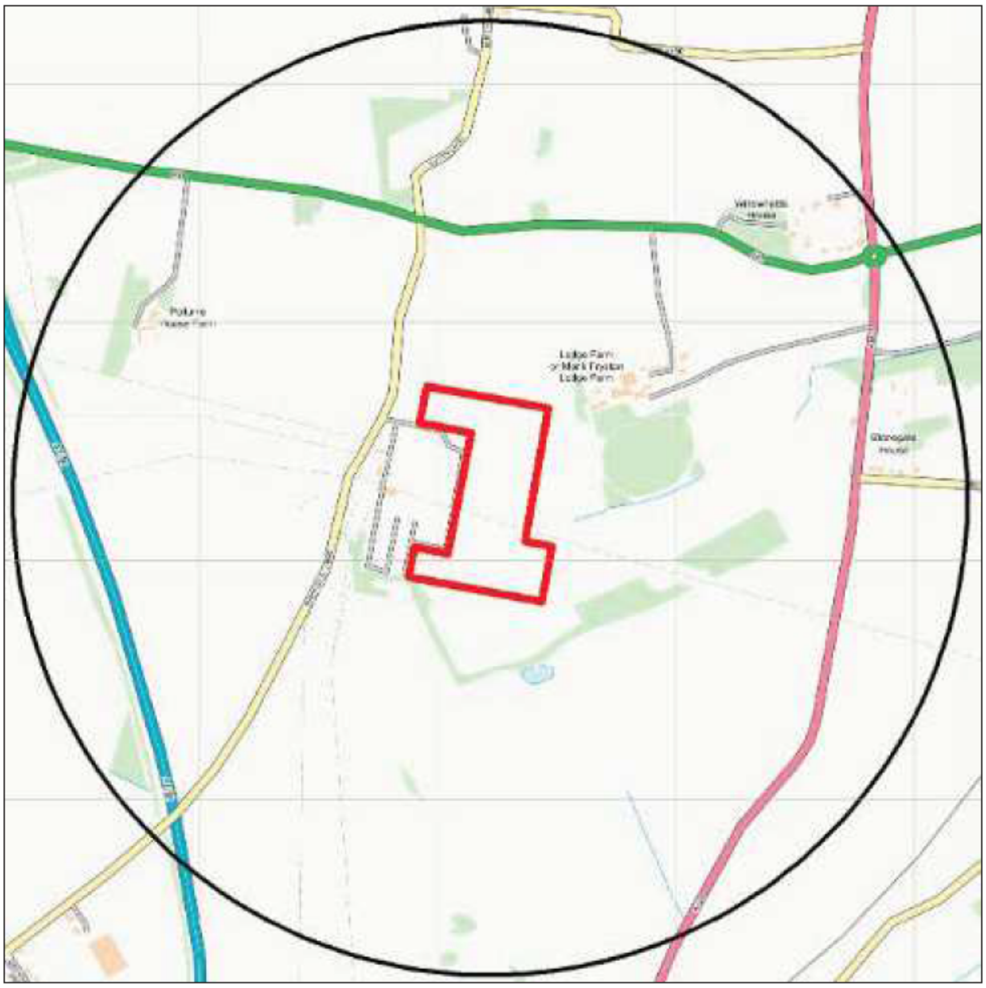
special risks consultancy

Preliminary Unexploded Ordnance (UXO) Threat Assessment

Meeting the requirements of *CIRIA* C681 'Unexploded Ordnance (UXO) – A guide for the Construction Industry' Risk Management Framework



6 Alpha Project number	8972	**Originator**	D. Barrett
Landmark Order number	278802908_1	**Reviewed By**	L. Gregory (18th May 2021)
Client Reference	100102545 SS03	**Released By**	L. Gregory (19th May 2021)
Study Site	Site at, Monk Fryston 400KV, North Yorkshire		
Recommendation	No further action is required to address the UXO risk at this Study Site		

Unexploded Ordnance Threat Assessment

Study Site

The Study Site is described as "Site at, Monk Fryston 400KV, North Yorkshire", and it is centred on National Grid Reference 448610, 429130.

Threat Potential and Recommendations

The potential for a UXO hazard to occur, and more specifically, the potential for unexploded WWI and WWII ordnance to exist at this site is assessed as being UNLIKELY (*Figure 2*).

In accordance with *CIRIA* C681 Chapter 5 on managing UXO risks, *6 Alpha* concludes that **NO FURTHER ACTION** is required to address the UXO risk at this Study Site. Should you have any queries, please contact *Envirocheck*.

Telephone: [redacted] Email: [redacted]

Envirocheck
LANDMARK INFORMATION GROUP

Report Summary

During WWII, the Study Site was situated within *Osgoldscross Rural District*, which recorded less than one High Explosive (HE) bomb strike per 100 hectares; a very low level of bombing.

Luftwaffe aerial reconnaissance photography associated with the Study Site did not identify any primary bombing targets on-site, or within 1,000m of the Study Site boundary.

Neither *Air Raid Precaution* (ARP) records nor official bomb damage were available. Nonetheless further research of historical records identified incendiary bombs (IBs) impacting at *Lumby* (approximately 810m north) during WWI. Nonetheless, neither further research of historical records nor an analysis of post-war mapping identified any bomb strikes or potential bomb damage on-site or in the immediate vicinity.

Although WWI bomb strikes were recorded in the wider area, as there was no bombing or bomb damage recorded in the Study Site's vicinity during WWII, there is no evidence to suggest that further investigation into UXO is warranted.

Using This Report

This Preliminary Assessment is designed to inform environmental and construction professionals of the potential threat of military related explosives and/or ordnance on, or in, the vicinity of the Study Site.

This assessment is designed to be employed as a site-screening tool to meet with the requirement of Phase One of the *CIRIA UXO Risk Management Framework*; there are two broad prospective outcomes; either the threat level requires a detailed threat & risk assessment; or no further action is required. In the former instance we can provide a report within 10 working days (or more quickly upon application).

Two figures accompany the report, the *Second World War* (WWII) High Explosive (HE) Bomb Density and the final Probability of UXO Encounter. The purpose of this approach is to demonstrate that whilst bomb density statistics give an indication for WWII bombing, they should not be relied upon exclusively to generate a holistic assessment.

For further information, please contact *Envirocheck*: Telephone: [redacted]
Website: [redacted] Email: [redacted]

DATA FINDINGS

Threat Source (within 1,000m)	Detail	
	Identified	Comments
Airfields/Military Facilities	✗	None recorded within 1,000m.
Ordnance Manufacture/Storage	✗	None recorded within 1,000m.
WWII Decoy Bombing Sites	✗	None recorded within 1,000m.
WWII Defensive Features	✗	None recorded within 1,000m.
WWII *Luftwaffe* Designated Bombing Targets	✗	*Luftwaffe* aerial photography did not identify any primary bombing targets on-site or within 1,000m of the Study Site boundary.
WWII Bomb Strikes (Study Site Boundary)	✗	ARP records were not available.
WWI/WWII Bomb Strikes (Wider Area)	✓	Further research identified WWI-era IBs impacting approximately 810m north.
WWII Bomb Damage	✗	Official bomb damage mapping was not available.
Abandoned Bomb Register	✗	The official abandoned bomb list did not identify any abandoned bombs on-site or within 1,000m of the Study Site boundary.
Potential Threat Sources	✗	Further research has not uncovered any potential UXO threat sources associated with the Study Site.
WWII Bombing Density Per 100 Hectares	✓	The Study Site was located within *Osgoldscross Rural District*, which recorded less than one HE bomb strike per 100 hectares.

IMPORTANT NOTES

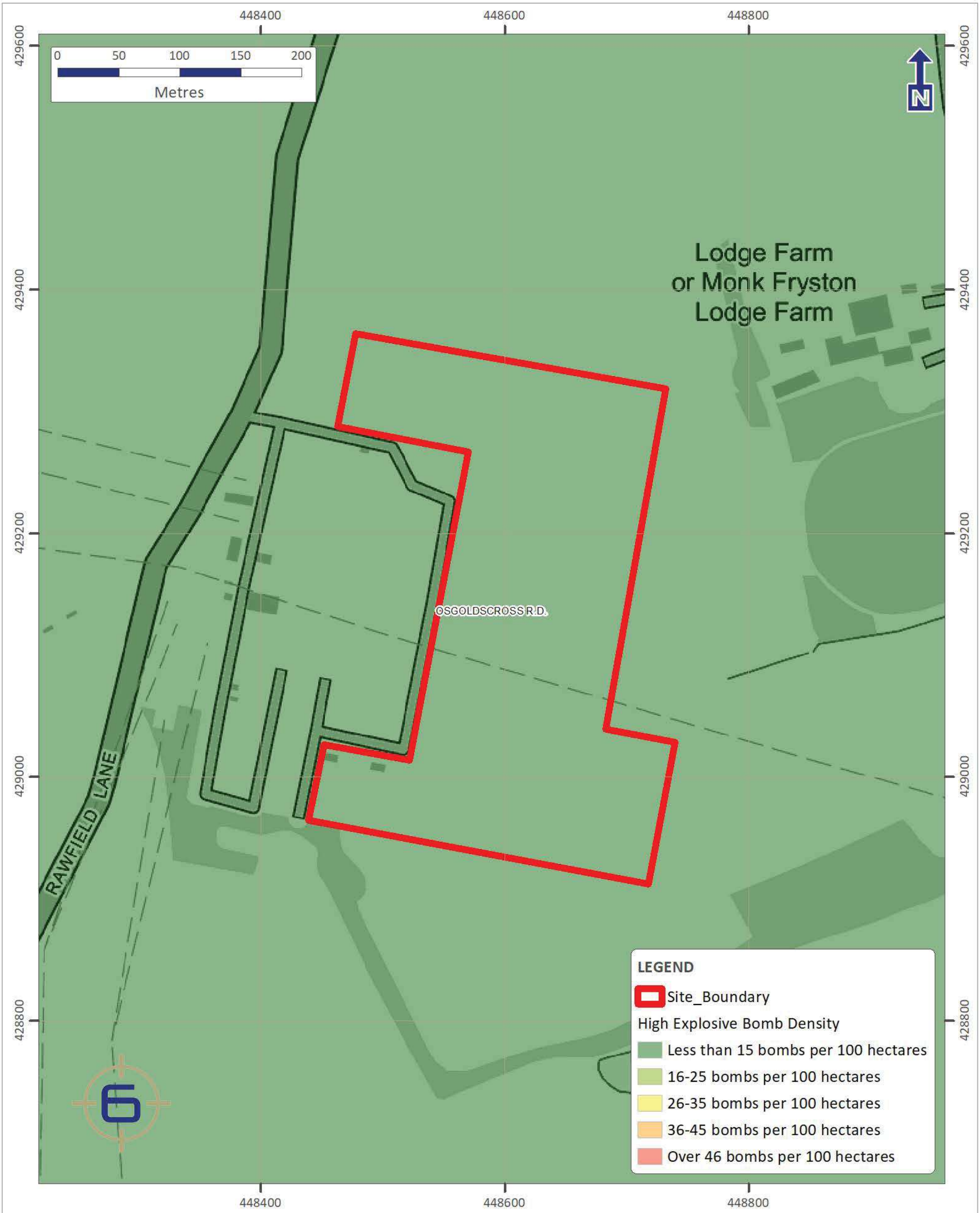
1. The term 'Preliminary UXO Threat Assessment' has been used to describe this report, to fall in line with the *CIRIA* C681 guidelines. Whilst the term 'Risk' can be justifiably used at this stage, the reader should note that the 'Consequence' function of 'Risk' is not considered. Should it be required, this would be addressed in the 'Detailed UXO Threat & Risk Assessment' (Stages 2 and 3).
2. This report is accurate and up to date at the time of writing.
3. The assessment levels have been generated from historical data and third-party sources. Where possible *6 Alpha* have sought to verify the accuracy of such data, but cannot be held accountable for inherent errors that may be in third party data sets (e.g. *National Archives* or library sources).
4. *6 Alpha* have exercised all reasonable care, skill and due diligence in producing this service.
5. Whilst every effort has been used to identify all potential UXO/explosive threats, there were a number of private facilities, which may not have released privately recorded information concerning UXO/explosive threats into the public domain. It is therefore possible that some of the aforementioned sites may not be included within the database.

BRITISH NATIONAL GRID

SITE AT, MONK FRYSTON 400KV, NORTH YORKSHIRE

WWII High Explosive Bomb Density

BOMB SEARCH
WWW.6ALPHA.COM



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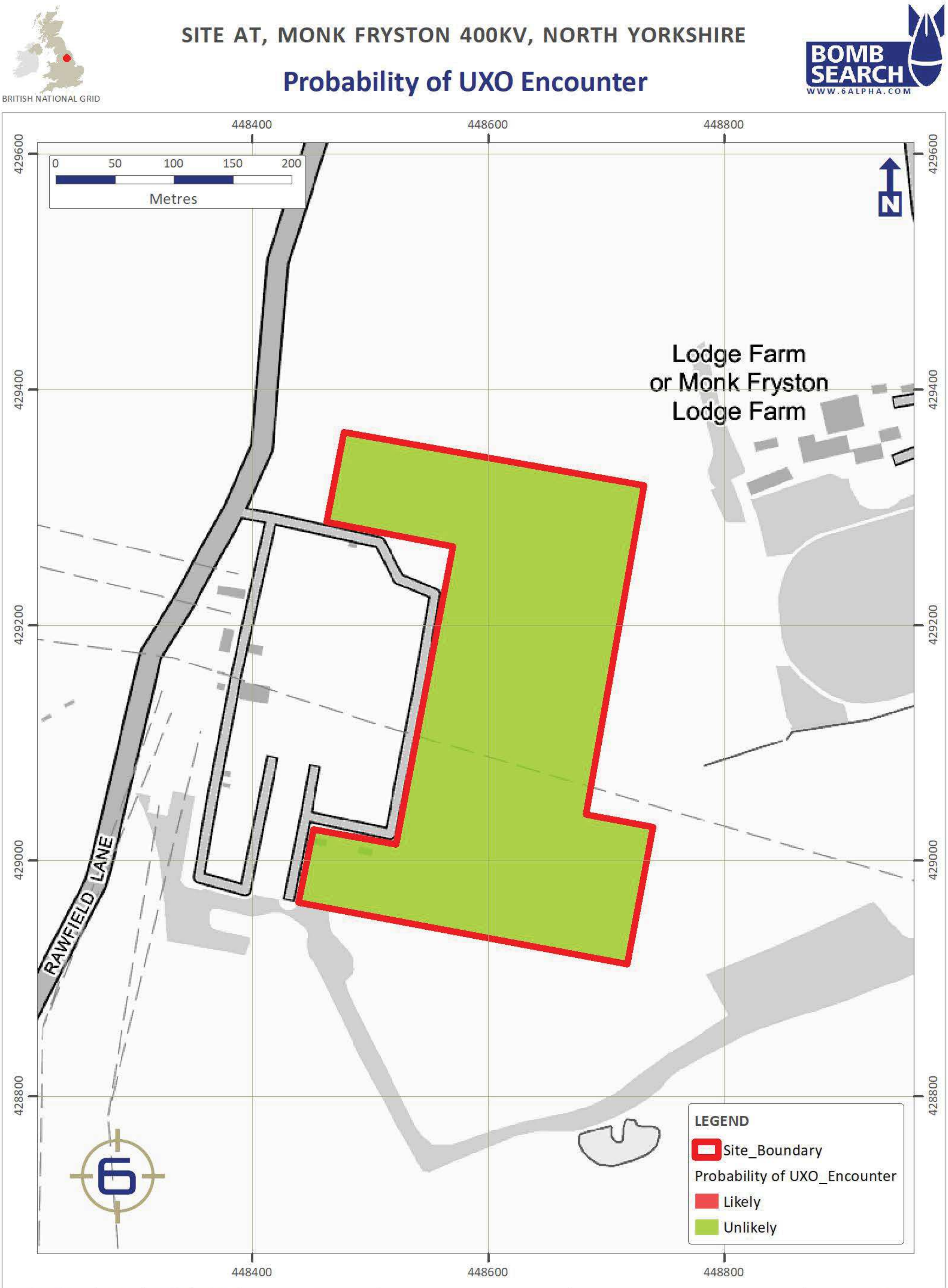
SITE AT, MONK FRYSTON 400KV, NORTH YORKSHIRE

Probability of UXO Encounter



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8972	2	CC	LG	18 May 2021	Contains Ordnance Survey data © Crown copyright and database right 2017	Produced by and Copyright to 6 Alpha Associates Ltd. Users noting any errors please notify 6 Alpha.

zeticaUXO

Pre-Desk Study Assessment

Site:	Monk Fryston Substation, North Yorkshire
Client:	Mott MacDonald
Contact:	Louise Gelder
Date:	23rd April 2021
Pre-WWI Military Activity on or Affecting the Site	None identified.
WWI Military Activity on or Affecting the Site	None identified.
WWI Strategic Targets (within 5km of Site)	The following strategic targets were located in the vicinity of the Site: ■ Transport infrastructure and public utilities. ■ Royal Flying Corps (RFC) Sherburn-in-Elmet.
WWI Bombing	None identified on the Site.
Interwar Military Activity on or Affecting the Site	None identified.
WWII Military Activity on or Affecting the Site	None identified.
WWII Strategic Targets (within 5km of Site)	The following strategic targets were located in the vicinity of the Site: ■ Transport infrastructure and public utilities. ■ Royal Air Force (RAF) Sherburn-in-Elmet. ■ Anti-Aircraft (AA) and anti-invasion defences.
WWII Bombing Decoys (within 5km of Site)	None.
WWII Bombing	During WWII the Site was located in the Rural District (RD) of Osgoldcross, which officially recorded 25No. High Explosive (HE) bombs with a bombing density of 0.7 bombs per 405 hectares (ha). No readily available records have been found to indicate that the Site was bombed.
Post-WWII Military Activity on or Affecting the Site	None identified.
Recommendation	A detailed desk study, whilst always prudent, is not considered essential in this instance.

This summary is based on a cursory review of readily available records. Caution is advised if you plan to action work based on this summary.

It should be noted that where a potentially significant source of UXO hazard has been identified on the Site, the requirement for a detailed desk study and risk assessment has been confirmed and no further research will be undertaken at this stage. It is possible that further in-depth research as part of a detailed UXO desk study and risk assessment may identify other potential sources of UXO hazard on the Site.

UNEXPLODED BOMB RISK MAP

zeticaUXO

SITE LOCATION

Map Centre: 448539,429075

LEGEND

High: Areas indicated as having a bombing density of 50 bombs per 1000acre or higher.

Moderate: Areas indicated as having a bombing density of 15 to 49 bombs per 1000acre.

Low: Areas indicated as having 15 bombs per 1000acre or less.

miltary	industry	UXO find
transport	dock	Luftwaffe targets
utilities	Bombing decoy	other

How to use your Unexploded Bomb (UXB) risk map?

The map indicates the potential for Unexploded Bombs (UXB) to be present as a result of World War Two (WWII) bombing.

You can incorporate the map into your preliminary risk assessment* for potential Unexploded Ordnance (UXO) for a site. Using this map, you can make an informed decision as to whether more in-depth detailed risk assessment* is necessary.

What do I do if my site is in a moderate or high risk area?

Generally, we recommend that a detailed UXO desk study and risk assessment is undertaken for sites in a moderate or high UXB risk area.

Similarly, if your site is near to a designated Luftwaffe target or bombing decoy then additional detailed research is recommended.

More often than not, this further detailed research will conclude that the potential for a significant UXO hazard to be present on your site is actually low.

Never plan site work or undertake a risk assessment using these maps alone. More detail is required, particularly where there may be a source of UXO from other military operations which are not reflected on these maps.

If my site is in a low risk area, do I need to do anything?

If both the map and other research confirms that there is a low potential for UXO to be present on your site then, subject to your own comfort and risk tolerance, works can proceed with no special precautions.

A low risk really means that there is no greater probability of encountering UXO than anywhere else in the UK.

If you are unsure whether other sources of UXO may be present, you can ask for one of our **pre-desk study assessments (PDSA)**

If I have any questions, who do I contact?

tel: [redacted]

emai[redacted]

web:[redacted]

The information in this UXB risk map is derived from a number of sources and should be used in conjunction with the accompanying notes on our website:

[redacted]

Zetica cannot guarantee the accuracy or completeness of the information or data used and cannot accept any liability for any use of the maps. These maps can be used as part of a technical report or similar publication, subject to acknowledgment. The copyright remains with Zetica Ltd.

It is important to note that this map is not a UXO risk assessment and should not be reported as such when reproduced.

*Preliminary and detailed UXO risk assessments are advocated as good practice by industry guidance such as CIRIA C681 'Unexploded Ordnance (UXO), a guide for the construction industry'.

LSTC

GROUP

Document Control Sheet

Project: Yorkshire Green Energy Enablement Project

Client: National Grid

Document Title: Geotechnical Desk Study- New Towers

LSTC Reference: 20_210116_48

LSTC Office: Yorkshire House, York Road, Little Driffield, East Yorkshire, YO25 5XA

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Date:	22/07/2021		
Revision:	A		
Description:			

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Signature:			
Date:			
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Description:			

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Table of Contents

Executive Summary

National Grid (NG) are proposing to build approximately 7km of new overhead lines, new underground cables and two substations to link up the existing 2TW/YR route and XCP route to reinforce the system to increase the capacity of the network in the area. Thirty-three new towers are proposed, and thirteen temporary structures will be required.

This desk study reviews the potential ground strata profile at each proposed tower location, land use, potential ground contamination, hydrology, flood risk, mining and quarrying records, natural geological hazards and available as-built records to predict the potential foundation requirements and makes recommendations for intrusive ground investigation.

A quantified risk assessment (QRA) has been included. The report adopts a colour code (“traffic light”) system to highlight potential hazards and a score rating to assess risk to the foundation type that will be required from geotechnical parameters. The risk “scores” are added to provide a total geotechnical risk rating for each tower to assist in selecting towers for further investigation.

The superficial geology identified from the desk study comprises till, sand, alluvial and glaciolacustrine deposits. Three locations have no superficial geology recorded.

For the information collated piled foundations would be predicted at five proposed tower locations, ground bearing pad and column type foundations (potentially non-standard) at thirteen locations, with the remaining fifteen having potential for either type.

For the temporary structures, ground bearing type foundations would be envisaged at eleven locations. The remaining two may require some form of ground improvement or piling.

A ground investigation borehole would be required at each location to accurately determine the foundation type. To achieve a better indication of foundation types and depths it would seem sensible to target a selection of tower locations along the proposed routes.

1 Introduction

The Yorkshire Green Energy Enablement (Yorkshire GREEN) Project is a proposal by National Grid Electricity Transmission to upgrade and reinforce the high voltage power network, so that more low-carbon energy gets to homes and businesses in Yorkshire and further afield.

National Grid (NG) are proposing to build approximately 7km of new overhead lines, new underground cables and two substations to link up the existing 2TW/YR route and XCP route to reinforce the system to increase the capacity of the network in the area.

The existing 400kV 2TW/YR route will form a new double tee-off connection southbound to the proposed Overton substation. The existing 275kV XCP route is to be part-dismantled with two new double circuit connections into the Overton substation. Another double tee-off is proposed at XC481 in the Tadcaster area.

The entire XC route OHL is subject to reconductoring with Leipzig conductor, tower studies are underway with various proposed replacement towers and large-scale potential strengthening works.

LS Transmission Consultancy (LSTC) has at the request of National Grid, prepared a geotechnical desk study reviewing the potential ground strata profile at each proposed tower location, proposed land use, potential ground contamination, hydrology and hydrogeology, flood risk, mining and quarrying records natural geological hazards and as built records of adjacent towers where available to predict probable foundation types and make recommendations for ground investigation.

A quantified risk assessment (QRA) has been compiled and can be found in Appendix A. The assessment adopts a colour code (“traffic light”) system to highlight potential hazards associated with the route refurbishment. The hazard identifiers are as follows:

- Very Low/Low risk; identified with green colouring.
- Medium/Moderate risk; identified with amber colouring.
- High risk; identified with red colouring.

Associated with the colour coding system is a geotechnical risk rating to rate each tower location according to the potential risks to the foundation capacity and condition. This rating is applied only to specific geotechnical parameters. The scores applied for each level of risk are:

- Very Low risk; score 0

- Low risk; score 1
- Medium/Moderate risk; score 2
- High risk; score 3

These risk ratings are totalled for each tower location to provide an overall geotechnical risk rating to help identify towers recommended for further investigation, with a total potential score of 54.

The opinions expressed and the recommendations and conclusions made in this report are based upon the expected ground conditions revealed by the desk study. LSTC can accept no responsibility for conditions that fall beyond the scope of reference.

2 Document Review

The desk study was based upon the following documents:

- Groundsure Environmental and Geological data covering all routes
- Google Earth file QRA - NEW & EXISTING ALIGNMENTS.kmz
- XC, XCP, XD, 4YS, YR, 2TW Route tower schedules
- Balfour Beatty Foundation Assessment Report Towers Towers XC428 to XCP26 reference BK/PTD/6456/009 dated 02/08/16

Additionally, the following data was acquired from Groundsure:

- **GSIP-2021-10915-5229_GDB.gdb**This information is based upon the British Geological Survey (BGS) 1:50 000 Digital Geological Map of Britain. It contains location information pertinent to; historical borehole and trial pit records and logs, superficial and bedrock geology, historical and current surface ground workings, historical and current mining, extraction and quarrying and natural landslip and ground subsidence.
- **GSIP-2021-10915-5230_GDB.gdb**This information is compiled from submissions provided by various agencies involved with environmental and historical/archeological protection of significant sites as well as agencies tasked with identifying and monitoring areas prone to affects of the natural environment. It contains location information pertinent to; current land usage, designated environmentally sensitive areas, groundwater and flood zones, historical land use and potential locations of made ground, hydrology and hydrogeology and sundry natural geological hazards.

Other sources consulted include the BGS online Digital Geological Map of Britain and aerial photography on the Google Earth application.

2.1 Tower Types

Tower and foundation types have been included in the desk study summary sheets (included as Appendix A).

SP Route

- 4 proposed towers

XC Route

- 19. proposed towers
- 9 temporary structures

XD Route

- 1 proposed tower
- 2 temporary structures

YR Route

- 1. proposed tower
- 2 temporary structures

YN Route

- 8 proposed towers

2.2 Land Use and Hydrology

A site walkover was undertaken in phase 4.2 of works covering the existing XCP, XC, XD routes in addition to Monk Fryston line entries. Land usage, crossings and critical crossings such as watercourses, surface hydrology, roads and dwellings have been interpreted from the findings through the walkover in addition to watercourse information included in Envirosight information from Groundsure. New build locations use findings from Google Earth. Route plan maps are included in Appendix B.

To be read in conjunction with existing tower report 20_210116_05.

XC / XCP / XD / SP

The XCP route from tower XCP001 to XCP014 are to be dismantled and replaced with new towers in proximity to the existing. The new towers traverse similar route, heading eastbound from proposed tower XC429 then deviating north at proposed tower XC422 towards Overton substation. For the critical crossings, the River Ouse has a proposed crossing at new tower XC421 and the east coast main line at new tower XC417. The river has been allocated an amber rating (geotechnical score = 2) due to its proximity to tower XC421 and the potential effect on the local groundwater level.

Existing tower SP007 and proposed towers SP006, SP005 & SP004 are in close proximity to Herns Gutter.

At towers XC481, the line tees off towards Knaresborough. XD001T & XD002 are included in the study, these are both located in arable fields. This is the same for proposed tower XD001.

At the end of the XC route, towers XC522T to XC525T are to be dismantled and replaced with towers on a similar route through arable farmland before terminating at Monk Fryston substation, therefore with similar land use.

YR - YN

The land use around the YR tee off position and along the new build YN tower positions is mostly arable / pastoral fields. This has been identified from Google Earth. Small inland rivers have been identified adjacent to YR001 and YR038.
Herns gutter runs closely adjacent to towers YN005 and YN006.

Local water features can be indicative of a high water table or create a local high water table. Where these features have been identified in the vicinity of towers a geotechnical risk rating of 2 has been applied.

2.3 Historical Land Use

Historical mapping from the Groundsure Envirosight information acquired by LSTC is used in the following findings.

SP

A pit has been identified dating back from 1982, within 20m of proposed tower position SP006.

XC

The XC route has identified a railway building from 1892 constructed 250m from proposed tower position XC416. A backfilled former quarry from 1850 has been identified under the proposed HDD route at Tadcaster CSEC.
XC522 shows evidence of a pollution incident in 2005. Records indicate that this involved the incorrect management of biodegradable waste.

XD

A disused quarry from 1957 has been identified within 30m of proposed tower position XD001, in addition to cuttings 50m from the tower, dating back to 1991.

2.4 Unexploded Ordnance (UXO)

The Zetica risk maps were assessed along all routes to identify the risk of encountering unexploded bombs.

XC

All new build proposals are classified as low risk.

All remaining routes were classified as low risk with no proximity to any constraints found on the risk maps.

2.5 Hydrogeology

XC

The Groundsure EnviroInsight information acquired by LSTC, identifies the superficial hydrogeology for proposed tower XC429 is underlain by an unproductive aquifer, where rock layers have low permeability and negligible significance to water supple or river base flow. Proposed tower position XC421 has identified Secondary A superficial aquifers.

The remaining proposed towers are underlain by secondary (undifferentiated) or no superficial hydrogeology recorded.

All proposed towers are underlain by principal bedrock aquifer.

SP

The entire SP route is underlain by unproductive aquifers and principal bedrock aquifer.

XD

The XD route towers being studied show no records of hydrogeological superficial data and are all underlain by principal bedrock aquifer.

YR - YN

The Groundsure EnviroInsight information acquired by LSTC, identifies the superficial hydrogeology for towers YN002 and YN004 is a secondary A aquifer. This is permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.

The remaining YR and YN towers are underlain by an unproductive superficial aquifer, where rock layers have low permeability and negligible significance to water supple or river base flow.

All YR and YN tower locations are underlain by a principal bedrock aquifer, it usually provides a high level of water storage and may support water supply/river base flow on a strategic scale.

2.6 Designated environmentally sensitive sites

SP

No new build proposals are identified near environmentally sensitive sites.

XC

Ancient woodlands have been identified near proposed towers XC427, XC420 and XC421.

XD

There are no environmentally sensitive sites within 500m of the route.

YR – YN

Deciduous woodland is identified in proximity to tower locations YR038, YR039, and 2TW168 – allocated an amber/medium hazard rating.

All of the above findings have been allocated an amber/medium hazard rating.

2.7 Designated historically sensitive sites

For historically sensitive sites (listed buildings, etc.) a 300m swathe around the OHL was examined and sites within the swathe were recorded.

XC

No new build proposals are identified near historically sensitive sites.

XD

A 'Milestone' listed building was identified 150m from tower XD002.

YR – YN

There are no historically sensitive sites within 500m of the route.

2.8 Contaminated Land – Environmental Protection Act 1990 [1]

Data included as part of the Groundsure EnviroInsight package indicates that there are no areas of designated contaminated land on any of the sites.

2.9 Flooding

SP

Proposed towers SP006, 5 & 4 lay within flood zone 3.

XC

The start of the route lays between flood zone 2 and 3 at XC429

XD

No flood risk has been identified near the site**.**

YR – YN

The proposed tower positions for YN004 and YN007 have been identified as within flood zone 2. A historic flood (2015) has also been identified at the proposed location of YN008.

All the above have been assigned a medium/amber risk rating (geotechnical risk rating = 2).

2.10 Drift geology

Information for the superficial geology has been extracted from the Groundsure Geoinsight information acquired by LSTC and has been cross-checked against the BGS online Digital Geological Map of Britain.

SP

The site is underlain by Alne Glaciolacustrine Formation. This contains clay and silt.

XC

Tower XC429 is underlain by clay & silt (Alne Glaciolacustrine Formation).

The remaining towers are identified as Harrogate Till formation

XD

No superficial geology is recorded for this route.

YN

Tower locations YN002 and YN004 are underlain with Sand (Sutton Sand Formation). The remaining towers are all underlain by Clay & Silt.

Till (diamicton), which comprises clays, silts, sands, gravel, pebbles and boulders is predominantly cohesive and generally provides soil properties suitable for standard foundations. A low/green risk rating has been adopted, however there is some potential for water bearing and weaker bands and therefore a geotechnical risk rating of 1 has been adopted.

Alluvium and tidal flat deposits comprise a mixture of clays, silts, sands and gravels. The clays and silts (the cohesive elements) found in alluvium can be soft and weak when compared to other superficial geology classifications. The granular components increase the likelihood of encountering groundwater. Each tower location with this drift geology classification has been awarded a medium/amber risk rating and a geotechnical risk rating of 2, reflecting the potential for weak or buoyant conditions being encountered. These locations could potentially require a larger or special foundation.

Sands and gravels generally have good ground bearing properties but are susceptible to groundwater effects Each tower location with this drift geology classification has been awarded a medium/amber risk rating and a geotechnical risk rating of 2. These locations could potentially require a larger or special foundation.

Where no superficial deposits are recorded weathering of underlying strata may have resulted in a stoney cohesive subsoil and a low risk rating and a geotechnical risk rating of 0 has been allocated.

2.11 Solid geology

Information for the bedrock geology has been extracted from the Groundsure Report information acquired by LSTC and has been cross-checked against the BGS online Digital Geological Map of Britain.

There are four distinct bedrock types identified throughout the OHL routes: sandstone, mudstone, dolostone & limestone. All four bedrocks share good ground bearing properties and with mining/quarrying assessed elsewhere a very low/green risk rating has been awarded (geotechnical risk rating = 0).

SP

All tower locations along these routes are underlain by the Sherwood Sandstone Group.

XC

Tower XC429 is underlain by the Sherwood Sandstone group.

The remainder of the proposed development is a mixture of Dolostone, Limestone and Mudstone.

YR – YN

All tower locations along these routes are underlain by the Sherwood Sandstone Group.

2.12 Artificial ground

SP

No artificial ground was encountered anywhere along the route.

XC

Worked / made ground was not encountered anywhere along the new build proposals

YR – YN

No artificial ground was encountered anywhere along the routes.

4YA

No artificial ground was encountered anywhere along the route.

Artificial ground can adversely affect foundations through potential ground contamination or reduced strength.

2.13 Mining and quarrying

Historical surface and underground working features have been identified from Groundsure's historical land use database which includes data derived from 1:10,000 and 1:10,560 historical Ordnance Survey mapping.

SP

There is no evidence of underground working, surface working, coal mining or brine extraction at any of the tower locations.

XC

Proposed towers XC522 to XC525 have been identified as being situated on mineable coal.

XD

There is no evidence of underground working, surface working, coal mining or brine extraction at any of the tower locations.

YR – YN

There is no evidence of underground working, surface working, coal mining or brine extraction at any of the tower locations.

2.14 Natural hazards

Risks of encountering shrink/swell clay, landslide, ground dissolution of soluble rocks, compressible deposits and running sand are obtained from the Groundsure Geonsight data and verified using online BGS records.

SP

For the full route, compressible deposits are classified as moderate hazard rating. Shrink/swell clay, running sands, collapsible deposits, landslides and dissolution of soluble rocks are classified as negligible, very low or low for the entire route.

XC

For tower XC429, compressible deposits are classified as moderate hazard rating. Shrink/swell clay, running sands, collapsible deposits, landslides and dissolution of soluble rocks are classified as negligible, very low or low for the entire route.

XD

For all studied towers on this route, Compressible deposits, Shrink/swell clay, running sands, collapsible deposits, landslides and dissolution of soluble rocks are classified as negligible, very low or low.

YR – YN

For most of the route, compressible deposits are classified as moderate hazard rating. Shrink/swell clay, running sands, collapsible deposits, landslides and dissolution of soluble rocks are classified as negligible, very low or low.

These natural hazards have been graded in a standard manner – with moderate risk representing an amber risk rating (geotechnical risk rating = 2) and high-risk sites given a red rating (geotechnical risk rating = 3).

2.15 Historical borehole logs

Historical borehole logs have been extracted from the Groundsure data and Balfour Beatty Report, and compared with the data obtained from the geological maps. The closest boreholes, up to a maximum of 50m from the tower have been listed.

XC424 – SE 55 NW/47, BB Report BK/PTD/6456/009

XC522 – SE 42 NE/246

YN005 – SE 55 NE/62

YN006 – SE 55 NE/90

YN008 – SE 55 NE/77

The results of borehole logs have not been included in the geotechnical risk score. Borehole logs in the vicinity provide very basic generic descriptions of the geology as found. The logs are presented in Appendix C.

2.16 Soil classification and Concrete Design Strength

National Grid Technical Specification (NGTS) 3.4.15 "Overhead line support foundations" [1] schedules geotechnical design parameters for foundation design in Appendix A of the document. The columns have been allocated a soil type as shown in Tables A1 and A2 below for the purposes of this report analysis. Types 1A and 1C would be considered as "standard" conditions. Types 2A and 2C would be considered as non standard requiring larger than generic or special foundations

Type 3 soil would be either non cohesive, N<10, or cohesive, C<35kN/m^2 and not normally suited for concrete ground bearing/pyramid type foundations.

Table 2.16.1 Design parameters for non-cohesive soils (NG TS 3.4.15)

Parameter		Value of Standard Penetration Test for Non –cohesive materials(N)				
		N<10	10<N<20		N>20	
		TYPE 3	**TYPE 2A**	**TYPE 2B**	**TYPE 1A**	**TYPE 1B**
			Above water table	Submerged	Above water table	Submerged
Bulk density (Mg/m^3)	Soil	N/A	1.8	1.0	1.9	1.0
	Backfill	N/A	1.6	0.9	1.6	0.9
Max design ground bearing pressure under ultimate applied loading (kN/m^2)		N/A	150	75	345	170
Frustum angle (degrees)		N/A	15	15	25(3)	25(3)
Design passive pressure on chimney under ultimate applied load (kN/m^2)		N/A	240	120	240	120

Table 2.16.2 Design parameters for cohesive soils (NG TS 3.4.15)

Parameter	Value of undrained shear strength for cohesive materials (kN/m^2)		
	C<35	35<C<49	C>50
	TYPE 3	**TYPE 2C**	**TYPE 1C**

Bulk density (Mg/m^3)	Soil	N/A	1.7	1.9
	Backfill	N/A	1.6	1.6
Max design ground bearing pressure under ultimate applied loading (kN/m^2)		N/A	200	345
Frustum angle (degrees)		N/A	15	25(3)
Design passive pressure on chimney under ultimate applied load (kN/m^2)		N/A	120	240

3 Summary and Conclusions

3.1 Potential Foundation Types

The superficial geology identified from the desk study comprises till, sand, alluvial and glaciolacustrine deposits. Three locations have no superficial geology recorded.

Ground bearing type pad and column foundations (possibly non-standard) would be envisaged at thirteen locations, and piled foundations would be envisaged at five locations. At the remaining fifteen locations non-standard pad and column or piled foundations would be envisaged.

At the proposed temporary structure locations good ground bearing properties would be envisaged at eleven locations. Two locations identified weak ground with adjacent as built towers having piled foundations, and some ground strengthening or piled foundations would be envisaged.

3.2 **Ground Investigation**

A ground investigation borehole would be required at each location to accurately determine the foundation type. To achieve a better indication of foundation types and depths it would seem sensible to target a selection of tower locations along the proposed routes. Requirements for ground investigation at tower locations are presented in Appendix D.

4 References

[1] National Grid Technical Specification (NGTS) 3.4.15 Overhead line support foundations Issue 4 (February 2018).

[2] Electricity Supply Industry Standard ESI 43-4 Design of foundations for steel towers for overhead transmission lines at 132kV and higher voltages. Issue 1 (November 1972).

[3] National Grid Technical Specification (NGTS) 2.04 Generic design principles for reutilisation of overhead lines Issue 4 (September 2009).

[4] National Grid Technical Specification (NGTS) 2.04 Generic design principles for reutilisation of overhead lines Issue 5 (August 2017).

Appendix A: Geotechnical Desk Study Summary Sheets

YR - YN Routes, New Build
Desk Study Summary Data

Tower Number	YR038T	YR039T	YR040	YN001	YN002	YN003	YN004	YN005	YN006	YN007	YN008
Tower Type											
Foundation Type	Temporary Mast	Temporary Mast	New Tower	New Tower	New Tower	New Tower	New Tower	New Tower	New Tower	New Tower	New Tower
Drawing ref											
UXO Risk Assessment	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
General Information											
Land Use- potential local contamination	Arable field	Arable field	Arable field	Arable field	Arable field	Arable field	Arable field	Arable field	Arable field	Arable field	Arable field
Crossings (C) / Critical Crossings (CC) Forward Span	Ponds	None	None	None	Road (Corban Lane)	Farm track	None	Farm track	Farm track	A19	None
Hydrogeology Superficial	Unproductive aquifer	Unproductive aquifer	Unproductive aquifer	Unproductive aquifer	Secondary A	Unproductive aquifer	Secondary A	Unproductive aquifer	Unproductive aquifer	Unproductive aquifer	Unproductive aquifer
Hydrogeology Bedrock	Principle aquifer	Principle aquifer	Principle aquifer	Principle aquifer	Principle aquifer	Principle aquifer	Principle aquifer	Principle aquifer	Principle aquifer	Principle aquifer	Principle aquifer
Designated environmentally/historically sensitive sites (300m swathe for historically sensitive sites)	None	None	None	None	None	None	None	None	None	None	None
Historical map review (recent year, proximity)											
Geotechnical Assessment											
Hydrology*	None	None	None	None	None	None	None	Herns Gutter	None	Herns Gutter	None
Flooding*	None	None	None	None	None	None	Flood zone 2	None	None	Flood zone 2	Historic flood (2015)
Artificial ground*	None	None	None	None	None	None	None	None	None	None	None
Geology - drift*	Clay & Silt	Clay & Silt	Clay & Silt	Clay & Silt	Sand (Sutton Sand Formation)	Clay &Silt	Sand (Sutton Sand Formation)	Clay &Silt	Clay &Silt	Clay &Silt	Clay &Silt
Geology - solid*	Sandstone (Sherwood Sandstone Group)	Sandstone (Sherwood Sandstone Group)	Sandstone (Sherwood Sandstone Group)	Sandstone (Sherwood Sandstone Group)	Sandstone (Sherwood Sandstone Group)	Sandstone (Sherwood Sandstone Group)	Sandstone (Sherwood Sandstone Group)	Sandstone (Sherwood Sandstone Group)	Sandstone (Sherwood Sandstone Group)	Sandstone (Sherwood Sandstone Group)	Sandstone (Sherwood Sandstone Group)
Underground mining*	None	None	None	None	None	None	None	None	None	None	None
Historical surface working*	None	None	None	None	None	None	Pond (200m)	None	None	None	None
Historical underground working*	None	None	None	None	None	None	None	None	None	None	None
Current ground working*	None	None	None	None	None	None	None	None	None	None	None
Mining, extractions and natural cavities*	None	None	None	None	None	None	None	None	None	None	None
Mine Waste*	None	None	None	None	None	None	None	None	None	None	None
Brit Pits	None	None	None	None	None	None	None	None	None	None	None
Natural Hazards (risk):-											
Shrink/swell clay*	Low	Low	Low	Low	Negligable	Low	Negligable	Low	Low	Low	Low
Landslide*	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
Ground dissolution of soluble rocks*	Negligable	Negligable	Negligable	Negligable	Negligable	Negligable	Negligable	Negligable	Negligable	Negligable	Negligable
Compressible deposits*	Moderate	Moderate	Moderate	Moderate	Negligable	Moderate	Negligable	Moderate	Moderate	Moderate	Moderate
Collapsible deposits*	Very low	Very low	Very low	Very low	Negligable	Very low	Negligable	Very low	Very low	Very low	Very low
Running sand*	Negligable	Negligable	Negligable	Negligable	Low	Negligable	Low	Negligable	Negligable	Negligable	Negligable
Geotechnical risk rating ∑*/54	**4**	**4**	**4**	**4**	**2**	**4**	**4**	**6**	**4**	**8**	**6**
Historical borehole logs (Logs accessible via BGS Portal appear in **BOLD**)								**SE 55 NE/62**	**SE 55 NE/90**		**SE 55 NE/77**
Soil classification	2A/B/C	2A/B/C	2A/B/C	2A/B/C	1A/B, 2A/B	2A/B/C	1A/B, 2A/B	2A/B/C	2A/B/C	2A/B/C	2A/B/C
Nearest available as built	2TW169 Piled	2TW169 Piled	2TW169 Piled	2TW169 Piled	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Potential foundation type	Piled?	Piled?	Piled	Pile/Pad&col	Pile/Pad&col	Pile/Pad&col	Pile/Pad&col	Pile/Pad&col	Pile/Pad&col	Pile/Pad&col	Pile/Pad&col
Legend	**Potential Hazards**		Very Low Low Medium High	***Geotechnical risk rating**	0 1 2 3	Very Low Low Medium High	**QRA Result** (max 54)		5/54, 6/54 >6/54		**Temp mast**

XCP Route-New Build
Desk Study Summary Data

Tower Number	XC428	XC427	XC426	XC425	XC424	XC423	XCP004T	XCP005T	XCP006AT	XC422	XC421	XC420
Tower Type												
Foundation Type	New Tower	New Tower	New Tower	New Tower	New Tower	New Tower	Temporary Mast	Temporary Mast	Temporary Mast	New Tower	New Tower	New Tower
Drawing ref												
UXO Risk Assessment	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
General Information												
Land Use- potential local contamination	Arable	Arable	Pastoral	Arable	Rough Ground	Arable	Arable	Rough Ground	Arable	Arable	Arable	Arable
Crossings (C) / Critical Crossings (CC) Forward Span		Road (Hall Lane)		Small watercourse			Small watercourse					
Hydrogeology Superficial	Unproductive aquifer	Unproductive aquifer	Unproductive aquifer	Unproductive aquifer	Secondary A	Unproductive aquifer	Unproductive aquifer	Secondary A	Unproductive aquifer	Unproductive aquifer	Secondary A	Unproductive aquifer
Hydrogeology Bedrock	Principle aquifer	Principle aquifer	Principle aquifer	Principle aquifer	Principle aquifer	Principle aquifer	Principle aquifer	Principle aquifer	Principle aquifer	Principle aquifer	Principle aquifer	Principle aquifer
Designated environmentally/historically sensitive sites (300m swathe for historically sensitive sites)		Redhouse Wood (Ancient Woodland)										Overton Wood (Ancient Woodland)
Historical map review (recent year, proximity)												
Geotechnical Assessment												
Hydrology*					The Foss			The Foss			River Ouse	
Flooding*		Flood Zone 2	Flood Zone 2		Flood Zone 3	Flood Zone 2		Flood Zone 3	Flood Zone 2		Flood Zone 3	
Artificial ground*												
Geology - drift*	Clay & Silt (Alne Glaciolacustrine Formation)	Clay & Silt (Alne Glaciolacustrine Formation)	Clay & Silt (Alne Glaciolacustrine Formation)	Clay & Silt (Alne Glaciolacustrine Formation)	Clay & Silt (Alne Glaciolacustrine Formation)	Clay & Silt (Alne Glaciolacustrine Formation)	Clay & Silt (Alne Glaciolacustrine Formation)	Clay & Silt (Alne Glaciolacustrine Formation)	Clay & Silt (Alne Glaciolacustrine Formation)	Clay & Silt (Alne Glaciolacustrine Formation)	Clay, Silt, Sand & Gravel (Alluvium)	Clay & Silt (Alne Glaciolacustrine Formation)
Geology - solid*	Sandstone (Sherwood Sandstone Group)	Sandstone (Sherwood Sandstone Group)	Sandstone (Sherwood Sandstone Group)	Sandstone (Sherwood Sandstone Group)	Sandstone (Sherwood Sandstone Group)	Sandstone (Sherwood Sandstone Group)	Sandstone (Sherwood Sandstone Group)	Sandstone (Sherwood Sandstone Group)	Sandstone (Sherwood Sandstone Group)	Sandstone (Sherwood Sandstone Group)	Sandstone (Sherwood Sandstone Group)	Sandstone (Sherwood Sandstone Group)
Underground mining*												
Historical surface working*				Pond (100m)			Pond (100m)					
Historical underground working*												
Current ground working*												Slurry bed
Mining, extractions and natural cavities*												
Mine Waste*												
Brit Pits												
Natural Hazards (risk):-												
Shrink/swell clay*	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Very low	Low
Landslide*	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
Ground dissolution of soluble rocks*	Negligable	Negligable	Negligable	Negligable	Negligable	Negligable	Negligable	Negligable	Negligable	Negligable	Negligable	Negligable
Compressible deposits*	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
Collapsible deposits*	Negligable	Negligable	Negligable	Negligable	Negligable	Negligable	Negligable	Negligable	Negligable	Negligable	Very low	Negligable
Running sand*	Negligable	Negligable	Negligable	Negligable	Negligable	Negligable	Negligable	Negligable	Negligable	Negligable	Low	Negligable
Geotechnical risk rating ∑*/54	**4**	**6**	**6**	**5**	**8**	**6**	**5**	**8**	**6**	**4**	**6**	**6**
Historical borehole logs (Logs accessible via BGS Portal appear in **BOLD**)					**SE 55 NW/47** BB Report Groundwater @ 3.2m			**SE 55 NW/47** BB Report Groundwater @ 3.2m			BB Report Groundwater@ 3.8m	BB Report Groundwater@ 3.8m
Soil classification	2A/B/C	2A/B/C	2A/B/C	2A/B/C	2A/B/C	2A/B/C	2A/B/C	2A/B/C	2A/B/C	2A/B/C	2A/B/C	2A/B/C
Nearest available as built	XCP001 Pyramid	XCP001 Pyramid	XCP001 Pyramid	XCP001 Pyramid	XCP001 Pyramid	XCP001 Pyramid	XCP001 Pyramid	XCP001 Pyramid	XCP001 Pyramid	XCP7 and 8 pyramid	XCP7 Pyramid	
Potential foundation type	Pad&col	Pad&col	Pad&col	Pad&col	Pad&col	Pad&col	Ground bearing pos pile	Ground bearing pos pile	Ground bearing pos pile	Padcol/pile	Pile/pad&col	Pile/pad&col
Legend	**Potential Hazards**		Very Low Low Medium High	***Geotechnical risk rating**	0 1 2 3	Very Low Low Medium High	**QRA**	5/54, 6/54 >6/54		***Geotechnical risk rating**	**Temp mast**	

XCP Route-New Build
Desk Study Summary Data

Tower Number	XC419	XC418	XC417	XC416	XCP006BT	XCP006CT	XCP007AT	SP006	SP005	SP004	SP003
Tower Type											
Foundation Type	New Tower	New Tower	New Tower	New Tower	Temporary Mast	Temporary Mast	Temporary Mast	New Tower	New Tower	New Tower	New Tower
Drawing ref											
UXO Risk Assessment	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
General Information											
Land Use- potential local contamination	Arable	Arable	Arable	Arable	Arable	Arable	Arable	Arable	Arable	Arable	Arable
Crossings (C) / Critical Crossings (CC) Forward Span											
Hydrogeology Superficial	Unproductive aquifer	Unproductive aquifer	Unproductive aquifer	Unproductive aquifer	Unproductive aquifer	Unproductive aquifer	Unproductive aquifer	Unproductive aquifer	Unproductive aquifer	Unproductive aquifer	Unproductive aquifer
Hydrogeology Bedrock	Principle aquifer	Principle aquifer	Principle aquifer	Principle aquifer	Principle aquifer	Principle aquifer	Principle aquifer	Principle aquifer	Principle aquifer	Principle aquifer	Principle aquifer
Designated environmentally/historically sensitive sites (300m swathe for historically sensitive sites)	Overton Wood (Ancient Woodland)							Deciduous Woodland			
Historical map review (recent year, proximity)				Railway Building (1892, 250m)				Pit (1982, 20m)			
Geotechnical Assessment											
Hydrology*			Surface Water Drain			The Foss		Herns Gutter	Herns Gutter	Herns Gutter	
Flooding*			Flood Zone 2	Flood Zone 3	Flood Zone 3	Flood Zone 3		Flood Zone 3	Flood Zone 3	Flood Zone 3	
Artificial ground*											
Geology - drift*	Clay & Silt (Alne Glaciolacustrine Formation)	Clay & Silt (Alne Glaciolacustrine Formation)	Clay & Silt (Alne Glaciolacustrine Formation)	Clay & Silt (Alne Glaciolacustrine Formation)	Clay & Silt (Alne Glaciolacustrine Formation)	Clay & Silt (Alne Glaciolacustrine Formation)	Clay & Silt (Alne Glaciolacustrine Formation)	Clay, Silt, Sand & Gravel (Alluvium)	Clay & Silt (Alne Glaciolacustrine Formation)	Clay & Silt (Alne Glaciolacustrine Formation)	Clay & Silt (Alne Glaciolacustrine Formation)
Geology - solid*	Sandstone (Sherwood Sandstone Group)	Sandstone (Sherwood Sandstone Group)	Sandstone (Sherwood Sandstone Group)	Sandstone (Sherwood Sandstone Group)	Sandstone (Sherwood Sandstone Group)	Sandstone (Sherwood Sandstone Group)	Sandstone (Sherwood Sandstone Group)	Sandstone (Sherwood Sandstone Group)	Sandstone (Sherwood Sandstone Group)	Sandstone (Sherwood Sandstone Group)	Sandstone (Sherwood Sandstone Group)
Underground mining*											
Historical surface working*				Pond (150m)				Pit			
Historical underground working*											
Current ground working*	Slurry bed										
Mining, extractions and natural cavities*											
Mine Waste*											
Brit Pits											
Natural Hazards (risk):-											
Shrink/swell clay*	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
Landslide*	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
Ground dissolution of soluble rocks*	Negligable	Negligable	Negligable	Negligable	Negligable	Negligable	Negligable	Negligable	Negligable	Negligable	Negligable
Compressible deposits*	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
Collapsible deposits*	Negligable	Negligable	Negligable	Negligable	Negligable	Negligable	Negligable	Negligable	Negligable	Negligable	Negligable
Running sand*	Negligable	Negligable	Negligable	Negligable	Negligable	Negligable	Negligable	Negligable	Negligable	Negligable	Negligable
Geotechnical risk rating ∑*/54	**6**	**4**	**8**	**7**	**6**	**6**	**4**	**10**	**8**	**8**	**4**
Historical borehole logs (Logs accessible via BGS Portal appear in **BOLD**)	BB Report Groundwater@ 3.8m							Borehole identified. Not Available.	Borehole identified. Not Available.	Borehole identified. Not Available.	
Soil classification	2A/B/C	2A/B/C	2A/B/C	2A/B/C	2A/B/C	2A/B/C	2A/B/C	2A/B/C	2A/B/C	2A/B/C	2A/B/C
Nearest available as built					XCP7 and 8 pyramid	XCP7 and 8 pyramid		XCP14 Piled			
Potential foundation type	Pile/pad&col	Pile/pad&col	Pile/pad&col	Pile/pad&col	Ground bearing	Ground bearing	Ground bearing	**Pile**	**Pile**	**Pile**	**Pile**
Legend		**Potential Hazards**		Very Low	0	Very Low	**QRA**			**Temp mast**	
				Low	1	Low		5/54, 6/54			
				Medium	2	Medium		>6/54			
				High	3	High					

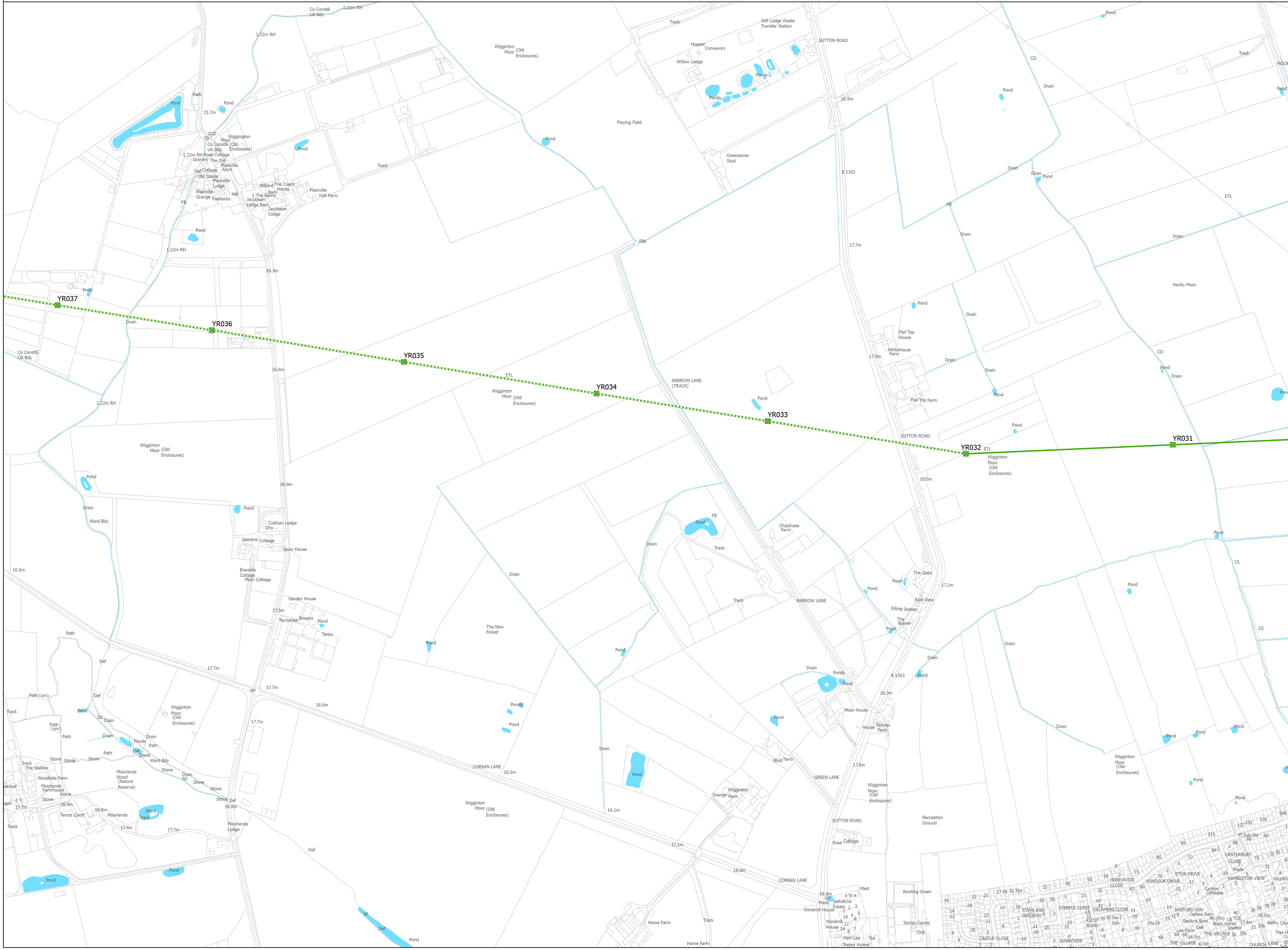
XC Route-New Build
Desk Study Summary Data

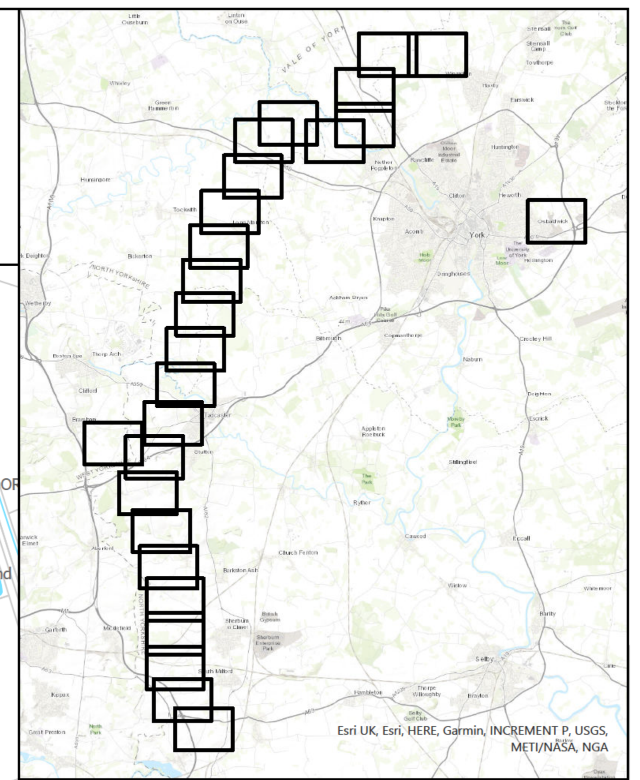
Tower Number	XC429	XC430T	XC522	XC523	XC524	XC525	XC526	XC523T	XC524T	XD001	XC481T	XD002T
Tower Type												
Foundation Type	New Tower	Temporary Mast	New Tower	New Tower	New Tower	New Tower	New Tower	Temporary Mast	Temporary Mast	New Tower	Temporary Mast	Temporary Mast
Drawing ref												
UXO Risk Assessment	Low		Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
General Information												
Land Use- potential local contamination	Pastoral		Rough Ground. Biodegradable pollution spill (2005)	Arable	Arable	Arable	Grass	Arable	Arable	Arable	Arable	Arable
Crossings (C) / Critical Crossings (CC) Forward Span										Road (A659)	Road (A659)	None
Hydrogeology Superficial	Unproductive aquifer		Secondary (undifferentiated)	Secondary (undifferentiated)	Secondary (undifferentiated)	Secondary (undifferentiated)	Secondary (undifferentiated)	Secondary (undifferentiated)	Secondary (undifferentiated)	None	None	None
Hydrogeology Bedrock	Principle aquifer		Principle	Principle	Principle	Principle	Principle	Principle	Principle	Principle	Principle	Principle
Designated environmentally/historically sensitive sites (300m swathe for historically sensitive sites)												
Historical map review (recent year, proximity)										Disused Quarry (1957, 30m) Cuttings (1991, 50m)		
Geotechnical Assessment												
Hydrology*												
Flooding*	Flood Zone 3	Flood Zone 4										
Artificial ground*												
Geology - drift*	Clay & Silt (Alne Glaciolacustrine Formation)	Clay & Silt (Alne Glaciolacustrine Formation)	Clay, Sandy, Gravelly (Harrogate Till Formation)	Clay, Sandy, Gravelly (Harrogate Till Formation)	Clay, Sandy, Gravelly (Harrogate Till Formation)	Clay, Sandy, Gravelly (Harrogate Till Formation)	Clay, Sandy, Gravelly (Harrogate Till Formation)	Clay, Sandy, Gravelly (Harrogate Till Formation)	Clay, Sandy, Gravelly (Harrogate Till Formation)	None	None	None
Geology - solid*	Sandstone (Sherwood Sandstone Group)	Sandstone (Sherwood Sandstone Group)	Limestone (Brotherton Formation)	Limestone (Brotherton Formation)	Limestone (Brotherton Formation)	Limestone (Brotherton Formation)	Limestone (Brotherton Formation)	Limestone (Brotherton Formation)	Limestone (Brotherton Formation)	Limestone (Brotherton Formation)	Limestone (Brotherton Formation)	Limestone (Brotherton Formation)
Underground mining*			Minable Coal	Minable Coal	Minable Coal	Minable Coal	Minable Coal	Minable Coal	Minable Coal			
Historical surface working*										Hill of Comfort Borrow Pit (Dolomite)	Hill of Comfort Borrow Pit (Dolomite)	Hill of Comfort Borrow Pit (Dolomite)
Historical underground working*												
Current ground working*												
Mining, extractions and natural cavities*												
Mine Waste*												
Brit Pits			Limestone							Dolomite		
Natural Hazards (risk):-												
Shrink/swell clay*	Low	Low	Very low	Very low	Very low	Very low	Very low	Very low	Very low	Negligable	Negligable	Negligable
Landslide*	Very low	Very low	Very low	Very low	Very low	Very low	Very low	Very low	Very low	Negligable	Negligable	Negligable
Ground dissolution of soluble rocks*	Negligable	Negligable	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
Compressible deposits*	Moderate	Moderate	Negligable	Negligable	Negligable	Negligable	Negligable	Negligable	Negligable	Negligable	Negligable	Negligable
Collapsible deposits*	Negligable	Negligable	Very low	Very low	Very low	Very low	Very low	Very low	Very low	Low	Low	Low
Running sand*	Negligable	Negligable	Very low	Very low	Very low	Very low	Very low	Very low	Very low	Negligable	Negligable	Negligable
Geotechnical risk rating ∑*/54	**6**	**7**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**4**	**2**	**2**
Historical borehole logs (Logs accessible via BGS Portal appear in **BOLD**)			**SE 42 NE/246**									
Soil classification	2A/B/C		1A/B	1A/B	1A/B	1A/B	1A/B	1A/B	1A/B	1A	1A	1A
Nearest available as built	XC428 Pad&Col	XC428 Pad&Col	4YS28,29,30 C/N	4YS28,29,30 C/N	4YS28,29,30 C/N	4YS28,29,30 C/N	4YS28,29,30 C/N			XD01 Pad&col	XD01 Pad&col	XD01 Pad&col
Potential foundation type	Pad&col	Ground bearing	Pad&col	Pad&col	Pad&col	Pad&col	Pad&col	Ground bearing	Ground bearing	Pad&col	Ground bearing	Ground bearing

Legend	***Geotechnical risk rating**	0	Very Low	**Potential Hazards**	(dark green)	Very Low	**QRA**	(light orange) 5/54, 6/54	(blue) **Temp mast**
		1	Low		(light green)	Low		(dark orange) >6/54	
		2	Medium		(amber)	Medium			
		3	High		(red)	High			

Appendix B: Route Plans

THE NATIONAL GRID (YORKSHIRE GREEN) ORDER
ROUTE MAP - SECTION B





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- EXISTING LATTICE PYLON - TO BE DISMANTLED
- EXISTING GANTRY - TO BE DISMANTLED
- INDICATIVE NEW LATTICE PYLON
- INDICATIVE NEW GANTRY
- INDICATIVE NEW FULL LINE TENSION GANTRY
- INDICATIVE TEMPORARY PYLON OR MAST
- EXISTING OVERHEAD LINE - NOT AFFECTED
- EXISTING OVERHEAD LINE - TO BE MODIFIED
- EXISTING OVERHEAD LINE - TO BE REPLACED
- EXISTING OVERHEAD LINE - TO BE DISMANTLED
- INDICATIVE NEW OVERHEAD LINE
- INDICATIVE NEW UNDERGROUND CABLE
- INDICATIVE TEMPORARY OVERHEAD LINE
- INDICATIVE CABLE SEALING END COMPOUND
- INDICATIVE SUBSTATION BOUNDARY
- SHEET INDEX

Notes

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Coordinate System: British National Grid

Sheet X Centroid Coordinate: 459424 Sheet Y Centroid Coordinate: 458814

0 5 10 20 Kilometers

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Title

THE NATIONAL GRID (YORKSHIRE GREEN) ORDER ROUTE MAP SECTION B

nationalgrid

Application Number

Drawing Reference

REPORT ITEM

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1:2,500	A0	SHEET 2 OF 26	A

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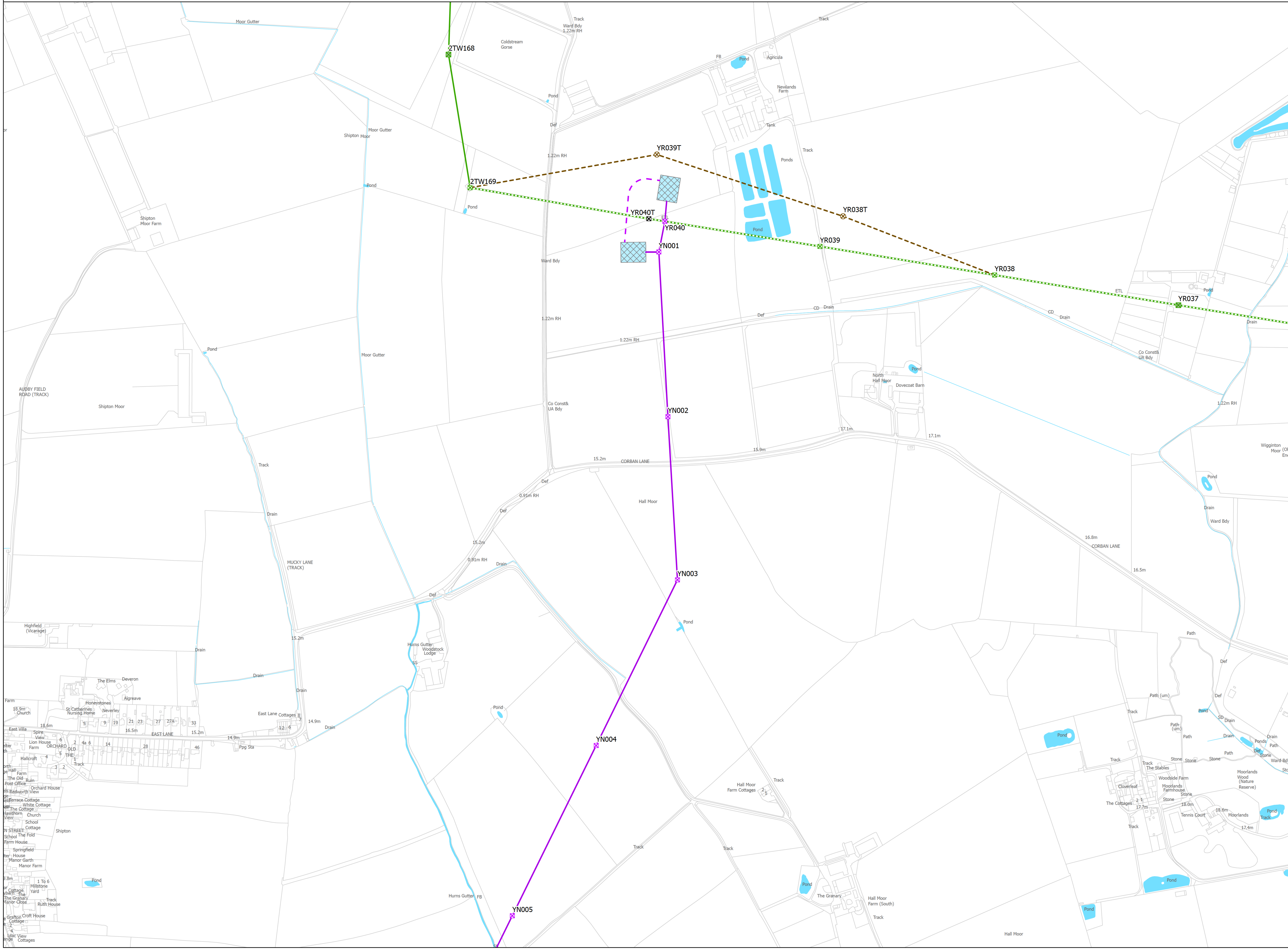
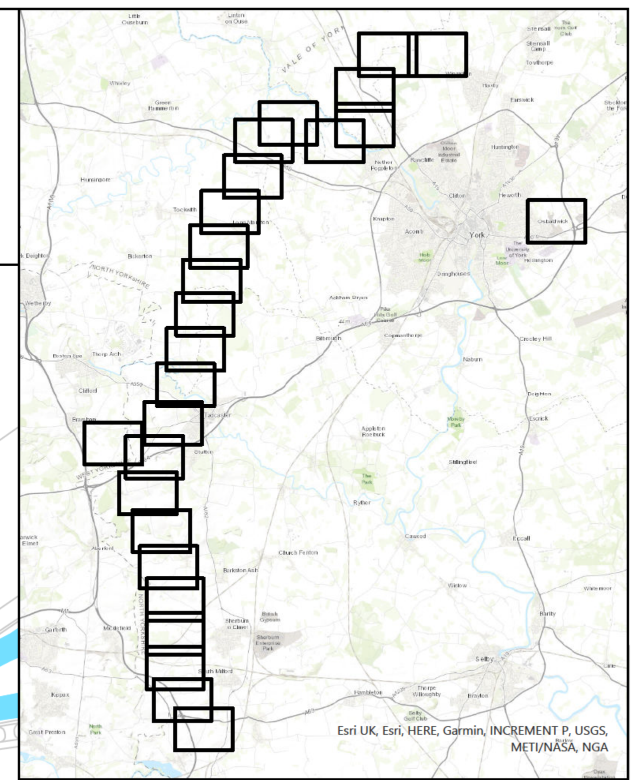
THE NATIONAL GRID (YORKSHIRE GREEN) ORDER
ROUTE MAP - SECTION B





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Notes

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Application Number

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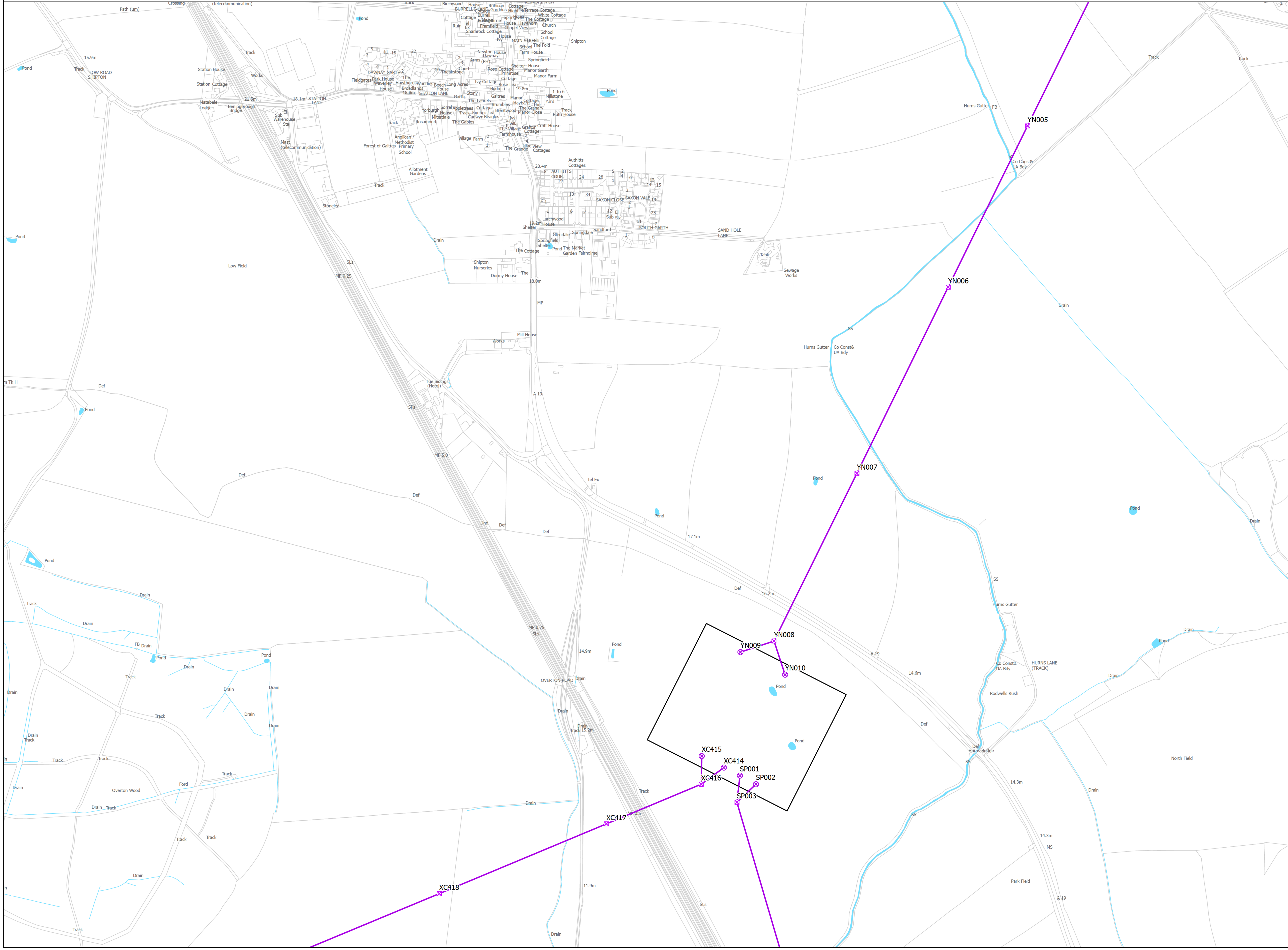
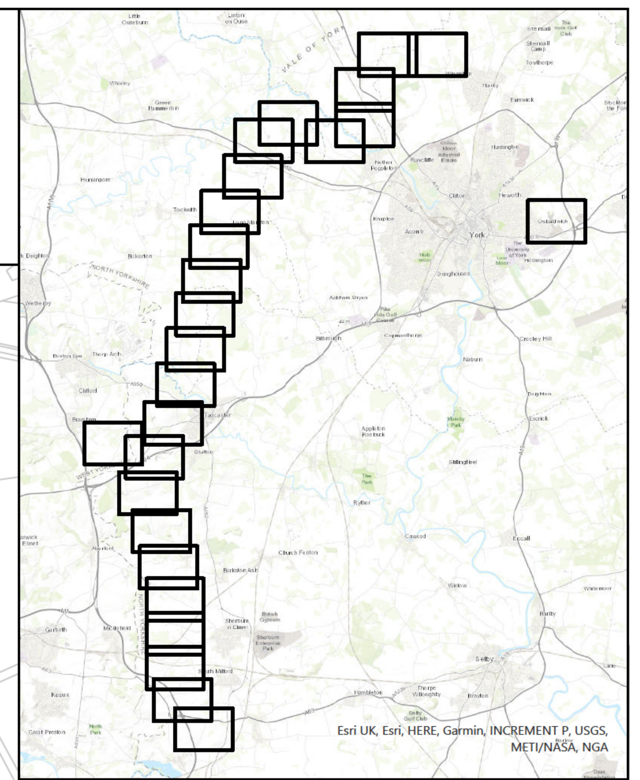
ROUTE MAP - SECTION B





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Coordinate System: British National Grid

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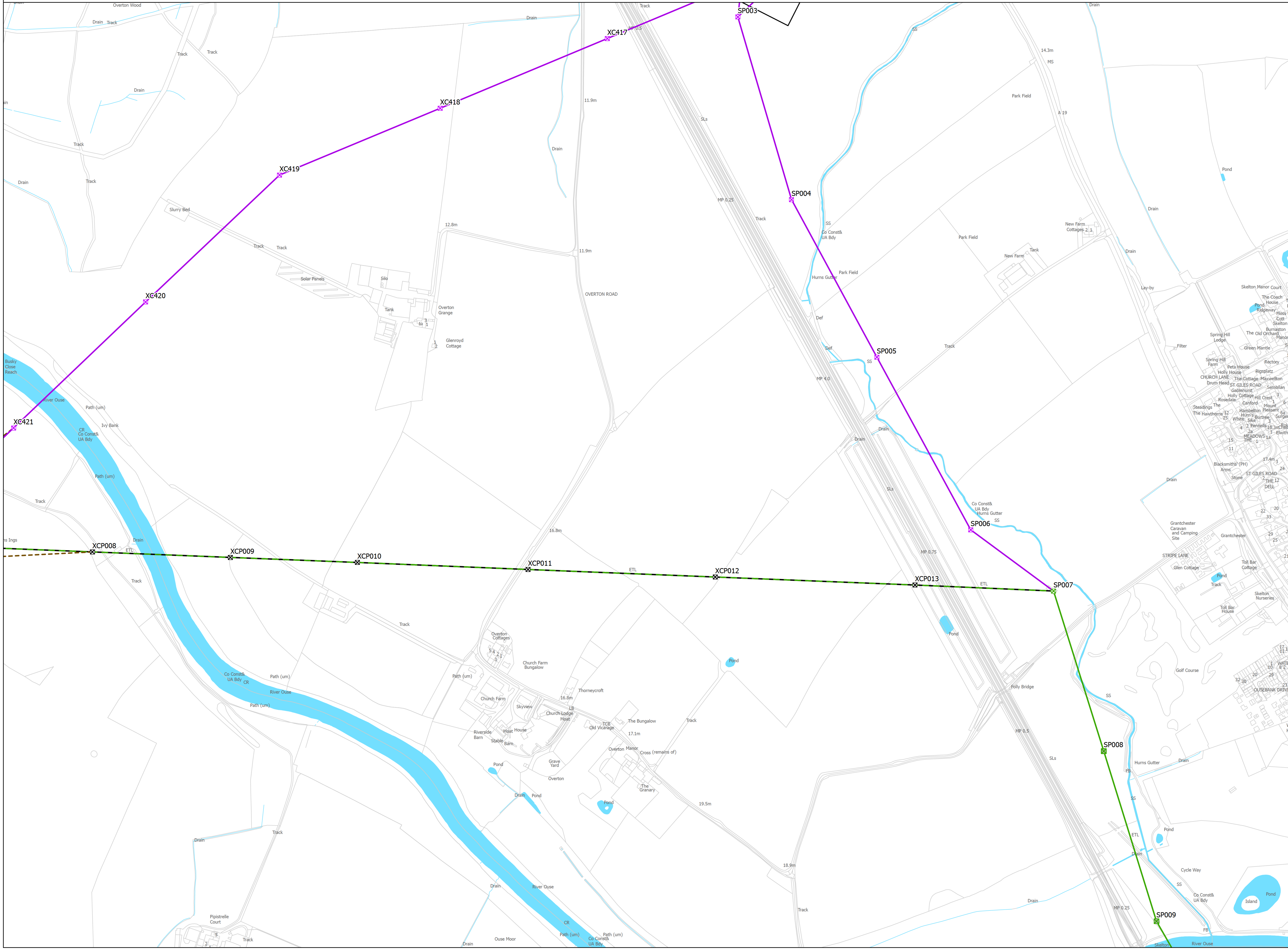
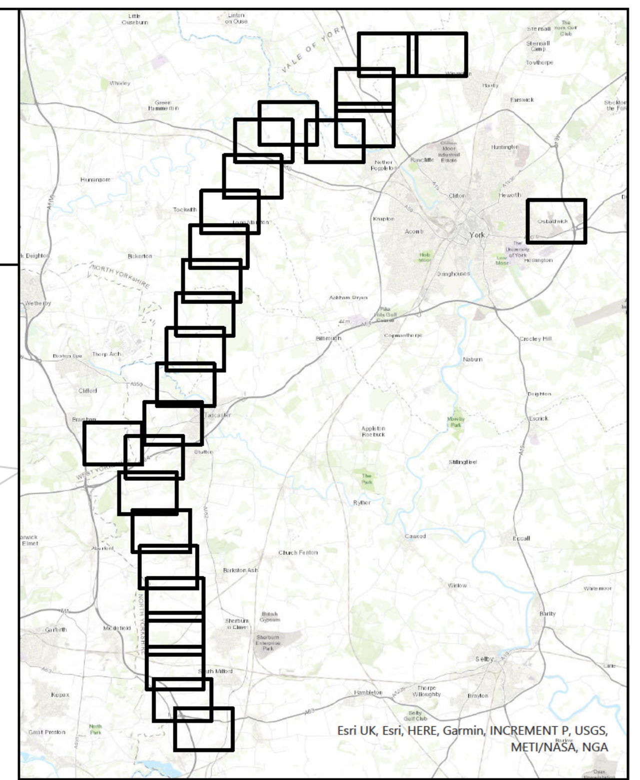
ROUTE MAP - SECTION B





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Coordinate System: British National Grid

Sheet X Centroid Coordinate: 456286 Sheet Y Centroid Coordinate: 455553

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THE NATIONAL GRID (YORKSHIRE GREEN) ORDER
ROUTE MAP
SECTION B

nationalgrid

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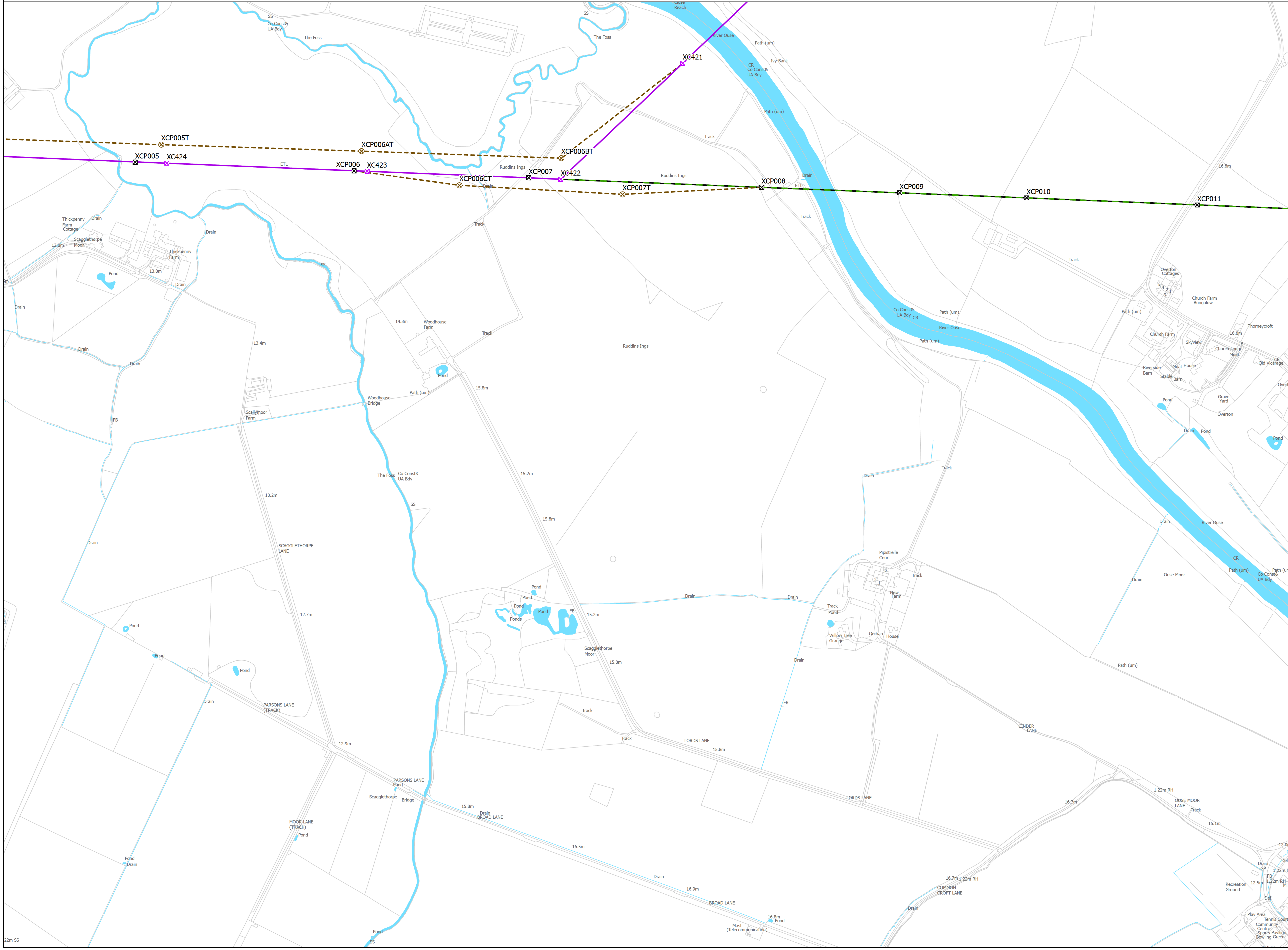
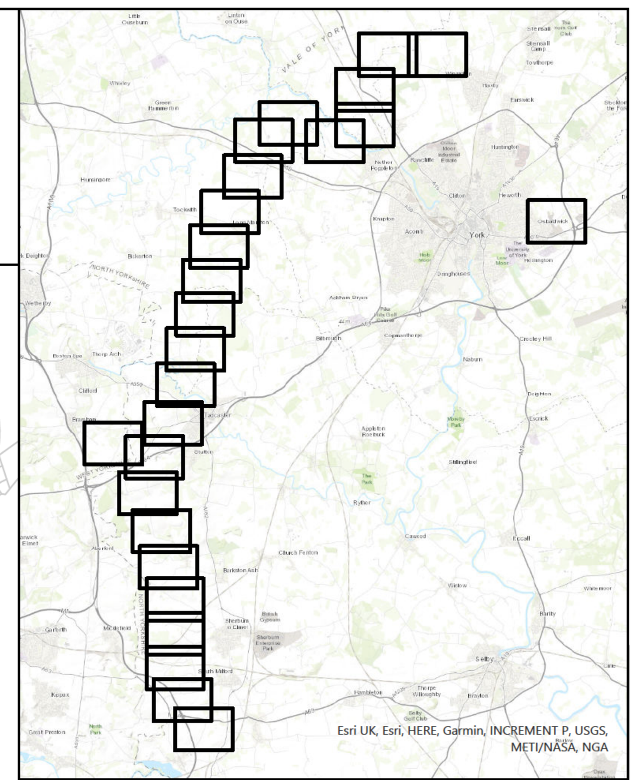
ROUTE MAP - SECTION B





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Notes

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Coordinate System: British National Grid

Sheet X Centroid Coordinate: 455561 Sheet Y Centroid Coordinate: 454220

0 5 10 20 Kilometers

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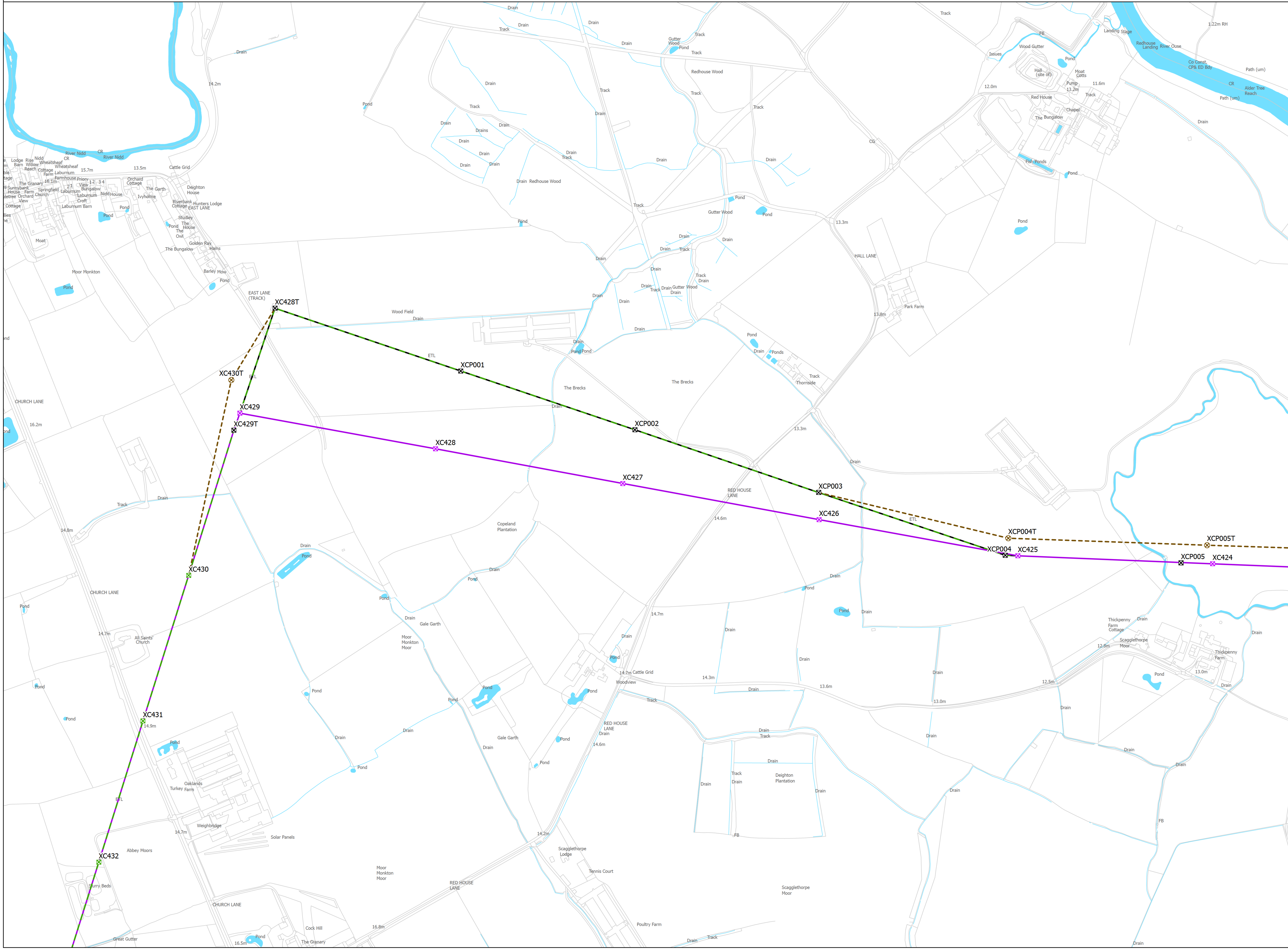
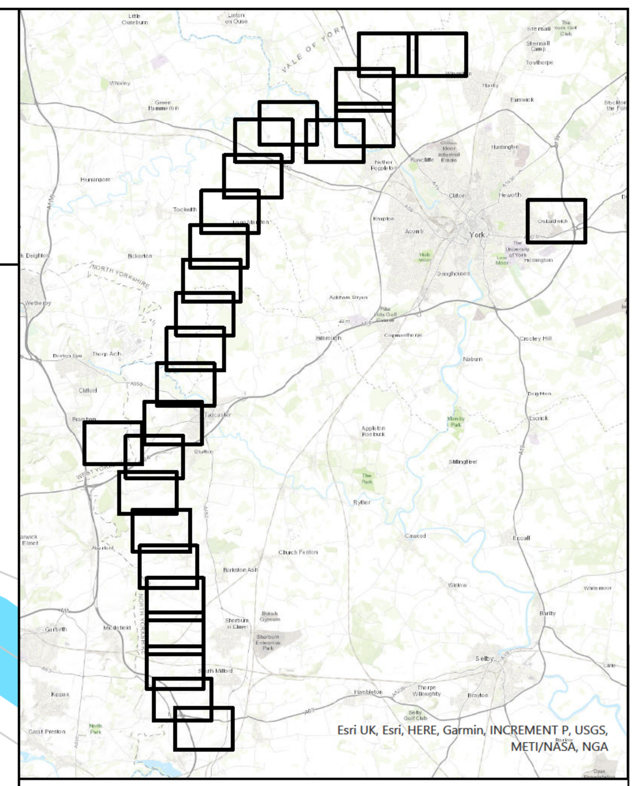
ROUTE MAP - SECTION B





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Notes

This drawing is scaled at paper size A0, therefore any prints taken at smaller sizes will affect accuracy of the measurement units and should not be scaled against.

Coordinate System: British National Grid

Sheet X Centroid Coordinate: 456359 Sheet Y Centroid Coordinate: 452136

0 5 10 20 Kilometers

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Issue	Date	Remarks	Drawn	Checked	Approved

Title

THE NATIONAL GRID (YORKSHIRE GREEN) ORDER ROUTE MAP SECTION B

nationalgrid

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REPORT ITEM

Scale	Sheet Size	Sheet	Issue
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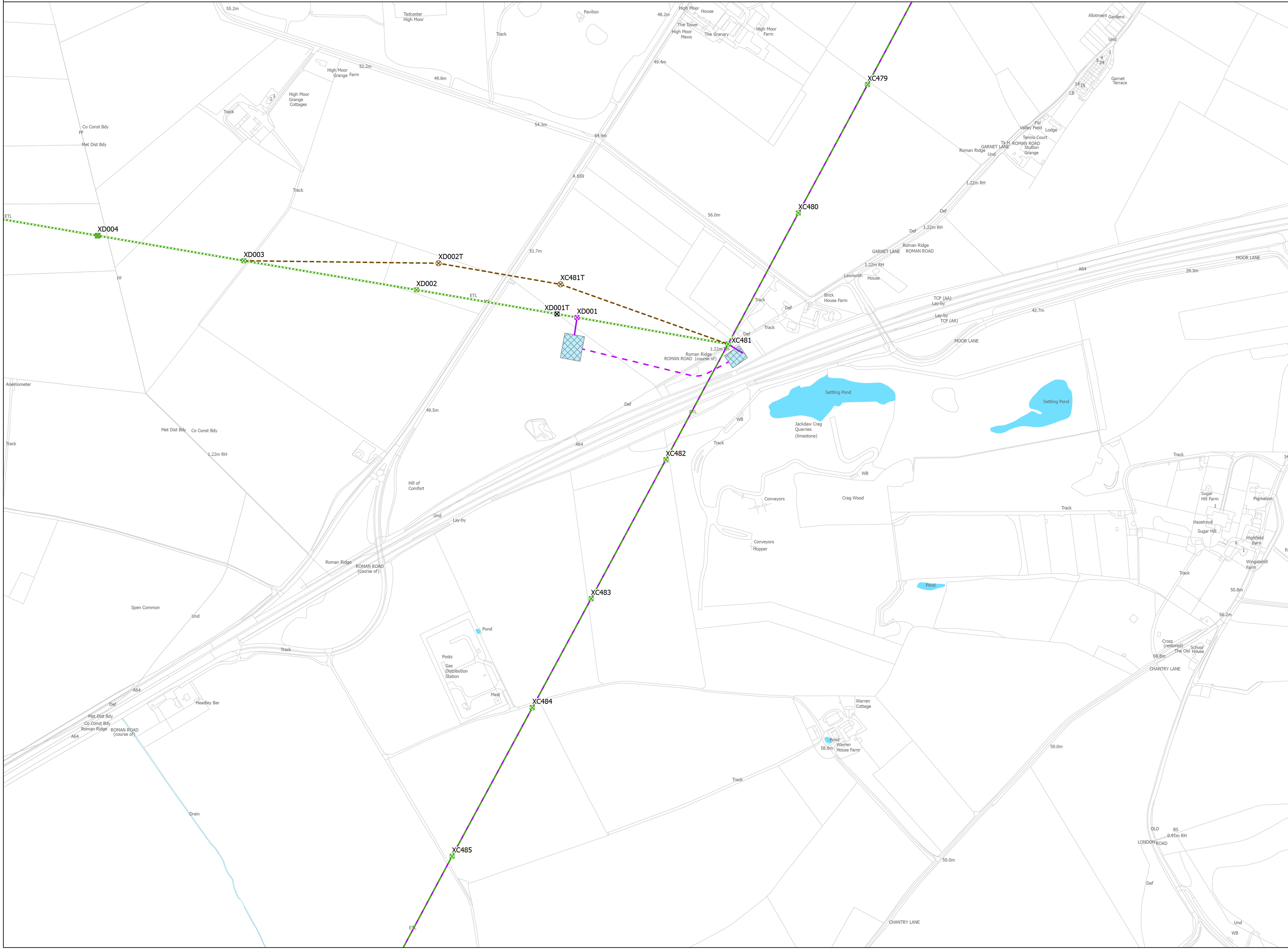
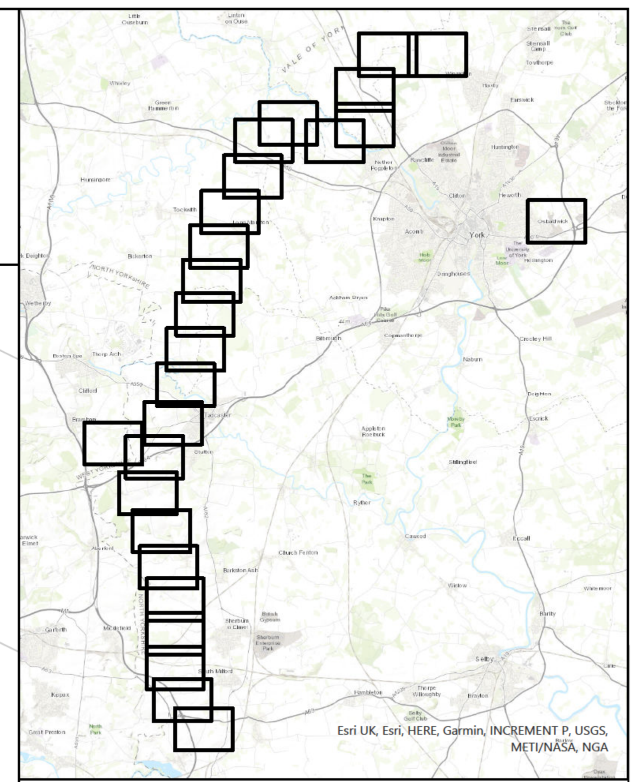
THE NATIONAL GRID (YORKSHIRE GREEN) ORDER
ROUTE MAP - SECTION D





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- INDICATIVE NEW FULL LINE TENSION GANTRY
- INDICATIVE TEMPORARY PYLON OR MAST
- EXISTING OVERHEAD LINE - NOT AFFECTED
- EXISTING OVERHEAD LINE - TO BE MODIFIED
- EXISTING OVERHEAD LINE - TO BE REPLACED
- EXISTING OVERHEAD LINE - TO BE DISMANTLED
- INDICATIVE NEW OVERHEAD LINE
- INDICATIVE NEW UNDERGROUND CABLE
- INDICATIVE TEMPORARY OVERHEAD LINE
- INDICATIVE CABLE SEALING END COMPOUND
- INDICATIVE SUBSTATION BOUNDARY
- SHEET INDEX

Notes

This drawing is scaled at paper size A0, therefore any prints taken at smaller sizes will affect accuracy of the measurement units and should not be scaled against.

Coordinate System: British National Grid
Sheet X Centroid Coordinate: 441438 Sheet Y Centroid Coordinate: 446149

0 5 10 20 Kilometers

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Issue	Date	Remarks	Drawn	Checked	Approved
A	02/06/2021	FIRST ISSUE	TF	JDH	JKS

Title

THE NATIONAL GRID (YORKSHIRE GREEN) ORDER
ROUTE MAP
SECTION D

nationalgrid

Application Number

Drawing Reference
REPORT ITEM

Scale	Sheet Size	Sheet	Issue
1:2,500	A0	SHEET 4 OF 26	A

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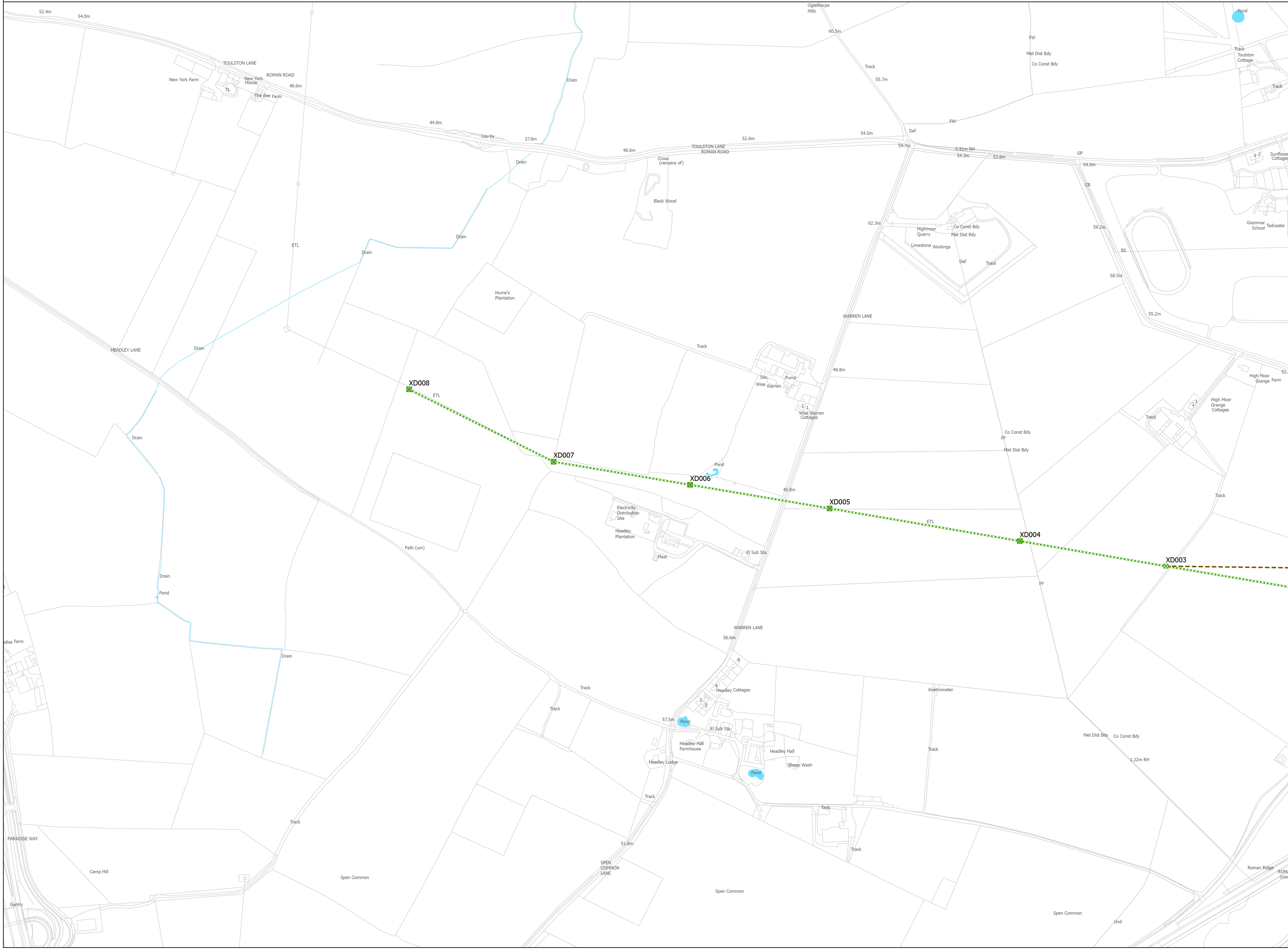
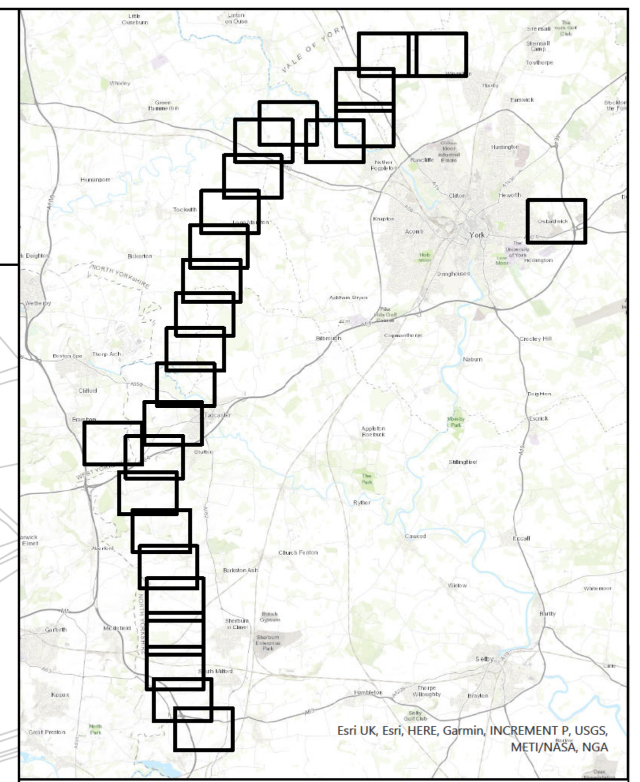
THE NATIONAL GRID (YORKSHIRE GREEN) ORDER
ROUTE MAP - SECTION D





LEGEND

- EXISTING LATTICE PYLON - NOT AFFECTED
- EXISTING GANTRY - NOT AFFECTED
- EXISTING LATTICE PYLON - TO BE MODIFIED
- EXISTING GANTRY - TO BE MODIFIED
- EXISTING LATTICE PYLON - TO BE DISMANTLED
- EXISTING GANTRY - TO BE DISMANTLED
- INDICATIVE NEW LATTICE PYLON
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- SHEET INDEX

Notes

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Coordinate System: British National Grid
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0 5 10 20 Kilometers

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Issue	Date	Remarks	Drawn	Checked	Approved
A	02/06/2021	FIRST ISSUE	TF	JDH	JKS

Title

THE NATIONAL GRID (YORKSHIRE GREEN) ORDER ROUTE MAP SECTION D

nationalgrid

Application Number

Drawing Reference: REPORT ITEM

Scale	Sheet Size	Sheet	Issue
1:2,500	A0	SHEET 9 OF 26	A

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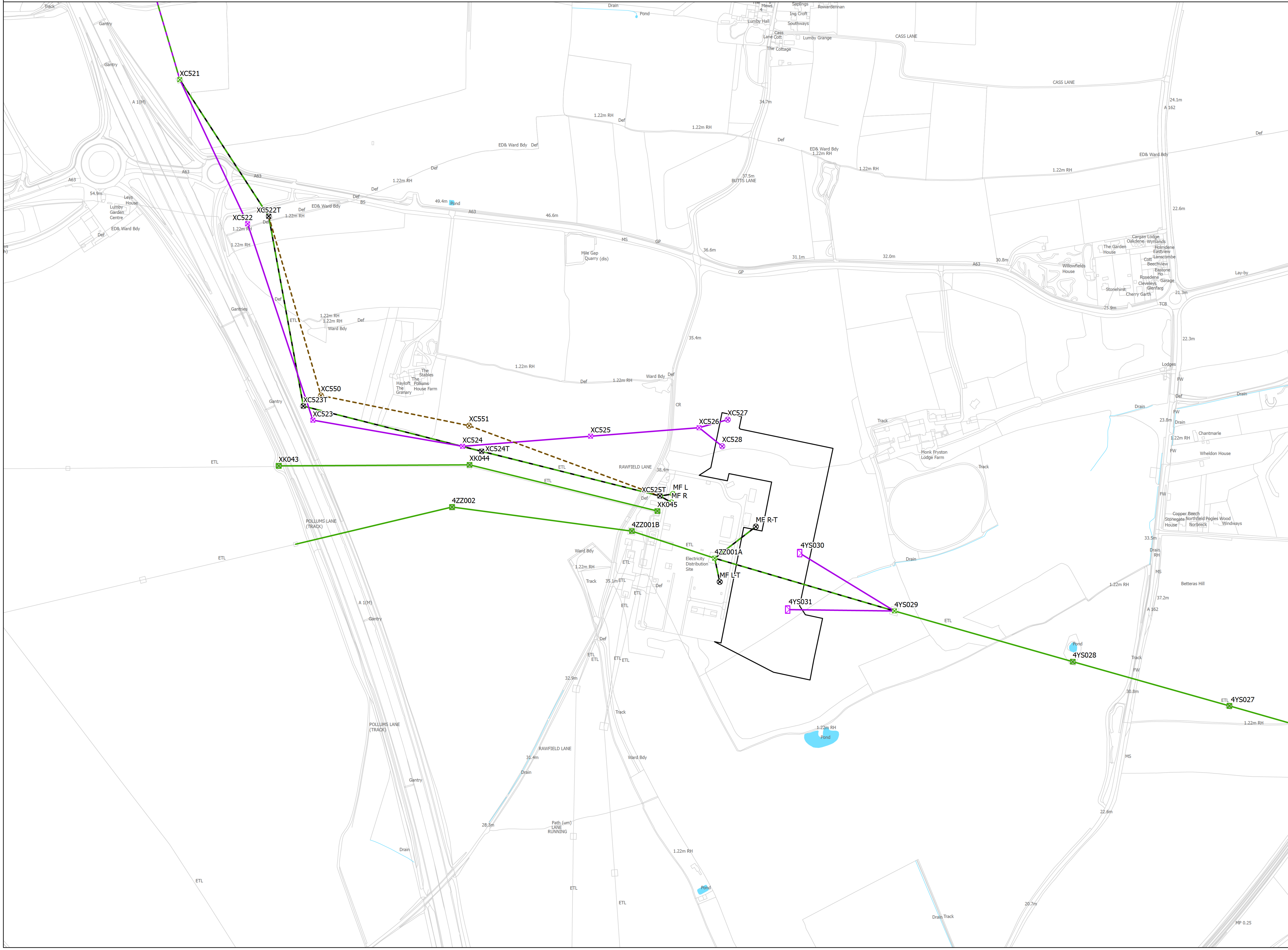
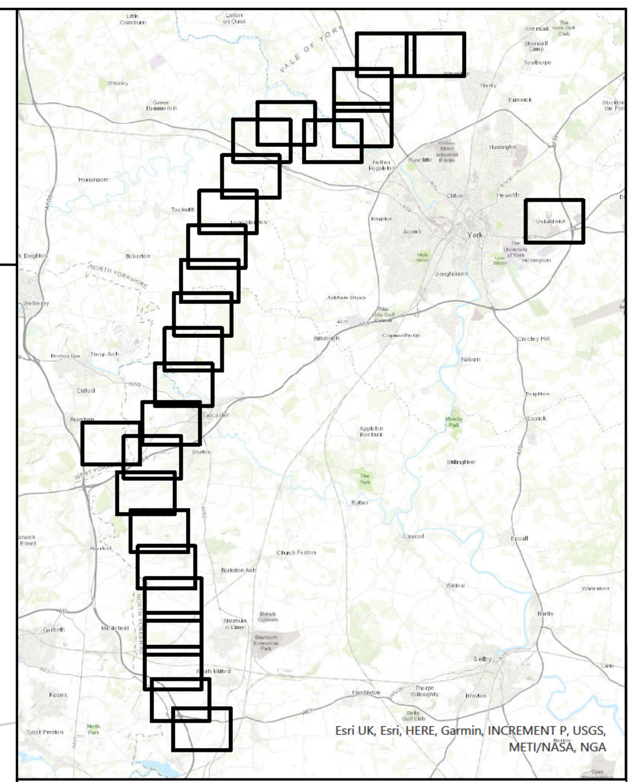
THE NATIONAL GRID (YORKSHIRE GREEN) ORDER
ROUTE MAP - SECTION F





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- EXISTING GANTRY - NOT AFFECTED
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- EXISTING GANTRY - TO BE MODIFIED
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- INDICATIVE CABLE SEALING END COMPOUND
- INDICATIVE SUBSTATION BOUNDARY
- SHEET INDEX

Notes

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Coordinate System: British National Grid

Sheet X Centroid Coordinate: 429284 Sheet Y Centroid Coordinate: 448362

0 5 10 20 Kilometers

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Issue	Date	Remarks	Drawn	Checked	Approved
A	02/06/2021	FIRST ISSUE	TF	JDH	JKS

Title

THE NATIONAL GRID (YORKSHIRE GREEN) ORDER
ROUTE MAP
SECTION F

nationalgrid

Application Number

Drawing Reference
REPORT ITEM

Scale	Sheet Size	Sheet	Issue
1:2,500	A0	SHEET 6 OF 26	A

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Appendix C: Borehole/Trial Pit Logs

SESSNE 62

Sampling

Depth	Type	Casing Depth	Date/ Water	SPT N (Cu)
			28/04 1993	
0.35-0.40	D			
0.50-0.95	U(23)	NIL	DRY	
0.95-1.00	D			
1.05-1.10	D			
1.10-1.55	U(21)	NIL	DRY	
1.55-1.60	D	NIL	DRY	
		NIL	DRY	
1.60			29/04	
		NIL	DRY	
2.00-2.10	D			
2.50-2.95	U(21)	2.50	DRY	
2.95-3.00	D			
3.50-3.60	D			
4.00-4.45	U(17)	4.00	DRY	
4.45-4.50	D			
5.00-5.10	D			
5.25-5.30	D			
5.30-5.75	U(14)	4.89	DRY	
5.70	W			
5.75-5.80	D			
6.20-6.30	D			
6.40-6.50	D			
6.50-6.95	S,D	6.41	DRY	16
6.50-6.95	B			
7.00-7.45	U(41)	7.00	DRY	
7.45-7.50	D			
8.00-8.10	D			
8.50-8.60	U(40)	7.93	DRY	NR
8.60-9.05	S,D	8.60	DRY	38
8.60-8.70	D			
9.00-9.45	S,D,B	9.00	5.70	13

Strata

Description	Depth (Thickness)	Level	Legend
	G.L.	13.98	
Turf on clayey TOPSOIL**	0.35	13.63	
Firm brown mottled orange and grey CLAY, with many rootlets and occasional fine gravel.	(0.70)		
	1.05	12.93	
Firm orange brown grey mottled, CLAY with occasional thin rootlets.	(0.50)		
	1.55	12.43	
Firm thinly laminated red brown CLAY with dusting of grey silt and orange fine sand partings between laminae. From 2.75m: Mainly dusting of fine sand between laminae.	(3.70)		
	5.25	8.73	
Soft to firm red brown very sandy CLAY, with much fine to coarse rounded and angular gravel. From 6.20m: Stiff.	(3.45)		
	8.70	5.28	
Medium Dense red brown silty fine SAND.			

Equipment: Cable Percussion

Borehole Dia (mm) 200 to 12.00m

Casing Dia (mm) 200 to 12.00m

Groundwater

No.	Struck	Behaviour	Sealed
1	8.70	Rose to 5.70m After 20 minutes	

Ground Level 13.98 m OD

Coordinates S6294.44 mE, S8421.83 mN

Drilled by WS
Logged by GG
Checked by AD

Remarks Chiselling obstruction from 9.50 - 9.60m: 30 minutes
Standpipe piezometer installed on completion: Tip at 9.05m, sand filter from 8.40m - 9.50m.

See key sheet and appendices for explanations.

Form 1/0

Borehole Record

Exploration Associates

Project A19 Shipton By Beningbrough Bypass
The Department of Transport

Contract 133080

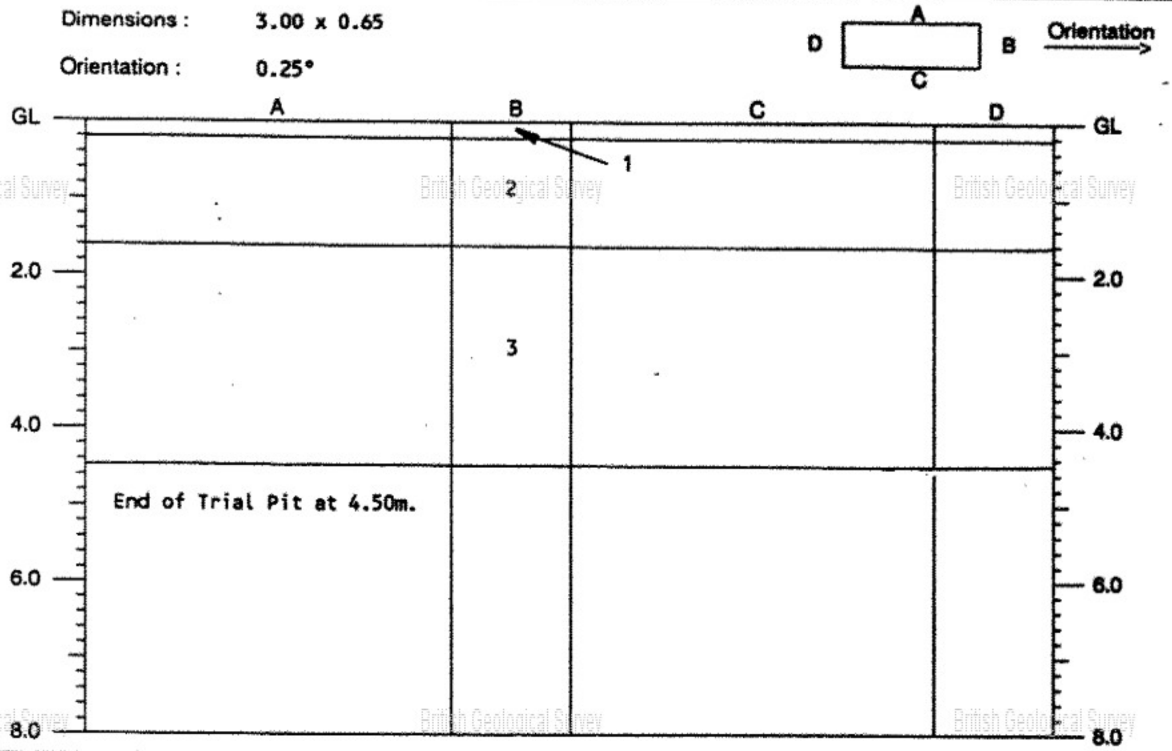
Borehole 6(1 of 2)

British Geological Survey

SESSNE 77

Dimensions : 3.00 x 0.65

Orientation : 0.25°



Strata

Depth (m)	No.	Description
0.00-0.20	1	Soft, grey brown, clayey TOPSOIL.
0.20-1.60	2	Firm orange brown and light grey, sandy CLAY with some gleyed fissures and very thin beds of orange brown clayey sand and fine to coarse sand Below 1.00m Stiff with light grey silt lenses.
1.60-4.50	3	Stiff dark brown, fissured and thinly laminated CLAY with gleying, grey and blue grey fine sand and silt partings. Below 2.80m Orange brown fine sand partings ripple marks. #below 3.50m firm to stiff and thinly laminated with medium to coarse orange sand and ripple marks.

Samples and Tests

Depth (m)	Type	Results
0.50	B	
0.70	V(H)	65,67 kPa
1.60	V(H)	98,103,93 kPa
1.70	B	
2.60	B	
2.80	V(H)	101,110,115 kPa
3.90	B	
4.50	V(H)	122,124,117 kPa

Date of Excavation 28/04/93
Equipment Mechanical Excavator
Stability Sides stable throughout

Groundwater
No. Struck Behaviour
No groundwater encountered

5589 mE
5759 mN

Logged by GG
Checked by AD

Remarks

See key sheet
and appendices
for explanations.

Form 2/0

Trial Pit Record

Exploration Associates

Project
A19 Shipton By Beningbrough Bypass
The Department of Transport

Contract 133080

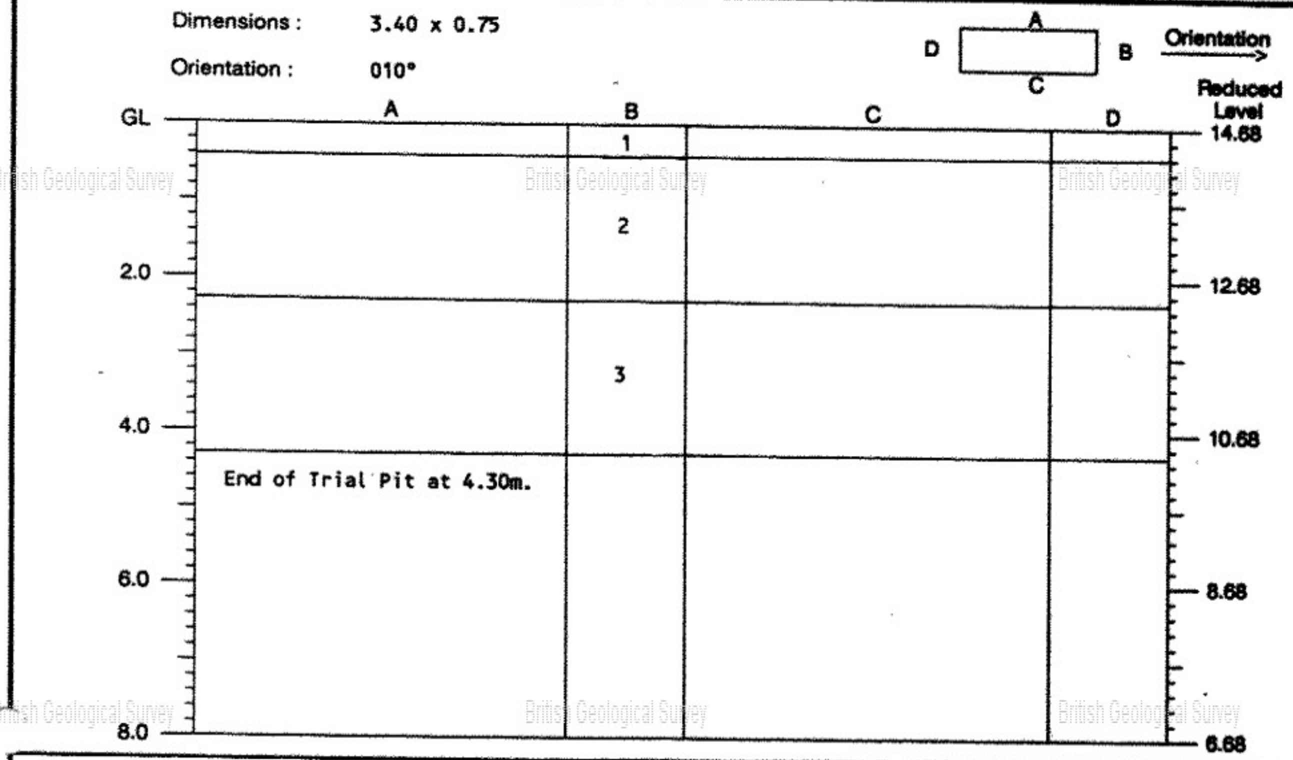
Trial Pit 7

British Geological Survey

SE55NE 90

Dimensions : 3.40 x 0.75

Orientation : 010°



Strata

Depth (m)	No.	Description
0.00-0.40	1	Soft, grey brown clayey TOPSOIL with occasional fine to coarse gravel.
0.40-2.30	2	Firm to stiff, orange brown and grey mottled fissured CLAY with some fine sand and silt lenses.
2.30-4.30	3	Stiff red brown, sandy CLAY with much fine to coarse rounded to sub-angular gravel, some cobbles and occasional small boulders. Below 3.00m: Firm to stiff, and very sandy.

Samples and Tests

Depth (m)	Type	Results
0.60	B	
0.80	V(H)	60,60,62 kPa
1.60	B	
1.80	V(H)	105,101,105 kPa
2.50	B	
2.60	V(H)	110,120,113 kPa
3.80	B	
4.30	V(H)	Fail.

Date of Excavation 29/04/93
Equipment Mechanical Excavator
Stability Sides stable throughout excavation.

Groundwater

No.	Struck	Behaviour
1	3.10	Damp

Ground Level 14.68 m OD
Coordinates 56159.43 mE
58289.06 mN

Logged by GG
Checked by AD

Remarks

See key sheet and appendices for explanations.

Form 2/0

Trial Pit Record

Exploration Associates

Project A19 Shipton By Beningbrough Bypass
The Department of Transport

Contract 133080

Trial Pit 21

British Geological Survey

63/321 B

SE56 SE/9

(For Institute use only) GEOLOGICAL CLASSIFICATION	NATURE OF STRATA If measurements start below ground surface, state how far.	THICKNESS Feet	Inches	Metres	DEPTH Feet	Inches	Me.
DRIFT	Clay	6		1.83	6		1.83
	Running Sand	4		1.21	10		3.04
	Clay	36		10.97	46		14.02
SHERWOOD SANDSTONE GROUP	Loose Banded Red Sandstone & Marl	114		34.74	160		48.76
	Grey Marl	14		4.26	174		53.03
	Red Sandstone	76		23.16	250		76.20
H.J. 24.2.78							

British Geological Survey

Appendix D: Ground Investigation Requirements

GENERAL REQUIREMENTS FOR GROUND INVESTIGATION -TOWERS

Method

- Trial Pits – Preferred method for ground bearing foundations where conditions allow.
- Cable Percussive Boreholes - If trial pits unable to assess relative density of granular soil and/or if groundwater encountered restricts target depths of excavation.
- Rotary Boreholes - If rock parameters required for pile/ mini pile/ rock anchor design.

Minimum Requirements

- Companies to be employed with appropriate resources who have experience in working within the Power Industry and in the vicinity of live overhead lines.
- Companies to be employed who have Geotechnical Engineer with a minimum of 3 years relevant experience on site at all times to supervise and log work.
- Sampling and testing in accordance with UK Specification for Ground Investigation (ICE publishing 2012) BS5930 and BS1377.
- Risk Assessments and Method Statements to be provided prior to work commencing.

Aim of Investigation

- Determine soil/rock profile – descriptions on site by a Geotechnical Engineer in accordance with BS5930.
- Ground water – monitor level struck and any rise rate. End of shift/start of shift record water level. Installation as scheduled/site instruction.
- Determination of cohesive strengths
- Determination of relative density of granular soils (SPT's).
- Determination of rock properties/strength.
- Laboratory testing - minimum: soil (water soluble sulphate), groundwater (sulphate) and pH.
- If encountered determine contaminates in made ground for waste disposal and human health.
- Engineers log/Borehole log/ CPT log fully detailed.
- Report (Factual/interpretative-ref Specification).

ADDENDUM A: LSTC GROUP

The LSTC Group consists of a number of companies either owned wholly or partially by LSTC or by the directors of LSTC, these include: LSTC; TDI and ERM (as described below) all with a common aim of delivering a high-quality consultancy service to the Power Industry. The LSTC directors are also directors of all the LSTC Group companies but have no day-to-day operational role in TDI and ERM.

LS Transmission Consultancy Ltd (**LSTC**) provides the bulk of these consultancy services, ranging from feasibility works, various survey services to detailed design of overhead transmission and distribution lines.

Transmission and Distribution Innovations Ltd (**TDI**) provides innovative product solutions and processes bespoke to the Power Industry both in the UK and overseas. It also operates as a representative/agent. The LSTC Group consists of a number of companies either owned wholly or partially by LSTC which operate in the UK and/or parts of Europe for several suppliers of products in the Power Industry, and in so doing receives retainer and/or sales commission payments from such companies.

Although LSTC does not identify or recommend TDI as a supplier, we may in the ordinary course of our services (for legitimate technical & engineering reasons) specify the use of certain products for which TDI is appointed as representative/agent, which, if purchased, will generate retainer or commission payments to TDI. You consent to TDI (part of the LSTC Group) retaining any such payments derived from purchases of products made by you or others as part of the works.

Earthing Risk Management Ltd (**ERM**) services include lightning protection design and risk assessment, pipeline interference studies, incident investigation, earthing design and inspection, impressed voltage studies, soil resistivity measurements, fall of potential tests and quantified risk assessments.

National Grid plc
National Grid House,
Warwick Technology Park,
Gallows Hill, Warwick.
CV34 6DA United Kingdom

Registered in England and Wales
No. 4031152

[redacted]