HyNet North West Hydrogen Pipeline

Delivering clean growth

Cadent

Your Gas Network

Appendix 12D

Geohazards Desk Study

October 2024

Revision 1
Volume 0001
Document ref. 852552-WSPE-IA-ES-PD-G4-118696

United Living Infrastructure Services Ltd Hynet

Geo-Hazard Desktop study

322968 R01 (00)

RSK GEOSCIENCES

JULY 23

RSK GENERAL NOTES

Project No.: 322968

Title: HyNet Desktop Study

Client: United Living Infrastructure Services Ltd

Date: July 2023

Office: RSK Environment Ltd 18 Frogmore Road, Hemel Hempstead, Herts, HP3 9RT
Tel 01442437500

Status: Draft

Author	Mark Kentish	**Technical reviewer**	Jonathan Bailey
Signature		Signature	
Date:	12 July 2023	Date:	12 July 2023
Project manager	Mark Kentish	**Quality reviewer**	Helen Bailey
Signature		Signature	
Date:	12 July 2023	Date:	12 July 2023

Revision control sheet				
Revision ref.	**Date**	**Reason for revision**	**Amended by:**	**Approved by:**
Rev Version 00	12/07/2023	First issue	n/a	see above

RSK Environment Limited (RSK) has prepared this report for the sole use of the client, showing reasonable skill and care, for the intended purposes as stated in the agreement under which this work was completed. The report may not be relied upon by any other party without the express agreement of the client and RSK. No other warranty, expressed or implied, is made as to the professional advice included in this report.

Where any data supplied by the client or from other sources have been used, it has been assumed that the information is correct. No responsibility can be accepted by RSK for inaccuracies in the data supplied by any other party. The conclusions and recommendations in this report are based on the assumption that all relevant information has been supplied by those bodies from whom it was requested.

This work has been undertaken in accordance with the quality management system of RSK Environment Ltd. No part of this report may be copied or duplicated without the express permission of RSK and the party for whom it was prepared.

CONTENTS

ABBREVIATIONS ..... **IV**

PART 1 – CONTEXT AND SETTING OF AREA OF INTEREST AND PROJECT INFRASTRUCTURE **1**

1 GENERAL **2**

1.1 Introduction 2

1.2 Project brief 2

1.3 Project objectives 2

1.4 Scope of services 3

1.4.1 Deliverables 3

1.5 Methodology 4

1.5.1 Data collection and review 4

1.5.2 Analysis and interpretation 6

1.5.3 Geo-hazard risk assessment 7

1.6 Desktop study report format 8

1.7 Limitations 8

2 STUDY AREA DETAILS **11**

2.1 Project area 11

2.1.1 Proposed development 11

2.1.2 Site description – facilities 13

2.1.3 Site description – pipeline route alignments 25

3 GEOLOGICAL SETTING **44**

3.1 Site Geology 44

3.1.1 North 1 Pipeline 45

3.1.2 North 2 Pipeline 48

3.1.3 East Pipeline 50

3.1.4 South Pipeline 57

3.1.5 West Pipeline 62

3.1.6 Spur Pipelines 66

4 GEOHAZARDS AND GEOTECHNICAL HAZARDS & MITIGATION **75**

4.1 Potential geological and geotechnical hazards within Project Area 75

4.1.1 Filled / Made Ground 75

4.1.2 Fault hazard 76

4.1.3 Adverse ground and groundwater chemistry 76

4.1.4 High groundwater table 77

4.1.5 Groundwater Flooding 78

4.1.6 Potentially liquifiable soils 78

4.1.7 Collapsible soil 79

4.1.8 Highly compressible and low bearing capacity ground 79

4.1.9 High swelling/shrinkage potential soils 80

4.1.10 Risk of running sands 80

4.1.11 Risk of landslide/slope stability hazards 81

4.1.12 Excavatability 82

4.1.13 Excavation Stability 82

4.1.14 Potential for dissolution of soluble rocks 83
4.1.15 Gully, Gully erosion and incised channels (buried valleys) 84
4.2 Summary of geohazards and geomorphological hazards affecting development 84
4.2.1 North1, North 2 and Spur Pipelines N1-02, N1-05, N2-04 and N2-06, Higher Walton HAGI, Clockface HAGI and Central Hub HAGI 84
4.2.2 East Pipeline and Spur Pipelines E-01, E-02, E-04 and E-05, Block Valve 1, Warburton HAGI and Partington HAGI 86
4.2.3 C-01 Spur Pipeline 88
4.2.4 South Pipeline and Block Valve 2 and Inoyvn Gas Storage HAGI 90
4.2.5 West Pipeline, Spur Pipelines W-01, W02 and W03, Rocksavage HAGI, Runcorn HAGI and Stanlow HPP HAGI 92
PART 2 – GEO-HAZARDS ASSESSMENT 95
5 GEOHAZARD, GEOMORPHOLOGICAL AND HYDROLOGY HAZARDS 96
5.1 Types of hazards 96
5.2 Rationale applied for the assessment 97
BIBLIOGRAPHY 98
APPENDIX A PROJECT OVERVIEW DRAWINGS 99
APPENDIX B BACKGROUND INFORMATION 100
APPENDIX C HAZARD RISK ASSESSMENT TABLES 101

TABLES

Table 1 Risk Rating 8
Table 2 North 1 Pipeline 45
Table 3 North 2 Pipeline 48
Table 4 East Pipeline 50
Table 5 South Pipeline 57
Table 6 West Pipeline 62
Table 7 Spur Pipelines 66
Table 8: Summary of main potential geotechnical hazards that may affect the Northern Pipelines N1 and N2 and adjoining Spur Pipelines N1-02, N1-05, N2-04 and N2-06, Higher Walton HAGI, Clockface HAGI and Central Hub HAGI 85
Table 9: Summary of main potential geotechnical hazards that may affect the East Pipeline and Spur Pipelines E-01, E-02, E-04 and E-05, Block Valve 1, Warburton HAGI and Partington HAGI 87
Table 10: Summary of main potential geotechnical hazards that may affect the C-01 Spur pipeline alignment 88
Table 11: Summary of main potential geotechnical hazards that may affect the South pipeline alignment and Block Valve 2 and Inoyvn Gas Storage HAGI 90
Table 12: Summary of main potential geotechnical hazards that may affect the West Pipeline and Spur Pipelines W-01, W-02 and W-03 alignments and Rocksavage HAGI, Runcorn HAGI and Stanlow HPP HAGI 92

FIGURES

FIGURE 1: PROJECT LOCATION 11
FIGURE 2: CENTRAL HUB HAGI LAYOUT AND LOCATION 13
FIGURE 3: STANLOW HPP HAGI LAYOUT AND LOCATION 14
FIGURE 4: STANLOW HPP HAGI LAYOUT AND LOCATION 15
FIGURE 5: SIGNIFICANT TOPOGRAPHIC RELIEF AT STANLOW HPP HAGI 16
FIGURE 6: INOYVN GAS STORAGE HAGI LAYOUT AND LOCATION 17

FIGURE 7: WARBURTON HAGI LAYOUT AND LOCATION....18
FIGURE 8: PARTINGTON HAGI LAYOUT AND LOCATION....19
FIGURE 9: HIGHER WALTON HAGI LAYOUT AND LOCATION....20
FIGURE 10: CLOCKFACE HAGI LAYOUT AND LOCATION....21
FIGURE 11: RUNCORN HAGI LAYOUT AND LOCATION....22
FIGURE 12: SIGNIFICANT TOPOGRAPHIC RELIEF AT RUNCORN HAGI....23
FIGURE 13: BLOCK VALVE STATION 1 LOCATION....24
FIGURE 14: BLOCK VALVE STATION 2 LOCATION....24
FIGURE 15: BLOCK VALVE STATION 2 TOPOGRAPHIC RELIEF....25
FIGURE 16: NORTH 1 PIPELINE KP00 TO KP06 LOCATION....26
FIGURE 17: FORTH 1 PIPELINE KP06 TO KP15 LOCATION....27
FIGURE 18: NORTH 1 PIPELINE KP15 TO END LOCATION....27
FIGURE 19: SPUR PIPELINE N-02 LOCATION....28
FIGURE 20: SPUR PIPELINE N-05 LOCATION....29
FIGURE 21: NORTH 2 PIPELINE AND SPUR PIPELINES N2-04, N2-06, N2-07 LOCATION....30
FIGURE 22: EAST PIPELINE FROM KP00 TO KP11....31
FIGURE 23: EAST PIPELINE FROM KP11 TO KP19....32
FIGURE 24: EAST PIPELINE FROM KP19 TO PARTINGTON HAGI AND SPUR PIPELINES E-01, E04 AND E05 FROM PARTINGTON HAGI....32
FIGURE 25: SOUTH PIPELINE FROM KP00 TO KP08....34
FIGURE 26: SOUTH PIPELINE FROM KP06 TO END AT INOYVN GAS STORAGE HAGI....34
FIGURE 27: SIGNIFICANT TOPOGRAPHIC RELIEF AT KP02 – RIVER WEAVER VALLEY....35
FIGURE 28: SIGNIFICANT TOPOGRAPHIC RELIEF AT KP03+500 – RIVER WEAVER VALLEY....35
FIGURE 29: SIGNIFICANT TOPOGRAPHIC RELIEF AT KP04+500 TO 04+750 – GRANGE BROOK GULLEY / VALLEY....36
FIGURE 30: SIGNIFICANT TOPOGRAPHIC RELIEF AT KP11 TO KP11+600 – RIVER WEAVER VALLEY....36
FIGURE 31: SIGNIFICANT TOPOGRAPHIC RELIEF AT KP15+700 – RIVER DANE VALLEY....37
FIGURE 32: C-01 SPUR PIPELINE LOCATION....38
FIGURE 33: C-01 SPUR PIPELINE – SIGNIFICANT TOPOGRAPHIC RELIEF....38
FIGURE 34: WEST PIPELINE – LOCATION KP09+500 TO KP19+300....40
FIGURE 35: WEST PIPELINE – LOCATION KP00+000 TO KP09+000....41
FIGURE 36: W-01, W-02 AND W-03 SPUR PIPELINES – LOCATION....41
FIGURE 37: W-01, W-02 AND W-03 SPUR PIPELINES – SIGNIFICANT TOPOGRAPHIC RELIEF....42
FIGURE 38: WEST PIPELINE – SIGNIFICANT TOPOGRAPHIC RELIEF KP10+100 TO KP11....42
FIGURE 39: WEST PIPELINE – SIGNIFICANT TOPOGRAPHIC RELIEF – KP18....43

MAP BOOK

ABBREVIATIONS

Term	Definition
AOD	above ordnance datum
AGI	above ground installation
AOI	area of interest
COMPANY	Cadent Gas
DD	data deficient
DEM	digital elevation model
DSM	digital surface model
DTM	digital terrain model
DTS	desktop study
GEO	geohazard related constraint
GIS	geographic information system
GL	ground level
GNSS	global navigation satellite system
GPS	global positioning system
ID	identification number
KP	kilometre point
PS	Performance Standard
PSHA	Probabilistic Seismic Hazard Assessment
RoW	right of way
RSK	RSK Environment Limited
SI	site investigation
SPT	standard penetration test
S_u	undrained strength
ULIS	United Living Infrastructure Services Ltd (the client)
Wood	Wood Plc

Unit	Definition
°	degrees
°C	degree Celsius
%	percentage
µm	micrometre
Φ	friction angle
Ωm	ohm metre
mm	millimetre

Unit	Definition
c’	apparent cohesion
cm	centimetre
cm/km	centimetre per kilometre
cm/s	centimetre per seconds
cm/yr	centimetre per year
E’	drained stiffness
g/l	gram per litre
km^2	square kilometre
km/h	kilometre per hour
kN/m^2	kilonewton per square metre
m	metre
ma	mega annum
mbgl	metre below ground level
MN/m^2	meganewton per square metre
m/s	metre per seconds
m^3/s	cubic metre per second
mg/l	milligram per litre
mg/m^3	milligram per cubic metre

PART 1 – CONTEXT AND SETTING OF AREA OF INTEREST AND PROJECT INFRASTRUCTURE

1 GENERAL

1.1 Introduction

On the instructions of Wood Plc, on behalf of United Living Infrastructure Services Ltd, RSK Environment was commissioned to produce a geo-hazards desktop study (DTS) for the Hydrogen Pipeline network (herein referred to as 'the project'), which forms part of the HyNet North West Project.

The project is the flagship project for Cadent Gas to deliver an integrated hydrogen pipeline network located in the North West of England, designed to provide a safe, reliable and cost effective hydrogen network for the transmission of hydrogen gas. The Project forms an integral part of the wider HyNet North West scheme whose primary objective is to reduce regional CO_2 emissions by being able to safely produce, transport, store and use hydrogen as a replacement for natural gas in a range of applications.

The Project will deliver the hydrogen transportation network required to enable the UK's first full chain integrated hydrogen supply system, connecting hydrogen production with bulk hydrogen storage, along with hydrogen connections to key industrial users in the region. The Project is anticipated to consist of circa 90 km of underground high pressure steel pipeline with associated consumer connection spurs, together with a number of Hydrogen Above Ground Installations (HAGI) along the route of the pipeline. As a result of its scale, The Project is classed as a Nationally Significant Infrastructure Project (NSIP) under The Planning Act 2008, and therefore requires an application for a Development Consent Order (DCO).

The Project will provide the hydrogen transportation network required to allow low carbon hydrogen for fuel switching of industrial users and dispatchable power generators, together with injection into the existing Local Transmission System (LTS) for blending with natural gas at existing Cadent Gas sites at Partington and Warburton. In addition, the Project connects hydrogen production at Stanlow to salt cavern storage South East of Northwich, to provide system balancing and resilience.

The project location and general project overview are presented in Appendix A.

1.2 Project brief

The overall project brief, as set by Wood Plc, is to undertake a DTS to gather and analyse available relevant data contained within the provided Groundsure reports, in order to deliver a comprehensive assessment of the project area with respect to the geological and geotechnical hazards and potential mitigation. The gathered data was used to undertake a preliminary desktop review of the proposed routing and facilities' locations and the associated risks and hazards for the project elements.

1.3 Project objectives

The key objectives of the DTS are:

- identify types of geo-hazards that are relevant to onshore pipeline construction and operation and provide a high level narrative of the processes

- produce a Geo-hazard risk matrix on a pipeline section by section basis that identifies potential geo-hazards and ground instability risk
- outline potential mitigation measures that could be applied and use these applied for each hazard identified to assess residual risk.

1.4 Scope of services

The DTS has been completed to a mutually agreed brief as set out in the COMPANY scoping document (unreferenced), Geo-Hazard Desk Study, submitted to RSK on 7th February 2023) and as detailed in RSK's technical proposal document number CTR019_322968 T02 (00), 28th February 2023.

The scope of services for the DTS includes:

- data collection and review all available relevant data from ULIS and from third parties (see Section 1.5.1), under the following fields of interest.
    - geology
    - hydrogeology
    - geohazards and geotechnical hazards
- a review of the geological and hydrogeological conditions in the project area from publicly available records
- development of a preliminary ground model(s) for the project area / infrastructure
- preliminary consideration / discussion on the nature of geological and geotechnical constraints and hazards
- analysis and interpretation of the above data sources and information to assess the geographical distribution of the potential geohazards affecting the onshore developments
- presentation of the assessment as a series of hazard risk assessment schedules.

1.4.1 Deliverables

The following deliverables have been generated during the DTS:

- Production of a written report presenting the findings of the various assessments outlined above, including presentation of the rationale applied to the various geo-hazard assessments, and culminating in presentation of a series of hazard tables presenting the risk/consequence of each assessed hazard for each of the route alignments and facility locations. The written report includes the following sections:
    - site geology
    - high level discussion on the nature of identified Geo-hazard and Geotechnical Hazards
    - high level discussion / presentation of the potential mitigation and engineering considerations.
- Provision of a series of geo-hazards risk assessment schedules to include:

- geotechnical & geological hazards
- geo-morphological constraints / hazards and
- hydrological hazards.

1.5 Methodology

This section provides a summary of the methodologies that have been applied in order to identify, gather and analyse data relevant to meet the objectives and aims of the DTS. Detailed information regarding the methodologies applied in the study can be found within RSK proposal reference CTR019_322968 T02 (00), 28th February 2023.

1.5.1 Data collection and review

The initial phase of the DTS has been a data gathering exercise aimed at identifying and assembling all available pertinent data and information to inform the study. Data and information has been obtained from the following primary data sources:

- data made available from ULIS / Wood
- data available internally within RSK from RSK site investigation along the project alignment
- secondary data and information available in the public domain.

The bibliography at the end of this report presents a comprehensive list of references. Pertinent data used in the study has been included in Appendix B.

1.5.1.1 Data from ULIS / Wood

The following data was provided by COMPANY:

- groundsure Enviro+Geo-Insight reports for the entire route corridor. 20 No. Reports are provided in both PDF report and GIS data formats
- pipeline route centre lines in CAD/GIS format e.g. shp file
- environmental Agency Topographical Data Contours_5m_res_1m
- trenchless Crossing Schedule.

1.5.1.2 Data from RSK

RSK has referenced the existing ground investigation data for the project:

- Factual Ground Investigation Report, Ian Farmer Associates, 2230746 (03), May 2023.

1.5.1.3 Data from public domain

RSK reference and utilise other relevant free to source publicly available information as listed below:

- relevant data contained within British Geological Survey (BGS) – Geoindex web-based database
- BGS Geological Maps
- freely available published BGS geo-index borehole records

- satellite imagery / base mapping available within ESRI ArcGIS Pro desktop GIS application
- where possible, we will have compiled relevant readily available environmental and geological spatial data layers held within the public domain by sources such as British Geological Survey (BGS), the Coal Authority, the EA, Natural England and DEFRA, that may provide additional or enhanced information on the above listed geo-hazards, extra / over the information contained within the ground sure reports
- freely available Lidar 1m DTM data
- surface Water Flooding modelling data from DEFRA.

1.5.1.4 Imagery

The imagery analysis undertaken within the context of the study has included normal optical analysis.

Satellite Optical Imagery

RSK has utilised ESRI's ArcDesktop ArcPro suite to manage and analyse project imagery data. Inherent to the ArcDesktop suite are a variety of imagery derived base maps that have been used as the base imagery across the wider project area, which has been used within the detailed visual analysis of the proposed routing alignments and facilities' locations.

The optical imagery has been used as part of a wider dataset included within the Groundsure reports, to inform the assessment of the features/lineaments and hazards within the project area, and more specifically at the locations of the proposed facilities and pipeline alignments.

1.5.1.5 Data assimilation and processing

A significant volume of information relating to the project was provided in the set of twenty Groundsure reports that have been commissioned by client, with the data available in PDF and GIS Formats. This dataset has formed the basis of the assessment of geo-hazards for the pipeline corridor. In order to assimilate, process and interrogate this scale of data, RSK have utilised the industry standard ESRI ArcGIS Pro desktop GIS application to compile and maintain a GIS data repository comprising base-mapping and other spatial layers relating to the project. ArcGIS Pro was used to publish spatial data to the ESRI ArcGIS Online (AGOL) cloud. A web-mapping application was used to privately share access to the project's mapped information with technical specialists in the RSK Geosciences team, who assessed the data against the objectives outlined above.

Using this approach, we have utilised the Groundsure GIS spatial hazard data and other data sources to record the spatial extents of the identified geo-hazards affecting the pipeline. This method has been used to collect and assess all relevant / available geo-hazard data and collate all required information to produce a Geo-hazard risk matrix for the pipeline as set out in objectives.

1.5.2 Analysis and interpretation

Analysis and interpretation of the data has aimed to address all of the requirements of the project objectives (Section 1.3) and scope of work (Section 1.4).

Sections 3 through 5 outline the analysis and interpretation. Data was collated and presented in GIS format to support subsequent risk-based assessment of geo-hazards (Refer to PART 2 – GEO-HAZARDS ASSESSMENT) for each of the proposed facilities and pipelines.

1.5.2.1 Geology and Geo-hazard Identification

In order to meet the objectives of the study and understand and define some of the geological and geotechnical hazards, RSK have undertaken a review of the available geological data for the proposed route corridor.

RSK have provided a summary on the conjectural geology along each proposed pipeline route and facility location. This has allowed RSK to complete an assessment potentially difficult soils/rocks and assess some of the geo-hazards that are not specifically covered in the Groundsure Geo-Insight report, such as groundwater levels, liquefaction potential soils, excavatability etc, along the proposed route alignments.

From the information gathered within the assessments/research completed as detailed above, RSK have completed a preliminary assessment of potential geohazards and geotechnical hazards along the pipeline and at the HAGI's. This information was recorded digitally within the AGOL online web app, allowing us to produce a concise tabulated lists of hazards, their spatial extents and which has also formed the basis of the Geo-hazard risk assessment.

Preliminary ground models have been provided for each pipeline route and facility location, which are used to inform discussions later in the report on geotechnical hazard identification and preliminary geotechnical engineering recommendation/characteristics for the various geological units.

1.5.2.2 Geohazards and geotechnical hazards

A preliminary assessment of potential geohazards and geotechnical hazards for each of the identified geological units was undertaken and a discussion is provided on the nature of the hazard that may affect each of the proposed facilities and pipelines, based on the anticipated ground model(s). The hazards are presented in a concise tabulated list format, clearly identifying which hazard may affect the development and the location of the hazard. The reader can also refer to the relevant discussion section that outlines the nature of the hazard and to the subsequent chapter presenting the engineering considerations / mitigation, if the hazard is considered likely to affect the site.

1.5.2.3 Geotechnical engineering considerations and mitigation

RSK have provided a high level discussion on the potential mitigation and geotechnical engineering considerations pertinent to pipeline construction, and construction of the HAGI's, relevant to each of the identified geo-hazards.

1.5.3 Geo-hazard risk assessment

The information gathered from the data review, analysis and interpretation were compiled into a series of geo-hazard schedules (Section PART 2 – GEO-HAZARDS ASSESSMENT) for the proposed pipeline route alignments to include the following:

- geological & geotechnical hazards
- geo-morphological hazards; and
- hydrological (flooding) hazards

The risk matrix schedules will summarise (where information is available) the following:

- unique identification number of the geo-hazard – Identification number for the identified geo-hazard
- geo-hazard Type/Reference
- kilometre points (KP) – KPs (from and to) for the identified geo-hazard
- description of hazard – A brief description of the geo-hazard
- description of the potential impact
- assessment of the risk before mitigation / control measures (Probability x Impact = Risk)
- a list of potential mitigation that could be applied to address the geo-hazard
- assessment of the residual risk following mitigation / control measures (Probability x Impact = Risk)

Each of the above schedules are provided in MS Excel spreadsheet format presenting concise information identified for each feature/constraint, as outlined above. The schedules for each assessed hazard are included in Appendix C.

1.5.3.1 Rationale applied for the assessment of constraints

The risk matrix takes the form of a typical risk register, whereby the degree of risk (R) is determined by combining an assessment of the probability (P) of the hazard occurring with an assessment of the Impact (I) the hazard and associated mitigation will cause if it occurs (R = P x I). The scale against which the probability and impact are measure and the resulting degree of risk determined is presented below.

Table 1 : Risk Rating

Probability	(P)		Impact	(I)		Risk	Risk
Very Likely	5		High	5		20 - 25	Severe
Likely	4		Moderate	4		15 - 19	Substantial
Plausible	3	X	Low	3	=	10 - 14	Moderate
Unlikely	2		Very Low	2		5 - 9	Minor
Very Unlikely	1		Negligible	1		1 – 4	None/Negligible

Within the assessment all relevant hazards are assessed along the pipeline centreline or within the footprint of the HAGI, BVS or crossing. Where relevant the assessment of a hazard has included a buffer of either 25m, 50m or 100m either side of the pipeline alignment.

Further information regarding the type of constraints identified under each category is provided in Section 4.

1.6 Desktop study report format

In order to address the aims and project brief this report includes the following sections:

Part 1 Context and setting of area of interest:

- Section 1 (this section) – Introduction, project objectives, scope of work, methodology, limitations
- Section 2 – Study area details
- Section 3 – Geological setting
- Section 4 - Geohazards and Geotechnical Hazards and Mitigation

Part 2 – Geo-hazard Assessment:

- Section 5 – Geohazard, geomorphological and hydrological hazards

Bibliography

Appendices

1.7 Limitations

RSK has prepared this DTS report for the sole use of ULIS showing reasonable skill and care, for the intended purposes as stated in the agreement under which this work was completed. The report may not be relied upon by any other party without the express agreement of ULIS and/or RSK. No other warranty, expressed or implied, is made as to the professional advice included in this report.

No part of this report may be copied or duplicated without the express permission of ULIS and RSK.

Where any data supplied by ULIS or from other sources has been used, it has been assumed that the information is correct. No responsibility can be accepted by RSK for inaccuracies in the data supplied by any other party.

The following limitations apply to the scope of work and this report:

General limitations

- The DTS is a preliminary high-level geo-hazards assessment based on available information at the time of writing and professional judgement from a team of geoscientists / geotechnical engineers. Ground conditions and related hazards may differ on the ground and ground-truthing should be conducted.
- This preliminary assessment extended generally within between 25m to 100m either side of the pipeline alignment and proposed facility locations, depending on the type /nature of the hazard. For some features, lineaments and hazards the spatial presence of that hazard may extend beyond the extents assessed. Should re-routing be considered it may be necessary to review the datasets again to define the wider spatial extent of a hazard(s) at the proposed re-route location(s).
- Given the scale of the supplied and available imagery, it has not always been possible to full identify and classify a constraint type. Some constraints may require confirmation (via screening assessment results or a subsequent site visit) for the avoidance of doubt.
- The information contained in reviewed borehole information (BGS and RSK) represent discreet locations and there may be conditions and variances pertaining to the geological units discussed that have not been discovered by historic investigation work and therefore there can be no reliance on the accuracy or completeness of the information presented below.

Geohazard, geotechnical and geo-morphological limitations

- It is anticipated there will be several geohazard risks which will require resolute data to identify. Such geohazards may require avoidance or other mitigation measures and hence may require the expansion of any planned survey corridors if required.
- Geological and geotechnical constraints were assessed on the basis of professional judgement considering the proximity of proposed routes to particular geomorphological/environmental/geological features.
- It should be understood that through the use of published data, whilst they can be used to provide a comprehensive overview of the geological and geo-hazard characteristics for the project area and infrastructure, the data / information is not specific to the project infrastructure and was not obtained for the purposes of informing the design of project infrastructure. It cannot be relied upon for any purpose other than preliminary characterisation and guiding more detailed assessment and ground truthing.
- It should be understood that the depths presented for the various geological units / strata have been taken from historical published records in the most part and provide only a very small / partial coverage the project area. The depths quoted are often based on historical boreholes very remote from the proposed pipeline

alignment or facility and are provided for the purpose of preliminary development of ground models. They cannot be relied upon for design and should be considered as indicative only. Ground truthing through appropriate ground investigation should be conducted to confirm any information contained in this report.

- The comments given in this report and the opinions expressed are based on information gathered from a review of published literature and information. There may be conditions pertaining to the site(s) that have not been disclosed by the previous investigations and literature used to inform this study and therefore could not be taken into account in the discussions and recommendations.

2 STUDY AREA DETAILS

2.1 Project area

The project is located in the north-western part of England and extends across a total area measuring approximately 28km north to south and 30km east to west. The northernmost branch of the proposed pipeline network terminates within the town of St Helens. The easternmost part of the proposed pipeline network terminates near to the town of Partington in Greater Manchester. The southernmost part of the proposed pipeline network terminates ~3km north of the town of Middlewich. The westernmost part of the proposed pipeline network terminates ~4km east of Whitby.

A series of smaller spur pipelines extend from the main pipelines to the towns of Runcorn, Northwich and to the southeast of Warrington.

An overview of the project location is present below in Figure 1.

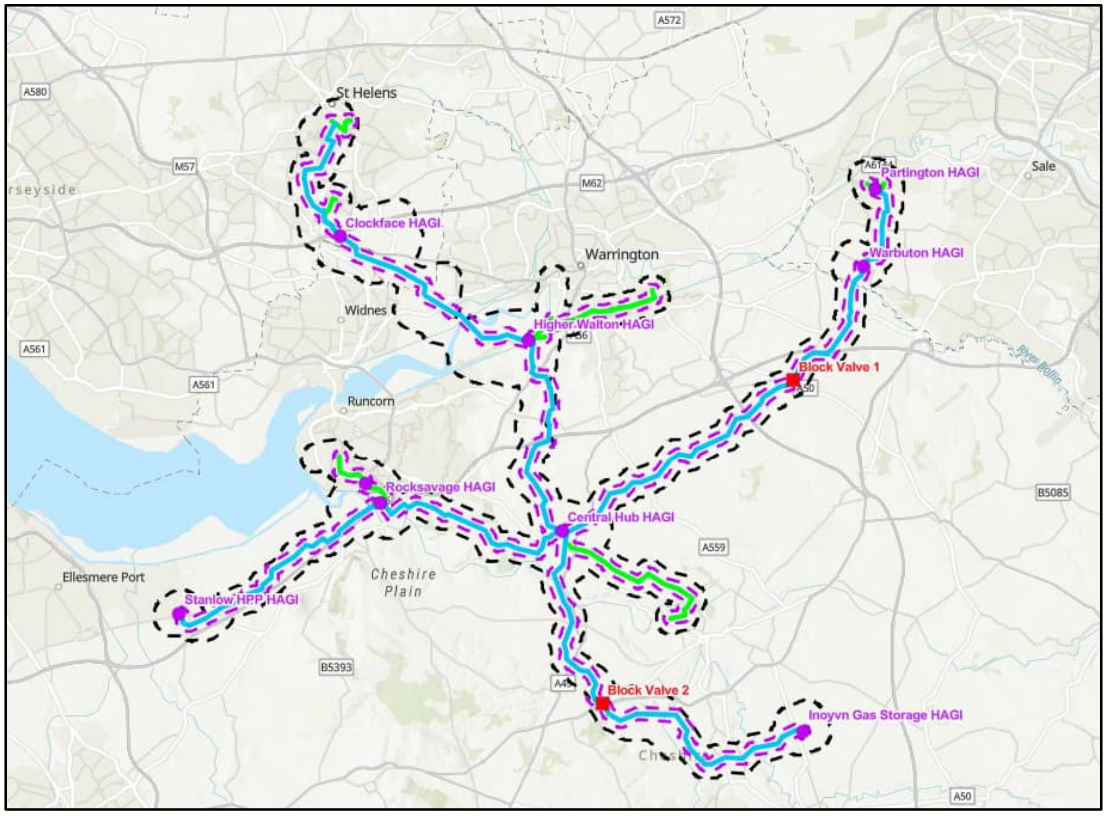


Figure 1: Project location

2.1.1 Proposed development

The Project will comprise the construction of nine Hydrogen Above Ground Installations (HAGI) and a network of ~90km of connecting buried high pressure steel hydrogen gas pipelines, across four primary pipelines and a series of thirteen smaller spur pipelines. There are two block valve locations within the proposed infrastructure. The four primary pipelines will converge at Central Hub HAGI.

The extent of the project area and the project infrastructure are shown in drawings included in Appendix A.

A full list of project infrastructure (proposed facilities and pipelines) is provided below, and more detail is provided in Section 2.1.2: (*NB: Infrastructure names taken from ULIS GIS data package*).

Facilities: (HAGI and BVS)

- Central Hub HAGI
- Stanlow HPP HAGI
- Rocksavage HAGI
- InoyvnGas Storage HAGI
- Warburton HAGI
- Partington HAGI
- Higher Walton HAGI
- Clockface HAGI
- Runcorn HAGI
- Block Valve Station 1
- Block Valve Station 2

Primary Pipelines:

- North 1
- North 2
- East
- South
- West

Spur Pipelines:

- C-01
- E-01
- E-02
- E-04
- E-05
- N1-02
- N1-05
- N2-04
- N2-06
- N2-07

- W-01
- W-02
- W-03

2.1.2 Site description – facilities

High level descriptions of the facilities and pipeline route alignments are presented in the sections below.

2.1.2.1 Central Hub HAGI

The proposed central hub site occupies an area of farmland measuring ~135m (NW-SE) by 125m NE-SW), covering an area of ~1.7 hectares (ha). The site is located approximately 1.5 km north of the village of Bartington and approximately 1.4km southwest of the village of Lower Whitley. The local context of the site is shown in Figure 2.

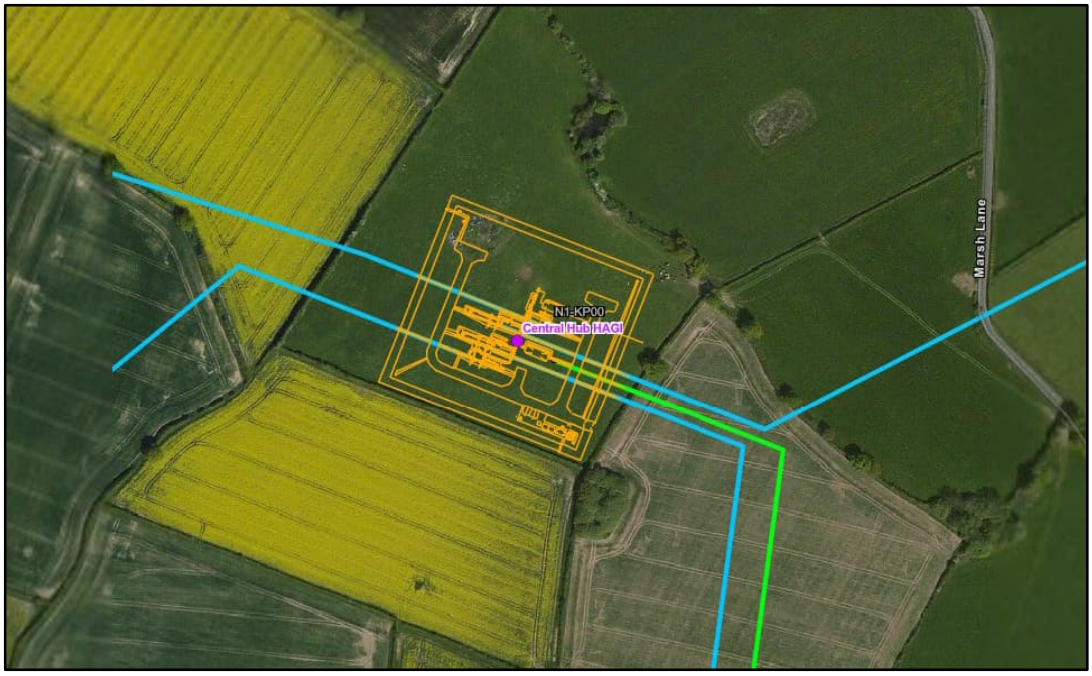


Figure 2: Central Hub HAGI layout and location

The site is roughly square in shape, trending in a north-east to south-west direction and has a generally gentle relief, with the surface level dipping gently to the south-east, from an elevation high of between ~49 metre (m) above ordnance datum (AOD) and ~46 m AOD, in the eastern part of the site. The site comprises a farm field used for grazing livestock. A small area of disturbed ground is located in the northwest corner, although does not appear in any relevant datasets.

2.1.2.2 *Stanlow HPP HAGI*

The proposed Stanlow HPP HAGI site occupies an area of land measuring maximum of ~400m (NW-SE) by 145m NE-SW). The site is split in to two smaller areas, which combined cover an area of ~38 hectares (ha). The site is located at the end (KP00) of the Western pipeline, and is sited in the south-eastern corner of the existing Essar Stanlow Refinery, approximately 300m northwest of the village of Elton Green and approximately 300m east/northeast of the village of Thornton Le Moors. The local context of the site is shown in Figure 3.

Figure 3: Stanlow HPP HAGI layout and location

The two site areas are roughly square or rectangular in shape, trending in a east to west direction and has a generally gentle relief, with the surface level dipping gently to the west, from an elevation high of ~11 m AOD in the eastern part of the site, dropping very slightly to ~9-10 m AOD in the central and western part of the site. The site comprises an industrial area with a mix of hardstanding, warehouses and industrial buildings associated with the existing refinery.

2.1.2.3 *Rocksavage HAGI*

The proposed Rocksavage HAGI site occupies an area of land measuring ~55m (NW-SE) by 70m (NE-SW), covering an area of ~0.39hectares (ha). The site is located on the Western Pipeline at approximately KP10+500, on a parcel of land located between the Weaver Navigational Channel to the north/northeast and the River Weave to the south/southwest, with the M56 motorway located immediately to the west / northwest. The local context of the site is shown in Figure 4.

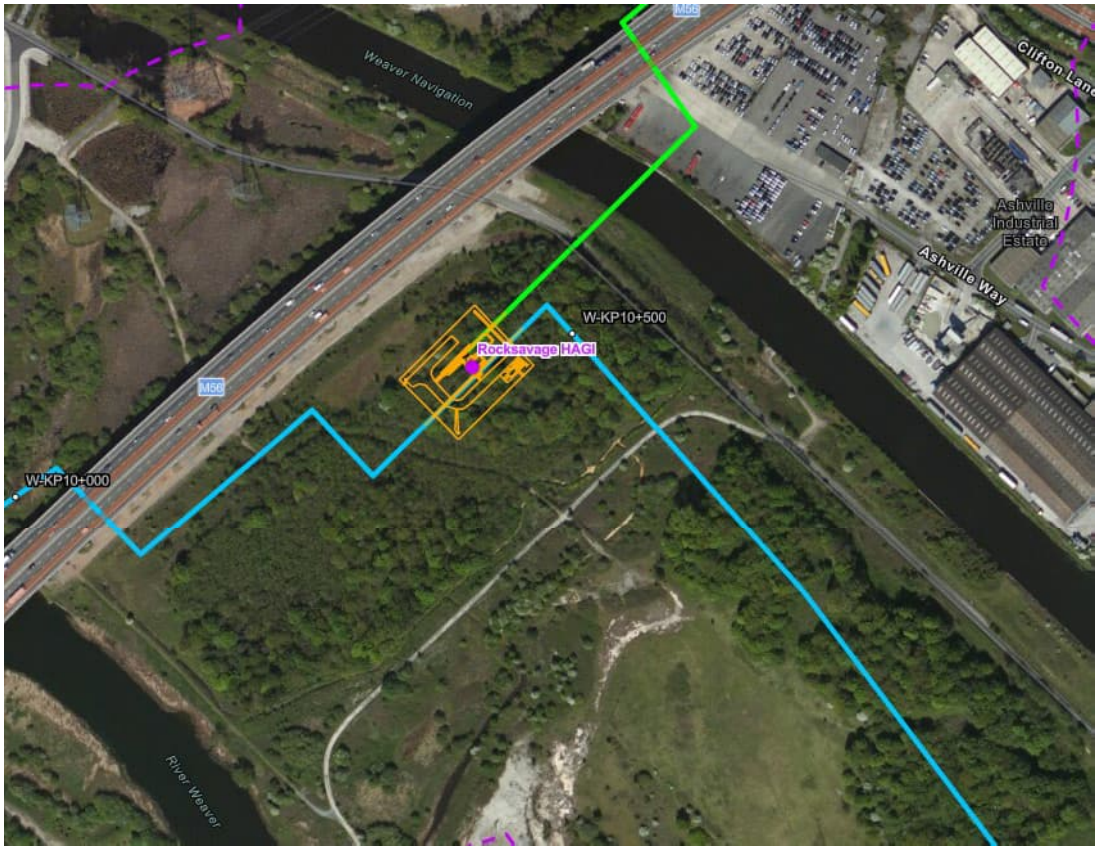


Figure 4: Stanlow HPP HAGI layout and location

The site areas are roughly rectangular in shape, trending in a northeast to southwest direction. The site is located on top of what appears to potentially be a man-made mound/heap, with sloping relief dipping to the south, from an elevation high of ~17 m AOD in the eastern part of the site, dropping to ~13.5 m AOD in the south part of the site. The ground to the south and west slopes away significantly over a short distance, which

is consistent with a topographic relief noted for a recorded landfill refuse heap close to the south-east. The topographic relief can be seen in Figure 5.

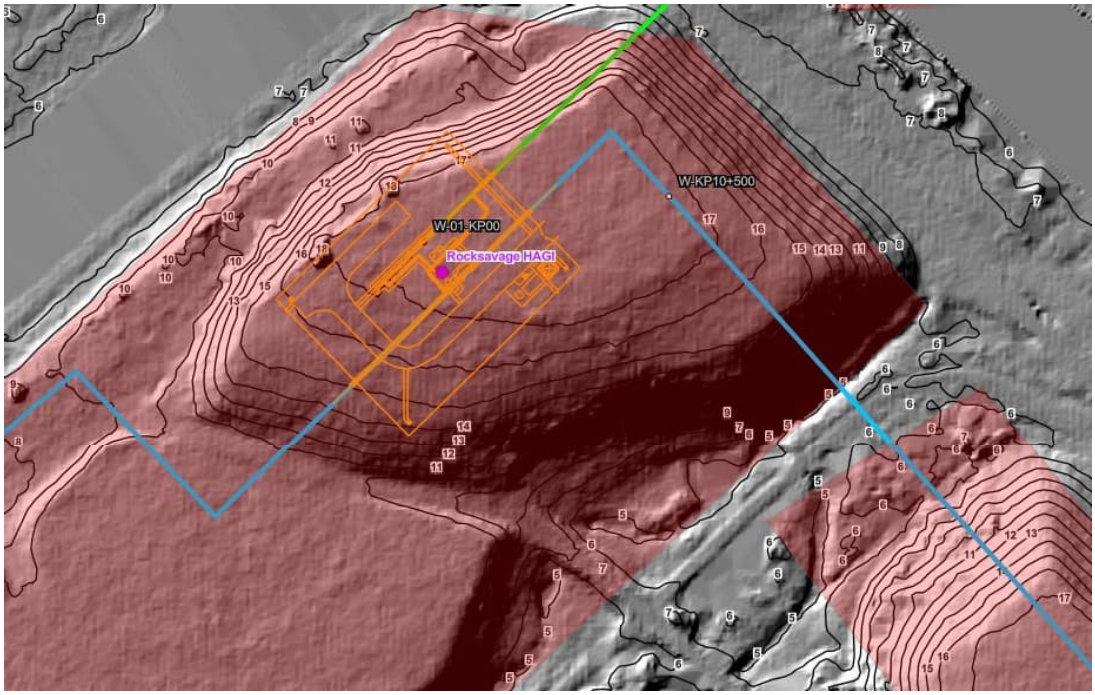


Figure 5: Significant topographic relief at Stanlow HPP HAGI

2.1.2.4 Inoyvn Gas Storage HAGI

The proposed Inovyn Gas Storage HAGI site occupies an area of farmland measuring ~83m (N-S) by 100m E-W), covering an area of ~0.83 hectares (ha). The site is located at the end of the South Pipeline at ~KP18+450, approximately 2.85 km north of the village of Middlewich and approximately 2.5km south of the village of Rudheath. The local context of the site is shown in Figure 6.

Figure 6: Inoyvn Gas Storage HAGI layout and location

The site is roughly square in shape, trending in an east to west direction and has a generally flat relief, with the surface at an elevation of ~32 m AOD. The site comprises a farm field possibly used for grazing livestock.

2.1.2.5 *Warburton HAGI*

The proposed Warburton HAGI site occupies an area of farmland and measures ~110m (NE-SW) by 90m NW-SE), covering an area of ~0.99 hectares (ha). The site is located on the East Pipeline at ~KP17+750, immediately to the east of Warbuton National Grid. The local context of the site is shown in Figure 7.

Figure 7: Warburton HAGI layout and location

The site is roughly rectangular in shape, trending in a northeast to southwest direction and has a generally flat relief, with the surface at an elevation of ~23 m AOD. The site comprises a farm field possibly used for grazing livestock.

2.1.2.6 Partington HAGI

The proposed Partington HAGI site occupies an area of industrial land and measures ~110m (NW-SE) by 100m NE-SW), covering an area of ~1.10 hectares (ha). The site is located on the end of East Pipeline at ~KP21+600, and the start of the Spur pipelines E-01 and E-04 at KP00. The site is located between Partington, immediately to the west/southwest and Carrington, immediately to the northeast.

The location is a former above ground installation, and the HAGI sits directly over the footprint of a former above ground storage tank that is now removed. There remains a circular depression at the site which is potentially filled with water. The local context of the site is shown in Figure 8. (Note the tank in the photo is no longer present on site).

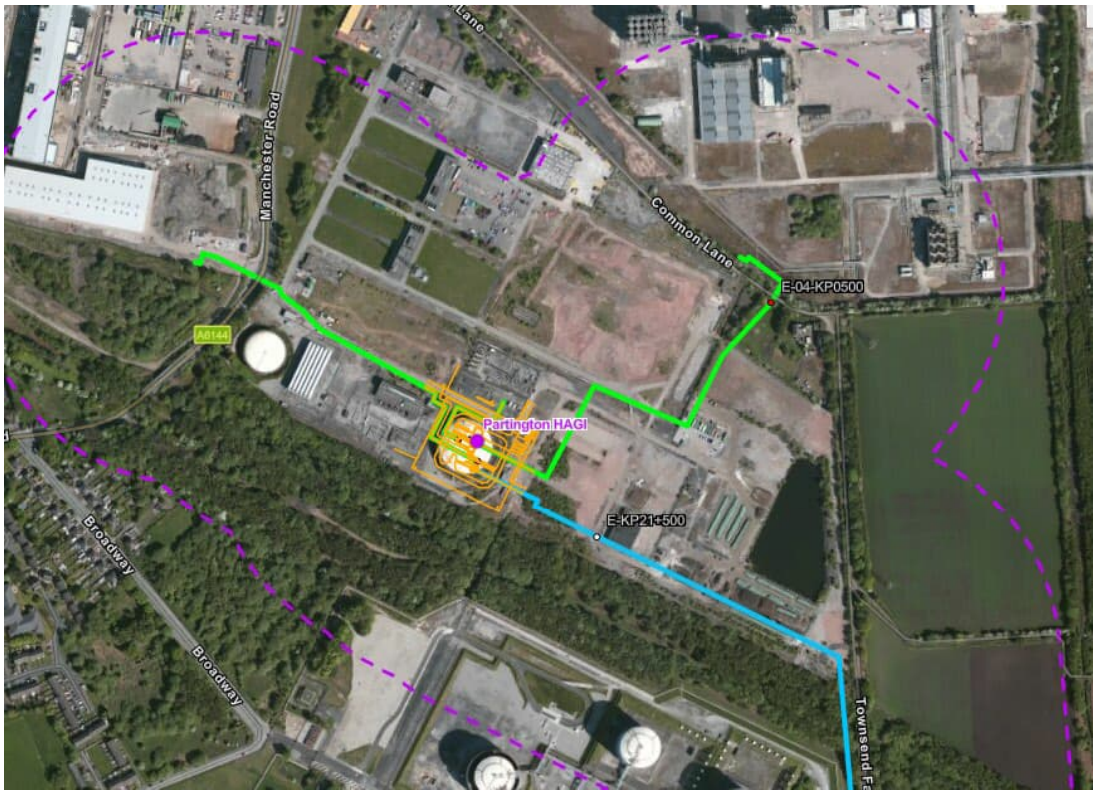


Figure 8: Partington HAGI layout and location

The site is roughly rectangular in shape, trending in a northwest to southeast direction and the surrounding area has a generally flat relief, with the surface at an elevation of ~18 m AOD. The central part of the site has a depression / excavation of perhaps 1-2m across the footprint of the former tank.

2.1.2.7 Higher Walton HAGI

The proposed Higher Walton HAGI site occupies an area of land immediately to the north of the Manchester Ship Canal, and measures ~114m (E-W) by 93m N-S), covering an area of ~1.06 hectares (ha). The site is located on the East Pipeline on the North 1 Pipeline at ~KP09+560 and at the start of the Spur Pipelines N-02 and N05 at Kp 00. It is located immediately to the east of Port Warrington. The local context of the site is shown in Figure 9.

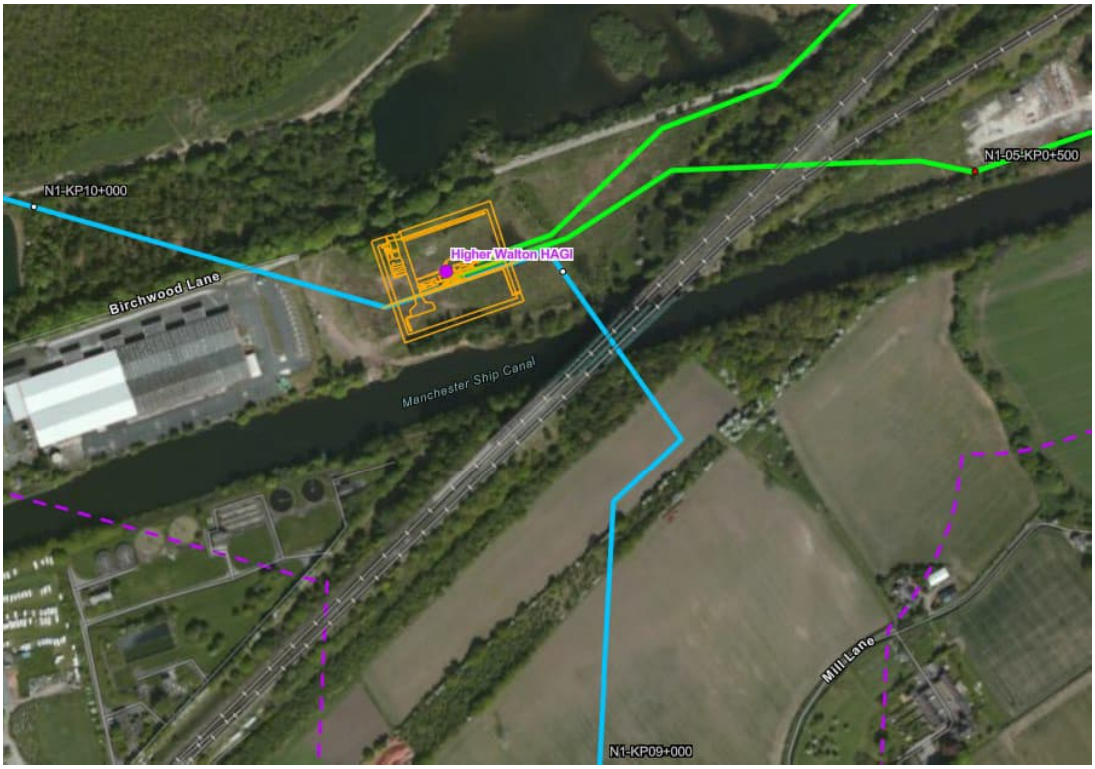


Figure 9: Higher Walton HAGI layout and location

The site is roughly rectangular in shape, trending in a east/northeast to west/southwest direction and has a generally flat relief, with the surface at an elevation of ~11 m AOD. There is a small area of raise ground along the northwest and northern boundary.

2.1.2.8 Clockface HAGI

The proposed Clockface HAGI site occupies an area of farmland measuring ~120m (SW-NE) by 100m NW-SE), covering an area of ~1.2 hectares (ha). The site is located at the end (KP00) of the North 1 pipeline at KP19 and the start of North 2 Pipeline at KP00. It is located immediately to the south of the M62 motorway and approximately 500m northwest of the Old Brook Hall. The local context of the site is shown in Figure 10.

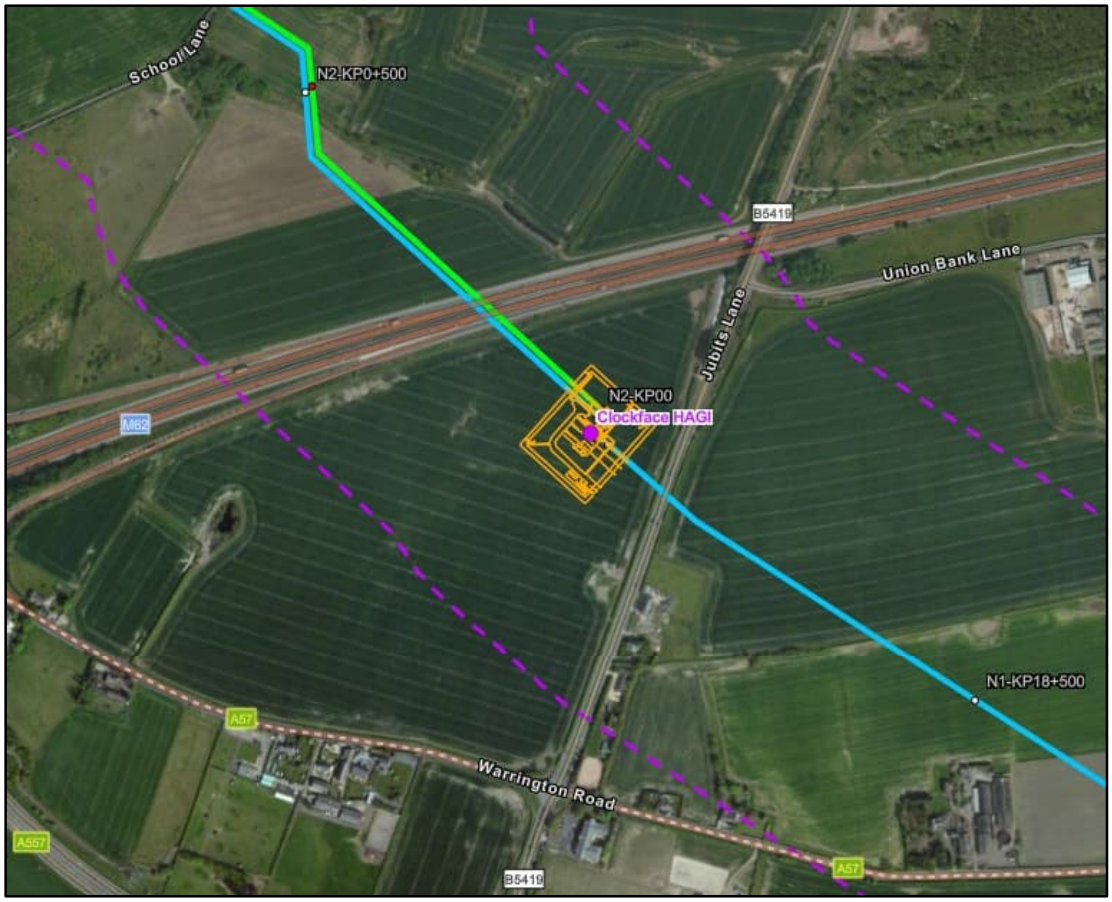


Figure 10: Clockface HAGI layout and location

The site is rectangular in shape, trending in a northeast to southwest direction and has a generally gentle relief, with the surface level dipping marginally to the northwest, from an elevation high of ~57.5 m AOD to 56m AOD towards to the M62.

2.1.2.9 Runcorn HAGI

The proposed Runcorn HAGI site occupies an area of heavily vegetated land, immediately to the east of Weston Power Station. It measures ~105m (N-S) by 110m W-E), covering an area of ~1.15 hectares (ha). The site is located at the beginning of Spur Pipeline W-01 at KP00 and at the end of Spur Pipeline W-01 at ~KP01+470. It is located approximately 260m north of the Weaver Navigation Channel. The local context of the site is shown in Figure 11.

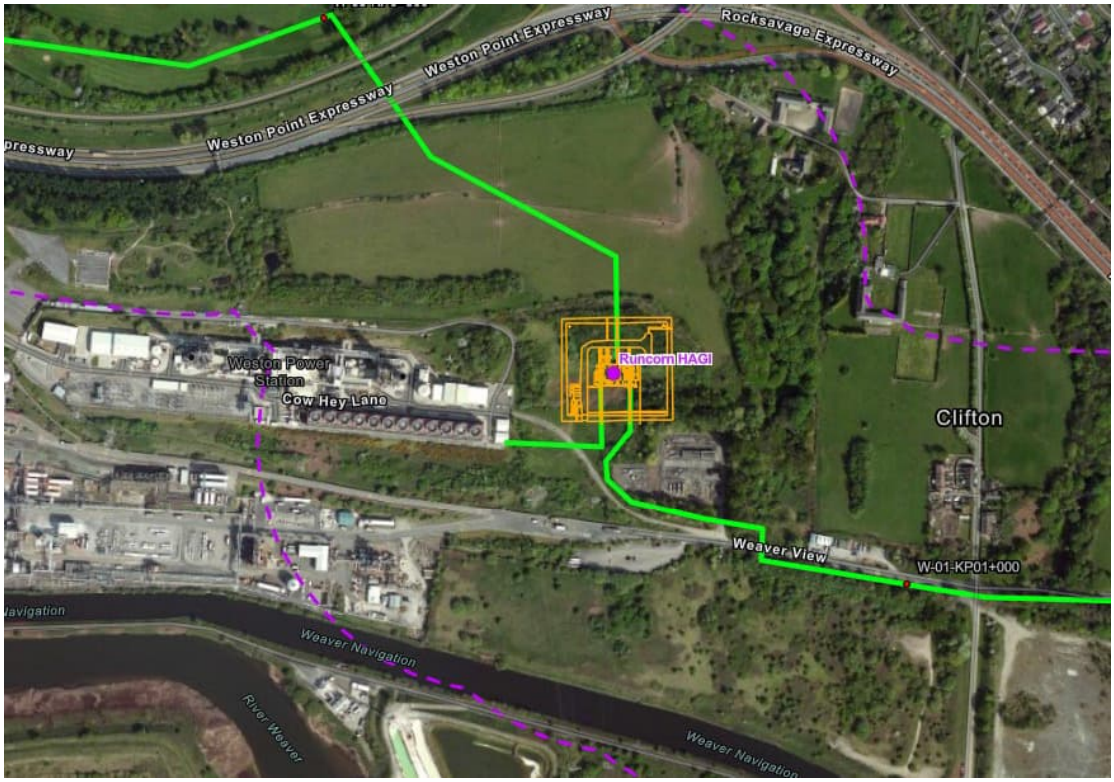


Figure 11: Runcorn HAGI layout and location

The site is approximately square in shape, trending in a north to south direction. and has a generally gentle relief, with the surface level dipping marginally to the northwest, from an elevation high of ~57.5 m AOD to 56m AOD towards to the M62.

The site is located within what appears to potentially be an old excavation, although it is not registered or recorded as a surface ground working. The northern half of the site is dominated by a steep slope rising from an elevation of ~29m AOD in the centre of the site to ~44m AOD at the northern extent of the site. The central and southern part of the site is generally level at an elevation of ~29m AOD, but for a small slope along the south boundary of the site rising to ~31m AOD. The topographic relief can be seen in Figure 12.

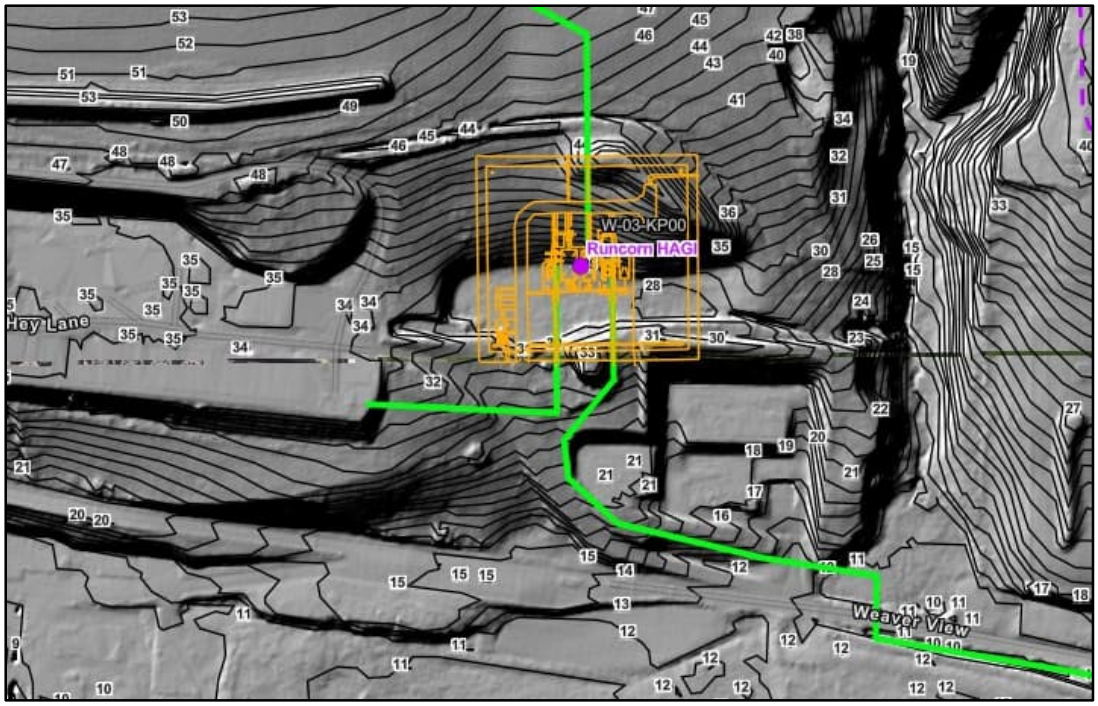


Figure 12: Significant topographic relief at Runcorn HAGI

2.1.2.10 Block Valve Station 1

The proposed Block Valve Station 1 site occupies an area of farmland, and measures ~33m (NW-SE) by ~30m NE-SW), covering an area of ~0.01hectares (ha). The site is located on the East Pipeline at ~KP11+775. It is located approximately 500m west of the village of High Legh and ~1km southeast of the M56 motorway. The local context of the site is shown in Figure 13.

Figure 13: Block valve Station 1 location

The site is approximately square in shape, trending in a northeast to southwest direction and has a generally gentle relief, with the surface level dipping marginally to the west, from an elevation high of ~73 m AOD to 52m AOD towards to the west.

2.1.2.11 Block Valve Station 2

The proposed Block Valve Station 2 site occupies an area of farmland, and measures ~33m (SW-NE) by ~30m NW-SE), covering an area of ~0.01hectares (ha). The site is located on the South Pipeline at ~KP8+300. It is located approximately 650m east of the town of Sandiway and immediately north of the A556 Chester Road. The local context of the site is shown in Figure 14.

Figure 14: Block valve Station 2 location

The site is approximately square in shape, trending in a southeast to northwest direction and has a sloping relief, with the surface level sloping up significantly to the east from an elevation of ~39 m AOD, across the western part of the site, rising to 45m AOD across the east. The topographic relief can be seen in Figure 15.

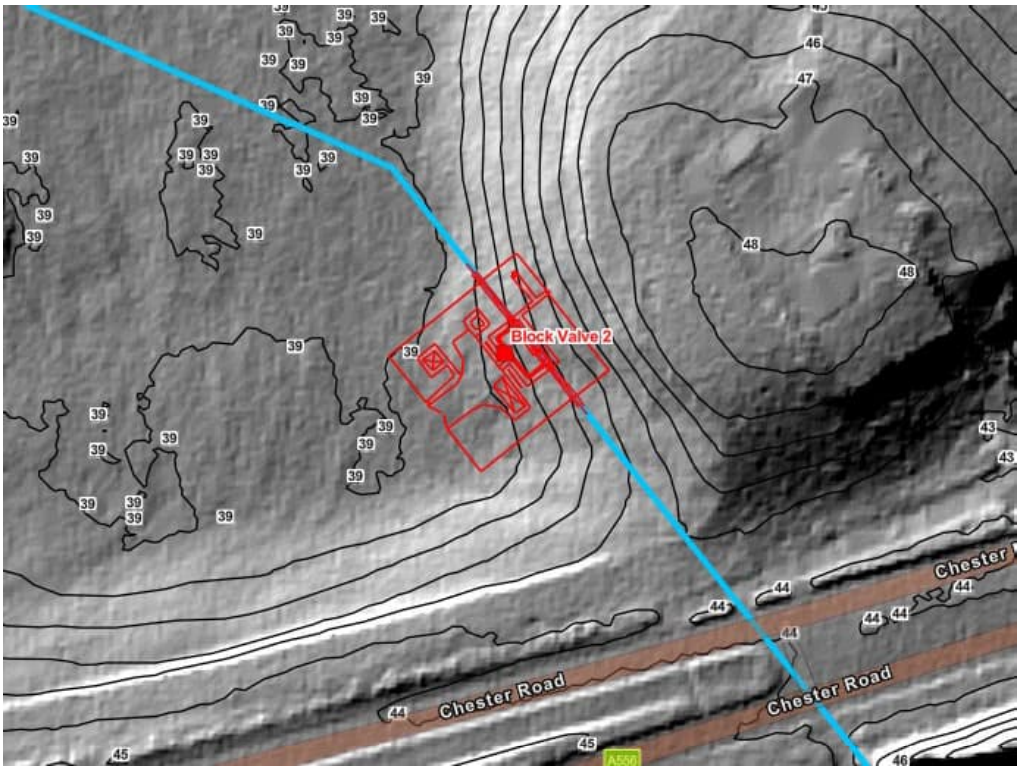


Figure 15: Block valve Station 2 topographic relief

2.1.3 Site description – pipeline route alignments

2.1.3.1 North 1 & 2 Primary pipeline and Spur Pipelines N2-02, N2-04, N2-05, N N2-06 and N2-07

The **North 1** Pipeline corridor extends a total of ~19km. Starting at Central Hub HAGI at an elevation of ~49m AOD, the pipeline trends in a north / north-westerly direction rising to an elevation of ~63m AOD at ~KP03. From here the pipeline turns slight to trend in a northerly direction to Higher Walton HAGI located at KP9+550. The elevation across this section rises from ~63m AOD to a peak of ~75m AOD at ~KP05+550 before dropping to an elevation of ~10m AOD at High Walton HAGI, located adjacent to the Manchester Shipping Canal. From Higher Walter HAGI the pipeline trends in a north-westerly direction to its end at KP00 at the junction with Pipeline North 2. The elevation across this section is an initial drop to ~5m AOD where it crosses the River Mersey, remaining at this elevation until ~KP12+750, after which it rises steadily to an elevation of ~60m AOD at its end at Clockface HAGI.

The North 1 pipeline crosses numerous minor roads, streams and brooks. There are a number of major crossings located along the pipeline, which are listed below:

- M56 Motorway at ~KP04+900
- A56 main road at ~KP08

- Bridgewater Canal at ~KP08+500
- West Coast Mainline Railway at ~KP09+425
- River Mersey at KP12+500
- A562 main road at KP13+750
- A5080 main road at ~KP14+650
- Manchester and Allerton Railway at ~KP14+900
- A57 main road at ~KP18+250

Figure 16: North 1 pipeline KP00 to KP06 Location

Figure 17: Forth 1 pipeline KP06 to KP15 Location

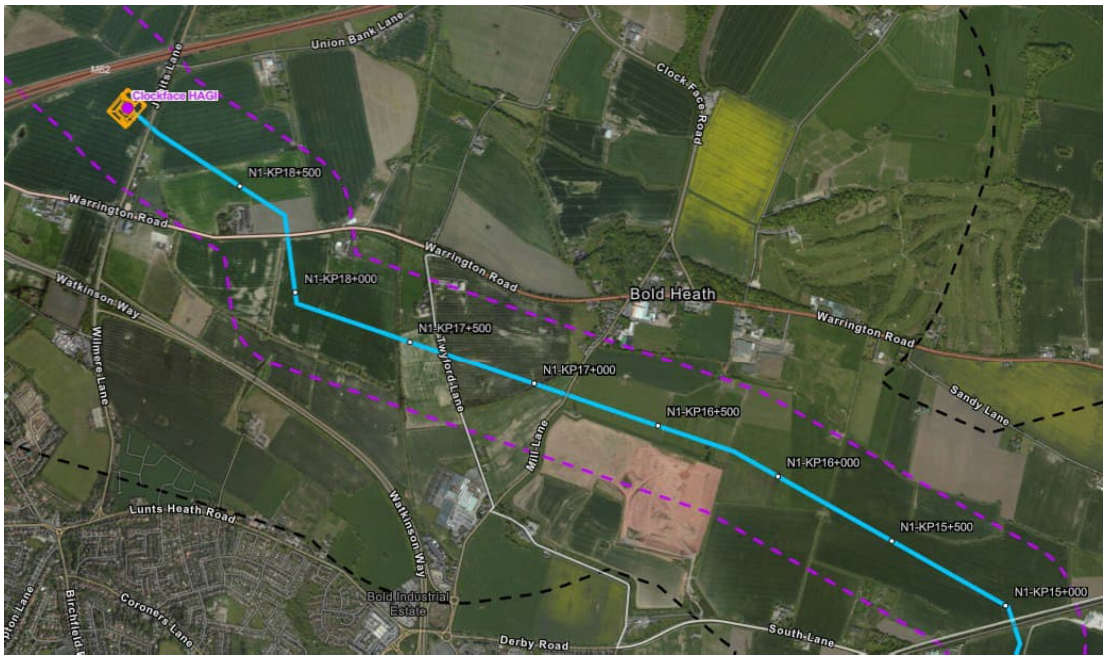


Figure 18: North 1 pipeline KP15 to end Location

The **N-02 Spur Pipeline** corridor extends a total of ~6km. Starting at Higher Walton HAGI the pipeline trends in a north-easterly direction to ~KP01+250, where it turns to trend in an easterly direction to KP05+750, before turning northwards to its end. The elevation along the pipeline is generally between 6m AOD and 13m AOD. From ~KP04 to KP05+750 the pipeline tracks close to the north side of the Manchester Shipping Canal. There are a number of major crossings located along the pipeline, which are listed below:

- West Coast Mainline Railway at ~KP01+250
- Eastford Road and Canal at ~KP01+550 to KP01+850
- A5060 main road at ~KP01+925
- A5061 main road at ~KP04+600

Figure 19: Spur Pipeline N-02 Location

The **N-05 Spur Pipeline** corridor extends a total of ~0.67km. Starting at Higher Walton HAGI the pipeline trends in an easterly terminating at Baronet Works adjacent to the Manchester Shipping Canal. The elevation along the pipeline is generally 10m AOD. There is a single major crossing located along the pipeline, listed below:

- West Coast Mainline Railway at ~KP00+250 to ~KP00+500.

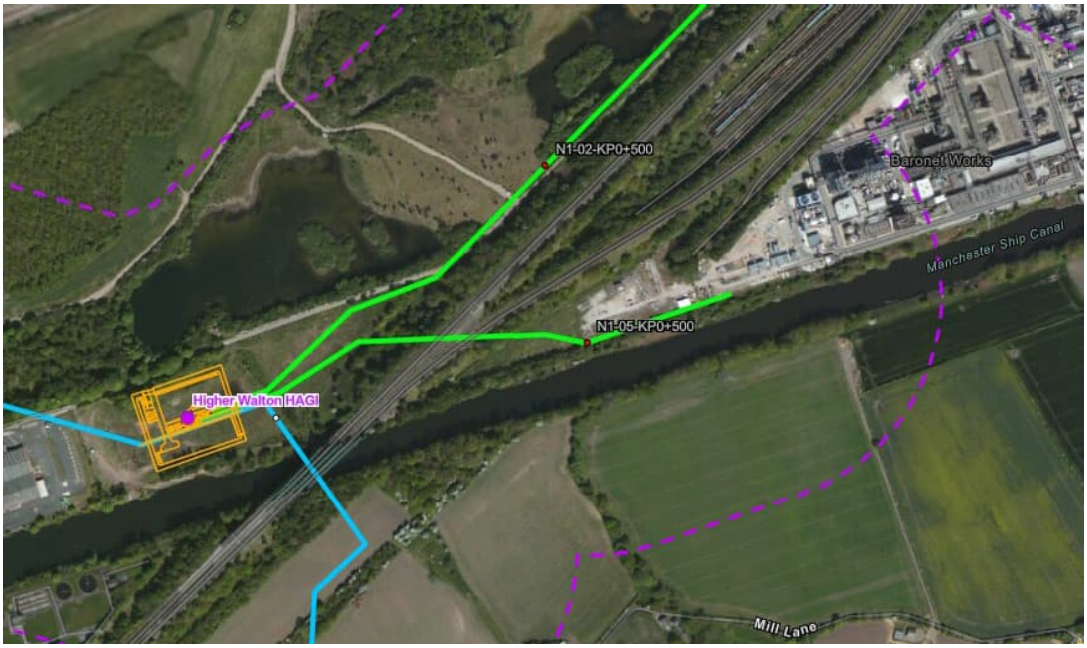


Figure 20: Spur Pipeline N-05 Location

The **North 2** Pipeline corridor extends a total of ~6.1km. Starting at the end of North 1 Pipeline at Clockface HAGI, at an elevation of ~60m AOD, the pipeline trends in a northerly direction rising to an elevation of ~70m AOD at ~KP03. From here the pipeline turns slightly to trend in a north-easterly direction to its end at ~KP06+100. The elevation across this section falls from ~70m AOD to a ~30m AOD at ~KP06+100.

The North 2 pipeline crosses numerous minor roads, streams and brooks. There are a number of major crossings located along the pipeline, which are listed below:

- M62 Motorway at ~KP00+150
- A570 main road at ~KP01+400
- Liverpool to Manchester Railway at ~KP02+350

The **N2-04 Spur Pipeline** corridor extends a total of ~2km. Starting at Clockface HAGI, the pipeline trends in a north-westerly direction to ~KP01+150, where it turns to trend in a north-easterly direction to its end. The elevation across the pipeline ranges from between ~50m AOD to a ~55m AOD.

The N2-04 spur pipeline crosses numerous minor roads. There is a single major crossing located along the pipeline, listed below:

- M62 Motorway at ~KP00+150

The **N2-06 Spur Pipeline** corridor extends a total of ~1.2km. Starting at the end of the N2 main pipeline, the pipeline trends in a south-easterly direction to ~KP00+600, where it turns to trend in a north/north-easterly direction to its end. The elevation across the pipeline ranges from between ~25m AOD to a ~33m AOD.

The N2-06 spur pipeline has a single major crossing located along the pipeline, listed below:

- A570 main road at ~KP00+850

The **N2-07 Spur Pipeline** corridor extends a total of ~160m. Starting at the end of the N2 main pipeline, the pipeline trends in a north-westerly direction to its end, tracking along Burtonhead Road at an elevation of 30m AOD.

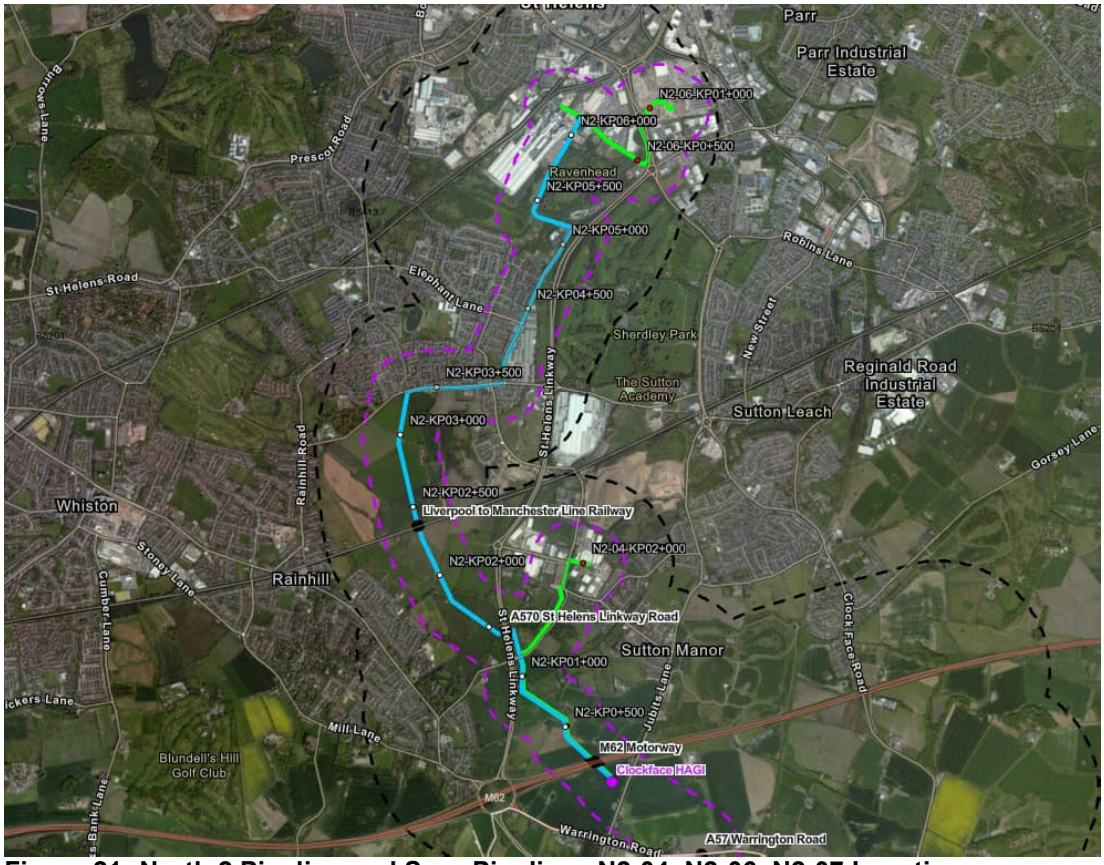


Figure 21: North 2 Pipeline and Spur Pipelines N2-04, N2-06, N2-07 Location

2.1.3.2 East Primary pipeline and Spur Pipelines E-01, E-02, E-04 and E-05

The **East Pipeline** corridor extends a total of ~21.63km. Starting at Central Hub HAGI the pipeline has an overall trend in a north-easterly direction. The pipeline starts at elevation of ~47m AOD, rising to a peak of ~84m AOD at the A559 crossing at ~KP4+150. From here the elevation drops to ~52m AOD at the M6 crossing at ~KP09+500. After the M6 the elevation rises to ~72m AOD just to the east of the A50 crossing at ~KP11+750. From ~KP14+500 to ~KP15 there is a sharp decent from an elevation of ~60m AOD to 30m AOD, whereafter it continues to drop in elevation down to ~14m AOD at the River Bollin crossing at ~KP16+900. From here to the end of the pipeline, at Partington HAGI, the elevation is generally between 15m AOD and 24m AOD.

The **E-02 Spur Pipeline** corridor extends a total of ~150m. Starting at Warburton HAGI, the pipeline trends in a westerly direction to its end at Warburton National Grid. The elevation across the pipeline ranges from between ~24m AOD to a ~25m AOD.

The **E-01 Spur Pipeline** corridor extends a total of ~550m. Starting at Partington HAGI, the pipeline trends in a west/north-westerly direction to its end. The elevation across the pipeline is ~18m AOD.

The **E-04 Spur Pipeline** corridor extends a total of ~600m. Starting at Partington HAGI, the pipeline trends in a north-easterly direction to its end. The elevation across the pipeline is ~18m AOD to 19m AOD.

The **E-05 Spur Pipeline** corridor extends a total of ~120m. Starting at Partington HAGI, the pipeline trends in a north-easterly direction to its end. The elevation across the pipeline is ~19m AOD at its start dropping to ~16m AOD at its end.

The East pipeline crosses numerous minor roads, streams and brooks. There are a number of major crossings located along the pipeline, which are listed below:

- A49 main road at ~KP01+250
- A556 main road at ~KP04+200
- M6 Motorway at ~KP09+425
- A50 main road at ~KP11+200
- M56 motorway at ~KP13+800
- A56 main road at ~KP15+400
- Bridgewater Canal at ~KP15+600
- River Bolin at ~KP16+900
- A6144 at ~KP00+350 (Spur Line E-01).

Figure 22: East Pipeline from KP00 to KP11

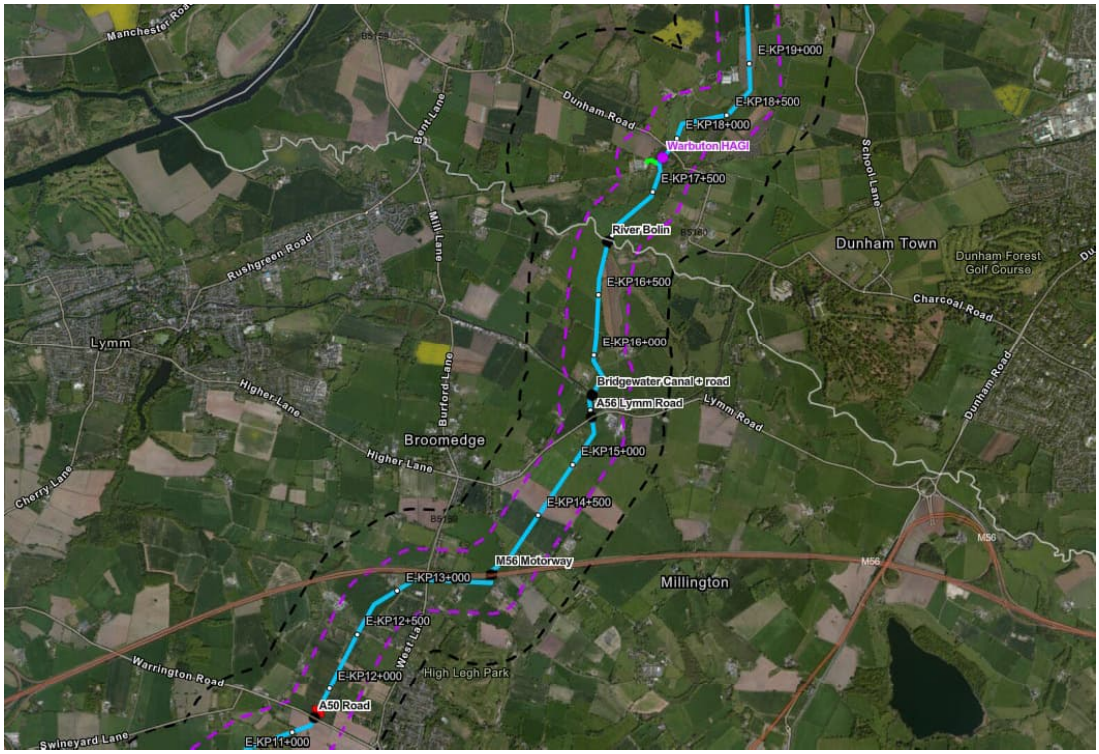


Figure 23: East Pipeline from KP11 to KP19

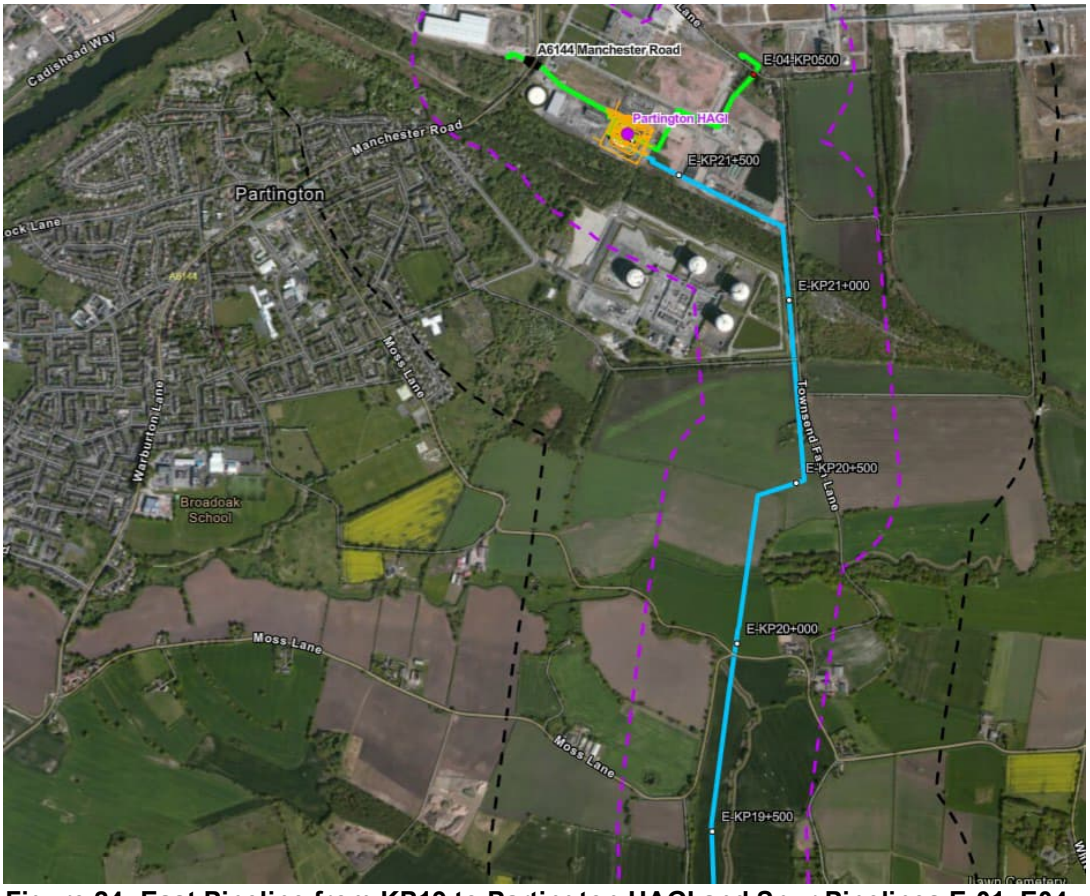


Figure 24: East Pipeline from KP19 to Partington HAGI and Spur Pipelines E-01, E04 and E05 from Partington HAGI

2.1.3.3 South Primary pipeline

The **South Pipeline** corridor extends a total of ~18.45km. Starting at Central Hub HAGI the pipeline trends in a southerly direction to ~KP09. From here to ~KP11+500 the pipeline trends in an easterly direction, after which it turns and trends in a southerly direction to ~KP14. From here until the end of the pipeline at Inoyvn Gas Storage HAGI the pipeline trends in an easterly direction.

The pipeline starts at elevation of ~47m AOD, dropping to a low of 7-9m AOD at the River Weave Valley between ~KP02 to ~KP02+750. From here to ~KP03+500 there is a gentle rise in elevation to ~15m AOD, after which there is a sharp rise to ~32m AOD by ~KP03+700. The topography is undulating over the next section of pipeline from ~KP03+700 to ~KP08+900, where the elevation is ~37m AOD. At ~KP04+500 to ~KP04+750 there is a sharp fall in elevation from 33m AOD to 22m AOD followed by a sharp rise back to 33m AOD, associated Grange Brook Valley. There is a steep rise from ~37m AOD to 60m AOD between ~KP08+900 to ~KP09+500. From this point to ~KP10+500 there is a gradual fall to 40m AOD, followed by a sharp fall to ~14m AOD between KP11+100 to KP11+375 across the Weaver Navigation Channel. On the eastern side of the Weaver valley, there is a steep rise from 14m AOD to 48m AOD over a 225m distance to ~KP11+600. From here until ~KP15+700 the topography is undulating with elevation ranging from ~36m AOD to 48m AOD. At KP15+700 there is a further sharp fall in elevation from 48 m AOD to 17m AOD at ~KP16+250 as the pipeline crosses the River Dane valley. From here to the end of the pipeline there is a general rise in elevation but again undulating, rising to ~33m AOD at the end of the pipeline at Inoyvn Gas StorageHAGI.

The South pipeline crosses numerous minor roads, streams and brooks. There are also a number of major crossings located along the pipeline, which are listed below:

- A533 main road at ~KP00+600
- Trent and Mersey Canal at ~KP01+675
- Weaver Navigation Channel at ~KP02+150
- West Coast Mainline at ~KP04+350
- A49 main road at ~KP05+900
- Mid Cheshire Railway at ~KP07+150
- A559 main road at ~KP08+350
- River Weaver and West Coast Mainline at ~KP11
- A533 main road at ~KP14+830
- London Road at ~KP15+600
- River Deane at ~KP16+250
- Trent and Mersey Canal at ~KP16+550
- Middlewich Line railway at ~KP17+600
- A530 main road at ~KP18+75

Figure 25: South Pipeline from KP00 to KP08

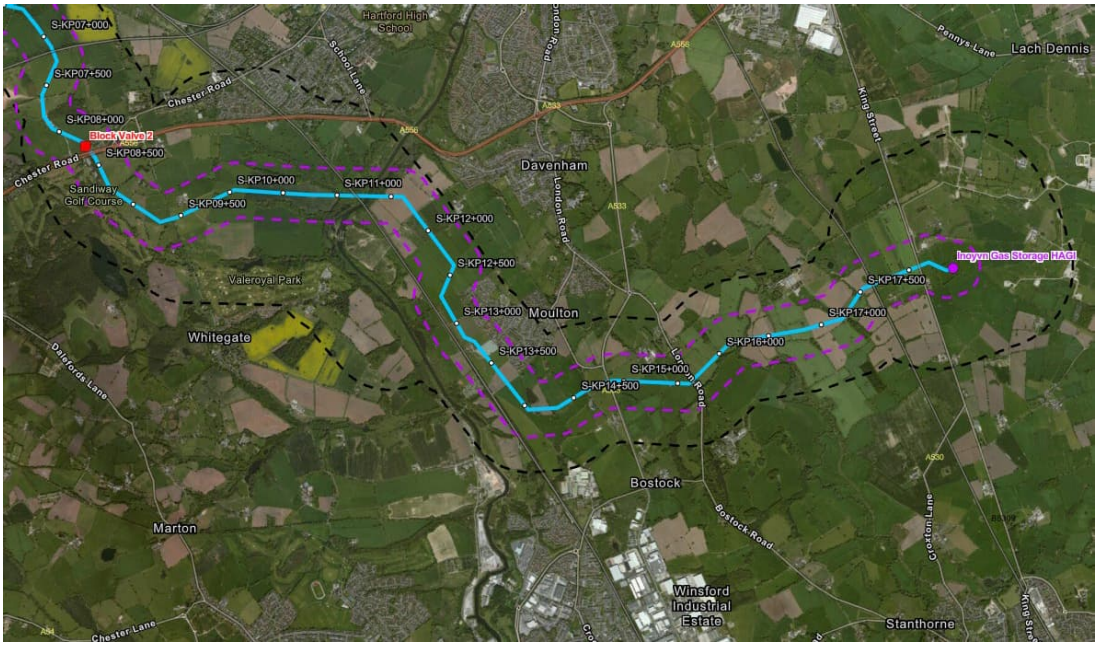


Figure 26: South Pipeline from KP06 to End at Inoyvn Gas Storage HAGI

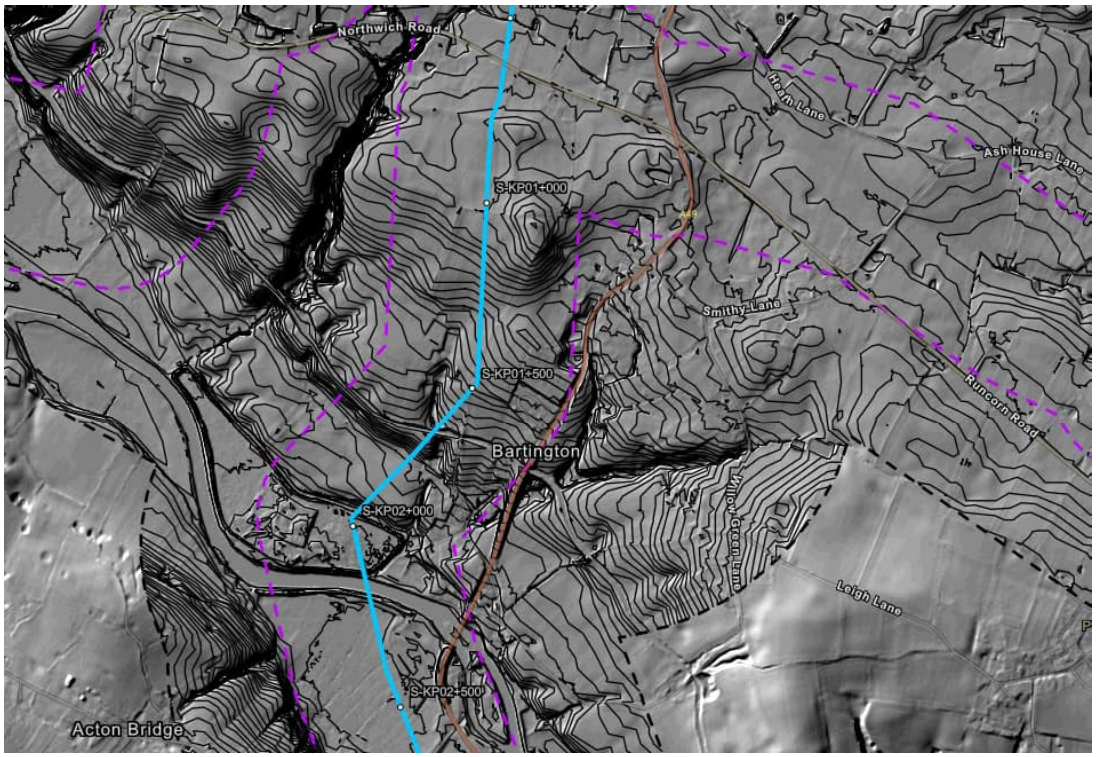


Figure 27: Significant topographic relief at KP02 – River Weaver Valley

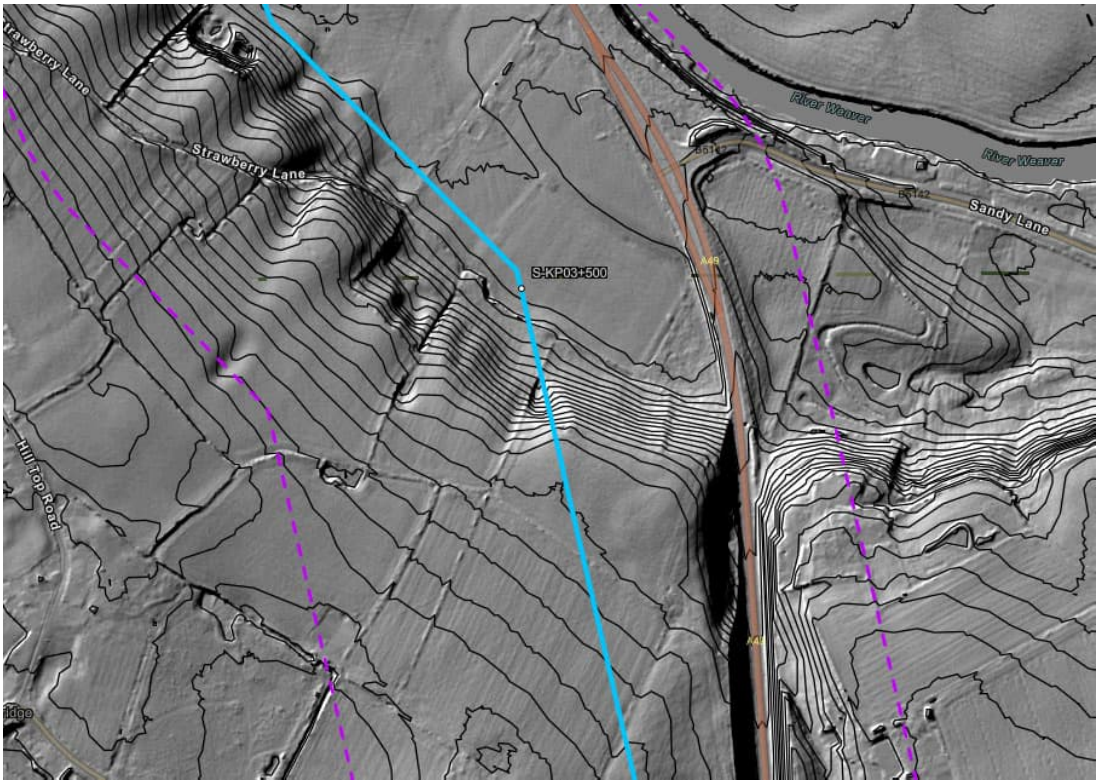


Figure 28: Significant topographic relief at KP03+500 – River Weaver Valley

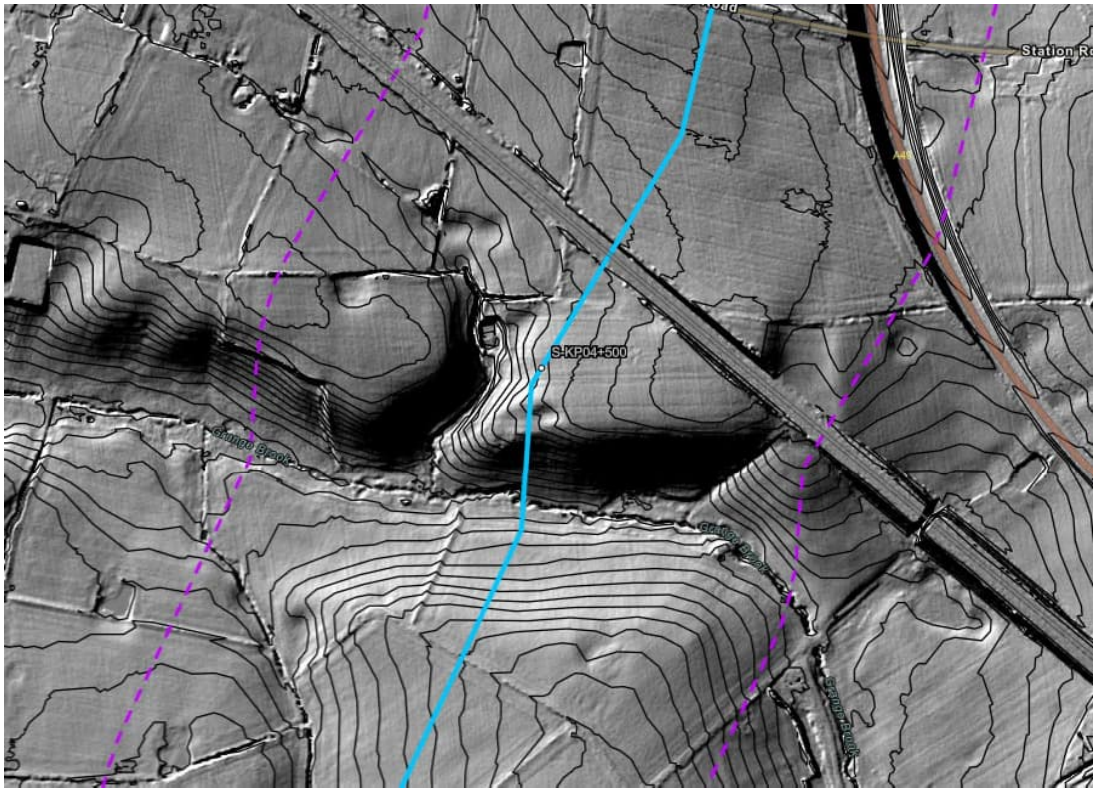


Figure 29: Significant topographic relief at KP04+500 to 04+750 – Grange Brook Gulley / Valley

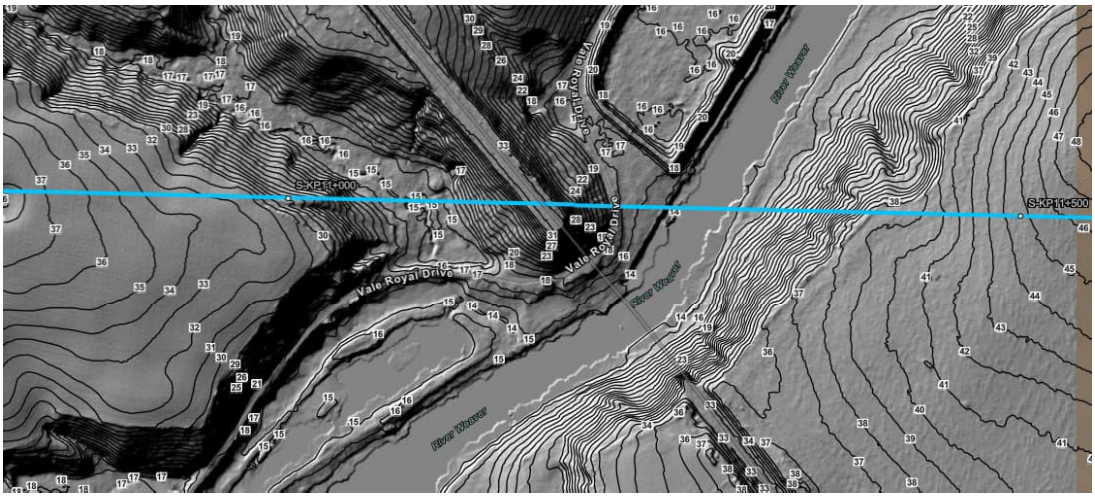


Figure 30: Significant topographic relief at KP11 to KP11+600 – River Weaver Valley

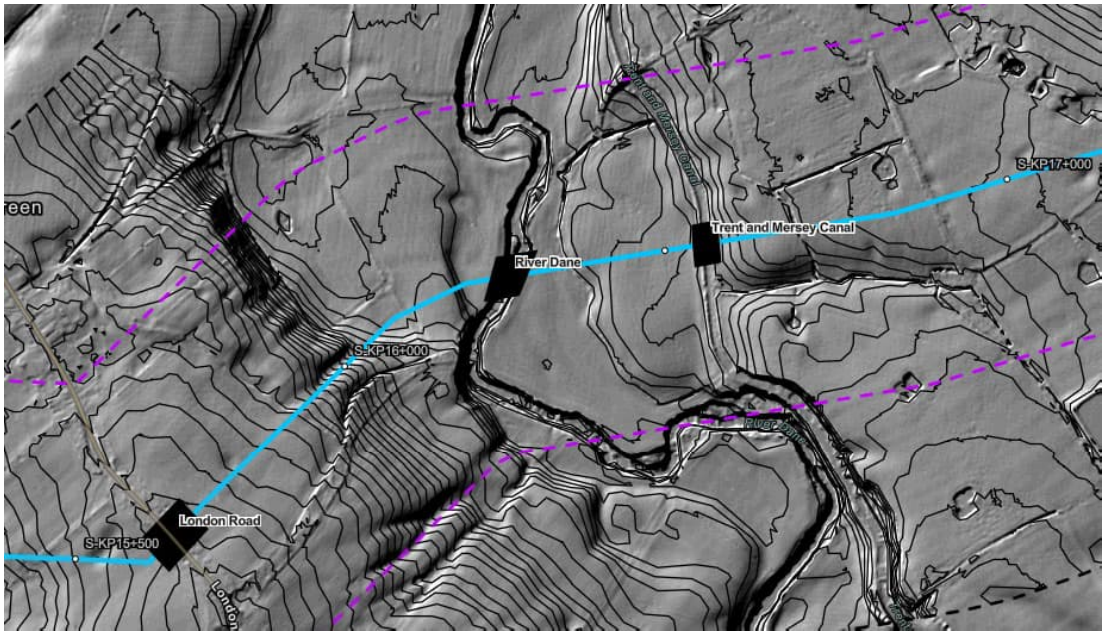


Figure 31: Significant topographic relief at KP15+700 – River Dane Valley

2.1.3.4 *Spur Pipeline C-01*

The **Spur Pipeline C-01** corridor extends a total of ~7.95km. Starting at Central Hub HAGI the pipeline trends in an overall south-easterly direction to its end.

The pipeline starts at elevation of ~47m AOD, with the topography generally undulating between ~40m AOD and 50m AOD until ~KP05+500. From here there is a fall in elevation 25m AOD at ~KP06+100, associated with the Trent and Mersey Canal, followed by a rise to an elevation of 36m AOD by ~KP06+650. There is a sharp fall in elevation from 36m AOD to 13m AOD from between ~KP06+700 to KP06+800 down the River Weaver Valley. The pipeline finishes at an elevation of ~20m AOD.

The C-01 Spur pipeline crosses numerous minor roads, streams and brooks. There are also a number of major crossings located along the pipeline, which are listed below:

- A533 main road at ~KP00+850 and again at ~KP01+100
- Trent and Mersey Canal at ~KP06+050
- River Weaver at ~KP07

Figure 32: C-01 Spur Pipeline Location

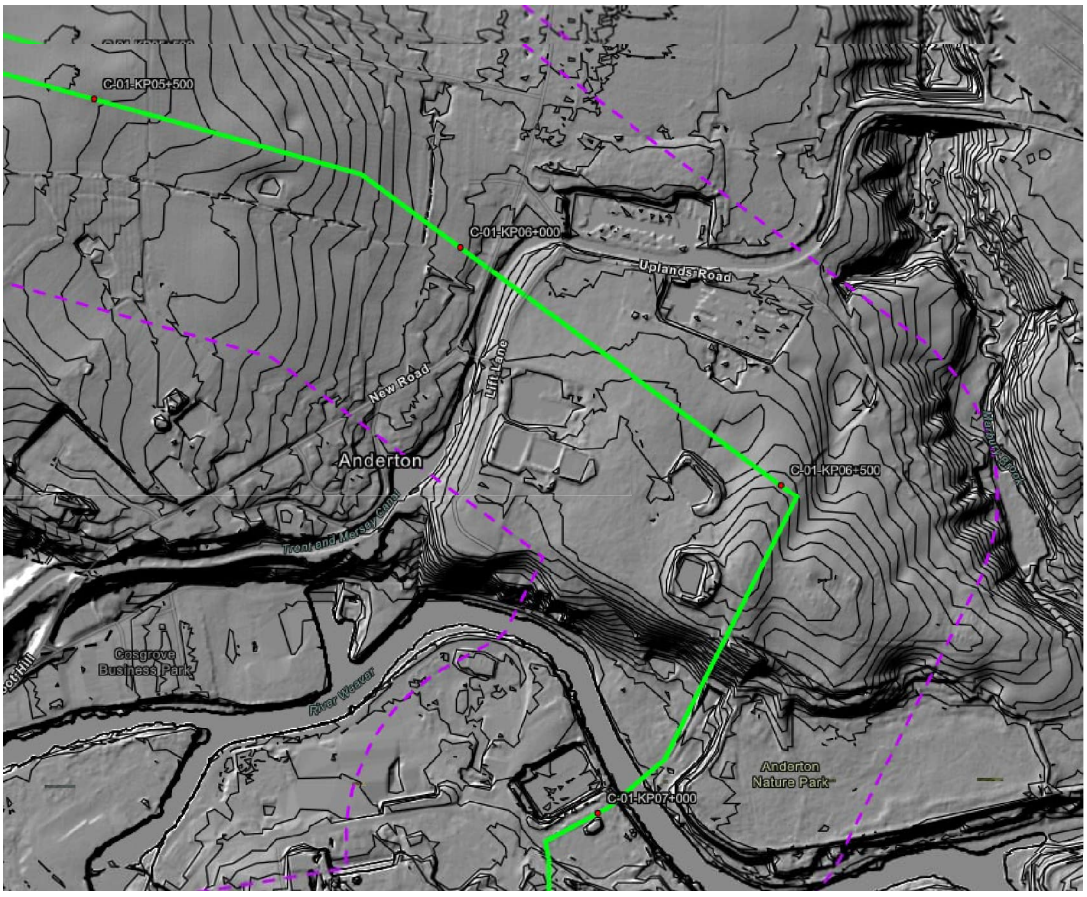


Figure 33: C-01 Spur Pipeline – Significant topographic relief

2.1.3.5 West Primary pipeline

The **West Pipeline** corridor extends a total of ~19.30km. Starting at Central Hub HAGI (At KP19+300) the pipeline trends in a north-westerly direction to ~KP10+500. From here to its end at KP00, the pipeline trends in a south-westerly direction. The 'start' of the pipeline is considered as the Central Hub HAGI for the purposes of this discussion.

The pipeline starts at elevation of ~47m AOD at Central Hub HAGI, with general undulating topography from KP19+300 to ~KP18+500, where the elevation is ~45m AOD. From here to KP17+920 there is a fall to 27m AOD to the Trent and Mersey Canal, after which there is a sharp fall in elevation to 8mAOD by ~KP17+750, down to the River Weaver valley. From ~KP17 there is a significant overall rise in elevation to 65m AOD by ~KP14+500, with locally steeper sections and some more gentle rises. There is undulating but generally falling elevation and topography between ~KP14+500 and KP12+500, to an elevation of ~40m AOD. From KP12+500 to ~KP11+300 there is a drop in elevation to 6m AOD. There is a local rise in elevation to ~18m AOD between ~KP11 to ~KP10+100, where the pipeline and Rocksavage HAGI are located on historic refuse heaps, now heavily vegetated. After here the pipeline traverses the historic tidal flat area where the elevation sits at ~5m AOD. There is a slight rise to 17m AOD from ~KP02+500 to KP01+750, with the final stretch of pipeline undulating and finishing at an elevation of ~10m AOD.

The West pipeline crosses numerous minor roads, streams, drainage channels and brooks. There are also a number of major crossings located along the pipeline, which are listed below:

- A517 main road at ~KP00+250 and again at KP01+750 to KP01+900
- Ellesmere Port Railway at ~KP03+250
- River Weaver at ~KP10
- Chester to Manchester Railway at ~KP11
- Sutton and Weaver Canal at ~KP11+250
- A56 at ~KP11+750
- West Coast Mainline at ~KP16+500
- Trent and Mersey Canal at ~KP17+900
- A533 main road at ~KP18+375

The **W-01 Spur Pipeline** corridor extends a total of ~1.46km. Starting at Rocksavage HAGI, after an initial short trend toward the northeast to ~KP00+500, the pipeline trends in a north-westerly direction to its end at Runcorn HAGI. The pipeline starts at an elevation of 17m AOD at Rocksavage HAGI, before dropping to ~6m AOD across the River Weaver at ~KP00+175. On the north side of the River Weaver, to ~KP01+150 the topography is undulating with elevation varying from ~7m AOD to 13m AOD. From here there is a sharp rise over undulating ground to Runcorn HAGI where the pipeline ends at ~30m AOD.

The W-01 spur pipeline crosses has major crossings located along the pipeline, which are listed below:

- River Weaver at ~KP00+175

- M56 Motorway at KP00+225

The W-02 Spur Pipeline corridor extends a total of ~170m. Starting at Runcorn HAGI, after an initial short trend toward the south, the pipeline trends in a westerly direction to its end. The pipeline starts at an elevation of 26m AOD at Runcorn HAGI, before quickly rising to 30m AOD and then dropping to ~25m AOD before it turns west and rises to it end at an elevation of 34m AOD.

The **W-03 Spur Pipeline** corridor extends a total of ~1.95km. Starting at Runcorn HAGI, after an initial short trend toward the north to KP00+100 the pipeline turns to trend in a north-westerly direction to ~KP01+300, after which it turns to trend north its end. The pipeline starts at an elevation of 32m AOD at Runcorn HAGI, rising very steeply to 44m AOD over 75m, before continuing a fairly steep rise to ~71m AOD at ~KP00+500, shortly after the A557 crossing. From here to its end the topography is generally undulating, which local steeper gradients, with elevations ranging from ~58m AOD to 73m AOD.

The W-01 spur pipeline has a single major crossing located along the pipeline, listed below:

- A557 main road at ~KP00+500

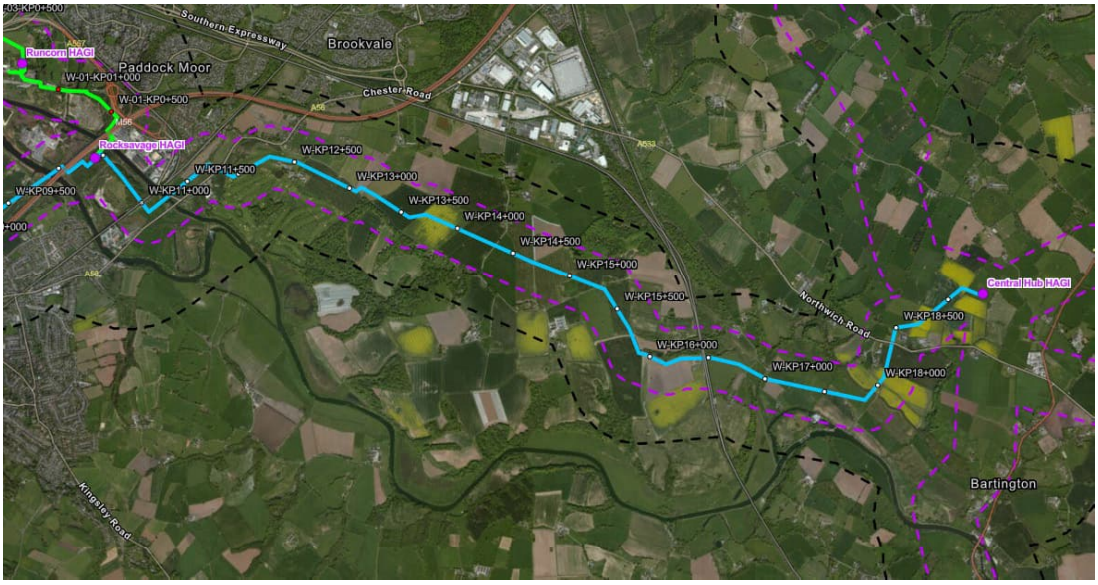


Figure 34: West Pipeline – Location KP09+500 to KP19+300

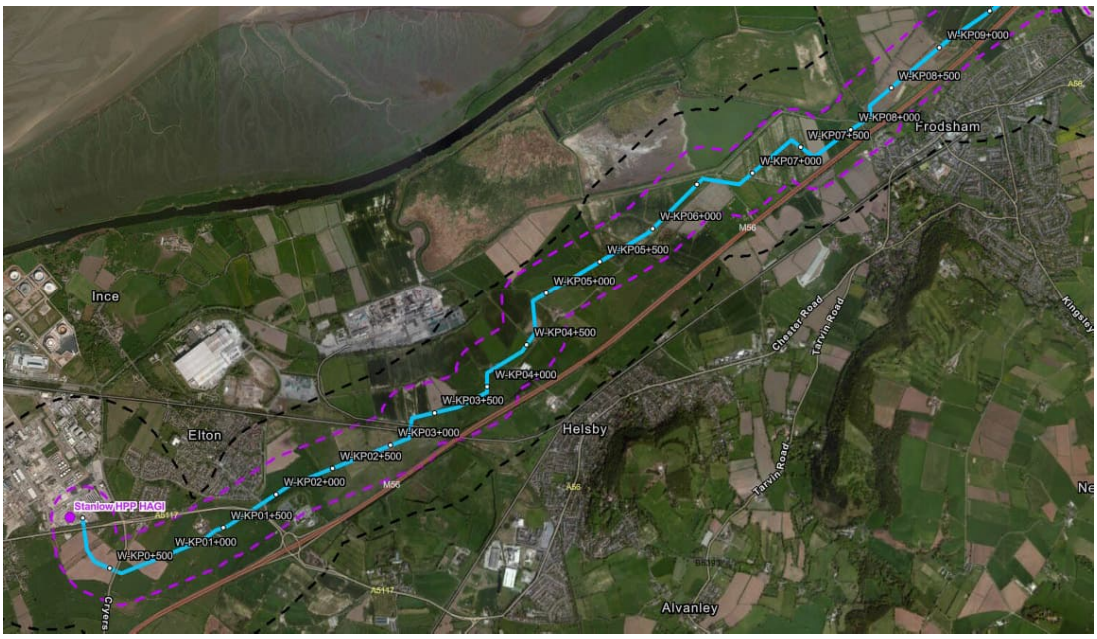


Figure 35: West Pipeline – Location KP00+000 to KP09+000

Figure 36: W-01, W-02 and W-03 Spur Pipelines – Location

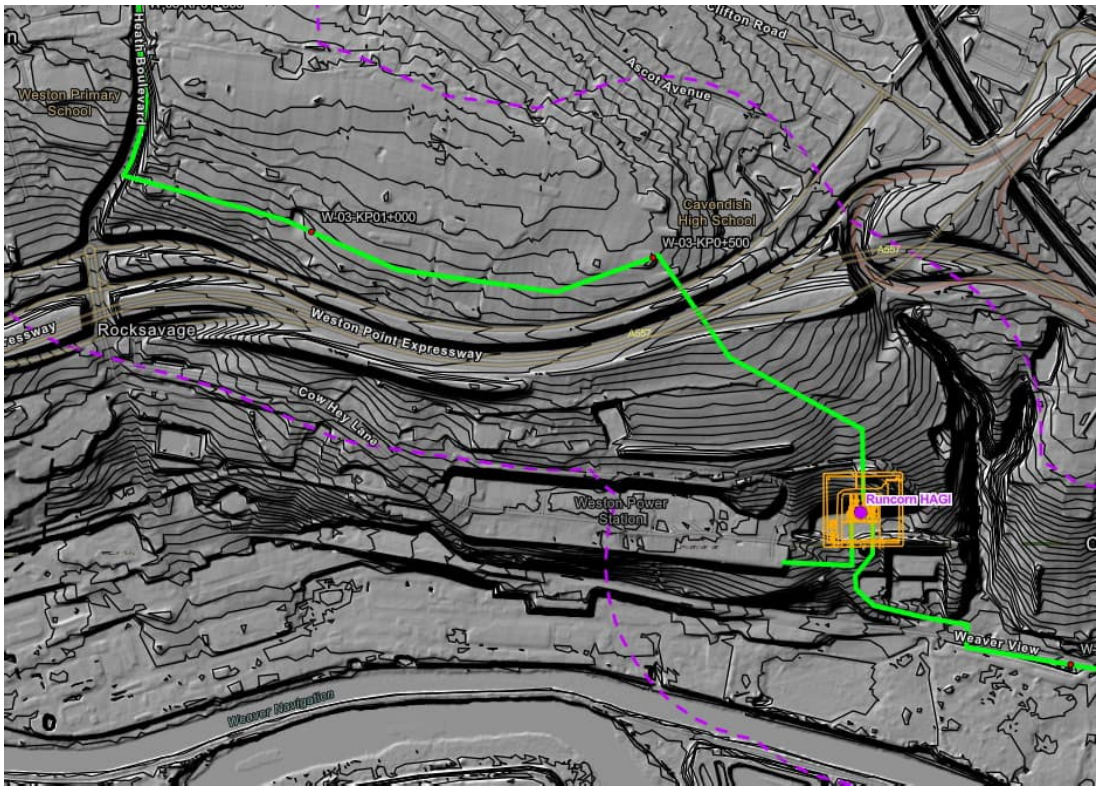


Figure 37: W-01, W-02 and W-03 Spur Pipelines – Significant Topographic Relief

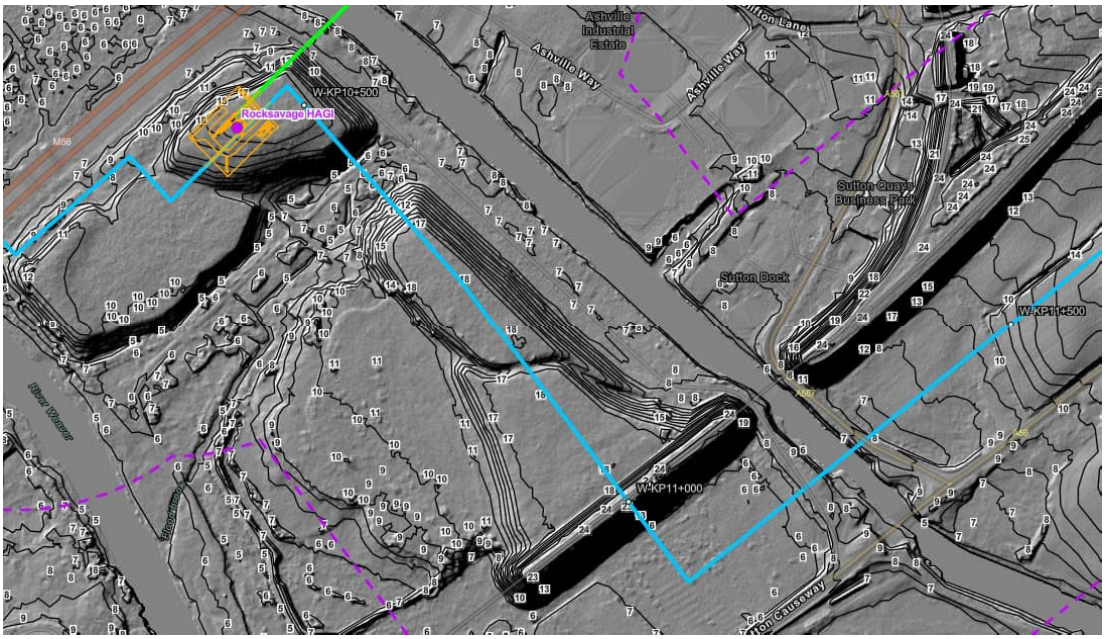


Figure 38: West Pipeline – Significant Topographic Relief KP10+100 to KP11

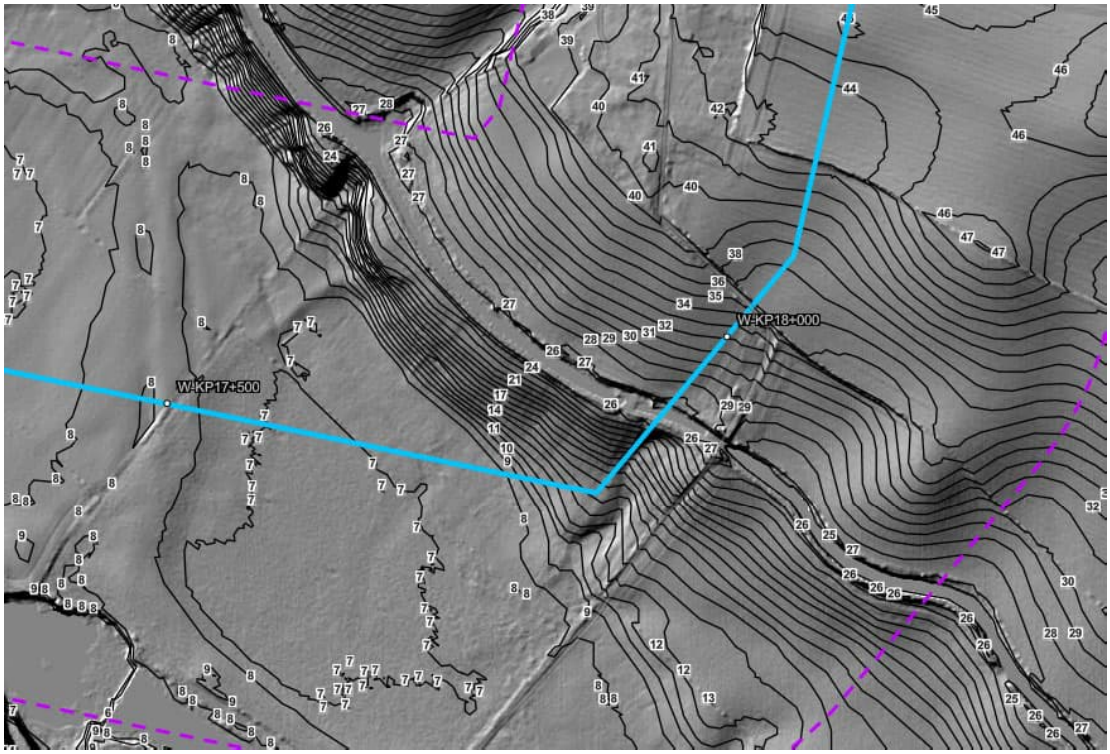


Figure 39: West Pipeline – Significant Topographic Relief – KP18

3 GEOLOGICAL SETTING

3.1 Site Geology

The following information has been established from a review of published records (British Geological Survey (BGS), 1:50,000 series, reference to the British Geological Survey (BGS) GeoIndex online database and the Groundsure Geo-Insight reports (pdf and digital information). The review has included reference to available published historical borehole logs within ~250m either side of the pipeline centrelines. The ground investigation data from the work completed along the project infrastructure has also been included in the review.

On the basis of the published information, geological maps of the area and available existing project ground investigation data, the full anticipated succession of made ground and natural strata for each of the facilities' locations and pipeline route alignments are provided in Section 3.1.1 to Section 3.1.6, below as a series of Conjectural Ground Models. Due to the complex nature of geology across the project infrastructure, each pipeline alignment and associated HAGI are broken down into segments represented by a specific conjectural ground model. The tables below present pertinent information for each geological unit / formation included a summary description, anticipated depth to top of stratum and anticipated thickness, along identifying the relevant project infrastructure and kilometre range over which is applies. For conjectural ground models at specific major crossing locations the reader should refer to the relevant KP range for the crossing and cross reference the relevant conjectural ground model for that specific location.

A full list of the numerous geological units and formations and their spatial distribution, as recorded on BGS mapping / Groundsure reports, can be found in Appendix C.

3.1.1 North 1 Pipeline

The conjectural geological succession for the North 1 pipeline are provided in Table 2

Table 2 North 1 Pipeline

	Formation	Description	Depth to top of stratum (m bgl)	Thickness (m)
KP00+000 to KP01+580, KP02+297 to KP02+656, KP05+000 to KP05+623 Central Hub HAGI				
	Topsoil	Sandy gravelly clayey SILT[1]	GL	0.20 – 0.40[2]
Bedrock	Bollin Mudstone Member	The upper mudstone member is largely dominated by laminated reddish-brown and greenish-grey mudstone with siltstones. The lower part is structureless and laminated, dominantly reddish-brown mudstone May be weathered in upper layers near surface.	0.20 – 0.40[2]	Up to > 350m (based on BGS BH SJ64SW/7)
KP01+580 to KP02+297, KP02+656 to KP05+000, KP05+623 to KP07+510				
	Topsoil	As above.[1]	0.00	0.70
	Made Ground	Backfill	0.00	0.50
Drift	Devensian Till (Diamicton)	Heterogenous mixture of clay, sand, gravel, and boulders varying widely in size and shape. Interpreted as a sub-glacial till. Often dark reddish brown, weaky calcareous and matrix supported. Clasts are mixed lithologies, including quartzite, metasedimentary rocks, sandstones and shale.	0.50 – 0.70	1.80 – 23.50
Bedrock	Bollin Mudstone Member	As above. May be weathered in upper layers near surface.	2.50 – 24.00	4.00 – 36.00[3] Up to > 350m (based on BGS BH SJ64SW/7)
KP07+510 to KP07+857				
	Topsoil	As above.[1]	0.00	0.20 – 0.40[2]
Drift	Devensian Till (Diamicton)	As above.	0.20 – 0.40[2]	Unknown
Bedrock	Tarporley Siltstone Formation	Heterolithic, comprising interlaminated and interbedded siltstones, mudstones and sandstones. Most mudstone and siltstone beds are reddish brown, though green-grey mottles and laminae are common.	Unknown	Up to >220m (BGS, Lexicon)
KP07+857 to KP08+80, KP13+650 to KP14+140 KP14+600 to KP15+792				

	Formation	Description	Depth to top of stratum (m bgl)	Thickness (m)
	Topsoil	As above.[1]	0.00	0.50
Drift	Devensian Till	As above.	0.50	1.10
Bedrock	Wilmslow Sandstone Formation	Red-brown to brick-red, fine- to medium-grained, generally pebble-free, cross-bedded sandstones, with sporadic siltstones. May be weathered in upper layers near surface.	0.50 – 1.60	8.90 – 10.30[3]
KP08+80 to KP08+714				
	Topsoil	As above.[1]	0.00	0.40
Drift	Shirdley Hill Sand Formation	Moderately to well-sorted, fine-grained sand with peat layers. Sand grains are dominated by rounded to sub-rounded quartz grains. The formation can be divided into an upper "white" sand and a lower "brown" sand that is olive grey and brown. It is interpreted as potentially being a coastal blown sand.	0.40	1.70 – 1.80
	Devensian Till	As above.	2.10 – 2.20	0.96 – 1.20
Bedrock	Helsby Sandstone Formation	Fine- to medium-grained, locally micaceous, cross-bedded and flat-bedded sandstones, weathering to sand near surface.	3.16 – 3.30	6.70 – 7.04[3]
KP08+714 to KP09+600				
	Made Ground	Sand and Clays Fill	0.00	1.00 – 1.50
Drift	Shirdley Hill Sand Formation	As above.	1.00 – 1.50	1.50
Bedrock	Helsby Sandstone Formation	As above.	2.50 – 3.00	0.50 – 18.90
	Wilmslow Sandstone Formation	As above.	21.60	40.50[3]
KP09+600 to KP09+750, Higher Walton HAGI				
	Topsoil	Sandy gravelly clayey SILT[1]	GL	0.20 – 0.40[2]
Drift	Tidal Flat Deposits	Unconsolidated clays, silts and sands. Silty clay with subsidiary gravel, sand and shells and trace clay, peat and silt.	0.20 – 0.40[2]	Unknown
Bedrock	Helsby Sandstone Formation	As above.	Unknown	35.97 - 176.42m (based upon Sellafield Borehole 13B, BGS Registered No. NY00SW/42)
KP09+750 to KP10+325, KP11+480 to KP12+625				

	Formation	Description	Depth to top of stratum (m bgl)	Thickness (m)
	Topsoil	As above. [1]	0.00	0.35
Drift	Tidal Flat Deposits	As above.	0.35	7.65
Bedrock	Wilmslow Sandstone Formation	As above.	8.00	32.00[3 4]
KP10+325 to KP11+480, KP12+965 to KP13+650				
	Topsoil	As above. [1]	0.00	0.20 – 0.40[2]
Drift	Shirdley Hill Sand Formation	As above.	0.00[5]	11.89[5]
Bedrock	Wilmslow Sandstone Formation	As above.	11.89[5]	109[3 & 5]
KP14+140 to KP14+600, KP15+792 to KP17+107				
	Topsoil	As above.[1]	0.00	0.30
Drift	Devensian Till (Diamicton)	As above.	0.30	4.27
Bedrock	Chester Formation	Conglomerates and reddish brown, cross-bedded, pebbly sandstones with subordinate beds of red-brown mudstone.	4.57	35.43[3]
KP17+107 to KP19+000 Clockface HAGI				
	Topsoil	Sandy gravelly clayey SILT[1]	0.00	0.20 – 0.40[2]
Drift	Devensian Till (Diamicton)	As above.	0.20 – 0.40[2]	>3m to up to 18m locally.
Bedrock	Kinnerton Sandstone Formation	Sandstone, red, yellow and brown, part pebbly; conglomeratic	~3m to 18m locally	Up to >150m (BGS Lexicon.

Notes:

[1] Assumed description in absence of borehole records or detailed description on borehole records.

[2] Assumed thickness/depth to top of stratum in absence of historical boreholes.

[3] Thicknesses not proven to base by BGS Borehole Records.

[4] Data representative of KP11+480 to KP12+537

[5] Data representative of KP12+965 to KP13+650

Stratigraphical succession has been determined from reference to published BGS geological mapping, published historical boreholes and RSK borehole records. In the instance that no relevant historical borehole records were available a stratigraphical succession has been assumed based on the published BGS mapping and datasets contained within BGS Geo-Index. Depth ranges based on available published borehole records.

3.1.2 North 2 Pipeline

The conjectural geological succession for the North 2 pipeline are provided in to Table 3

Table 3 North 2 Pipeline

	Formation	Description	Depth to top of stratum (m bgl)	Thickness (m)
KP00+000 to KP00+727				
	Topsoil	Sandy gravelly clayey SILT[1]	0.00	0.60
Drift	Devensian Till (Diamicton)	Heterogenous mixture of clay, sand, gravel, and boulders varying widely in size and shape. Interpreted as a sub-glacial till. Often dark reddish brown, weaky calcareous and matrix supported. Clasts are mixed lithologies, including quartzite, metasedimentary rocks, sandstones and shale.	0.60	2.14[3] – 22.00
Bedrock	Etruria formation	Mudstone, sandstone and conglomerate. Red, purple, brown, ochreous, green, grey and commonly mottled mudstone, with lenticular sandstones and conglomerates	11.00m to 22.00 (where base of Till proven)	Up to >300m (BGS, Lexicon)
KP00+727 to KP01+677				
	Topsoil	As above.[1]	GL	0.20 – 0.40[2]
Drift	Devensian Till (Diamicton)	As above.	0.20 – 0.40[2]	3.00m[3] to 15.80m
Bedrock	Pennine Middle coal measures	Interbedded grey mudstone, siltstone, pale grey sandstone and commonly coal seams, with a bed of mudstone containing marine fossils at the base	> 8.00m to 15.80m	Up to >600m (BGS Lexicon)
KP01+677 to KP03+315				
	Topsoil	As above.[1]	0.00	0.50
	Made Ground	Landfill Waste – associated with historic landfill at former Sutton Heath Quarry (potentially from ~KP02+650 to 02+775)	Unknown	Unknown
Drift	Devensian Till	As above.	0.35 - 0.50	0.90 to 2.60 (locally absent in one BH, with Kinnerton Sandstone present beneath Topsoil)

	Formation	Description	Depth to top of stratum (m bgl)	Thickness (m)
Bedrock	Kinnerton Sandstone Formation	Sandstone, red, yellow and brown, part pebbly but generally pebbly free. Fine to medium grained with cross stratification, deposited in an aeolian setting. Early Triassic in age.	0.35 – 2.60	Up to >150m (BGS Lexicon)
KP03+315 to END KP06+115				
	Made Ground	~KP02+650 to ~KP02+775: Potential for Landfill Waste – associated with historic landfill / Refuse Tip at former Collieries Quarry at former Sutton Heath Quarry. ~KP02+775 to ~KP05+200 – generalised made ground – no description provided except for 'rubbish' ~KP05+200 to ~KP06+135: Potential for Landfill Waste – associated with historic landfill at former quarry– wastes included Inert, Industrial, Commercial, Household, Special, Liquid sludge.	GL	Unknown. Locally between 0.80 to 1.37m from ~KP02+775 to ~KP05+200. Elsewhere variable and potentially significant thickness associated with historical landfills.
Drift	Devensian Till	As above.	Largely Unknown, may be absent locally due to historic surface ground workings. Where recorded on historic logs	1.05 – 1.12
Bedrock	Pennine Middle coal measures	As above.	2.00 – 2.50	Up to >600m (BGS Lexicon)

Notes:

[1] Assumed description in absence of borehole records or detailed description on borehole records.

[2] Assumed thickness/depth to top of stratum in absence of historical boreholes.

[3] Thicknesses not proven to base by BGS Borehole Records.

Stratigraphical succession has been determined from reference to published BGS geological mapping, published historical boreholes and RSK borehole records. In the instance that no relevant historical borehole records were available a stratigraphical succession has been assumed based on the published BGS mapping and datasets contained within BGS Geo-Index. Depth ranges based on available published borehole records.

3.1.3 East Pipeline

The conjectural geological succession for the East pipeline are provided in to.Table 4

Table 4 East Pipeline

	Formation	Description	Depth to top of stratum (m bgl)	Thickness (m)
KP00+000 to KP00+786, KP00+868 to KP01+580, KP03+169 to KP03+500, KP04+500 to KP05+052, KP11+238 to KP12+934, KP17+117 to KP17+322				
	Topsoil	Sandy gravelly clayey SILT[1]	0.00	0.20 – 0.40[2]
Bedrock	Bollin Mudstone Member	The upper mudstone member is largely dominated by laminated reddish-brown and greenish-grey mudstone with siltstones. The lower part is structureless and laminated, dominantly reddish-brown mudstone. May be weathered in upper layers near surface.	0.20 – 0.40[2]	Up to > 350m (based on BGS BH SJ64SW/7)
KP00+786 to KP00+868, KP06+050 to KP06+333, KP06+747 to KP07+020				
	Topsoil	As above.[1]	0.00[4]	0.30 – 0.33[4]
Drift	Alluvium	Unconsolidated, clay, silt, sand and gravel with organic material.	0.30 – 0.33[4]	2.07 – 2.40[4]
Bedrock	Bollin Mudstone Member	As above.	2.40 – 2.70[4]	Up to > 350m (based on BGS BH SJ64SW/7)
KP01+580 to KP02+212, KP02+500 to KP03+169, KP03+500 to KP03+655, KP05+052 to KP06+050, KP06+333 to KP06+443, KP06+672 to KP06+747, KP07+020 to KP11+238				
	Topsoil	As above.[1]	0.00[4]	0.30 – 0.60[4]
Drift	Devensian Till	Heterogenous mixture of clay, sand, gravel, and boulders varying widely in size and shape. Interpreted as a sub-glacial till. Often dark reddish brown, weaky calcareous and matrix supported. Clasts are mixed lithologies, including quartzite, metasedimentary rocks, sandstones and shale.	0.30 – 0.60[4]	0.50 – 3.20[4]
Bedrock	Bollin Mudstone Member	As above.	0.90 – 3.80[4]	Up to > 350m (based on BGS BH SJ64SW/7)

	Formation	Description	Depth to top of stratum (m bgl)	Thickness (m)
KP02+212 to KP02+500, KP03+655 to KP04+500, KP06+443 to KP06+672				
	Topsoil	Sandy gravelly clayey SILT[1]	0.00	0.20 – 0.40[2]
Drift	Glaciofluvial Deposits	Sand and gravel, locally with lenses of silt, clay or organic material.	0.20 – 0.40[2]	Unknown. Potentially up to a few metres[2]
	Devensian Till	As above.	Unknown. Potentially within 1-3m BGL[2]	Unknown. Potentially a few metres[2]
Bedrock	Bollin Mudstone Member	As above.	Unknown. Potentially 3-6m BGL[2]	Up to > 350m (based on BGS BH SJ64SW/7)
KP12+934 to KP13+793				
	Made Ground	Gravels (mixed lithology gravels in single BGS borehole record. Associated with former brickfields / quarry from ~KP13+300 to KP13+450. Locally potentially infilled ponds.	0.00	3.05[3]
Drift	Devensian Till	As above.	0.00 to 0.40m [5]	Up to 7.00m[5]
Bedrock	Bollin Mudstone Member	As above.	A few meters up to 7.00m[5]	Up to > 350m (based on BGS BH SJ64SW/7)
KP13+793 to KP14+722				
	Topsoil	Gravelly clayey SILT	0.00	0.25
	Made Ground	Fill	0.00	0.20
Drift	Devensian Till	As above.	0.20 – 0.25	4.80 – 6.75
Bedrock	Tarporley Siltstone Formation	Heterolithic, comprising interlaminated and interbedded siltstones, mudstones and sandstones. Most mudstone and siltstone beds are reddish brown, though green-grey mottles and laminae are common.	5.00 – 7.00	2.10 – 5.05[3] Up to 220m in Cheshire area (BGS Lexicon)
KP14+722 to KP15+117				
	Topsoil	As above.[1]	0.00	0.20 – 0.40[2]
Drift	Devensian Till	As above.	0.20 – 0.40[2]	Up to 2.50m recorded to north[2]

	Formation	Description	Depth to top of stratum (m bgl)	Thickness (m)
Bedrock	Helsby Sandstone Formation	Fine to medium-grained, locally micaceous, cross-bedded and flat-bedded sandstones. Weathering to sand near surface. Sandstones are of fluvial (sub-angular to sub-rounded grains) and aeolian (well-rounded grains)	Potentially within 2-4m BGL[2]	35.97 - 176.42m (based upon Sellafield Borehole 13B, BGS Registered No. NY00SW/42) Potentially up to 250m in Cheshire – Lancashire Area (BGS Lexicon)
KP15+117 to KP15+980				
	Topsoil	Sandy gravelly clayey SILT[1]	0.00	0.25 – 0.35
Drift	Shirdley Hill Sand Formation	Moderately to well-sorted, fine-grained sand with peat layers	0.25 – 0.35	2.95 – 7.80
	Devensian Till	As above.	3.30 - 3.55	2.45[3] - 6.45[3] Potentially up to ~30m thick
Bedrock	Northwich Halite Member	Halite with partings of mudstone	Potentially 30 – 40m BGL[2]	Up to >286m BGS Lexicon)
KP15+980 to KP16+680				
	Topsoil	As above.[1]	0.00	0.40[6]
Drift	Glaciofluvial Sheet Deposits	Boulders, gravel, sand, silt and clay	0.40[6]	3.60[6]
	Devensian Till	As above.	3.60[6]	3.00m[3,6] Potentially up to ~30m thick
Bedrock	Northwich Halite Member	As above.	Potentially 30 – 40m BGL[2]	Up to >286m BGS Lexicon)
KP16+680 to KP16+838				
	Topsoil	As above.[1]	0.00	0.20 – 0.40[2]
Drift	River Terrace Deposits	Sand and gravel, locally with lenses of silt, clay or peat.	0.20 – 0.40[2]	Unknown Potentially 1.00m to 4.00m[2]
	Glaciofluvial Sheet Deposits	As above.	Unknown Potentially 1.00m to 4.00m[2]	Unknown Potentially 1.00m to 4.00m[2]
	Devensian Till	As above.	Unknown Potentially 2.00m to 6.00m BGL[4]	Unknown Potentially up to ~30m thick

	Formation	Description	Depth to top of stratum (m bgl)	Thickness (m)
Bedrock	Northwich Halite Member	As above.	Potentially 30 – 40m BGL[2]	Up to >286m BGS Lexicon)
KP16+838 to KP17+117				
	Topsoil	As above.[1]	0.00	0.25 – 0.30
Drift	Alluvium	Unconsolidated, clay, silt, sand and gravel, with occasional thin peat layers/pockets and other organic material	0.25 - 0.30	2.70- 5.45
	Glaciofluvial Sheet Deposits	As above.	3.00 - 5.70	0.80 - 3.90
	Devensian Till	As above.	5.75 – 8.0	> 5.00m [3] Potentially up to ~30m thick
Bedrock	Bollin Mudstone Member	As above.	Potentially 30 – 40m BGL[2]	Up to > 350m (based on BGS BH SJ64SW/7)
KP17+117 to KP17+567				
	Topsoil	As above.[1]	0.00	0.20 – 0.40[2, 7]
Drift	Glaciofluvial Sheet Deposits	As above.	0.20 – 0.40[2, 7]	0.65 -1.50 [7] Potentially thicker deposits present
	Devensian Till	As above.	0.80 – 1.75 [7]	> 13.00m [3, 7] Potentially up to ~30m thick
Bedrock	Helsby Sandstone Formation	As above.		35.97 - 176.42m (based upon Sellafield Borehole 13B, BGS Registered No. NY00SW/42)
KP17+567 to KP18+124, Warburton HAGI				
	Topsoil	As above.	0.00	0.40
	Made Ground	Gravelly SAND.	0.00	0.60
Drift	Shirdley Hill Sand Formation	As above.	0.40 – 0.60	0.40 – 2.60
	Devensian Till	As above.	1.00 – 3.00	7.00 – 10.00[3] Potentially up to ~30m thick

	Formation	Description	Depth to top of stratum (m bgl)	Thickness (m)
Bedrock	Wilmslow Sandstone Formation	Red-brown to brick-red, fine- to medium-grained, generally pebble-free, cross-bedded sandstones, with sporadic siltstones		Up to > 920m (although thicknesses variable, according to BGS lexicon)
KP18+124 to KP18+695				
	Topsoil	As above.[1]	0.00	0.20 – 0.40[2]
Drift	Shirdley Hill Sand Formation	As above.	0.20 – 0.40[2]	Unknown. Potentially 2-4m [2]
Bedrock	Bollin Mudstone Member	As above.	Unknown. Potentially 2-4m [2]	Up to > 350m (based on BGS BH SJ64SW/7)
KP18+695 to KP19+000				
	Topsoil	As above.1	0.00	0.20
Drift	Shirdley Hill Sand Formation	As above.	0.20	4.906
Bedrock	Tarporley Siltstone Formation	Heterolithic, comprising interlaminated and interbedded siltstones, mudstones and sandstones. Most mudstone and siltstone beds are reddish brown, though green-grey mottles and laminae are common.	5.106	59.903,6
KP19+000 to KP19+878				
	Topsoil	As above.[1]	0.00	0.20 – 0.40[2]
Drift	Glaciofluvial sheet deposits	As above.	0.20 – 0.40[2]	Unknown. Potentially 3-6m [2]
Bedrock	Tarporley Siltstone Formation	As above.	Unknown. Potentially 3-6m [2]	Up to >220m (BGS, Lexicon)
KP19+878 to KP19+946, KP20+128 to KP20+181				
	Topsoil	As above.[1]	0.00	0.20 – 0.40[2]
Drift	Alluvium	Unconsolidated, clay, silt, sand and gravel	0.20 – 0.40[2]	Unknown. Potentially 1-4 [2]
	Glaciofluvial sheet deposits	Boulders, gravel, sand, silt and clay	Unknown. Potentially 1-4m [2]	Unknown. Potentially 2-5m [2]
Bedrock	Tarporley Siltstone Formation	As above.	Unknown. Potentially 3-8m [2]	Up to >220m (BGS, Lexicon)
KP19+946 to KP20+128, KP20+181 to KP20+722				
	Topsoil	As above.[1]	0.00	0.20 – 0.40[2]

	Formation	Description	Depth to top of stratum (m bgl)	Thickness (m)
Drift	Glaciofluvial sheet deposits	Boulders, gravel, sand, silt and clay	0.20 – 0.40[2]	Unknown. Potentially 3-6m [2]
Bedrock	Helsby Sandstone Formation	As above.	Unknown. Potentially 3-6m [2]	35.97 - 176.42m (based upon Sellafield Borehole 13B, BGS Registered No. NY00SW/42)
KP20+128 to KP20+181				
	Topsoil	As above.[1]	0.00	0.20 – 0.40[2]
Drift	Alluvium	Unconsolidated, clay, silt, sand and gravel	0.20 – 0.40[2]	Unknown. Potentially 1-4 [2]
	Glaciofluvial Sheet Deposits	As above.	Unknown. Potentially 1-4m [2]	Unknown. Potentially 2-5m [2]
Bedrock	Helsby Sandstone Formation	As above.	Unknown. Potentially 3-8m [2]	35.97 - 176.42m (based upon Sellafield Borehole 13B, BGS Registered No. NY00SW/42)
KP20+722 to KP21+060				
	Made Ground	Potentially infill associated with former surface ground workings may be locally found	0.00	Unknown. Potentially a few metres
Drift	Peat	Organic soils. May be locally absent in presence of made ground	0.00	0.46 - 2.74
	Glaciofluvial sheet deposits	As above.	0.46 - 2.74	4.26 to 6.00
Bedrock	Helsby Sandstone Formation	As above.	6.55 to 7.00	35.97 - 176.42m (based upon Sellafield Borehole 13B, BGS Registered No. NY00SW/42)
KP21+060 to KP21+122, KP21+500 to KP21+650				
	Topsoil	As above.[1]	0.00	0.20 – 0.40[2]
Drift	Glaciofluvial sheet deposits	As above.	0.20 – 0.40[2]	Unknown. Potentially 3-6m [2]
Bedrock	Wilmslow Sandstone Formation	As above.	Unknown. Potentially 3-6m [2]	Up to > 920m (although thicknesses variable, according to BGS lexicon)
KP21+122 to KP21+500, Partlington HAGI				

	Formation	Description	Depth to top of stratum (m bgl)	Thickness (m)
	Made Ground	Potentially infill associated with former surface ground workings may be locally found. (Reader should refer to appended hazard table for Made Ground)	0.00	Unknown. Potentially a few metres
	Topsoil	As above.	0.00	0.61
	Peat	Organic Soils	0.61	0.46 - 2.74
Drift	Glaciofluvial sheet deposits	As above.	0.46 - 2.74	4.26 - 8.54
Bedrock	Wilmslow Sandstone Formation	As above.	6.55 - 11.28	11.53[3]

Notes:
[1] Assumed description in absence of borehole records or detailed description on borehole records.
[2] Assumed thickness/depth to top of stratum in absence of historical boreholes.
[3] Thicknesses not proven to base by BGS Borehole Records.
[4] Data representative of KP06+050 to KP06+333.
[5] Based on BGS boreholes slightly east of KP range
[6] Based on single BGS BH
[7] Based on BGS boreholes remote from pipeline.

Stratigraphical succession has been determined from reference to published BGS geological mapping, published historical boreholes and RSK borehole records. In the instance that no relevant historical borehole records were available a stratigraphical succession has been assumed based on the published BGS mapping and datasets contained within BGS Geo-Index. Depth ranges based on available published borehole records.

3.1.4 South Pipeline

The conjectural geological succession for the South pipeline are provided in Table 5.

Table 5 South Pipeline

	Formation	Description	Depth to top of stratum (m bgl)	Thickness (m)
KP00+000 to KP00+500, KP03+500 to KP03+604				
	Topsoil	Sandy gravelly clayey SILT[1]	GL	0.20 – 0.40[2]
Bedrock	Bollin Mudstone Member	The upper mudstone member is largely dominated by laminated reddish-brown and greenish-grey mudstone with siltstones. The lower part is structureless and laminated, dominantly reddish-brown mudstone. May be weathered in upper layers near surface.	0.20 – 0.40[2]	Up to > 350m (based on BGS BH SJ64SW/7)
KP00+500 to KP00+781, KP00+983 to KP01+189, KP01+469 to KP01+825, KP04+606 to KP04+766, KP06+557 to KP07+255, KP07+518 to KP07+900, KP08+269 to KP08+778, KP08+937 to KP09+773, KP11+408 to KP13+271				
	Made Ground	Potentially infill associated with former surface ground workings may be locally found. (Reader should refer to appended hazard table for Made Ground)	0.00	Unknown. Potentially a few metres
	Topsoil	Sandy gravelly clayey SILT[1]	0.00	0.30
Drift	Glaciofluvial Deposits Devensian	Coarse-grained sediments (i.e. sand and gravel) with some finer-grained layers (i.e. clay and silt). Sand and gravel, locally with lenses of silt, clay or organic material.	0.30	Ranging from 2-3m up to 20-25m recorded [2,3]
	Devensian Till (Diamicton)	Heterogenous mixture of clay, sand, gravel, and boulders varying widely in size and shape. Interpreted as a sub-glacial till. Often dark reddish brown, weaky calcareous and matrix supported. Clasts are mixed lithologies, including quartzite, metasedimentary rocks, sandstones and shale.	From ~2-3m BGL to potentially locally absent [2,3]	Unknown > 3-5m[3] Potentially locally up to ~30m thick [2,3]
Bedrock	Bollin Mudstone Member	As above.	Variable, but anticipated to be >4-8m but locally much greater depths [2]	Up to > 350m (based on BGS BH SJ64SW/7)

	Formation	Description	Depth to top of stratum (m bgl)	Thickness (m)
KP00+781 to KP00+983, KP01+189 to KP01+469, KP03+604 to KP04+606, KP04+766 to KP06+557, KP07+255 to KP07+518, KP09+773 to KP11+000, KP11+331 to KP11+406				
	Made Ground	As above.	0.00	Unknown. Potentially a few metres
	Topsoil	As above.[1]	0.00	0.30 – 0.50 [4 5]
Drift	Devensian Till (Diamicton)	As above.	0.30 – 0.50[4 3]	1.60 – 3.70[4] 4.90 – 10.85[5]
Bedrock	Bollin Mudstone Member	As above.	1.60 – 3.70[4] 4.90 – 10.85[5]	6.80 – 16.60[3 4] 34.15 – 40.10 [3 5]
KP01+825 to KP01+975, KP02+282 to KP03+500, KP11+000 to KP11+071, KP11+101 to KP11+230				
	Topsoil	As above.[1]	GL	0.20 – 0.402
Drift	Glaciofluvial Sheet Deposits	Sand and gravel, locally with lenses of silt, clay or organic material	0.20 – 0.402	Unknown Potentially 1-3m 2
	Devensian Till (Diamicton)	As above.	Unknown Potentially 1-3m 2	Unknown Potentially 5-16m 2
Bedrock	Bollin Mudstone Member	As above.	Unknown Potentially 6-18m 2	Up to > 350m (based on BGS BH SJ64SW/7)
KP01+975 to KP02+802				
	Made Ground	Potentially infill associated with former dredging disposal site / surface ground workings may be locally found from ~KP01+950 to KP02+145. (Reader should refer to appended hazard table for Made Ground)	GL	Unknown. Potentially a few metres
	Topsoil	As above.[1]	0.00	0.30
Drift	Alluvium	Soft Clays	0.00 – 0.30	4.60
	Glaciofluvial Sheet Deposits	As above.	4.90	2.60
Bedrock	Bollin Mudstone Member	As above. Potentially weathered near surface / upper portion.	7.50 – 10.97	11.30 – 589.03[3]

	Formation	Description	Depth to top of stratum (m bgl)	Thickness (m)
KP08+778 to KP08+937				
	Topsoil	As above.[1]	GL	0.20 – 0.40[2]
Drift	Peat	Unconsolidated clays, silts and sands	0.20 – 0.40[2]	Unknown, potentially 1-3m [2]
	Glaciofluvial Deposits Devensian	As above.	Unknown, potentially 1-3m [2]	Ranging from 2-3m up to 20-25m recorded [2,3]
	Devensian Till (Diamicton)	As above.	From ~2-3m BGL to potentially locally absent [2,3]	Unknown > 3-5m[3] Potentially locally up to ~30m thick [2,3]
Bedrock	Bollin Mudstone Member	As above. Potentially weathered near surface / upper portion.	Variable, but anticipated to be >4-8m [2]	Up to > 350m (based on BGS BH SJ64SW/7)
KP04+606 to KP04+646, KP11+071 to KP11+101, KP11+230 to KP11+331				
	Topsoil	As above.1	0.002	0.106
Drift	Alluvium	Unconsolidated clays, silts and sands	0.10[6]	7.70[6]
	Devensian Till (Diamicton)	As above.	8.00[6] Possibly absent in incised channel/valley	1.50[6]
Bedrock	Bollin Mudstone Member	As above. Potentially weathered near surface / upper portion.	9.50[6]	1.00[3, 6] Up to > 350m (based on BGS BH SJ64SW/7)
KP14+000 to KP15+305, KP15+369 to KP15+468, KP16+048 to KP16+83, KP16+542 to KP17+648				
	Topsoil	As above.[1]	GL	0.20 – 0.407
Drift	Devensian Till (Diamicton)	As above.	0.00[7]	10.00[3] - 92.35[3, 7]
Bedrock	Northwich Halite Member	Halite with partings of mudstone	Unknown Potentially 30-90m BGL [2]	Up to >286m BGS Lexicon)
KP13+271 to KP14+000, KP15+468 to KP16+048				
	Made Ground	Potentially fill associated with infilled ponds, locally. (Reader should refer to appended hazard table for Made Ground)	GL	Unknown. Potentially a 1-3m

	Formation	Description	Depth to top of stratum (m bgl)	Thickness (m)
	Topsoil	As above.[1]	0.00 [4]	0.30 [4]
Drift	Glaciofluvial Deposits Devensian	As above.	0.30	Ranging from 2-3m up to 20-25m recorded [2,3]
	Devensian Till (Diamicton)	As above.	From ~2-3m BGL to potentially locally absent [2,3]	Unknown > 3-5m[3] Potentially locally up to ~30m thick [2,3]
Bedrock	Northwich Halite Member	As above.	Unknown Potentially 30-90m BGL [2]	Up to >286m BGS Lexicon)
KP15+305 to KP15+369, KP16+83 to KP16+121, KP16+222 to KP16+382				
	Topsoil	As above.[1]	GL	0.20 – 0.40[2]
Drift	Alluvium	Unconsolidated clays, silts and sands	0.20 – 0.40[2]	Unknown, potentially 3-8m. Potentially for incised channel / valley [2]
	Devensian Till (Diamicton)	As above.	Unknown, potentially 3-8m. Potentially for incised channel / valley [2]	Unknown. Potentially significant thickness from 20-60m [2]
Bedrock	Northwich Halite Member	As above.	Unknown. Potentially 30-80m [2]	Up to >286m BGS Lexicon)
KP16+121 to KP16+222, KP16+382 to KP16+542				
	Topsoil	As above.[1]	GL	0.20 – 0.40[2]
Drift	Alluvium	Unconsolidated clays, silts and sands	0.20 – 0.40[2]	Unknown, potentially 3-8m. Potentially for incised channel / valley [2]
	River Terrace Deposits	Sands and Gravels, locally with lenses of silt, clay or peat.	0.20 – 0.40[2]	Unknown, up to a 2-5m [2]
	Devensian Till (Diamicton)	As above.	Unknown, potentially 3-8m. Potentially for incised channel / valley [2]	Unknown. Potentially significant thickness from 20-60m [2]
Bedrock	Northwich Halite Member	As above.	Unknown. Potentially 30-80m [2]	Up to >286m BGS Lexicon)
KP17+648 to KP18+438, Inoyvn Gas Storage HAGI				
	Topsoil	As above.[1]	0.00	0.30

	Formation	Description	Depth to top of stratum (m bgl)	Thickness (m)
	Made Ground	Potentially fill associated with infilled ponds / surface ground working, locally. (Reader should refer to appended hazard table for Made Ground)	0.30	0.50. Maybe up to 1m-2m.
Drift	Devensian Till (Diamicton)	As above.	0.80 Maybe locally up to 1-3m [2]	7.20[3] Unknown. Potentially significant thickness from 20-60m [2]
Bedrock	Sidmouth Mudstone Formation	Dominantly red-brown mudstone and siltstone with common grey-green reduction patches and spots	Unknown. Potentially 30-80m [2]	Up to > 1600m (BGS Lexicon)

Notes:

[1] Assumed description in absence of borehole records or detailed description on borehole records.

[2] Assumed thickness/depth to top of stratum in absence of historical boreholes.

[3] Thicknesses not proven to base by BGS Borehole Records.

[4] Thicknesses and depths taken from historical borehole records between KP03+604 - KP04+606.

[5] Thicknesses and depths taken from historical RSK borehole records of the local area.

[6] Thicknesses and depths taken from historical borehole records between KP11+230 to KP11+331

[7] Thicknesses and depths taken from historical borehole records between KP14+000 to KP15+305. Based on single historic borehole.

Stratigraphical succession has been determined from reference to published BGS geological mapping, published historical boreholes and RSK borehole records. In the instance that no relevant historical borehole records were available a stratigraphical succession has been assumed based on the published BGS mapping and datasets contained within BGS Geo-Index. Depth ranges based on available published borehole records.

3.1.5 West Pipeline

The conjectural geological succession for the West pipeline are provided in Table 6
Table 6 West Pipeline

	Formation	Description	Depth to top of stratum (m bgl)	Thickness (m)
KP00+000 to KP01+665, Stanlow HPP HAGI				
	Made Ground	Potentially fill associated with infilled ponds / surface ground working, locally. (Reader should refer to appended hazard table for Made Ground)	GL	Maybe up to 1m-2m.
	Topsoil	Sandy gravelly clayey SILT[1]	GL	0.00 – 0.40
Drift	Devensian Till (Diamicton)	Heterogenous mixture of clay, sand, gravel, and boulders varying widely in size and shape. Interpreted as a sub-glacial till. Often dark reddish brown, weaky calcareous and matrix supported. Clasts are mixed lithologies, including quartzite, metasedimentary rocks, sandstones and shale.	0.00 – 0.40	0.50 – 1.50 Possibly locally slightly increased thicknesses to ~5-8m
Bedrock	Chester Formation	Comprises reddish brown, cross-bedded, sometimes pebbly, sandstones with subordinate beds of red-brown mudstone. Conglomerates present at depth and have a reddish brown sandy matrix and consist mainly of pebbles of brown or purple quartzite, with quartz conglomerate and vein quartz. Typically has a fining upwards sequence	0.90 – 1.50 Possibly locally ~5-8m	9.30 – 150.90[3] Potentially up to 300m thick (BGS Lexicon)
KP01+665 to KP02+282				
	Topsoil	As above.[1]	0.00	0.30 – 0.40
Drift	Devensian Till (Diamicton)	As above.	0.30 – 0.40	1.20 – 2.20[3] Possibly locally slightly increased thicknesses to ~5-8m
Bedrock	Kinnerton Sandstone Formation	Sandstone, red-brown to yellow, generally pebble-free, fine- to medium-grained, cross-stratified. Dominantly aeolian.	Possibly locally ~3-8m [2]	Up to >150m (BGS Lexicon.
KP02+282 to KP03+550				
	Topsoil	Sandy gravelly clayey SILT[1]	0.00	0.30 - 0.50

	Formation	Description	Depth to top of stratum (m bgl)	Thickness (m)
Drift	Tidal Flat Deposits	Unconsolidated clays, silts and sands, includes extensive layers of Peat	0.30 – 0.50	~6.00 to 12.02
	Devensian Till (Diamicton)	As above.	~6.00 - 12.90	12m to up to ~20m[3]
Bedrock	Kinnerton Sandstone Formation	As above.	> 12-30m [2,3]	66.5[3] Up to >150m (BGS Lexicon.
KP03+550 to KP04+925				
	Topsoil	Gravelly clayey SILT	0.00	0.30
Drift	Tidal Flat Deposits	As above.	0.30	4.70 – 10.50
	Devensian Till (Diamicton)	As above.	~5.00 – 10.80	12m to up to ~28m
Bedrock	Chester Formation	As above.	~16.00 – 38.00	9.30 – 150.90[3] Potentially up to 300m thick (BGS Lexicon)
KP04+925 to KP08+441				
	Topsoil	Gravelly clayey SILT	GL	0.20 – 0.40[2]
Drift	Tidal Flat Deposits	As above.	0.20 – 0.40[2]	9.50 – 11.70
	Devensian Till (Diamicton)	As above.	9.35 – 12.70	2.65[3] – 42.00m
Bedrock	Wilmslow Sandstone Formation	Red-brown to brick-red, fine- to medium-grained, generally pebble-free, cross-bedded sandstones, with sporadic siltstones. The sand grains are well rounded and indicate an aeolian origin	53.3m	>10 [4] Up to > 920m (although thicknesses variable, according to BGS lexicon)
KP08+441 to KP09+560				
	Topsoil	As above.	0.00	0.20
Drift	Tidal Flat Deposits	As above.	0.20	9.00[2] Up to 10.80[4]
	Devensian Till (Diamicton)	As above.	9.00[2] Up to 10.80[4]	~19.80[4]
Bedrock	Helsby Sandstone Formation	Fine- to medium-grained, locally micaceous, cross-bedded and flat-bedded sandstones, weathering to sand near surface.	10.80[4]	11.70 – 45.79[3]
KP09+560 to KP10+158				
	Topsoil	As above.[1]	0.00	0.30

	Formation	Description	Depth to top of stratum (m bgl)	Thickness (m)
Drift	Tidal Flat Deposits	Unconsolidated clays, silts and sands	0.30	6.00 – 10.30
	Devensian Till (Diamicton)	As above.	6.00 – 10.60	4.88 – 18.90
Bedrock	Tarporley Siltstone Formation	Heterolithic, comprising interlaminated and interbedded siltstones, mudstones and sandstones. Most mudstone and siltstone beds are reddish brown, though green-grey mottles and laminae are common.	14.32 – 29.50	1.90 – 3.18[3]
KP10+158 to KP11+350				
	Made Ground	Potentially fill associated with refuse tip and significant raised ground between ~KP10+165 to 18+920. (Reader should refer to appended hazard table for Made Ground)	GL	Maybe up to 10m.
	Topsoil	As above.[1]	0.00	0.18 – 0.40
Drift	Tidal Flat Deposits	Unconsolidated clays, silts and sands	0.18 – 0.40	6.40 – 16.87
	Devensian Till (Diamicton)	As above.	6.80 – 17.07	20.11 – 33.20
Bedrock	Bollin Mudstone Member	The upper mudstone member is largely dominated by laminated reddish-brown and greenish-grey mudstone with siltstones. The lower part is structureless and laminated, dominantly reddish-brown mudstone. May be weathered in upper layers	35.35 – 41.70	1.45 – 4.00[3] Up to > 350m (based on BGS BH SJ64SW/7)
KP11+350 to KP15+140, KP15+140 to KP16+874, KP17+654 to KP18+500				
	Topsoil	As above.[1]	0.00	0.40 0.25[5]
Drift	Glaciofluvial Deposits	As above.	0.25 – 0.40 Locally maybe absent in incised channels and surface depressions	7.62 – 12.00
	Devensian Till (Diamicton)	As above.	8.00 – 12.00	~2.00 – 9.00 Locally absent
Bedrock	Bollin Mudstone Member	As above.	10.25 to 25.00	>2.00-3.00[3] Up to > 350m (based on BGS BH SJ64SW/7)
KP15+140 to KP16+860, KP18+500 to KP19+300				
	Topsoil	As above.	0.00	0.30

	Formation	Description	Depth to top of stratum (m bgl)	Thickness (m)
Bedrock	Bollin Mudstone Member	As above. Likely to be weathered at the surface and upper layers (Potentially up to 8-10m of weathered material)	0.30	>10.20 Up to > 350m (based on BGS BH SJ64SW/7)
KP16+874 to KP17+654				
	Topsoil	As above	0.00	0.20-0.40[2]
Drift	Alluvium	As above	0.20-0.40[2]	Unknown ~2.00 – 10.00m [2] (potentially significant incised channel / valley.)
	Glaciofluvial Sheet Deposits	Sand and gravel, locally with lenses of silt, clay or organic material	~2.00 – 10.00m [2] (potentially significant incised channel / valley.) May be locally absent from succession	Unknown Possibly 2.00-6.00m[2]
Bedrock	Bollin Mudstone Member	As above.	Unknown Possibly varying from a few metres to > 10.00m	Up to > 350m (based on BGS BH SJ64SW/7)

Notes:
[1] Assumed description in absence of borehole records or detailed description on borehole records.
[2] Assumed thickness/depth to top of stratum in absence of historical boreholes.
[3] Thicknesses not proven to base by BGS Borehole Records.
[4] Based on single BGS borehole record
[5] Depths relate to outside of potential refuse landfill areas. In these areas the depths should include estimated 8-10m of made ground / fill.

Stratigraphical succession has been determined from reference to published BGS geological mapping, published historical boreholes and RSK borehole records. In the instance that no relevant historical borehole records were available a stratigraphical succession has been assumed based on the published BGS mapping and datasets contained within BGS Geo-Index. Depth ranges based on available published borehole records.

3.1.6 Spur Pipelines

The conjectural geological succession for the Spur pipeline N1-02 are provided in Table 7.

Table 7 Spur Pipelines

	Formation	Description	Depth to top of stratum (m bgl)	Thickness (m)
N1-02: KP00+000 to KP02+639				
	Made Ground	Sandy gravelly clayey SILT[1]	0.00	1.20
Drift	Tidal Flat Deposits	Unconsolidated clays, silts and sands. Silty clay with subsidiary gravel, sand and shells and trace clay, peat and silt.	1.20	3.40 [3] – 8.30
Bedrock	Helsby Sandstone Formation	Fine- to medium-grained, locally micaceous, cross-bedded and flat-bedded sandstones, weathering to sand near surface.	3.40 - 8.30	10.00[3] – 154m[3]
N1-02: KP02+639 to KP03+274				
	Made Ground	Potentially fill associated with refuse tip between ~KP02+800 to KP02+900. (Reader should refer to appended hazard table for Made Ground) Other made ground variable generic made ground, gravels, clays with variable brick, gravel of mixed lithologies etc.	0.00	0.70 – 0.88 – General made ground depth 4.50 – 6.70 at potential refuse tip
Drift	Tidal Flat Deposits	Unconsolidated clays, silts and sands	4.50 – 6.70	1.10 – 2.65
Bedrock	Wilmslow Sandstone Formation	Red-brown to brick-red, fine- to medium-grained, generally pebble-free, cross-bedded sandstones, with sporadic siltstones. Weathered upper layers.	6.80 – 7.80	5.85 – 9.90[3] Up to > 920m (although thicknesses variable, according to BGS lexicon)
N1-02: KP03+274 to KP04+692, KP04+881 to KP05+654				
Drift	Glaciofluvial Sheet Deposits	Sands and Gravel	0.00	3.65 - 13.42
Bedrock	Wilmslow Sandstone Formation	As above.	3.65 - 13.42	17.82[3] Up to > 920m (although thicknesses variable, according to BGS lexicon)
N1-02: KP04+692 to KP04+881				
	Topsoil	As above.[1]	GL	0.20 – 0.40[2]

	Formation	Description	Depth to top of stratum (m bgl)	Thickness (m)
Drift	Shirdley Hill Sand Formation	Moderately to well-sorted, fine-grained sand with peat layers	0.20 – 0.40[2]	3.00
Bedrock	Wilmslow Sandstone Formation	As above.	3.00	Up to > 920m (although thicknesses variable, according to BGS lexicon)
N1-02: KP04+881 to KP06+112				
	Topsoil	As above.[1]	GL	0.20 – 0.40[2]
Drift	Tidal Flat Deposits	Unconsolidated clays, silts and sands	0.20 – 0.40[2]	Unknown, possibly 2-6m
Bedrock	Wilmslow Sandstone Formation	As above.	Unknown possibly 2 to 6m	Up to > 920m (although thicknesses variable, according to BGS lexicon)
N1-05: KP00+000 to KP00+676				
	Made Ground	As above.[1]	0.00	1.20
Drift	Tidal Flat Deposits	Unconsolidated clays, silts and sands. Silty clay with subsidiary gravel, sand and shells and trace clay, peat and silt.	1.20	3.40 [3] – 8.30
Bedrock	Helsby Sandstone Formation	Fine- to medium-grained, locally micaceous, cross-bedded and flat-bedded sandstones, weathering to sand near surface.	3.40 - 8.30	10.00[3] – 154m[3]
N2-04: KP00+000 to KP00+727				
	Topsoil	As above.[1]	0.00	0.60
Drift	Devensian Till (Diamicton)	Heterogenous mixture of clay, sand, gravel, and boulders varying widely in size and shape. Interpreted as a sub-glacial till. Often dark reddish brown, weaky calcareous and matrix supported. Clasts are mixed lithologies, including quartzite, metasedimentary rocks, sandstones and shale.	0.60	2.14[3] – 22.00
Bedrock	Etruria formation	Mudstone, sandstone and conglomerate. Red, purple, brown, ochreous, green, grey and commonly mottled mudstone, with lenticular sandstones and conglomerates	11.00m to 22.00 (where base of Till proven)	Up to >300m (BGS, Lexicon)
N2-04: KP00+727 to KP02+030				
	Topsoil	Sandy gravelly clayey SILT[1]	GL	0.20 – 0.40[2]
Drift	Devensian Till (Diamicton)	As above.	0.20 – 0.40[2]	3.00m[3] to 15.80m
Bedrock	Pennine Middle coal measures	Interbedded grey mudstone, siltstone, pale grey sandstone and commonly coal seams, with a bed of	> 8.00m to 15.80m	Up to >600m (BGS Lexicon)

	Formation	Description	Depth to top of stratum (m bgl)	Thickness (m)
		mudstone containing marine fossils at the base		
N2-06: KP00+000 to KP01+209				
	Made Ground	~KP00 to ~KP00+500: Potential for Landfill Waste – associated with historic landfill at former quarry– wastes included Inert, Industrial, Commercial, Household, Special, Liquid sludge. Other historic ground workings & colliery across the area, potentially with historic landfill.	0.00	Variable 1.00 - 7.5m
Drift	Devensian Till (Diamicton)	As above.	1.00 –4.00 May be absent locally due to historic surface ground workings.	2.14 – 6.00[3]
Bedrock	Pennine Middle coal measures	As above.	3.35 – 7.50	40.50 – 61.65[3]
N2-07: KP00+000 to KP00+146				
	Made Ground	Fill, black soft with ash, shale, mudstone and coal debris.	0.00	1.00 - 1.30
Drift	Devensian Till (Diamicton)	As above.	1.00 – 1.30	2.10 – 2.50
Bedrock	Pennine Middle coal measures	As above.	3.35 – 3.60	40.50 – 61.65[3]
E-01: KP00+000 to KP00+354				
	Topsoil	As above.[1]	0.00	0.76
Drift	Glaciofluvial sheet deposits	Boulders, gravel, sand, silt and clay	0.76	4.14 – 4.57
Bedrock	Wilmslow Sandstone Formation	As above.	4.88 – 5.33	2.14 – 2.59[3]
E-01: KP00+354 to KP00+433				
	Topsoil	As above.[1]	GL	0.20 – 0.40[2]
Drift	Alluvium	Unconsolidated, clay, silt, sand and gravel	0.20 – 0.40[2]	Unknown. Potentially 1-4m
Bedrock	Wilmslow Sandstone Formation	As above.	Unknown. Potentially 1-4m	Up to > 920m (although thicknesses variable, according to BGS lexicon)
E-02: KP00+000 to KP00+153				
	Topsoil	Gravelly clayey SILT	0.00	0.40
	Made Ground	Gravelly SAND.	0.00	0.60

	Formation	Description	Depth to top of stratum (m bgl)	Thickness (m)
Drift	Shirdley Hill Sand Formation	Moderately to well-sorted, fine-grained sand with peat layers	0.40 – 0.60	0.40 – 2.60
	Devensian Till	As above.	1.00 – 3.00	7.00 – 10.00[3] Potentially up to ~30m thick
Bedrock	Wilmslow Sandstone Formation	As above.		Up to > 920m (although thicknesses variable, according to BGS lexicon)
E-04: KP00+000 to KP00+249				
	Made Ground	Potentially infill associated with former surface ground workings may be locally found. (Reader should refer to appended hazard table for Made Ground)	GL	Unknown. Potentially a few metres
	Topsoil	As above.[1]	0.00	0.76
Drift	Glaciofluvial Sheet Deposits	As above.	0.76	4.14 – 4.57
Bedrock	Wilmslow Sandstone Formation	As above.	4.88 – 5.33	2.14 – 2.59[3]
E-04: KP00+249 to KP00+586				
	Made Ground	Potentially infill associated with former surface ground workings may be locally found. (Reader should refer to appended hazard table for Made Ground)	GL	Unknown. Potentially a few metres
	Topsoil	Gravelly clayey SILT	GL	0.61
	Peat	Organic Soils	0.61	0.46 - 2.74
Drift	Glaciofluvial sheet deposits	As above.	0.46 - 2.74	4.26 - 8.54
Bedrock	Wilmslow Sandstone Formation	As above.	6.55 - 11.28	11.53[3]
E-05: KP00+000 to KP00+148				
	Made Ground	Potentially infill associated with former surface ground workings may be locally found. (Reader should refer to appended hazard table for Made Ground)	GL	Unknown. Potentially a few metres
	Topsoil	Gravelly clayey SILT	GL	0.61
Drift	Glaciofluvial sheet deposits	As above.	0.61	4.14 - 8.54
Bedrock	Wilmslow Sandstone Formation	As above.	4.88 - 11.28	11.53[3]
C-01: KP00+000 to KP00+485				

	Formation	Description	Depth to top of stratum (m bgl)	Thickness (m)
	Topsoil	Sandy gravelly clayey SILT[1]	GL	0.20 – 0.40[2]
Bedrock	Bollin Mudstone Member	The upper mudstone member is largely dominated by laminated reddish-brown and greenish-grey mudstone with siltstones. The lower part is structureless and laminated, dominantly reddish-brown mudstone. May be weathered in upper layers near surface.	0.20 – 0.40[2]	Up to > 350m (based on BGS BH SJ64SW/7)
C-01: KP00+485 to KP00+780, KP03+750 to KP04+000, KP05+350 to KP05+500, KP07+490 to KP07+950				
	Made Ground	Potentially infill associated with former surface ground workings and waste management facility, may be locally found from ~KP07+125 to KP07+650. (Reader should refer to appended hazard table for Made Ground) Potentially areas outside of the above with general made ground – sand, gravel with stone, ash, brick, tarmac.	0.00	0.60 – 6.00
Drift	Glaciofluvial Sheet Deposits	Coarse-grained sediments (i.e. sand and gravel) with some finer-grained layers (i.e. clay and silt). Sand and gravel, locally with lenses of silt, clay or organic material.	0.60 – 6.00 Potentially locally absent in areas with significant made ground	4.15 – 9.00
	Devensian Till (Diamicton)	As above.	From ~2-3m BGL to ~ 15.80. Potentially locally absent	Unknown > 5m[3] Potentially locally up to ~>30m thick [2,3]
Bedrock	Bollin Mudstone Member	As above.	From 7m to >34m	Up to > 350m (based on BGS BH SJ64SW/7)
KP00+850 to KP03+750, KP04+400 to KP05+350, KP05+500 to KP05+763				
	Made Ground	Potential infilled surface ground workings / potentially infilled ponds or other minor surface ground workings at various locations. (Reader should refer to appended hazard table for Made Ground)	GL	Unknown across most of alignment. Potentially from ~1.00m up to several metres at infilled groundworks locations.
	Topsoil	As above.[1]	0.00	0.20 – 0.50[2]
Drift	Devensian Till	As above.	0.20[2] to 1.60 Deeper at locations of infilled ground works	> 13.00 - 17.16 Potentially locally up to ~>30m thick [2,3]

	Formation	Description	Depth to top of stratum (m bgl)	Thickness (m)
Bedrock	Bollin Mudstone Member	As above.	Unknown across most of alignment. Locally proven in BGS record at 17.16	83.45[3] Up to > 350m (based on BGS BH SJ64SW/7)
C-01: KP05+800 to KP06+850, KP07+000 to KP07+060, KP07+200 to KP07+490				
	Topsoil	As above.[1]	0.00	0.10 – 0.40[2]
	Made ground	Potential infilled former brick pit / surface ground workings at ~ KP06+050 to KP06+260.	0.00	0.90 - 3.80 Greatest thickness at locations of infilled ground works
Drift	Devensian Till	As above.	0.20[2] to 1.30 Deeper at locations of infilled ground works	Generally 0.75 to 9.00. Locally up to 36.94[4]
Bedrock	Northwich Halite Member	Halite with partings of mudstone	Generally between 7.00 to 10.00m. Locally as shallow as 1.18m in area of former workings, and as deep as 38.94[4]	5.00[3] - 29.64[3] Up to > 350m (based on BGS BH SJ64SW/7)
C-01: KP07+060 to KP07+200				
	Topsoil	As above.[1]	0.00	0.70
	Made Ground	Former brick works and surface ground workings located this section of pipeline. Also former waste management site. Potential for infilled surface workings.	0.00	2.10[4] Locally thickness varies ~0.90 – 2.13[3]
Drift	Glaciofluvial Sheet Deposits	Coarse-grained sediments (i.e. sand and gravel) with some finer-grained layers (i.e. clay and silt). Sand and gravel, locally with lenses of silt, clay or organic material.	0.70 Potentially locally absent in areas with former workings	4.14[4] Locally thickness varies ~0.60 – 7.00[3]
	Devensian Till	As above.	4.14[4] Locally between ~4.14 – 6.80	1.00[4] Locally thickness varies ~0.73 – 9.00
Bedrock	Northwich Halite Member	As above.	7.00[4] Locally between ~1.18 – 9.90	Up to > 286m (BGS Lexicon)
C-01: KP06+838 to KP07+000				
	Made Ground	Gravel with brick fragments. Former ground workings locally with potential for infilled ground.	0.00	No records at / close alignment. Locally thickness varie 2.70 - 3.80

	Formation	Description	Depth to top of stratum (m bgl)	Thickness (m)
Drift	Alluvium	Sandy clays, organic clays, sandy silt and sands and gravels, with organic material and potentially peat layers / lenses	3.80	6.00[3] - 8.25
	Devensian Till	As above.	No records at alignment Locally between ~4.14 – 7.50	No records at / close alignment. Locally thickness varies ~0.73 – 9.00
Bedrock	Northwich Halite Member	As above.	8.60	Up to >286m BGS Lexicon)
W-01: KP00+000 to KP00+450				
	Made Ground	Potential for variable significant made ground thicknesses associated with historical landfills and refuse heaps (Reader should refer to appended hazard table for Made Ground)	0.00	0.90 – 4.14 Maybe up to 10m.
Drift	Tidal Flat Deposits	Unconsolidated clays, silts and sands	2.50 – 4.14	6.40 – 16.87
	Glaciofluvial Deposits	boulders, gravel, sand, silt and clay	19.20	3.90[3]
	Devensian Till (Dimictic)	As above.	Locally varying from ~6.80 – 17.07	20.11 – 33.20
Bedrock	Bollin Mudstone Member	As above.	Locally varying from 35.35 – 41.70	Up to > 350m (based on BGS BH SJ64SW/7)
W-01: KP00+450 to KP00+867				
	Topsoil	As above.[1]	0.00	0.25
	Made Ground	Potential for variable significant made ground thicknesses associated with historical landfills and refuse heaps (Reader should refer to appended hazard table for Made Ground)	0.00	0.90 – 1.20 Maybe up to several metres near former landfill
Drift	Glaciofluvial Deposits	boulders, gravel, sand, silt and clay	0.25 – 1.25	Varies locally between 2.60 - 8.75

	Formation	Description	Depth to top of stratum (m bgl)	Thickness (m)
Bedrock	Bollin Mudstone Member	As above.	Varies locally between 3.80 - 9.00	6.23[3] Up to > 350m (based on BGS BH SJ64SW/7)
W-01: KP00+867 to KP01+460				
	Topsoil	As above.[1]	0.00	0.25
	Made Ground	Mix of gravels, clays, hardcore and odours soap waste recorded in BGS Borehole near alignment	GL	Potentially locally up to 2.50m Locally likely to be absent.
Drift	Devensian Till (Diamicton)	As above.	0.25 - >2.50 (or possible absent in areas of significant made ground)	1.85[5]
Bedrock	Bollin Mudstone Member	As above.	2.10[5]	1.90[3, 5] Up to > 350m (based on BGS BH SJ64SW/7)
W-02: KP00+000 to KP00+164				
	Topsoil	As above.[1]	0.00	0.25
Drift	Devensian Till (Diamicton)	As above.	0.25[5] Absent from KP00 to KP00+020 and from KP100 to KP164	1.75[5]
Bedrock	Bollin Mudstone Member	As above.	0.25 - 2.00[5]	3.00[3] Up to > 350m (based on BGS BH SJ64SW/7)
W-03: KP00+000 to KP00+415, KP01+328 to KP01+948				
	Topsoil	As above.[1]	0.00	0.15 -0.40
Drift	Devensian Till (Diamicton) (Note: absent from BGS mapping but reference to local BGS Borehole records indicates potential presence of thin layer)	As above.	0.15 -0.40	1.10 – 3.00

	Formation	Description	Depth to top of stratum (m bgl)	Thickness (m)
Bedrock	Bollin Mudstone Member	As above.	1.10 – 3.00	8.30[3] Up to > 350m (based on BGS BH SJ64SW/7)
W-03: KP00+450 to KP00+867				
	Topsoil	Sandy gravelly clayey SILT[1]	0.00	0.45
Drift	Devensian Till (Diamicton) (Note: absent from BGS mapping but reference to local BGS Borehole records indicates potential presence of thin layer)	As above.	0.45	0.75 – 3.00
Bedrock	Tarporley Siltstone Formation	As above.	1.20 – 3.00	38.80[3]

Notes:
[1] Assumed description in absence of borehole records or detailed description on borehole records.
[2] Assumed thickness/depth to top of stratum in absence of historical boreholes.
[3] Thicknesses not proven to base by BGS Borehole Records.
[4] Based on single BGS borehole local to pipeline
[5] Based on single BGS borehole

Stratigraphical succession has been determined from reference to published BGS geological mapping, published historical boreholes and RSK borehole records. In the instance that no relevant historical borehole records were available a stratigraphical succession has been assumed based on the published BGS mapping and datasets contained within BGS Geo-Index. Depth ranges based on available published borehole records.

4 GEOHAZARDS AND GEOTECHNICAL HAZARDS & MITIGATION

A brief description and summary of the nature of the commonly occurring geotechnical and geological hazards within the AOI are presented in Section 4. A preliminary assessment of the occurrence of these geohazards has been undertaken for each facility location and pipeline alignment and is presented in Part 2 and Appendix C in a concise tabulated list format, clearly identifying which hazard may affect the development.

4.1 Potential geological and geotechnical hazards within Project Area

4.1.1 Filled / Made Ground

The location of areas of potential Filled / Made Ground are present in Schedule 1 in Appendix C and are described below.

Geological Unit(s) Potentially Affected: N/A

Description: Fill materials of anthropogenic origin, potentially contaminated material and present unpredictable engineering conditions and instability. Encountered at numerous locations across all project pipeline alignments were historical ground workings, recorded in the Groundsure dataset as surface ground workings (ponds, Brit Pits, borrow pits etc), excavations, and surface mining locations. These are often associated with subsequent infilling and backfilling as part of historical landfills, or redevelopment resulting in placement of large amounts waste materials and anthropogenic materials and possibly some engineered fill material. In several locations significant historical refuse heaps are located on / across and in very close proximity to proposed infrastructure, resulting in artificial significant rises in elevation locally.

These made ground soils are potentially prone to significant consolidation settlement under any increase in the applied effective stress, i.e. as a result of applied structural loads or raising ground levels, excessive displacement and differential displacement could occur, leading to foundation failure, slope failure and collapse of excavation sidewalls. With the potential for contaminated wastes there is a risk to construction worker through exposure and a risk of creation of pathways for migration of contamination to end users, groundwater and the environment.

Mitigation: A list of applicable mitigation is presented below.

- Ground investigation to determine exact geology and ground conditions and nature of any made ground materials
- Designer should consider conservative engineering parameters for made ground soils
- Foundations should be taken to competent natural strata
- Excavations should have trench support systems
- Consider reroute to avoid infilled /potentially unstable ground
- Contamination risk assessments for construction workers, end users, groundwater, environment, including foundation works risk assessment.

4.1.2 Fault hazard

The approximate location of fault systems and local faults within the project area presented on Schedule 2 and described below.

Geological Unit(s) Potentially Affected: N/A

Description: Based on a review of the geological maps presented in the Groundsure Reports there are number of faults and fault systems and other linear features are recorded across the project area intersecting the pipeline infrastructure. Faults represent planar fractures or discontinuities in a rock mass with visible displacement. They are recorded as either observed or inferred on the BGS data / mapping. Some fault displacements, fold zones can lead to surface expression of topographic and geomorphological features. Reactivation of faults could potentially lead to displacement across faults and movements at the surface.

The seismicity risk in the UK is generally considered to be low, however for sensitive structures seismicity should be considered.

Mitigation: A list of applicable mitigation is presented below.

- Designer to consider seismicity and seismic design for sensitive structures in accordance with BS EN 1998-1:2004 Eurocode 8.
- Design of structures for earthquake resistance, where necessary.

4.1.3 Adverse ground and groundwater chemistry

Geotechnical hazards associated with adverse ground and groundwater chemistry are presented Schedule 3 and described below.

Geological Unit(s) Potentially Affected:

High Sulphates/Sulfides: MADE GROUND, Alluvium, Peat, Mercia Mudstone Group (Taporley Siltstone Fm, Boolin Mudstone Member, Sidmouth Mudstone Fm, Northwich Halite Member

Medium Risk Sulphates/Sulfides: Till, Etruria Fm, Coal Measures

Low Risk Sulphates/Sulfides: Glaciofluvial Sheet Deposits, River Terrace Deposits, Shirdley Hill Sand Fm, Sherwood Sandstone Fm (Wilslow Sstone Fm, Chester Fm, Kineerton Sstone Fm, Helsby Sstone Fm)

Description: Chemical agents that are destructive to both concrete and metal are found throughout the soils of the project area. There are three principal types of chemical attack on concrete and steel:

i) Sulphate attack occurs when sulphate anions are transported to the concrete in water together with cations, such calcium, magnesium and sodium. Where porous concrete is in contact with saturated ground there is a continuous interface and as such sulphate ions, allowing for relatively easy/quick access into the body of the concrete. Above the groundwater, the migration of sulphate ions relies on diffusion provided there is sufficient water content in the soil to provide a coating to the soil particles.

ii) Acid attack occurs from acids found in groundwaters, which include carbonic acid, humic acid and sulfuric acid. The principal effect of the acid attack is to reduce to the cement to a paste like matrix.

iii) Chemical attack occurs from chemicals such as magnesium and chloride ions. Magnesium ions can cause a loss of binding of the cement paste through the replacement of calcium in the calcium silicate hydrates. Chlorides cause degradation of concrete through a physical mechanism of crystalising chloride salts on and near to the surface of concrete causing a weathering affect. There is also an increased risk of corrosion of embedded metals in due to a reduction in passivity at the metal surface from migration of chlorides ions into the concrete.

Mitigation: A list of applicable mitigation is presented below.

- Ground investigation to determine exact geology and groundwater conditions allow for determination of chemical agents for soil and groundwater.
- Designer to assess concentrations of chemicals in accordance with BS 8500-1:2006 and BS EN 206:2013 to determine the "Aggressive Chemical Environment for Concrete (ACEC) Classification" is and a Design Sulphate Class.
- Designer to include protective coatings to pipelines & buried metal structures, and suitable cover depth of steel reinforcement within concrete structures.
- Designer to consider soil resistivity and specify appropriate cathodic protection measures.

4.1.4 High groundwater table

Geotechnical hazards associated with a high groundwater table are presented in Schedule 4 in Appendix C and described below.

Geological Unit(s) Potentially Affected: Alluvium, Tidal Flat Deposits, Glaciofluvial Sheet Deposits, Peat, River Terrace Deposits, Made Ground, Shirdley Hill Sandstone Formation, Some Bedrock units without overlying superficial deposits.

Other considerations: Low lying ground near rivers, streams and Mersey Estuary and areas identified at risk of groundwater flooding within the Groundsure reports are also prone to shallow groundwater.

Description: High groundwater tables are likely to be encountered across the project infrastructure where the above geological units and other considerations apply. The presence of high groundwater table may affect the temporary and permanent works and may lead to excessive displacements, excavation and slope instability, running sands and buoyancy.

Mitigation: A list of applicable mitigation is presented below.

- Ground investigation to determine exact geology and groundwater conditions.
- Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; such as dewatering systems, trial excavations, excavation support systems.
- Designer to consider appropriate temporary and permanent drainage

- Designer to consider conservative groundwater conditions in temporary and permanent design

Mitigation: A list of applicable mitigation is presented below.

4.1.5 Groundwater Flooding

Geotechnical hazards associated with a groundwater flooding are presented in Schedule 5 in Appendix C and described below.

Geological Unit(s) Potentially Affected: Alluvium, Tidal Flat Deposits, Glaciofluvial Sheet Deposits, Peat, River Terrace Deposits, Made Ground, Shirdley Hill Sandstone Formation, Some Bedrock units without overlying superficial deposits.

Other considerations: Low lying ground near rivers, streams and Mersey Estuary and areas identified at risk of groundwater flooding within the Groundsure reports are also prone to shallow groundwater.

Description: High groundwater tables are likely to be encountered across the project infrastructure where the above geological units and other considerations apply. Groundwater flooding can occur due to unusually high groundwater levels and can last for weeks or months. The risk is assessed in the Groundsure report based on a 1:100 year return period. The presence of groundwater flooding may affect the temporary and permanent works and may lead to excessive displacements, excavation and slope instability, running sands and buoyancy.

Mitigation: A list of applicable mitigation is presented below.

- Ground investigation to determine exact geology and groundwater conditions.
- Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; such as dewatering systems, trial excavations, excavation support systems.
- Designer to consider appropriate temporary and permanent drainage
- Designer to consider conservative groundwater conditions in temporary and permanent design
- Flood Risk Assessment to determine flood risk.

4.1.6 Potentially liquifiable soils

Geotechnical hazards associated with potentially liquifiable soils are presented on Schedule 6 in Appendix C and described below.

Geological Unit(s) Potentially Affected: Alluvium, Tidal Flat Deposits, Glaciofluvial Sheet Deposits, Shirdley Hill Sand Formation. Any deposits with uniform loose water bearing sands.

Description: Soils that are susceptible to liquefaction due to seismic activity can be defined as uniformly graded saturated sand soils in very loose condition with a fines content of <10%. Fine soils can also be susceptible to liquefaction if the percentage of particles less than 2 µm is less than 10% and the corresponding liquid limit (LL) is less than 32%. Potentially liquifiable soils may be present in some geological units. However, the designer should consider seismicity, as well as quantitative assessment of soils. Insufficient design could lead to excessive and differential displacements, foundation failure and failure of slopes and excavation instability.

Mitigation: A list of applicable mitigation is presented below.

- Ground investigation to determine exact geology and groundwater conditions and determine liquefaction potential.
- Designer to consider seismicity and seismic design for sensitive structures in accordance with BS EN 1998-1:2004 Eurocode 8: Design of structures for earthquake resistance.
- Consider application of ground improvement techniques

4.1.7 Collapsible soil

Geotechnical hazards associated with collapsible soil are presented on Schedule 7 and described below.

Geological Unit(s) Potentially Affected: Risk presented by Groundsure reports is 'Very Low' to 'Negligible' for all soils across the project area.

Description: A 'Collapsible' soil can be defined as a soil that reduces in volume on wetting, typically responding rapidly to inundation. There are several factors that contribute to a soils' potentially collapsibility, including: i) a generally open 'meta-stable' soil structure, ii) low initial density, iii) low natural water content and low plasticity, and iv) the presence of a soluble cementing/bonding agent that stabilises the soil in the unsaturated condition. Collapsible soils often demonstrate relatively high stiffness and strength in the dry state.

If collapsible soils were found to be present they could lead to collapse during inundation and result in excessive displacement, differential displacement, and failure of slopes, foundations and excavations.

Mitigation: A list of applicable mitigation is presented below.

- Ground investigation to determine exact geology and groundwater conditions and determine potential for presence of collapsible soils.
- Design to consider engineering mitigation including:
    - in-situ compaction, removal and replacement;
    - pre-wetting to induce volume reduction prior to construction;
    - chemical stabilization or grouting; and
    - transfer of loads to competent strata not susceptible to collapse.

4.1.8 Highly compressible and low bearing capacity ground

Geotechnical hazards associated with highly compressible and low bearing capacity ground, alluvial/fluvial soils and peat or soils with high organic content, are presented on Schedule 8 in Appendix C and are described below.

Geological Unit(s) Potentially Affected: Alluvium, Tidal Flat Deposits, Peat, Made Ground.

Description: Potentially significant thicknesses of soft to very soft normally consolidated clay and silt soils and infilled ground / made ground are present across numerous parts of the project infrastructure.

These soils are potentially prone to significant consolidation settlement under any increase in the applied effective stress, i.e. as a result of applied structural loads or raising ground levels. Foundation design will therefore need to consider this carefully. In addition to this, caution should be exercised in relation to raising ground levels within these areas,

even by relatively small amounts (0.5 m+), due to the potential for widespread settlement to occur.

Mitigation: A list of applicable mitigation is presented below.

- Ground investigation to determine exact geology and groundwater conditions.
- Designer to consider conservative soil parameters.
- Foundation loads taken to competent strata.
- Designer to consider potential for consolidation settlement, secondary (creep) settlement as a result of applied structural loads or raising ground levels.
- Designer to consider negative skin friction in design.
- Use of engineering mitigation such as:
    - ground improvement; and
    - surcharging / band drain

4.1.9 High swelling/shrinkage potential soils

Geotechnical hazards associated with high swelling and shrinkage potential soils are presented Schedule 9 in Appendix C and are described below.

Geological Unit(s) Potentially Affected: Alluvium, Tidal Flat Deposits, Till, some Weathered Bedrock Units.

Description: Volume change in clay soils occurs as a result of a change in water content, with the degree of volume change potential related to the 'Activity' of the clay fraction of the soil. Soils with a high activity are considered to have a potential for swelling when water is added.

The Groundsure assessment of swelling / shrinkage potential classes all as potentially Low Plasticity. It is, however, considered that the above geological units have the potential for Low to Intermediate Plasticity. Swelling / shrinkage of ground can occur following vegetation removal / planting, as moisture content rebounds or reduces, respectively. This can lead to insufficient design, excessive displacement, differential displacement and potentially failure of foundations.

Mitigation: A list of applicable mitigation is presented below.

- Ground investigation to determine exact geology and groundwater conditions to allow for site-specific assessment of the soils susceptibility to swelling/shrinkage through assessment of 'activity'
- Design of foundations in accordance with NHBC guidance on building near trees.
- Designer to consider engineering mitigation such as voids, void formers, use of compressible materials, construction of foundations below zone of influence of vegetation.

4.1.10 Risk of running sands

Geotechnical hazards associated with risk of running sands are presented in Schedule 10 in Appendix C and described below.

Geological Unit(s) Potentially Affected: Alluvium, Tidal Flat Deposits, River Terrace Gravels, Glaciofluvial Sheet Deposits, Chester Formation, Till, Shirley Hill Sandstone,.

Description: 'Running sands' occurs when a sand layer/unit becomes fluidised by water flowing through it, causing it to 'run' into open excavations if sides are left unsupported. They typically comprise loose clean fine to medium sand. 'Blowing' sands may also occur in saturated granular geological units during piling operations.

From reference to published BGS records / data and knowledge about the above geological units, it is considered the conditions prevalent for running sands may exist in the project area.

Such sands can 'run', removing support from overlying buildings, excavation sidewalls and causing potential damage and / or stability issues. Other engineering risks include HDD / borehole instability, sudden changes in drilling parameters.

Mitigation: A list of applicable mitigation is presented below.

- Ground investigation to determine exact geology and groundwater conditions to allow for site-specific assessment of the soils susceptibility to running / blowing sands conditions.
- Designer to consider engineering mitigation such as:
    - excavation support systems;
    - use of casing for rotary bored piles or CFA piling;
    - use of appropriate drilling fluid type and / or viscosity; and
    - redesign HDD profiles to avoid or limit drill time in unstable soils.

4.1.11 Risk of landslide/slope stability hazards

Geotechnical hazards associated with risk of landslides and slope instability are presented in Schedule 11 in Appendix C and described below.

The Groundsure reports identify the potential for natural landslides and slope stability hazards to range from very low to moderate across the project infrastructure. Numerous areas exist with a combination of significant topographic relief with steeply sloping ground and potentially susceptible ground conditions. There is a potential for movement of rock, soil, debris down a sloping section of land, which can be due to natural ground conditions and geomorphological conditions or as a results of manmade features such as cut slopes, embankments and quarries.

The topography is very variable across the project area with numerous areas of steeply sloping ground, gullies, valleys and natural breaks in slope observed from reference to the hill shade digital elevation model (DEM) and topographic contours. No areas of instability were noted, although there is potential for instability is significant in many areas. There is also the potential for river bank erosion, along unprotected sections of the numerous rivers and streams in the project area, these features have not been identified within the imagery and DTM data.

Mitigation: A list of applicable mitigation is presented below.

Ground investigation to determine exact geology and groundwater conditions to allow for site-specific assessment of temporary and permanent slopes.

- Topographic survey to determine existing slope gradients and geomorphological mapping of any high risk areas

- Assessment of existing and proposed slope stability to current British and Eurocode standards and CoP documents
- Adoption of conservative parameters in assessment and design
- Consider reroute or bypass with HDD
- Designer to consider application of engineering mitigation such as:
    - regrading existing slopes;
    - slope / cliff stabilisation with soil nails; and
    - rock bolts.

4.1.12 Excavatability

Geotechnical hazards associated with potentially excavatability issues are presented on Schedule 12 in Appendix C and described below.

Geological Unit(s) Potentially Affected: Solid Rock outcropping of bedrock formations. Areas without superficial deposits and with bedrock from surface, depending on weathering state.

Description: Some ground conditions such as solid rock, cemented soils can result in potential difficulties and limitations of standard plant to form excavations and as a consequence there may be a need for heavier plant, hydraulic machinery, breakers, or blasting.

Mitigation: A list of applicable mitigation is presented below

- ground investigation to determine presence of solid rock geology and establish discontinuity index and rock strength
- assessment of excavatability
- designer to consider rock parameters, where relevant, in assessment of trenching techniques
- consider reroute or bypass with HDD.

4.1.13 Excavation Stability

Geotechnical hazards associated with risk of excavation stability is presented in Schedule 13 in Appendix C described below.

Geological Unit(s) Potentially Affected: Made Ground, Tidal Flat Deposits, Peat, Made Ground, Alluvium, River Terrace Gravels, Glacio-Fluvial Deposits, Shirdley Hill Sand Formation.

Description: Potential for side wall or base instability of excavations due to difficult ground conditions such as loose granular deposits, extremely low strength cohesive soils susceptible to extrusion and water bearing granular soils. This could result in failure of temporary or permanent slopes, excavation faces, excavation instability and could result in excessive displacement and differential displacements.

Mitigation: A list of applicable mitigation is presented below.

- ground investigation to determine exact geology and groundwater conditions
- designer to consider appropriate engineering mitigation to facilitate temporary works such as:
    - dewatering systems;

- trial excavations; and
- excavation support systems.

4.1.14 Potential for dissolution of soluble rocks

Geotechnical hazards associated with a dissolution of soluble rocks are presented on Schedule 14 in Appendix C and described below.

Geological Unit(s) Potentially Affected: Northwich Halite Member.

Description: The site is located within the Cheshire Brine Compensation District, where there is the potential for ground subsidence resulting from the pumping of brine. The bedrock across the eastern and south/south-eastern part of the project area (parts of East Pipeline, South Pipeline and Spur C-01) consists of the Mercia Mudstone Group, which has a total thickness of over 1.5km. The subdivision underlying the project area is the Sidmouth Mudstone Formation, with includes the Northwich Halite Member. The Northwich Halite Member comprises a major halite (rock salt) unit, with halite strata interbedded with marl. The unit is considered of economic importance. The area falls within a 'Brine Area', where brine extraction has taken place on an industrial scale since the 1800's. Pumping from brine wells has historically caused subsidence, potentially many miles away, due to hydrogeological conditions, with brine flow at depth causing dissolution of brine and formation of karsts and cavities. Development of natural karsts is also believed to have occurred during the Devensian glaciation. Known cavities can be up to 170m across and as close as 30m apart, with the shallowest recorded being at ~60m bgl in the north of the brine field.

It is known that rock salt creeps over time resulting in settlements of millimetres per year leading to formation of hollows and troughs in current ground surface. Farmers have reported that fields, previously level, now have parallel settlement troughs of up to 2m deep, and others report a pond has formed in a new surface hollow. It is believed that a lot of subsidence features across farmland go un-investigated. A number of potential surface depressions were noted in farmland from reference to the hill shade digital elevation model (DEM) and topographic contours, within areas underlain by the Northwich Halite Member in a 'Brine Area'.

The presence of these potential karsts at depth may lead to ground instability, void migration towards the surface and brine creep. This could result in excessive displacement, differential displacement, failure of foundations, slopes and excavation instability. Hole instability may also occur if HDD or pile bore penetrates deep filled hollows or migrating voids.

Mitigation: A list of applicable mitigation is presented below.

- Ground investigation to determine exact geology and groundwater conditions to allow for site-specific assessment.
- Topographic survey to determine existing geomorphology
- Designer to consider rerouting to avoid unstable geology.
- Consider mitigation remedial measures such as compaction grouting, void filling, foam concrete.

- Obtain Cheshire Salt Search report and complete detailed Brine extraction risk assessment for route alignment.

4.1.15 Gully, Gully erosion and incised channels (buried valleys)

Geotechnical hazards associated with risk of gullies, gully erosion and incised channels is presented in Schedule 17 in Appendix C described below.

Geological Unit(s) Potentially Affected: N/A – Geomorphological feature.

Description: A small hollow or channel incised into sediments or unconsolidated rock by running water, resulting in sudden lateral changes in ground conditions and potential for infill of loose saturated sediments. Or the potential for incised channels based on geology and / or surface water regime. Some regional river systems may have substantial historical buried valleys resulting from historical river migration and subsequent infilling and deposition of recent deposits.

In some cases, drainage ditches with the potential for incision into underlying soils due to flowing water have also been included in the assessment of presence of this feature.

Mitigation: A list of applicable mitigation is presented below.

- Ground investigation to determine exact geology and groundwater conditions and profile presence of buried channels.
- Topographic / bathymetric survey to determine depth of channels, depth of loose sediment and geomorphology.
- Adoption of conservative parameters in assessment and design.
- Designer to consider application of engineering mitigation such as:
  - redesigning HDD profile to avoid unstable geology,
  - trench / excavation support systems.

4.2 Summary of geohazards and geomorphological hazards affecting development

A detailed assessment of the potential prevalence and location of geohazards and geotechnical hazards has been undertaken using a range of data sources and captured digitally in a GIS database for the purposes of assessing the spatial distribution of hazards. Some of the listed hazards below have not been included in discussion in Section 4.1 due to them being geomorphological features or related to flood risk, with the inherent risk and mitigation already clear. The geohazards and geotechnical hazards and geomorphological features are presented in Appendix C as a series of detailed schedules

4.2.1 North1, North 2 and Spur Pipelines N1-02, N1-05, N2-04 and N2-06, Higher Walton HAGI, Clockface HAGI and Central Hub HAGI

A summary of commonly occurring anticipated geotechnical hazards along the North Pipeline and adjoining spur pipelines, and associated HAGI's is given in Table 8, together with an assessment of whether the site may be affected by each of the stated hazards. A detailed assessment of the potential prevalence and location of these hazards has been undertaken using a range of data sources and captured digitally in the GIS

geodatabase and presented in a series of schedules as outlined in Section 4.2. The reader should refer to these for detailed information.

Table 8: Summary of main potential geotechnical hazards that may affect the Northern Pipelines N1 and N2 and adjoining Spur Pipelines N1-02, N1-05, N2-04 and N2-06, Higher Walton HAGI, Clockface HAGI and Central Hub HAGI

Hazard category	Hazard status based on desk study findings and proposed development		Engineering considerations if hazard affects site
	Could be present and/or affect site	Unlikely to be present and/or affect site	
Sudden lateral changes in ground conditions	✓		Likely to affect ground engineering and foundation design and construction
Shrinkable clay soils	✓		Design to NHBC Standards Chapter 4 or similar
Highly compressible and low bearing capacity soils, (including peat and soft clay)	✓		Likely to affect ground engineering and foundation design and construction
Silt-rich soils susceptible to rapid loss of strength in wet conditions	✓		Likely to affect ground engineering and foundation design and construction
Running sand at and below water table	✓		Likely to affect ground engineering and foundation design and construction
Karstic dissolution features (including 'swallow holes' in Chalk terrain)		✓	May affect ground engineering and foundation design and construction – refer to Section 4.1.2
Evaporite dissolution features and/or subsidence		✓	May affect ground engineering and foundation design and construction
Ground subject to or at risk from landslides	✓		Likely to require special stabilisation measures
Ground subject to peri-glacial valley cambering with gulls possibly present	✓		Likely to affect ground engineering and foundation design and construction
Ground subject to or at risk from coastal or river erosion	✓		Likely to require special protection/stabilisation measures
High groundwater table (including waterlogged ground)	✓		May affect temporary and permanent works
Rising groundwater table due to diminishing abstraction in urban area		✓	May affect deep foundations, basements and tunnels

Hazard category	Hazard status based on desk study findings and proposed development		Engineering considerations if hazard affects site
	Could be present and/or affect site	Unlikely to be present and/or affect site	
Underground mining	✓		Likely to require special stabilisation measures
Effects of extreme temperature (e.g. cold stores or brick kilns/furnaces)	✓ (None known to exist but cannot be discounted)		Likely to affect ground engineering and foundation design and construction
Existing sub-structures (e.g. tunnels, foundations, basements, and adjacent sub-structures)	✓		Likely to affect ground engineering and foundation design and construction
Filled and made ground (including embankments, infilled ponds and quarries)	✓		Likely to affect ground engineering and foundation design and construction
Adverse ground chemistry (including expansive slags and weathering of sulphides to sulphates)	✓		May affect ground engineering and foundation design and construction
Site topography	✓		May affect ground engineering and foundation design and construction
Note: Seismicity is not included in the above table as this is not normally a design consideration in the UK.			

4.2.2 East Pipeline and Spur Pipelines E-01, E-02, E-04 and E-05, Block Valve 1, Warburton HAGI and Partington HAGI

A summary of commonly occurring anticipated geotechnical hazards along the East Pipeline and adjoining spur pipelines, and associated HAGI's is given in Table 9, together with an assessment of whether the site may be affected by each of the stated hazards. A detailed assessment of the potential prevalence and location of these hazards has been undertaken using a range of data sources and captured digitally in the GIS geodatabase and presented in a series of schedules as outlined in Section 4.2. The reader should refer to these for detailed information.

Table 9: Summary of main potential geotechnical hazards that may affect the East Pipeline and Spur Pipelines E-01, E-02, E-04 and E-05, Block Valve 1, Warburton HAGI and Partington HAGI

Hazard category	Hazard status based on desk study findings and proposed development		Engineering considerations if hazard affects site
	Could be present and/or affect site	Unlikely to be present and/or affect site	
Sudden lateral changes in ground conditions	✓		Likely to affect ground engineering and foundation design and construction
Shrinkable clay soils	✓		Design to NHBC Standards Chapter 4 or similar
Highly compressible and low bearing capacity soils, (including peat and soft clay)	✓		Likely to affect ground engineering and foundation design and construction
Silt-rich soils susceptible to rapid loss of strength in wet conditions	✓		Likely to affect ground engineering and foundation design and construction
Running sand at and below water table	✓		Likely to affect ground engineering and foundation design and construction
Karstic dissolution features (including 'swallow holes' in Chalk terrain)	✓		May affect ground engineering and foundation design and construction – refer to Section 4.1.2
Evaporite dissolution features and/or subsidence		✓	May affect ground engineering and foundation design and construction
Ground subject to or at risk from landslides	✓		Likely to require special stabilisation measures
Ground subject to peri-glacial valley cambering with gulls possibly present	✓		Likely to affect ground engineering and foundation design and construction
Ground subject to or at risk from coastal or river erosion	✓		Likely to require special protection/stabilisation measures
High groundwater table (including waterlogged ground)	✓		May affect temporary and permanent works
Rising groundwater table due to diminishing abstraction in urban area		✓	May affect deep foundations, basements and tunnels
Underground mining	✓ (Brine Area)		Likely to require special stabilisation measures

Hazard category	Hazard status based on desk study findings and proposed development		Engineering considerations if hazard affects site
	Could be present and/or affect site	Unlikely to be present and/or affect site	
Effects of extreme temperature (e.g. cold stores or brick kilns/furnaces)	✓ (None known to exist but cannot be discounted)		Likely to affect ground engineering and foundation design and construction
Existing sub-structures (e.g. tunnels, foundations, basements, and adjacent sub-structures)	✓		Likely to affect ground engineering and foundation design and construction
Filled and made ground (including embankments, infilled ponds and quarries)	✓		Likely to affect ground engineering and foundation design and construction
Adverse ground chemistry (including expansive slags and weathering of sulphides to sulphates)	✓		May affect ground engineering and foundation design and construction
Site topography	✓		May affect ground engineering and foundation design and construction
Note: Seismicity is not included in the above table as this is not normally a design consideration in the UK.			

4.2.3 C-01 Spur Pipeline

A summary of commonly occurring anticipated geotechnical hazards for the C-01 Spur pipeline alignment is given in Table 10 together with an assessment of whether the site may be affected by each of the stated hazards. A detailed assessment of the potential prevalence and location of these hazards has been undertaken using a range of data sources and captured digitally in the GIS geodatabase and presented in a series of schedules as outlined in Section 4.2. The reader should refer to these for detailed information.

Table 10: Summary of main potential geotechnical hazards that may affect the C-01 Spur pipeline alignment

Hazard category	Hazard status based on desk study findings and proposed development		Engineering considerations if hazard affects site
	Could be present and/or affect site	Unlikely to be present and/or affect site	
Sudden lateral changes in ground conditions	✓		Likely to affect ground engineering and foundation design and construction
Shrinkable clay soils	✓		Design to NHBC Standards Chapter 4 or similar
Highly compressible and low bearing capacity soils, (including peat and soft clay)	✓		Likely to affect ground engineering and foundation design and construction
Silt-rich soils susceptible to rapid loss of strength in wet conditions	✓		Likely to affect ground engineering and foundation design and construction
Running sand at and below water table	✓		Likely to affect ground engineering and foundation design and construction
Karstic dissolution features (including 'swallow holes' in Chalk terrain)	✓		May affect ground engineering and foundation design and construction – refer to Section 4.1.2
Evaporite dissolution features and/or subsidence		✓	May affect ground engineering and foundation design and construction
Ground subject to or at risk from landslides	✓		Likely to require special stabilisation measures
Ground subject to peri-glacial valley cambering with gulls possibly present	✓		Likely to affect ground engineering and foundation design and construction
Ground subject to or at risk from coastal or river erosion	✓		Likely to require special protection/stabilisation measures
High groundwater table (including waterlogged ground)	✓		May affect temporary and permanent works
Rising groundwater table due to diminishing abstraction in urban area		✓	May affect deep foundations, basements and tunnels
Underground mining	✓		Likely to require special stabilisation measures
Effects of extreme temperature (e.g. cold stores or brick kilns/furnaces)	✓		Likely to affect ground engineering and foundation design and construction

Hazard category	Hazard status based on desk study findings and proposed development		Engineering considerations if hazard affects site
	Could be present and/or affect site	Unlikely to be present and/or affect site	
	(None known to exist but cannot be discounted)		
Existing sub-structures (e.g. tunnels, foundations, basements, and adjacent sub-structures)	✓		Likely to affect ground engineering and foundation design and construction
Filled and made ground (including embankments, infilled ponds and quarries)	✓		Likely to affect ground engineering and foundation design and construction
Adverse ground chemistry (including expansive slags and weathering of sulphides to sulphates)	✓		May affect ground engineering and foundation design and construction
Site topography	✓		May affect ground engineering and foundation design and construction
Note: Seismicity is not included in the above table as this is not normally a design consideration in the UK.			

4.2.4 South Pipeline and Block Valve 2 and Inoyvn Gas Storage HAGI

A summary of commonly occurring anticipated geotechnical hazards for the South pipeline alignment, Block Valve 2 and Inoyvn Gas Storage HAGI is given in Table 11, together with an assessment of whether the site may be affected by each of the stated hazards. A detailed assessment of the potential prevalence and location of these hazards has been undertaken using a range of data sources and captured digitally in the GIS geodatabase and presented in a series of schedules as outlined in Section 4.2. The reader should refer to these for detailed information.

Table 11: Summary of main potential geotechnical hazards that may affect the South pipeline alignment and Block Valve 2 and Inoyvn Gas Storage HAGI

Hazard category	Hazard status based on desk study findings and proposed development		Engineering considerations if hazard affects site
	Could be present and/or affect site	Unlikely to be present and/or affect site	
Sudden lateral changes in ground conditions	✓		Likely to affect ground engineering and foundation design and construction
Shrinkable clay soils	✓		Design to NHBC Standards Chapter 4 or similar
Highly compressible and low bearing capacity soils, (including peat and soft clay)	✓		Likely to affect ground engineering and foundation design and construction
Silt-rich soils susceptible to rapid loss of strength in wet conditions	✓		Likely to affect ground engineering and foundation design and construction
Running sand at and below water table	✓		Likely to affect ground engineering and foundation design and construction
Karstic dissolution features (including 'swallow holes' in Chalk terrain)	✓		May affect ground engineering and foundation design and construction – refer to Section 4.1.2
Evaporite dissolution features and/or subsidence		✓	May affect ground engineering and foundation design and construction
Ground subject to or at risk from landslides	✓		Likely to require special stabilisation measures
Ground subject to peri-glacial valley cambering with gulls possibly present	✓		Likely to affect ground engineering and foundation design and construction
Ground subject to or at risk from coastal or river erosion	✓		Likely to require special protection/stabilisation measures
High groundwater table (including waterlogged ground)	✓		May affect temporary and permanent works
Rising groundwater table due to diminishing abstraction in urban area		✓	May affect deep foundations, basements and tunnels
Underground mining	✓		Likely to require special stabilisation measures
Effects of extreme temperature (e.g. cold stores or brick kilns/furnaces)	✓		Likely to affect ground engineering and foundation design and construction

Hazard category	Hazard status based on desk study findings and proposed development		Engineering considerations if hazard affects site
	Could be present and/or affect site	Unlikely to be present and/or affect site	
	(None known to exist but cannot be discounted)		
Existing sub-structures (e.g. tunnels, foundations, basements, and adjacent sub-structures)	✓		Likely to affect ground engineering and foundation design and construction
Filled and made ground (including embankments, infilled ponds and quarries)	✓		Likely to affect ground engineering and foundation design and construction
Adverse ground chemistry (including expansive slags and weathering of sulphides to sulphates)	✓		May affect ground engineering and foundation design and construction
Site topography	✓		May affect ground engineering and foundation design and construction
Note: Seismicity is not included in the above table as this is not normally a design consideration in the UK.			

4.2.5 West Pipeline, Spur Pipelines W-01, W02 and W03, Rocksavage HAGI, Runcorn HAGI and Stanlow HPP HAGI

A summary of commonly occurring anticipated geotechnical hazards for the West pipeline and adjoining Spur Pipelines W-01, W02 and W-03 and Rocksavage HAGI, Runcon HAGI and Stanlow HPP HAGI is given in Table 12, together with an assessment of whether the site may be affected by each of the stated hazards. A detailed assessment of the potential prevalence and location of these hazards has been undertaken using a range of data sources and captured digitally in the GIS geodatabase and presented in a series of schedules as outlined in Section 4.2. The reader should refer to these for detailed information.

Table 12: Summary of main potential geotechnical hazards that may affect the West Pipeline and Spur Pipelines W-01, W-02 and W-03 alignments and Rocksavage HAGI, Runcorn HAGI and Stanlow HPP HAGI

Hazard category	Hazard status based on desk study findings and proposed development		Engineering considerations if hazard affects site
	Could be present and/or affect site	Unlikely to be present and/or affect site	
Sudden lateral changes in ground conditions	✓		Likely to affect ground engineering and foundation design and construction
Shrinkable clay soils	✓		Design to NHBC Standards Chapter 4 or similar
Highly compressible and low bearing capacity soils, (including peat and soft clay)	✓		Likely to affect ground engineering and foundation design and construction
Silt-rich soils susceptible to rapid loss of strength in wet conditions	✓		Likely to affect ground engineering and foundation design and construction
Running sand at and below water table	✓		Likely to affect ground engineering and foundation design and construction
Karstic dissolution features (including 'swallow holes' in Chalk terrain)		✓	May affect ground engineering and foundation design and construction – refer to Section 4.1.2
Evaporite dissolution features and/or subsidence		✓	May affect ground engineering and foundation design and construction
Ground subject to or at risk from landslides	✓		Likely to require special stabilisation measures
Ground subject to peri-glacial valley cambering with gulls possibly present	✓		Likely to affect ground engineering and foundation design and construction
Ground subject to or at risk from coastal or river erosion	✓		Likely to require special protection/stabilisation measures
High groundwater table (including waterlogged ground)	✓		May affect temporary and permanent works
Rising groundwater table due to diminishing abstraction in urban area		✓	May affect deep foundations, basements and tunnels
Underground mining		✓	Likely to require special stabilisation measures
Effects of extreme temperature (e.g. cold stores or brick kilns/furnaces)	✓ (None known to exist but cannot be discounted)		Likely to affect ground engineering and foundation design and construction

Hazard category	Hazard status based on desk study findings and proposed development		Engineering considerations if hazard affects site
	Could be present and/or affect site	Unlikely to be present and/or affect site	
Existing sub-structures (e.g. tunnels, foundations, basements, and adjacent sub-structures)	✓		Likely to affect ground engineering and foundation design and construction
Filled and made ground (including embankments, infilled ponds and quarries)	✓		Likely to affect ground engineering and foundation design and construction
Adverse ground chemistry (including expansive slags and weathering of sulphides to sulphates)	✓		May affect ground engineering and foundation design and construction
Site topography	✓		May affect ground engineering and foundation design and construction
Note: Seismicity is not included in the above table as this is not normally a design consideration in the UK.			

PART 2 – GEO-HAZARDS ASSESSMENT

5 GEOHAZARD, GEOMORPHOLOGICAL AND HYDROLOGY HAZARDS

The assessment of geotechnical, geological, geomorphological and some hydrological hazards along the proposed route alignments considers all related features present on or in close proximity to the route alignments.

5.1 Types of hazards

The list of hazards/features included in the assessment is provided below. Given the scale of the supplied and available imagery, it has not always been possible to full identify and classify a hazard type. Some constraints may require confirmation (via screening assessment results or a subsequent site visit) for the avoidance of doubt.

- Geo-Hazard – Made Ground
- Geo-Hazard – Fault
- Geo-Hazard – Adverse Ground and Groundwater Chemistry
- Geo-Hazard – High Groundwater Table
- Geo-Hazard – Groundwater Flooding
- Geo-Hazard – Potentially Liquifiable Soils
- Geo-Hazard – Collapsible Soils
- Geo-Hazard – Compressible Soils
- Geo-Hazard – Swelling, Shrinkage Potential Soils
- Geo-Hazard – Running Sand
- Geo-Hazard – Landslides
- Geo-Hazard – Excavatability
- Geo-Hazard – Excavation Stability
- Geo-Hazard – Ground Dissolution of Soluble Rocks
- Geomorphology – Escarpments
- Geomorphology – Break in Slope
- Geomorphology – Gully, Gully Erosion and Incised Channels or Valleys
- Geomorphology – Ridges
- Geomorphology – Large Hill or Steep Terrain
- Geomorphology – Excavations
- Geomorphology – Potential Dissolution Feature
- Geomorphology – Surface Ground Workings
- Geomorphology – British Pits

- Geomorphology – Underground Workings
- Geomorphology – Brine Area
- Hydrology – Flooding Risk from Rivers and Seas
- Hydrology – Surface Water Flooding
- Geology – Distribution of Superficial Geological Units / Formations
- Geology – Distribution of Bedrock Geological Units / Formations

5.2 Rationale applied for the assessment

The risk rating system described in Section 1.5.3 has been applied to the geohazards, geotechnical and geomorphological and hydrologocial constraints as listed in Section 5.1. a detailed schedule of the full range of hazards assessed in this study is provided in Appendix C. The following information about the hazard can be found in this schedule.

- Discipline (Geology/Geotechnical, Geomorphology, Hydrology etc)
- Hazard ID
- Affected Geological Unit (if relevant)
- Datasets used
- Description of the hazard
- Description of impact of hazard
- Outline mitigation options

A second schedule is provided in Appendix C detailing the Risk Assessment Approach on a hazard by hazard basis, clearly outlining the approach and rationale applied to the assessments. The following Information about the risk assessment approach can be found in this schedule:

- Hazard ID
- Dataset used
- Probability rationale
- Probability score
- Impact score
- Risk (before mitigation) – number and term
- Mitigation options
- Residual Probability score
- Residual Impact score
- Residual Risk – number and term

The above information is then provided for each individual schedule for each hazard.

BIBLIOGRAPHY

Groundsure Enviro+Geo Insight Report, Ref GSIP-2021-12402-9276_A, dated 02/03/2022.

Groundsure Enviro+Geo Insight Report, Ref GSIP-2021-12402-9276_B, dated 02/03/2022.

Groundsure Enviro+Geo Insight Report, Ref GSIP-2021-12402-9276_C, dated 02/03/2022.

Groundsure Enviro+Geo Insight Report, Ref GSIP-2021-12402-9276_D, dated 02/03/2022.

Groundsure Enviro+Geo Insight Report, Ref GSIP-2021-12402-9276_E, dated 02/03/2022.

Groundsure Enviro+Geo Insight Report, Ref GSIP-2021-12402-9276_F, dated 02/03/2022.

Groundsure Enviro+Geo Insight Report, Ref GSIP-2021-12402-9276_G, dated 02/03/2022.

Groundsure Enviro+Geo Insight Report, Ref GSIP-2021-12402-9276_H, dated 02/03/2022.

Groundsure Enviro+Geo Insight Report, Ref GSIP-2021-12402-9276_I, dated 02/03/2022.

Groundsure Enviro+Geo Insight Report, Ref GSIP-2021-12402-9276_J, dated 02/03/2022.

Groundsure Enviro+Geo Insight Report, Ref GSIP-2021-12402-9276_K, dated 02/03/2022.

Groundsure Enviro+Geo Insight Report, Ref GSIP-2021-12402-9276_L, dated 02/03/2022.

Groundsure Enviro+Geo Insight Report, Ref GSIP-2021-12402-9276_M, dated 02/03/2022.

Groundsure Enviro+Geo Insight Report, Ref GSIP-2021-12402-9276_N, dated 02/03/2022.

Groundsure Enviro+Geo Insight Report, Ref GSIP-2021-12402-9276_O, dated 02/03/2022.

Groundsure Enviro+Geo Insight Report, Ref GSIP-2021-12402-9276_P, dated 02/03/2022.

Groundsure Enviro+Geo Insight Report, Ref GSIP-2021-12402-9276_Q, dated 02/03/2022.

Groundsure Enviro+Geo Insight Report, Ref GSIP-2021-12402-9276_R, dated 02/03/2022.

Groundsure Enviro+Geo Insight Report, Ref GSIP-2021-12402-9276_S, dated 02/03/2022.

Groundsure Enviro+Geo Insight Report, Ref GSIP-2021-12402-9276_T, dated 02/03/2022.

Factual Ground Investigation Report, Ian Farmer Associates, 2230746 (03), May 2023

British Standards Institution (BSI) (2020), 'BS 5930:2015+A1:2020. Code of practice for ground investigations'.

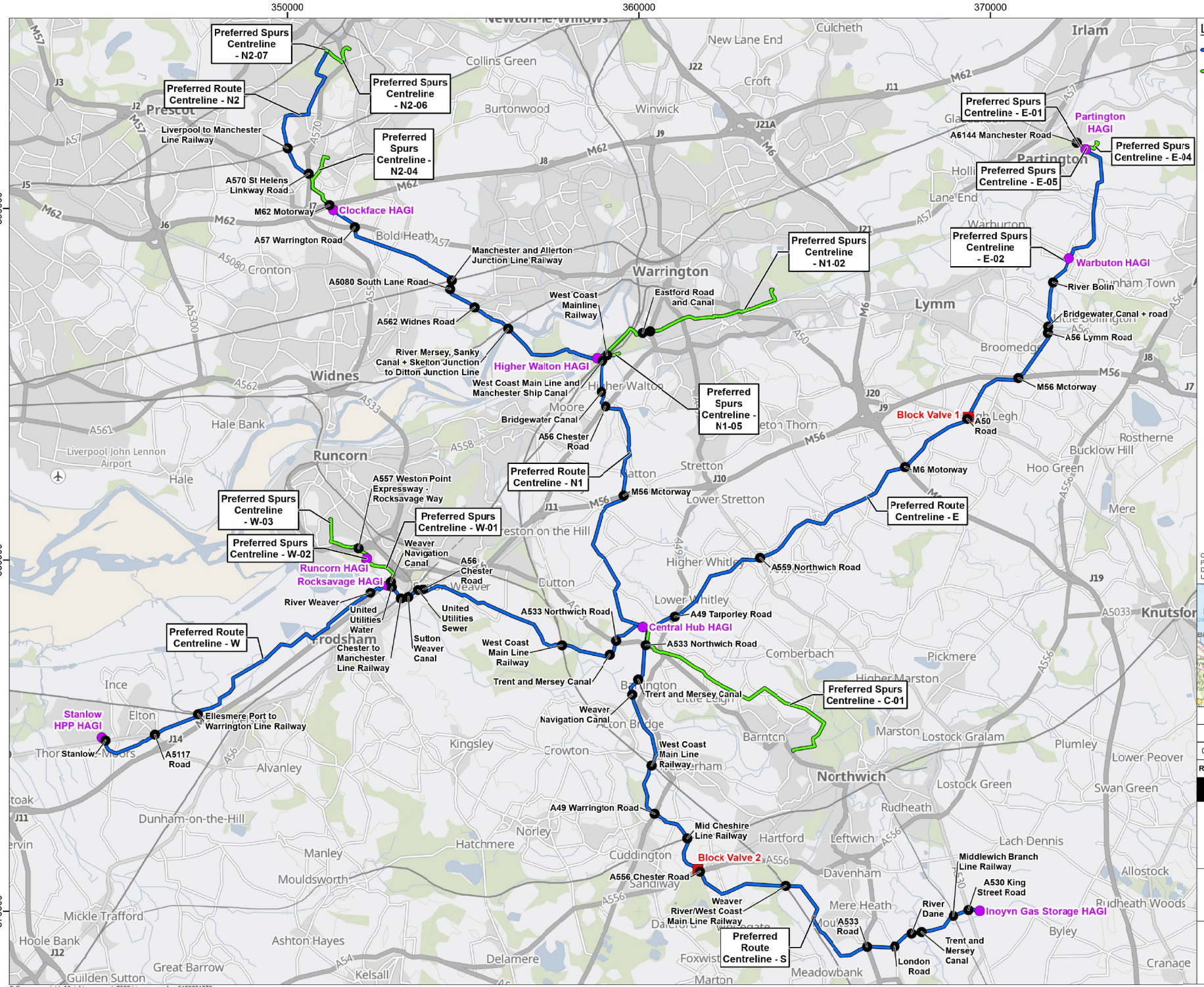
National House Building Council (NHBC) (2016), Technical Extra, April 2016.

www.bgs.ac.uk/map-viewers/geoindex-onshore

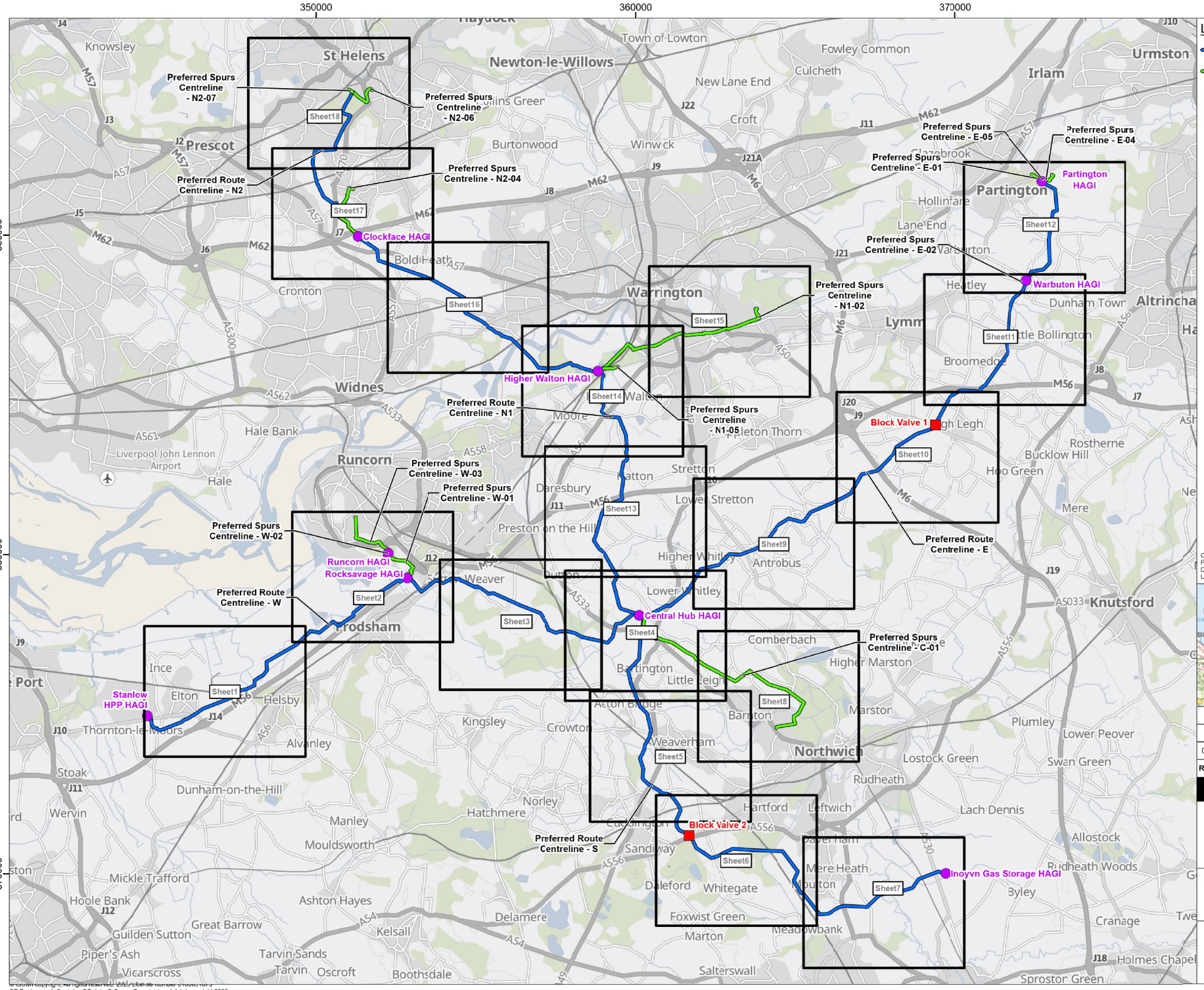
www.data.gov.uk/dataset/01b3ee39-da3f-47b6-83da-dc98e73a461f/lidar-composite-dtm-2022-1m

https://environment.data.gov.uk/DefraDataDownload/?Mode=rofsw

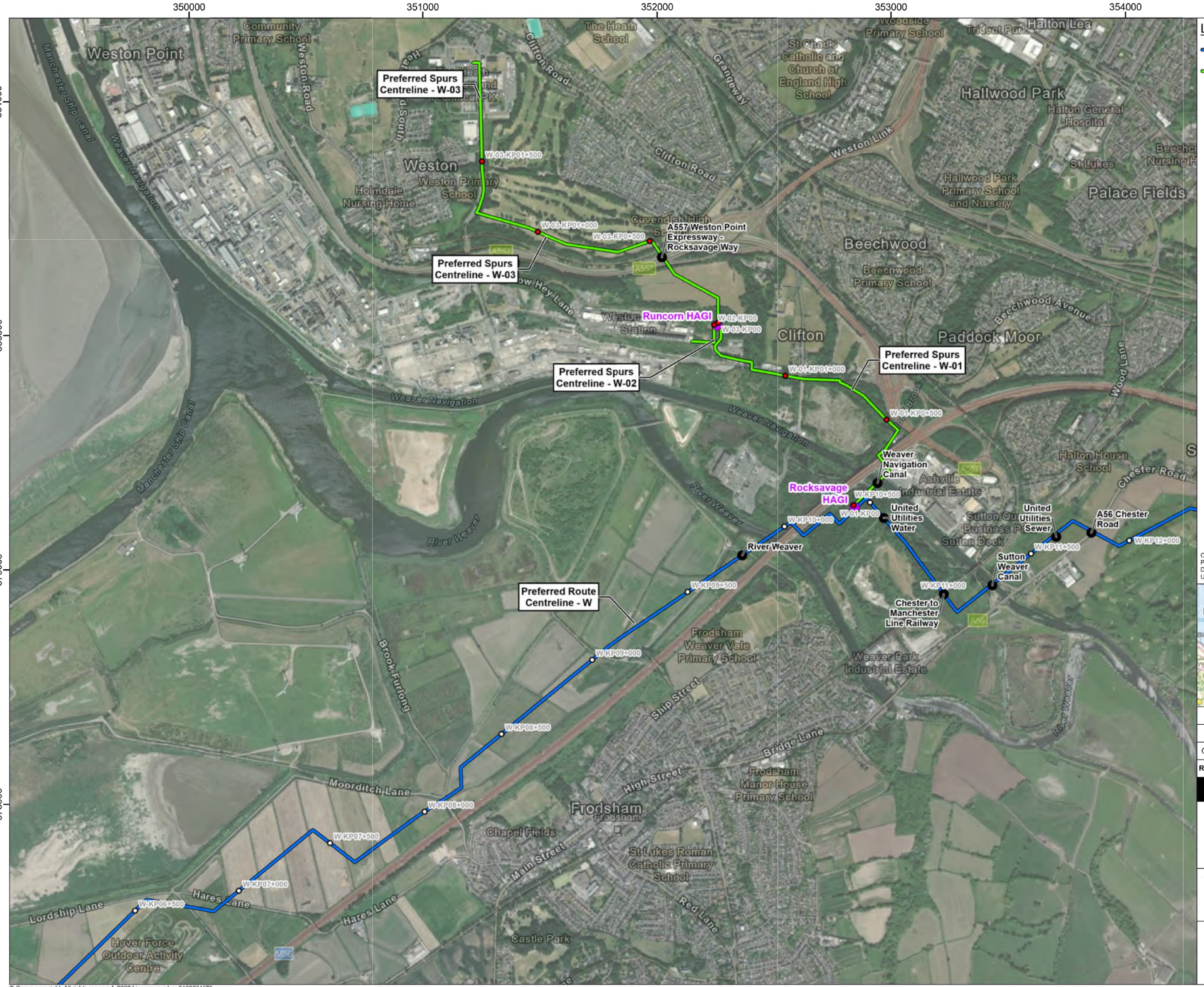
APPENDIX A
PROJECT OVERVIEW DRAWINGS



© Crown copyright, All rights reserved. 2023 License number 0100031673
GB Background: Contains OS data © Crown Copyright and database right 2022
Contains data from OS Zoomstack


350000
360000
370000
390000
380000
370000
Legend:
Preferred Route Centreline
Preferred Spurs Centreline
HAGI Locations
Block Valve Centroids
Preferred Spurs Centreline - N2-07
Preferred Spurs Centreline - N2-06
Preferred Spurs Centreline - N2-04
Preferred Route Centreline - N2
Preferred Spurs Centreline - E-05
Preferred Spurs Centreline - E-04
Preferred Spurs Centreline - E-01
Partington HAGI
Preferred Spurs Centreline - E-02
Warbuton HAGI
Clockface HAGI
Preferred Spurs Centreline - N1-02
Higher Walton HAGI
Preferred Route Centreline - N1
Preferred Spurs Centreline - N1-05
Block Valve 1
Preferred Route Centreline - E
Preferred Spurs Centreline - W-03
Preferred Spurs Centreline - W-01
Preferred Spurs Centreline - W-02
Runcorn HAGI
Rocksavage HAGI
Preferred Route Centreline - W
Central Hub HAGI
Preferred Spurs Centreline - C-01
Stanlow HPP HAGI
Block Valve 2
Preferred Route Centreline - S
Inoyvn Gas Storage HAGI
Sheet1
Sheet2
Sheet3
Sheet4
Sheet5
Sheet6
Sheet7
Sheet8
Sheet9
Sheet10
Sheet11
Sheet12
Sheet13
Sheet14
Sheet15
Sheet16
Sheet17
Sheet18
St Helens
Newton-le-Willows
Prescot
Warrington
Widnes
Runcorn
Frodsham
Partington
Altrincham
Knutsford
Northwich
Ellesmere Port
Thornton-le-Moors
Dunham-on-the-Hill
Mickle Trafford
Ashton Hayes
Tarvin Sands
Boothsdale
Salterswall
Holmes Chapel
Sprostor Green
Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936
Units: Meter
Rev | Date | Description | Drn | Chk | App
00 | 06/07/2023 | First Draft | DR | MK | MK
322968 - HyNet NW
United Living Energy Services
RSK GEOSCIENCES
TITLE:
322968 - Drawing 2
Hynet Geohazards Desk Study
Sheet Overview
0 2 4
Km
SCALE: 1:110,000 @ A3
REV 00
Document Path: C:\Users\droberts\Desktop\Workings\322968 NW Construction Project\01 - GIS\11 - ArcPro\322968 - Drawing 2 - Hynet Geohazards Desk Study - Sheet Overview.aprx
GB Background: Contains OS data © Crown Copyright and database right 2022
Contains data from OS Zoomstack

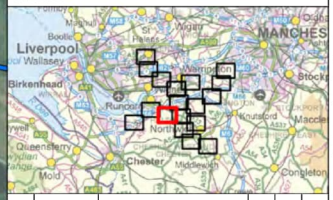
345000
346000
347000
348000
349000
377000
376000
375000
374000
Legend:
Preferred Route Centreline
Preferred Route Centreline KP Marker
HAGI Locations
Trenchless Crossing Points
Preferred Route Centreline - W
Stanlow HPP HAGI
W-KP00
Stanlow
W-KP0+500
W-KP01+000
W-KP01+500
A5117 Road
W-KP02+000
W-KP02+500
W-KP03+000
Ellesmere Port to Warrington Line Railway
W-KP03+500
W-KP04+000
W-KP04+500
W-KP05+000
W-KP05+500
W-KP06+000
Manchester Ship Canal
Marsh Lane
Lordship Lane
Rake Lane
Hornsmill Brook
Ince
Elton
Elton Green
Helsby
Hapsford
Quinn Glass Site
Chester Service Area
Helsby Community Sports Club
Horn's Mill Primary School
Ince and Elton
Pool Lane
Station Road
Sites Road
School Lane
Ash Road
Ince Lane
Chester Road
Old Chester Road
Back Lane
The Rock
Primrose Lane
Greers Lane
B5132
A5117
M56
Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936
Units: Meter
Liverpool
Chester
00 06/07/2023 First Draft DR MK MK
Rev Date Description Drn Chk App
322968 - HyNet NW
United Living Energy Services
RSK GEOSCIENCES
TITLE: 322968 - Drawing 3
Hynet Geohazards Desk Study
Project Overview
Sheet 1 of 18
0 200 400
Metres
SCALE: 1:15,000 @ A3
N
W E
S
REV 00
© Crown copyright, All rights reserved. 2023 License number 0100031673
World Imagery: Maxar, Microsoft
Hybrid Reference Layer: Esri Community Maps Contributors, Esri UK, Esri, HERE, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS
Document Path: C:\Users\droberts\Desktop\Workings\322968 NW Construction Project\01 - GIS\11 - ArcPro\322968 - Drawing 3 - Hynet Geohazards Desk Study - Sheets 1 to 18.aprx


350000
351000
352000
353000
354000
381000
380000
379000
378000
Preferred Spurs Centreline - W-03
Preferred Spurs Centreline - W-03
Preferred Spurs Centreline - W-02
Preferred Spurs Centreline - W-01
Preferred Route Centreline - W
A557 Weston Point Expressway - Rocksavage Way
Runcorn HAGI
Rocksavage HAGI
W-03-KP01+500
W-03-KP01+000
W-03-KP00+500
W-02-KP00
W-03-KP00
W-01-KP01+000
W-01-KP00+500
W-01-KP00
W-KP10+500
W-KP10+000
W-KP09+500
W-KP09+000
W-KP08+500
W-KP08+000
W-KP07+500
W-KP07+000
W-KP06+500
W-KP11+500
W-KP11+000
W-KP12+000
Weaver Navigation Canal
United Utilities Water
United Utilities Sewer
River Weaver
Sutton Weaver Canal
Chester to Manchester Line Railway
A56 Chester Road
Weston Point
Weston
Clifton
Paddock Moor
Beechwood
Hallwood Park
Palace Fields
Halton Lea
Halton House School
Ashville Industrial Estate
Sutton Dock
Weaver Park Industrial Estate
Frodsham
Frodsham Weaver Vale Primary School
Frodsham Manor House Primary School
St Lukes Roman Catholic Primary School
Castle Park
Chapel Fields
Hover Force Outdoor Activity Centre
Weston Primary School
Cavendish High School
Beechwood Primary School
Hallwood Park Primary School and Nursery
St Chad's Catholic and Church of England High School
The Heath School
Woodside Primary School
Community Primary School
Holmdale Nursing Home
Halton General Hospital
Weston Road
Clifton Road
Grangeway
Weston Link
Beechwood Avenue
Wood Lane
Chester Road
Manchester Ship Canal
Weaver Navigation
Brook Furlong
Ship Street
Bridge Lane
High Street
Moorditch Lane
Main Street
Red Lane
Lordship Lane
Hares Lane
Weston Station
Legend:
Preferred Route Centreline
Preferred Spurs Centreline
Preferred Route Centreline KP Marker
Preferred Spurs Centreline KP Marker
HAGI Locations
Trenchless Crossing Points
Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936
Units: Meter
00 06/07/2023 First Draft DR MK MK
Rev Date Description Drn Chk App
322968 - HyNet NW
United Living Energy Services
RSK GEOSCIENCES
TITLE: 322968 - Drawing 3
Hynet Geohazards Desk Study
Project Overview
Sheet 2 of 18
0 200 400
Metres
SCALE: 1:15,000 @ A3
REV 00
© Crown copyright, All rights reserved. 2023 License number 0100031673
World Imagery: Maxar, Microsoft
Hybrid Reference Layer: Esri Community Maps Contributors, Esri UK, Esri, HERE, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS
Document Path: C:\Users\droberts\Desktop\Workings\322968 NW Construction Project\01 - GIS\11 - ArcPro\322968 - Drawing 3 - Hynet Geohazards Desk Study - Sheets 1 to 18.aprx

Legend:

- Preferred Route Centreline
- Preferred Route Centreline KP Marker
- Trenchless Crossing Points

Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936
Units: Meter



Rev	Date	Description	Drn	Chk	App
00	06/07/2023	First Draft	DR	MK	MK

322968 - HyNet NW
United Living Energy Services

RSK GEOSCIENCES

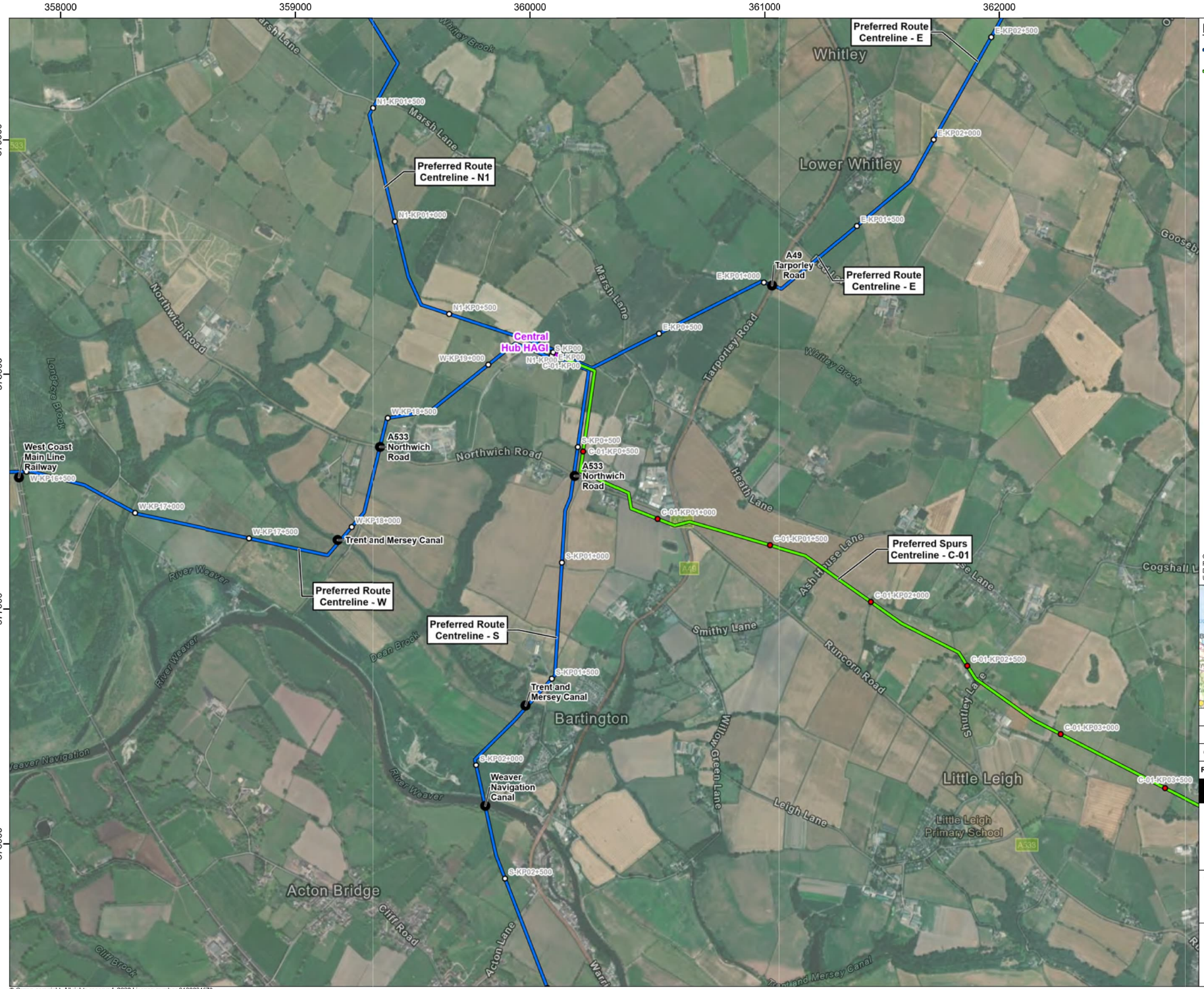
TITLE: 322968 - Drawing 3
Hynet Geohazards Desk Study
Project Overview
Sheet 3 of 18

0 200 400
Metres
SCALE: 1:15,000 @ A3

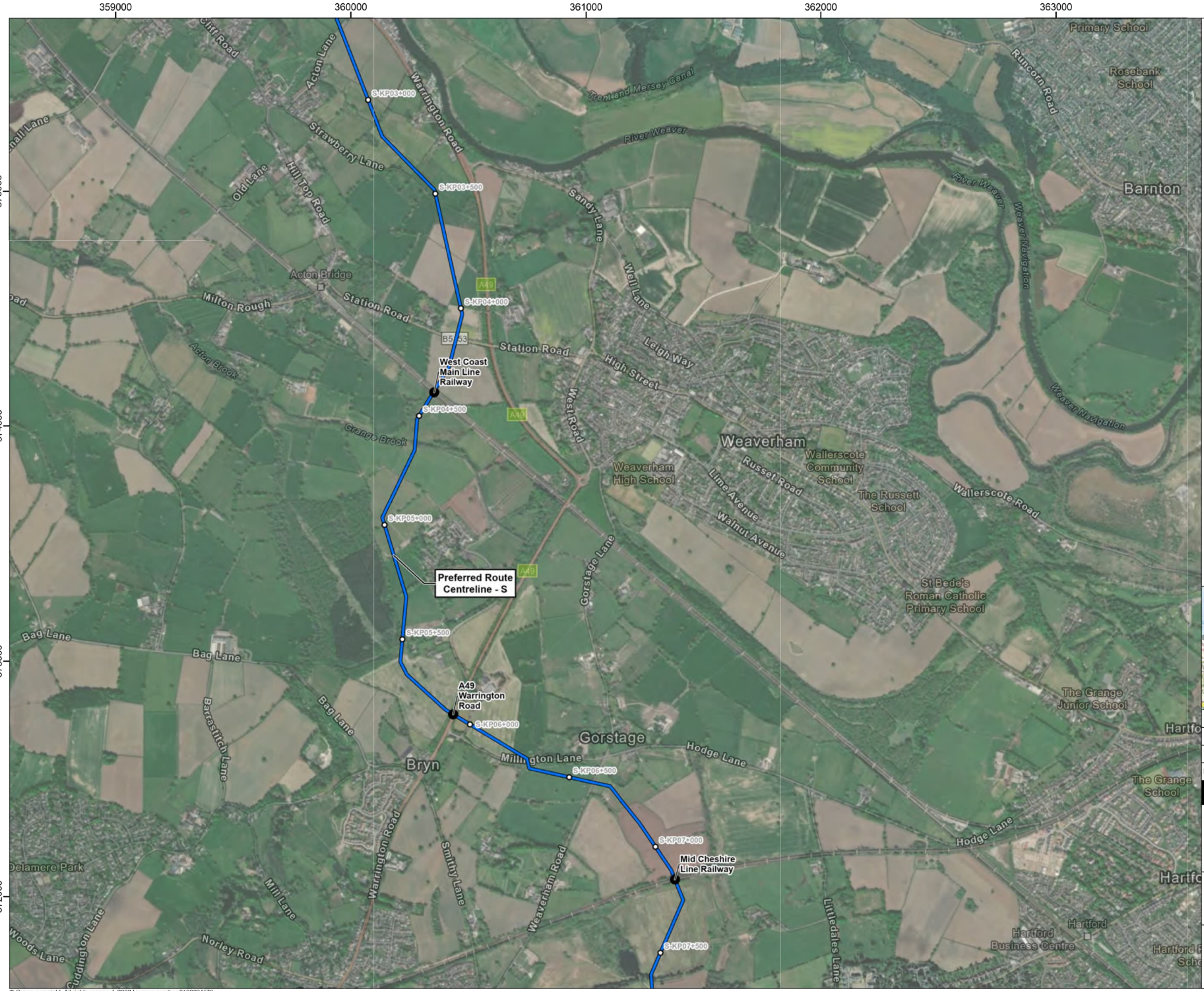
REV 00

Document Path: C:\Users\droberts\Desktop\Workings\322968 NW Construction Project\01 - GIS\11 - ArcPro\322968 - Drawing 3 - Hynet Geohazards Desk Study - Sheets 1 to 18.aprx

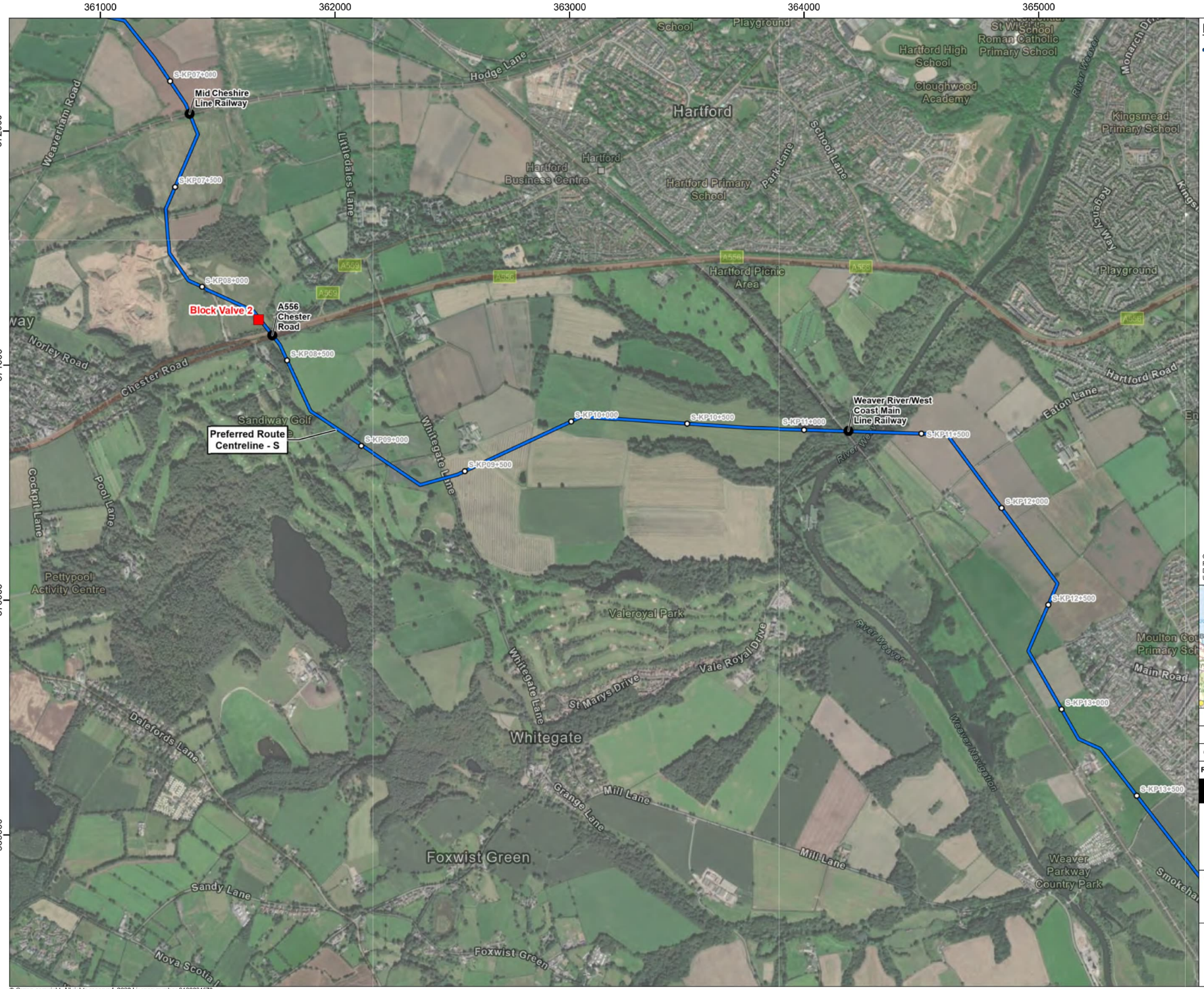
© Crown copyright, All rights reserved. 2023 License number 0100031673
World Imagery: Maxar, Microsoft
Hybrid Reference Layer: Esri Community Maps Contributors, Esri UK, Esri, HERE, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS



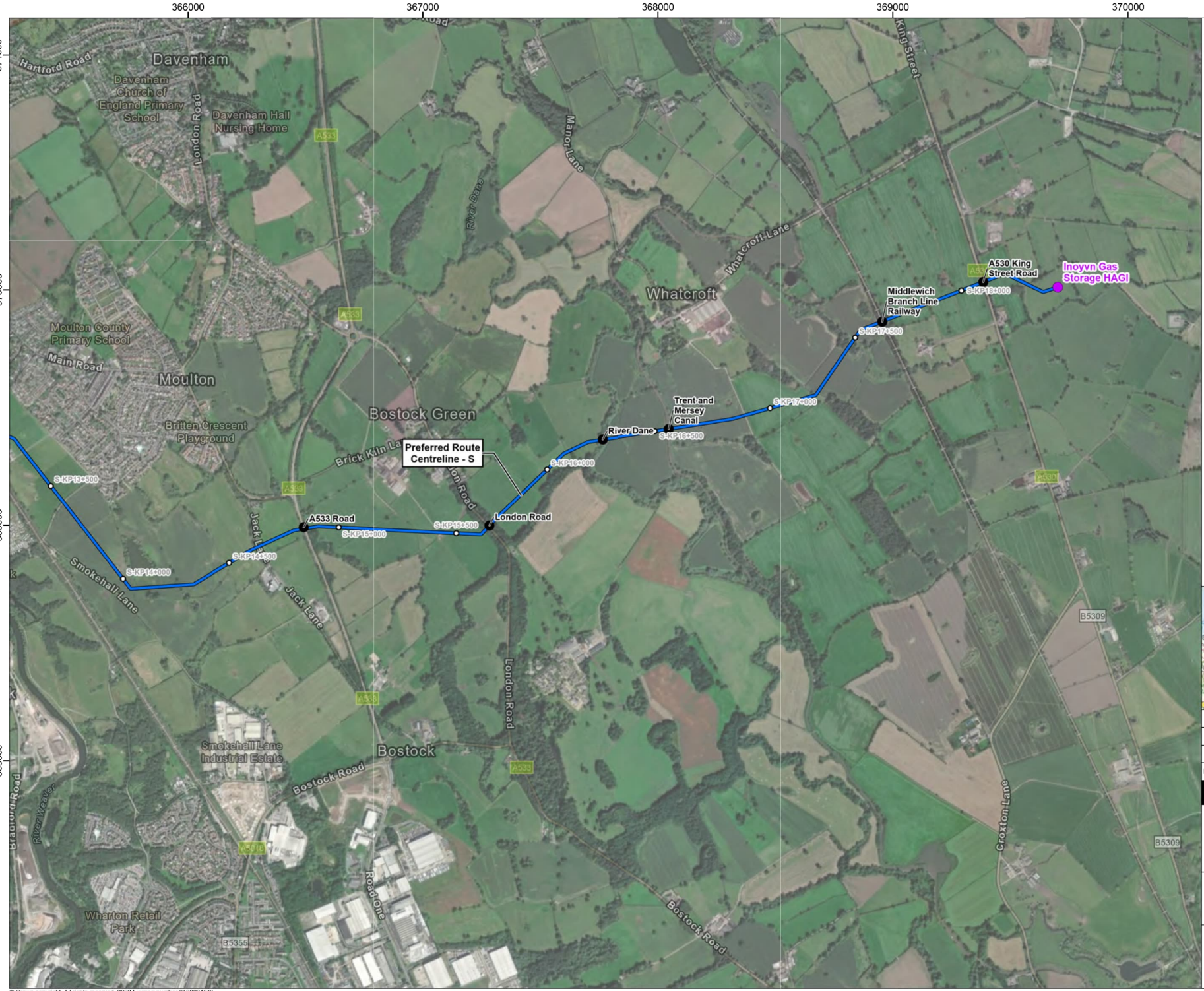
© Crown copyright, All rights reserved. 2023 License number 0100031673
World Imagery: Maxar, Microsoft
Hybrid Reference Layer: Esri Community Maps Contributors, Esri UK, Esri, HERE, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS



© Crown copyright, All rights reserved. 2023 License number 0100031673
World Imagery: Maxar, Microsoft
Hybrid Reference Layer: Esri Community Maps Contributors, Esri UK, Esri, HERE, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS



© Crown copyright, All rights reserved. 2023 License number 0100031673
World Imagery: Maxar, Microsoft
Hybrid Reference Layer: Esri Community Maps Contributors, Esri UK, Esri, HERE, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS

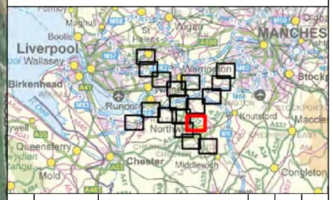


© Crown copyright, All rights reserved. 2023 License number 0100031673
World Imagery: Maxar, Microsoft
Hybrid Reference Layer: Esri Community Maps Contributors, Esri UK, Esri, HERE, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS

Legend:

- Preferred Spurs Centreline
- Preferred Spurs Centreline KP Marker

Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936
Units: Meter



Rev	Date	Description	Drn	Chk	App
00	06/07/2023	First Draft	DR	MK	MK

322968 - HyNet NW
United Living Energy Services

RSK GEOSCIENCES

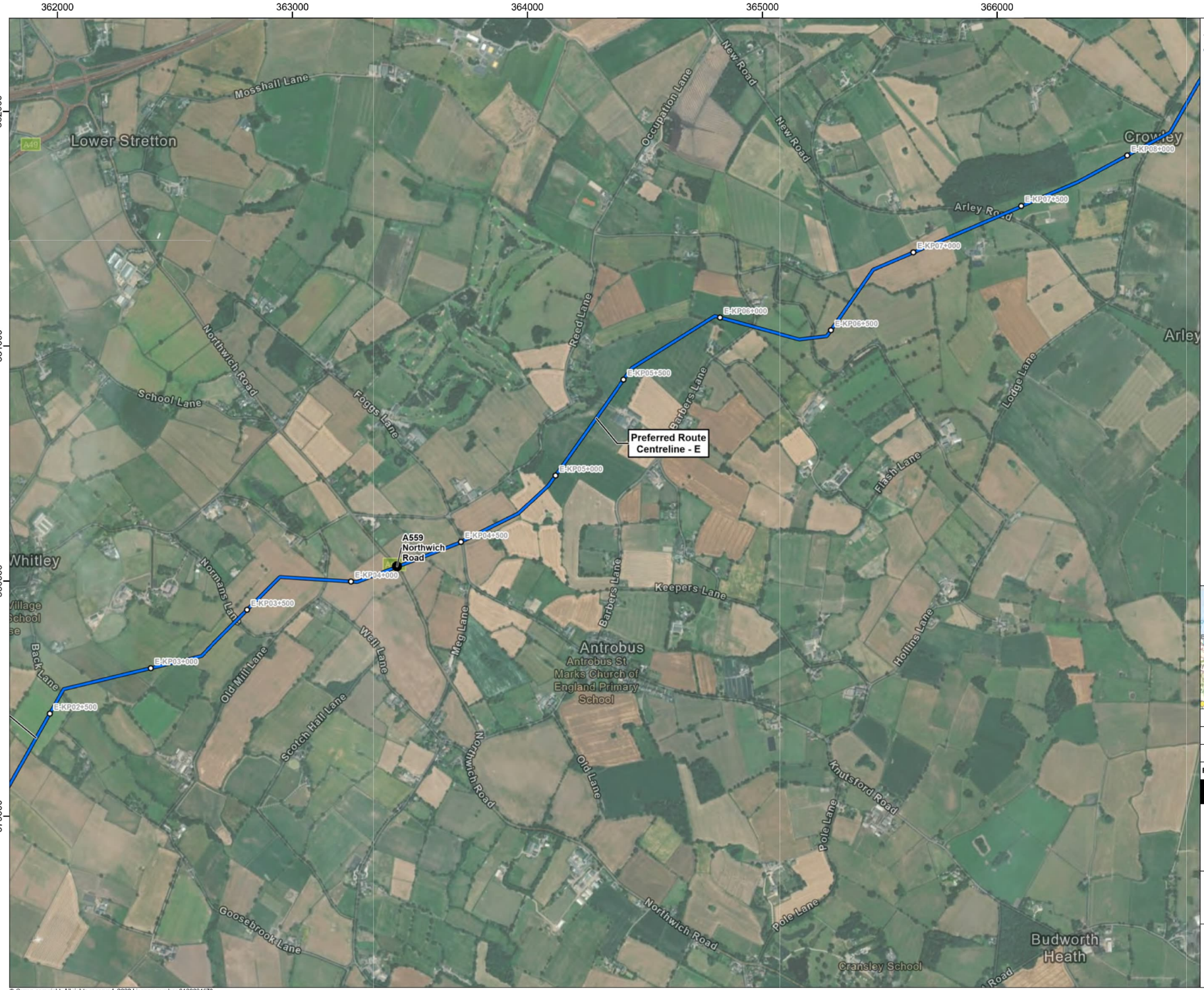
TITLE: 322968 - Drawing 3
Hynet Geohazards Desk Study
Project Overview
Sheet 8 of 18

0 200 400
Metres
SCALE: 1:15,000 @ A3

REV 00

Document Path: C:\Users\droberts\Desktop\Workings\322968 NW Construction Project\01 - GIS\11 - ArcPro\322968 - Drawing 3 - Hynet Geohazards Desk Study - Sheets 1 to 18.aprx

© Crown copyright, All rights reserved. 2023 License number 0100031673
World Imagery: Maxar, Microsoft
Hybrid Reference Layer: Esri Community Maps Contributors, Esri UK, Esri, HERE, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS

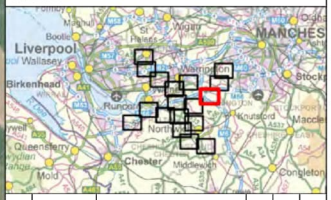


© Crown copyright, All rights reserved. 2023 License number 0100031673
World Imagery: Maxar, Microsoft
Hybrid Reference Layer: Esri Community Maps Contributors, Esri UK, Esri, HERE, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS

Legend:

- Preferred Route Centreline
- Preferred Route Centreline KP Marker
- Trenchless Crossing Points
- Block Valve Centroids

Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936
Units: Meter



Rev	Date	Description	Drn	Chk	App
00	06/07/2023	First Draft	DR	MK	MK

322968 - HyNet NW
United Living Energy Services

RSK GEOSCIENCES

TITLE: 322968 - Drawing 3
Hynet Geohazards Desk Study
Project Overview
Sheet 10 of 18

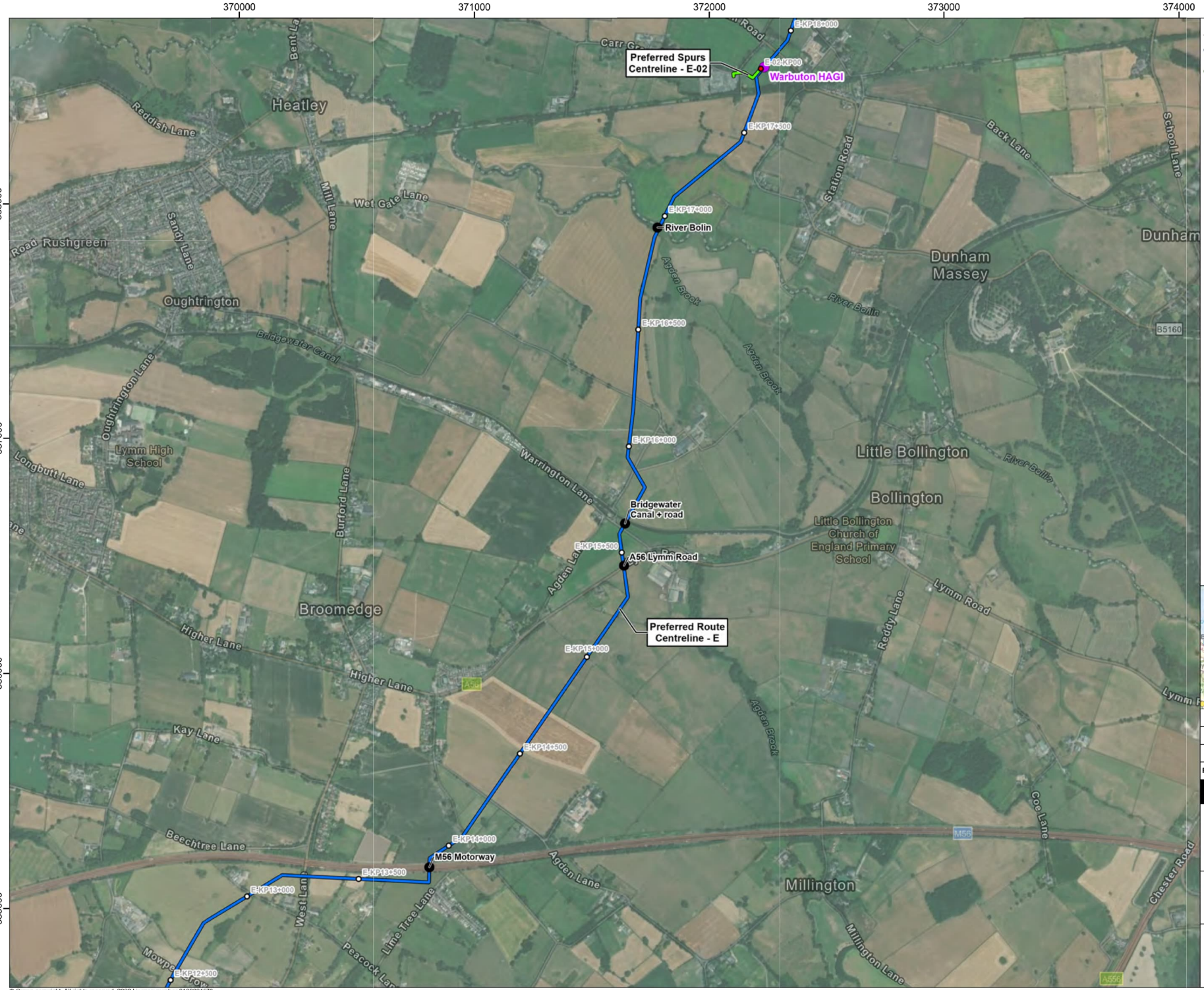
0 200 400
Metres
SCALE: 1:15,000 @ A3

N
W E
S

REV 00

Document Path: C:\Users\droberts\Desktop\Workings\322968 NW Construction Project\01 - GIS\11 - ArcPro\322968 - Drawing 3 - Hynet Geohazards Desk Study - Sheets 1 to 18.aprx

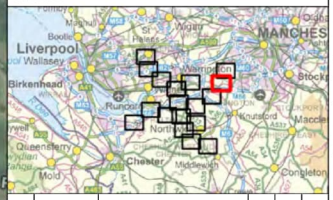
© Crown copyright, All rights reserved. 2023 License number 0100031673
World Imagery: Maxar, Microsoft
Hybrid Reference Layer: Esri Community Maps Contributors, Esri UK, Esri, HERE, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS



Legend:

- Preferred Route Centreline
- Preferred Spurs Centreline
- Preferred Route Centreline KP Marker
- Preferred Spurs Centreline KP Marker
- HAGI Locations
- Trenchless Crossing Points

Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936
Units: Meter



Rev	Date	Description	Drn	Chk	App
00	06/07/2023	First Draft	DR	MK	MK

322968 - HyNet NW
United Living Energy Services

RSK GEOSCIENCES

TITLE: 322968 - Drawing 3
Hynet Geohazards Desk Study
Project Overview
Sheet 11 of 18

0 200 400
Metres
SCALE: 1:15,000 @ A3

N W E S

REV 00

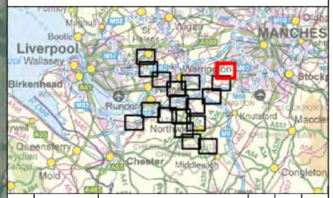
Document Path: C:\Users\droberts\Desktop\Workings\322968 NW Construction Project\01 - GIS\11 - ArcPro\322968 - Drawing 3 - Hynet Geohazards Desk Study - Sheets 1 to 18.aprx

© Crown copyright, All rights reserved. 2023 License number 0100031673
World Imagery: Maxar, Microsoft
Hybrid Reference Layer: Esri Community Maps Contributors, Esri UK, Esri, HERE, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS

Legend:

- Preferred Route Centreline
- Preferred Spurs Centreline
- Preferred Route Centreline KP Marker
- Preferred Spurs Centreline KP Marker
- HAGI Locations
- Trenchless Crossing Points

Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936
Units: Meter



Rev	Date	Description	Drn	Chk	App
00	06/07/2023	First Draft	DR	MK	MK

322968 - HyNet NW
United Living Energy Services

RSK GEOSCIENCES

TITLE: 322968 - Drawing 3
Hynet Geohazards Desk Study
Project Overview
Sheet 12 of 18

0 200 400
Metres
SCALE: 1:15,000 @ A3

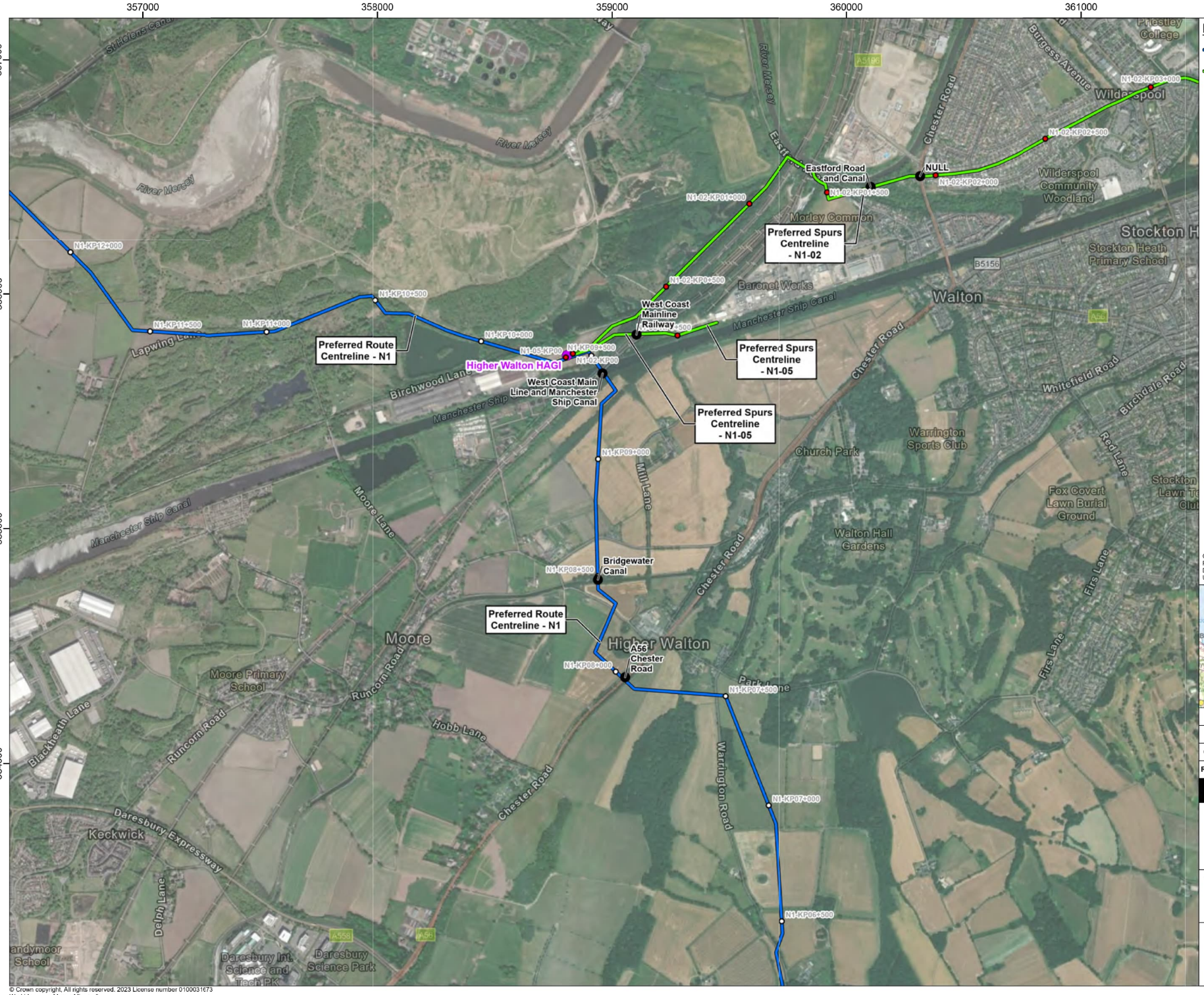
N W E S

REV 00

Document Path: C:\Users\droberts\Desktop\Workings\322968 NW Construction Project\01 - GIS\11 - ArcPro\322968 - Drawing 3 - Hynet Geohazards Desk Study - Sheets 1 to 18.aprx

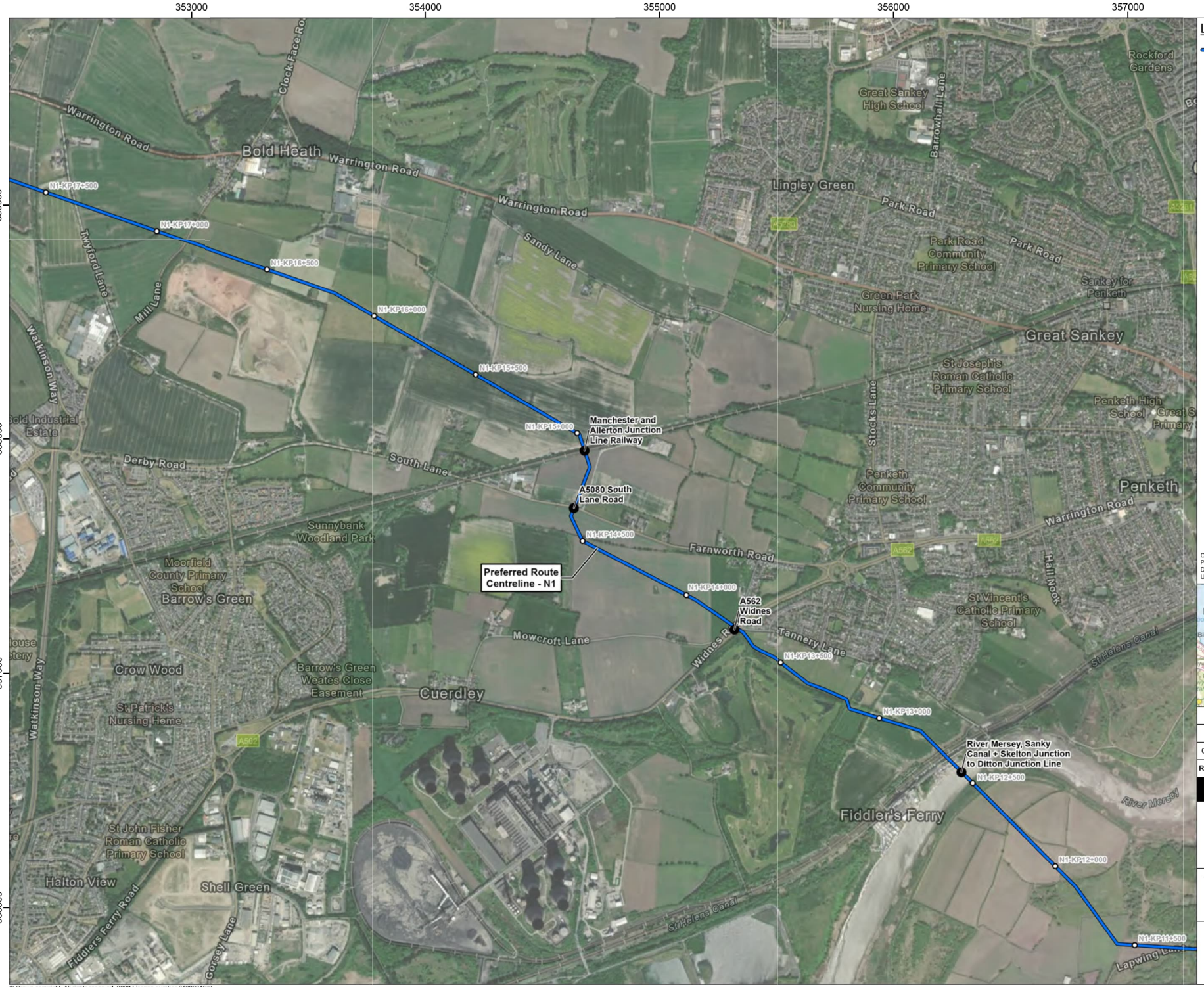
© Crown copyright, All rights reserved. 2023 License number 0100031673
World Imagery: Maxar, Microsoft
Hybrid Reference Layer: Esri Community Maps Contributors, Esri UK, Esri, HERE, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS

© Crown copyright, All rights reserved. 2023 License number 0100031673
World Imagery: Maxar, Microsoft
Hybrid Reference Layer: Esri Community Maps Contributors, Esri UK, Esri, HERE, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS

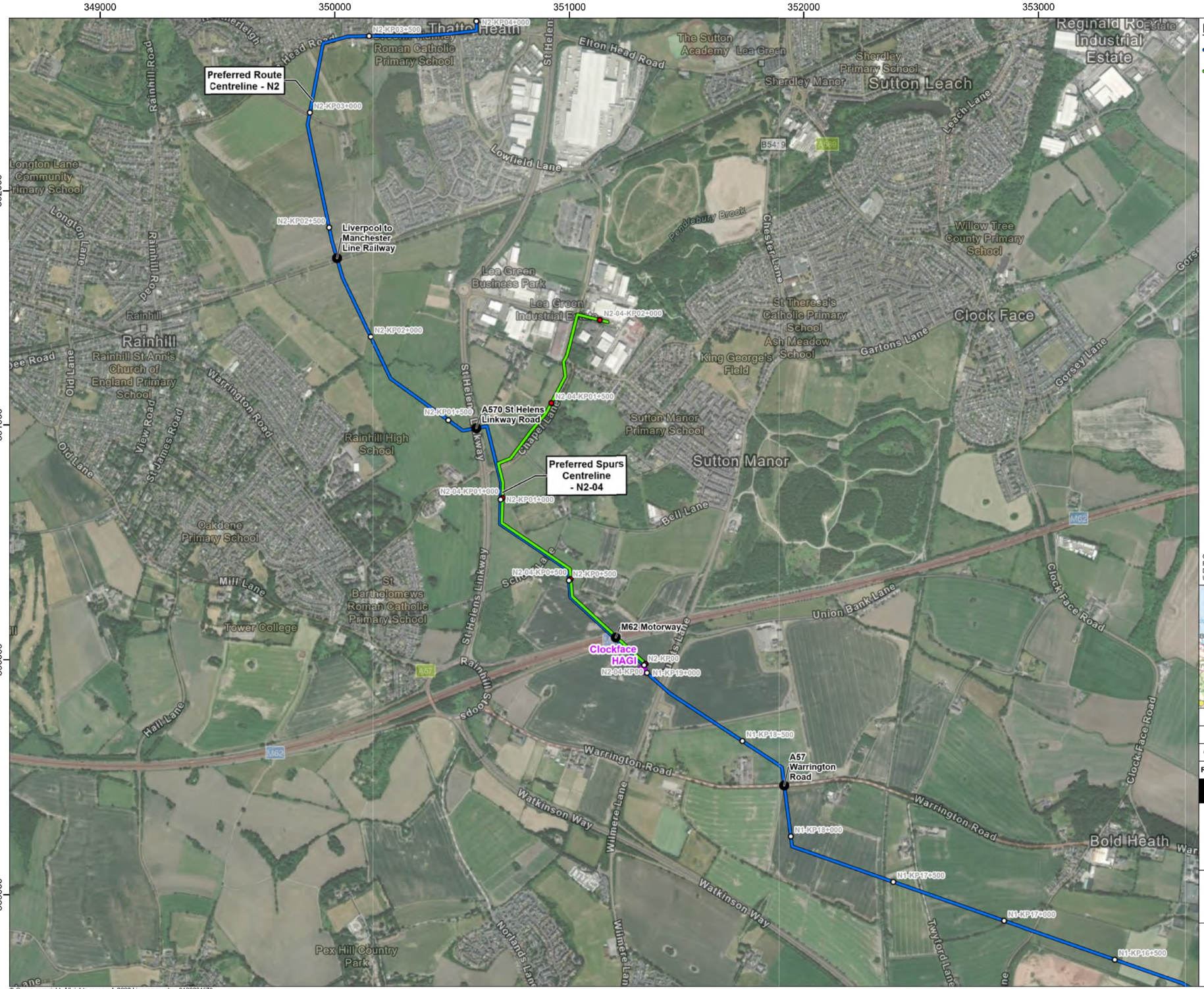


© Crown copyright, All rights reserved. 2023 License number 0100031673
World Imagery: Maxar, Microsoft
Hybrid Reference Layer: Esri Community Maps Contributors, Esri UK, Esri, HERE, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS

© Crown copyright, All rights reserved. 2023 License number 0100031673
World Imagery: Maxar, Microsoft
Hybrid Reference Layer: Esri Community Maps Contributors, Esri UK, Esri, HERE, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS



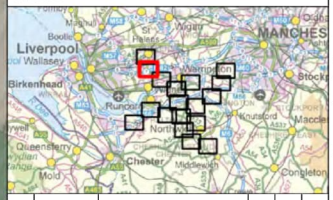
© Crown copyright, All rights reserved. 2023 License number 0100031673
World Imagery: Maxar, Microsoft
Hybrid Reference Layer: Esri Community Maps Contributors, Esri UK, Esri, HERE, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS



Legend:

- Preferred Route Centreline
- Preferred Spurs Centreline
- Preferred Route Centreline KP Marker
- Preferred Spurs Centreline KP Marker
- HAGI Locations
- Trenchless Crossing Points

Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936
Units: Meter



Rev	Date	Description	Drn	Chk	App
00	06/07/2023	First Draft	DR	MK	MK

322968 - HyNet NW
United Living Energy Services

RSK GEOSCIENCES

TITLE: 322968 - Drawing 3
Hynet Geohazards Desk Study
Project Overview
Sheet 17 of 18

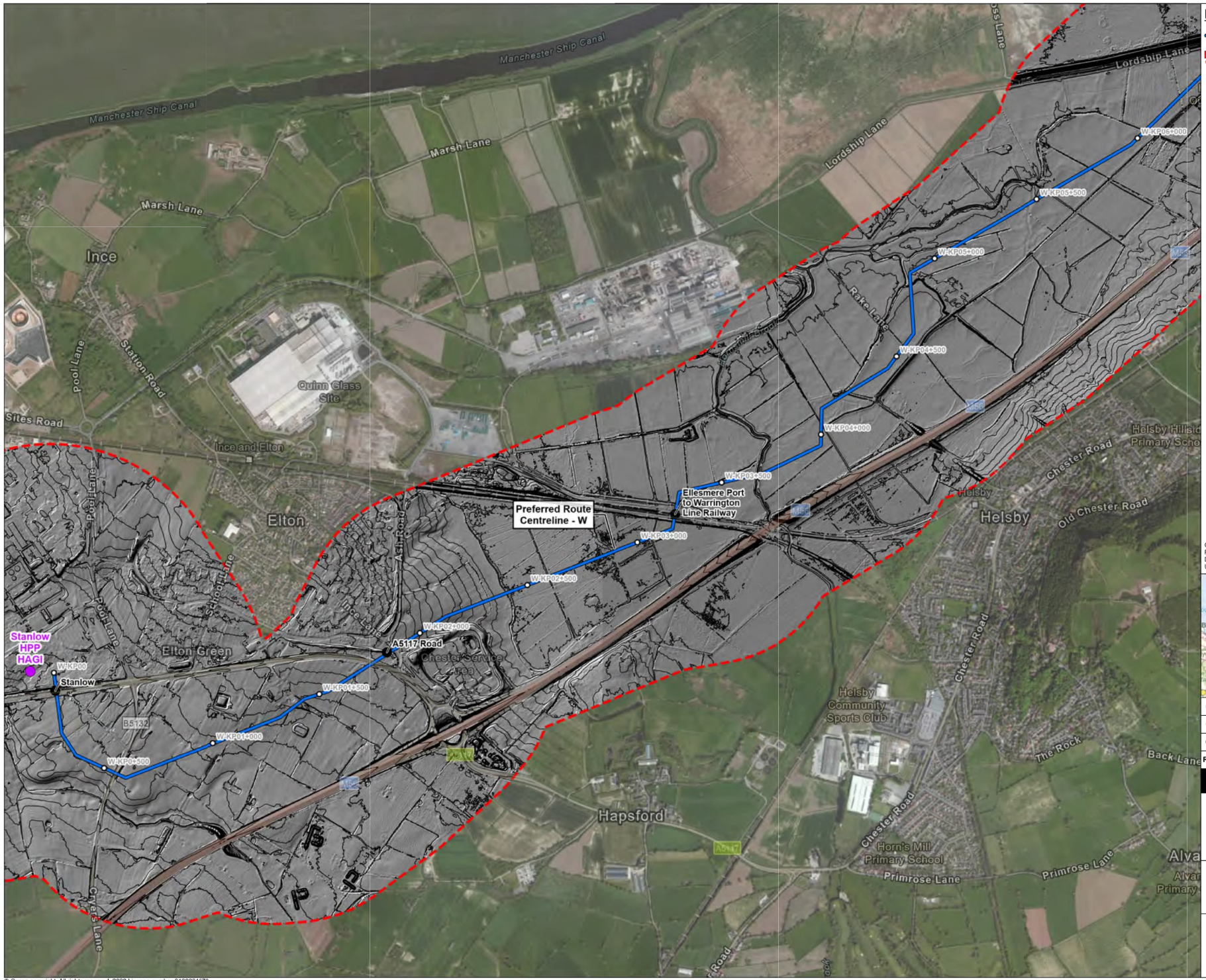
0 200 400
Metres
SCALE: 1:15,000 @ A3

REV 00

Document Path: C:\Users\droberts\Desktop\Workings\322968 NW Construction Project\01 - GIS\11 - ArcPro\322968 - Drawing 3 - Hynet Geohazards Desk Study - Sheets 1 to 18.aprx

© Crown copyright, All rights reserved. 2023 License number 0100031673
World Imagery: Maxar, Microsoft
Hybrid Reference Layer: Esri Community Maps Contributors, Esri UK, Esri, HERE, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS

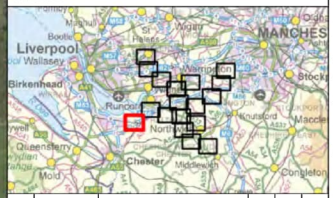
© Crown copyright, All rights reserved. 2023 License number 0100031673
World Imagery: Maxar, Microsoft
Hybrid Reference Layer: Esri Community Maps Contributors, Esri UK, Esri, HERE, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS



Legend:

- Preferred Route Centreline
- Groundsure Site Index
- Preferred Route Centreline KP Marker
- HAGI Locations
- Trenchless Crossing Points

Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936
Units: Meter



Rev	Date	Description	Drn	Chk	App
02	11/07/2023	Description Change	AA	AA	AA
01	11/07/2023	Description Change	AA	AA	AA
00	11/07/2023	First Draft	DR	MK	MK

322968 - HyNet NW
United Living Energy Services

RSK GEOSCIENCES

TITLE: 322968 - Drawing 4
Hynet Geohazards Desk Study
DTM and Topographic Contours
Sheet 1 of 18

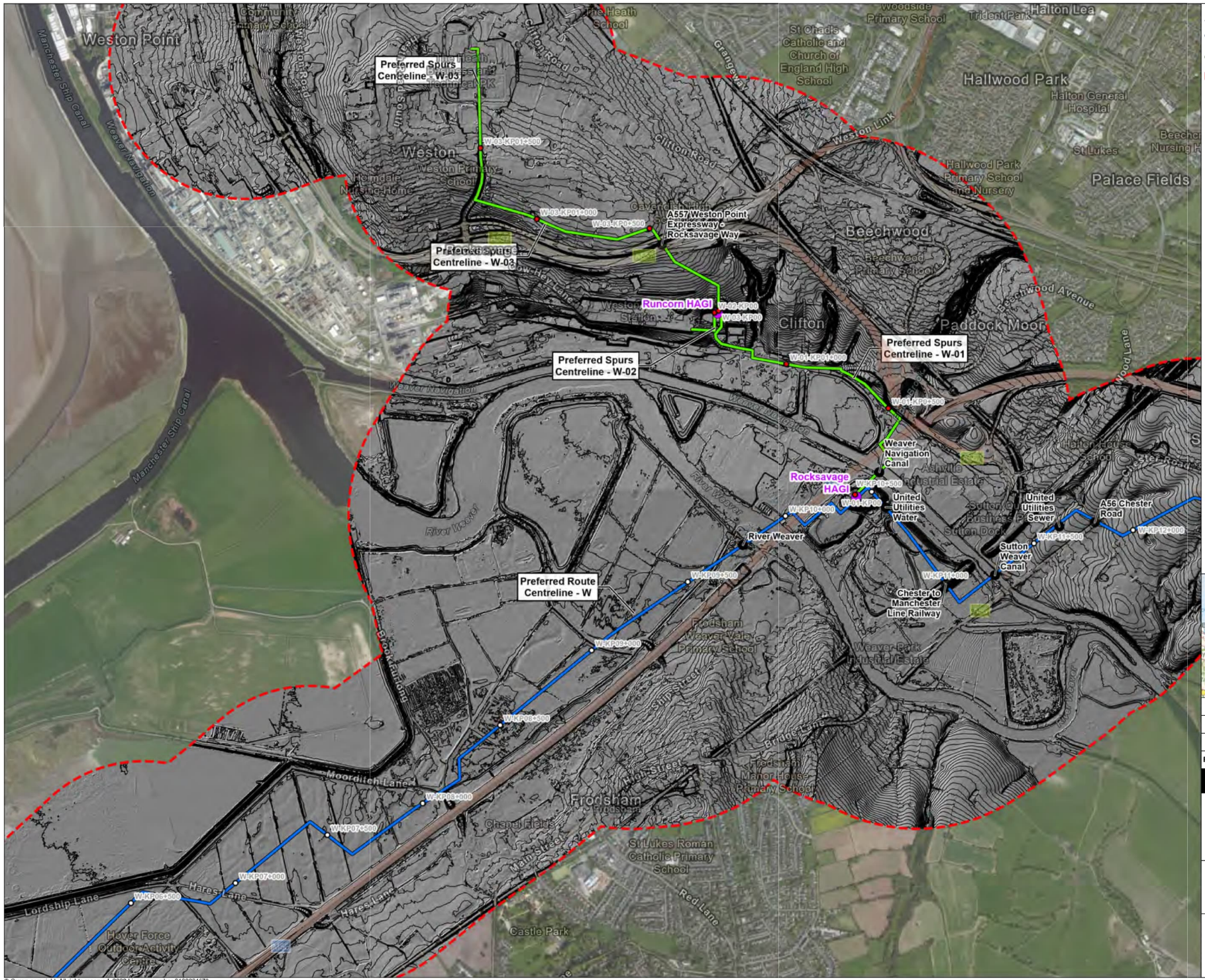
0 200 400
Metres
SCALE: 1:15,000 @A3

N W E S

REV 00

Document Path: C:\Users\droberts\Desktop\Workings\322968 NW Construction Project\01 - GIS\11 - ArcPro\322968 - Drawing 4 - Hynet Geohazards Desk Study - DTM and Topographic Contours - Sheets 1 to 18.aprx

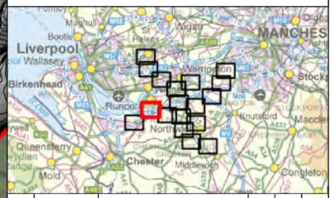
© Crown copyright, All rights reserved. 2023 License number 0100031673
Hybrid Reference Layer: Esri Community Maps Contributors, Esri UK, Esri, HERE, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS
World Imagery (Clarity): Source: Esri, Maxar, Earthstar Geographics, IGN, and the GIS User Community
SURVEY\LIDAR_Composite_1m_DTM_2022_Hillshade:



Legend:

- Preferred Route Centreline
- Preferred Spurs Centreline
- Groundsure Site Index
- Preferred Route Centreline KP Marker
- Preferred Spurs Centreline KP Marker
- HAGI Locations
- Trenchless Crossing Points

Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936
Units: Meter



Rev	Date	Description	Drn	Chk	App
02	11/07/2023	Description Change	AA	AA	AA
01	11/07/2023	Description Change	AA	AA	AA
00	11/07/2023	First Draft	DR	MK	MK

322968 - HyNet NW
United Living Energy Services

RSK GEOSCIENCES

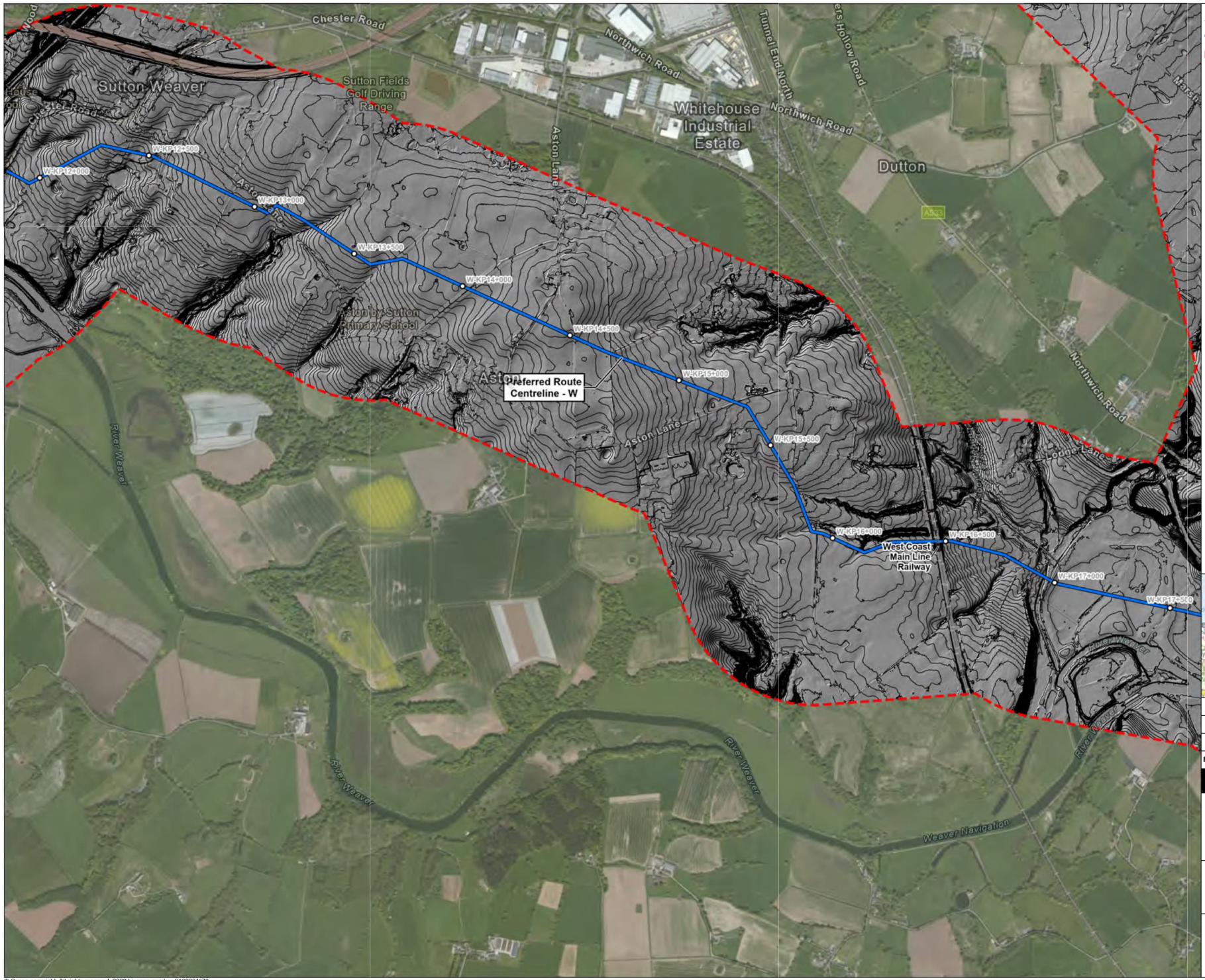
TITLE: 322968 - Drawing 4
Hynet Geohazards Desk Study
DTM and Topographic Contours
Sheet 2 of 18

0 200 400
Metres
SCALE: 1:15,000 @ A3

REV 00

© Crown copyright, All rights reserved. 2023 License number 0100031673
Hybrid Reference Layer: Esri Community Maps Contributors, Esri UK, Esri, HERE, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS
World Imagery (Clarity): Source: Esri, Maxar, Earthstar Geographics, IGN, and the GIS User Community
SURVEY\LIDAR_Composite_1m_DTM_2022_Hillshade:

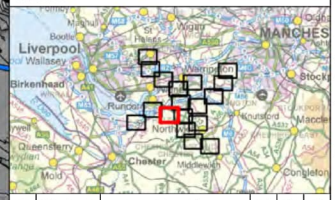
Document Path: C:\Users\droberts\Desktop\Workings\322968 NW Construction Project\01 - GIS\11 - ArcPro\322968 - Drawing 4 - Hynet Geohazards Desk Study - DTM and Topographic Contours - Sheets 1 to 18.aprx



Legend:

- Preferred Route Centreline
- Groundsure Site Index
- Preferred Route Centreline KP Marker
- Trenchless Crossing Points

Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936
Units: Meter



Rev	Date	Description	Drn	Chk	App
02	11/07/2023	Description Change	AA	AA	AA
01	11/07/2023	Description Change	AA	AA	AA
00	11/07/2023	First Draft	DR	MK	MK

322968 - HyNet NW
United Living Energy Services

RSK GEOSCIENCES

TITLE: 322968 - Drawing 4
Hynet Geohazards Desk Study
DTM and Topographic Contours
Sheet 3 of 18

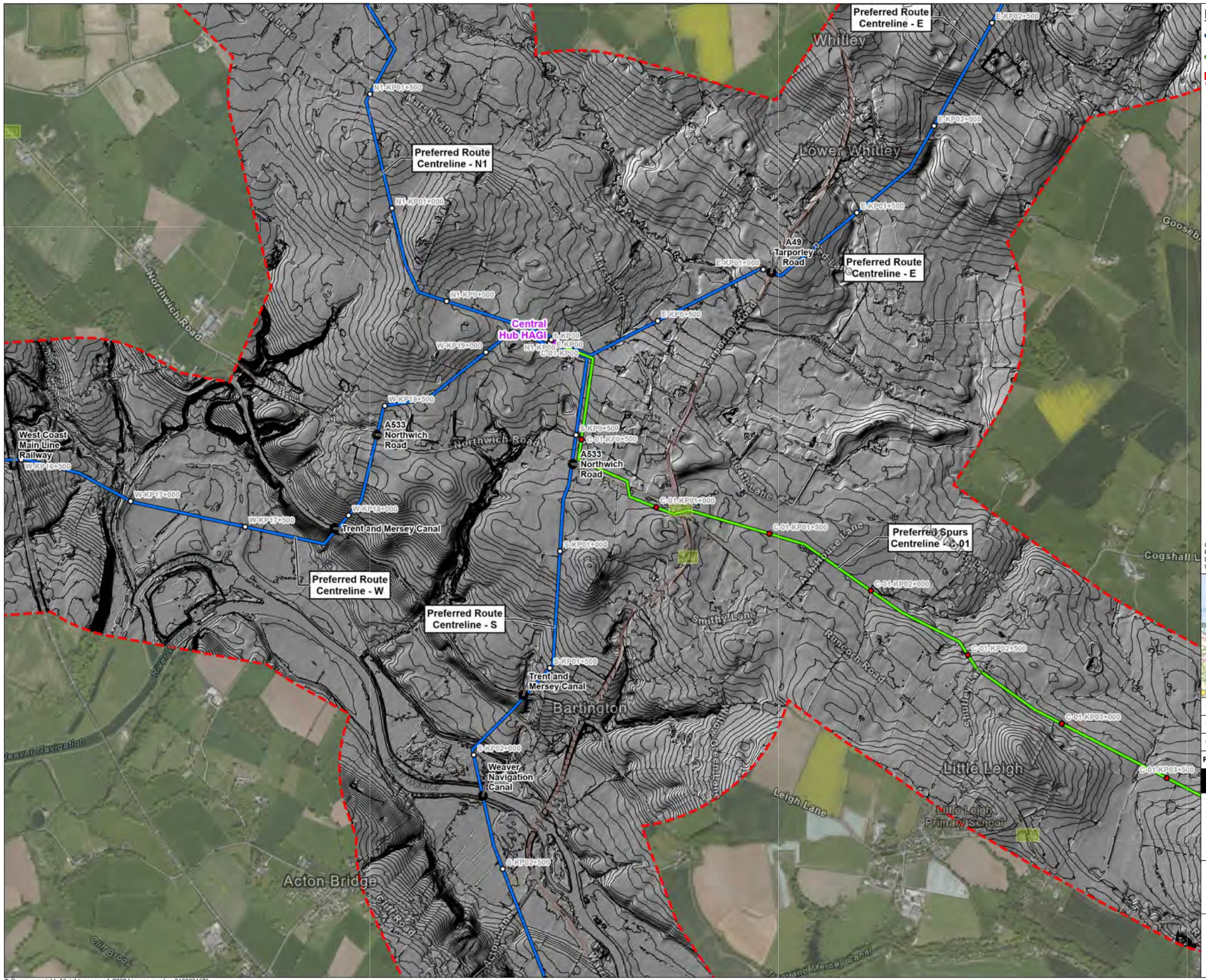
0 200 400
Metres
SCALE: 1:15,000 @A3

N W E S

REV 00

Document Path: C:\Users\droberts\Desktop\Workings\322968 NW Construction Project\01 - GIS\11 - ArcPro\322968 - Drawing 4 - Hynet Geohazards Desk Study - DTM and Topographic Contours - Sheets 1 to 18.aprx

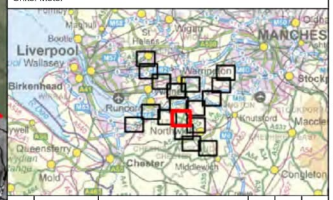
© Crown copyright, All rights reserved. 2023 License number 0100031673
Hybrid Reference Layer: Esri Community Maps Contributors, Esri UK, Esri, HERE, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS
World Imagery (Clarity): Source: Esri, Maxar, Earthstar Geographics, IGN, and the GIS User Community
SURVEY\LIDAR_Composite_1m_DTM_2022_Hillshade:



Legend:

- Preferred Route Centreline
- Preferred Spurs Centreline
- Groundsure Site Index
- Preferred Route Centreline KP Marker
- Preferred Spurs Centreline KP Marker
- HAGI Locations
- Trenchless Crossing Points

Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936
Units: Meter



Rev	Date	Description	Drn	Chk	App
02	11/07/2023	Description Change	AA	AA	AA
01	11/07/2023	Description Change	AA	AA	AA
00	11/07/2023	First Draft	DR	MK	MK

322968 - HyNet NW
United Living Energy Services

RSK GEOSCIENCES

TITLE: 322968 - Drawing 4
Hynet Geohazards Desk Study
DTM and Topographic Contours
Sheet 4 of 18

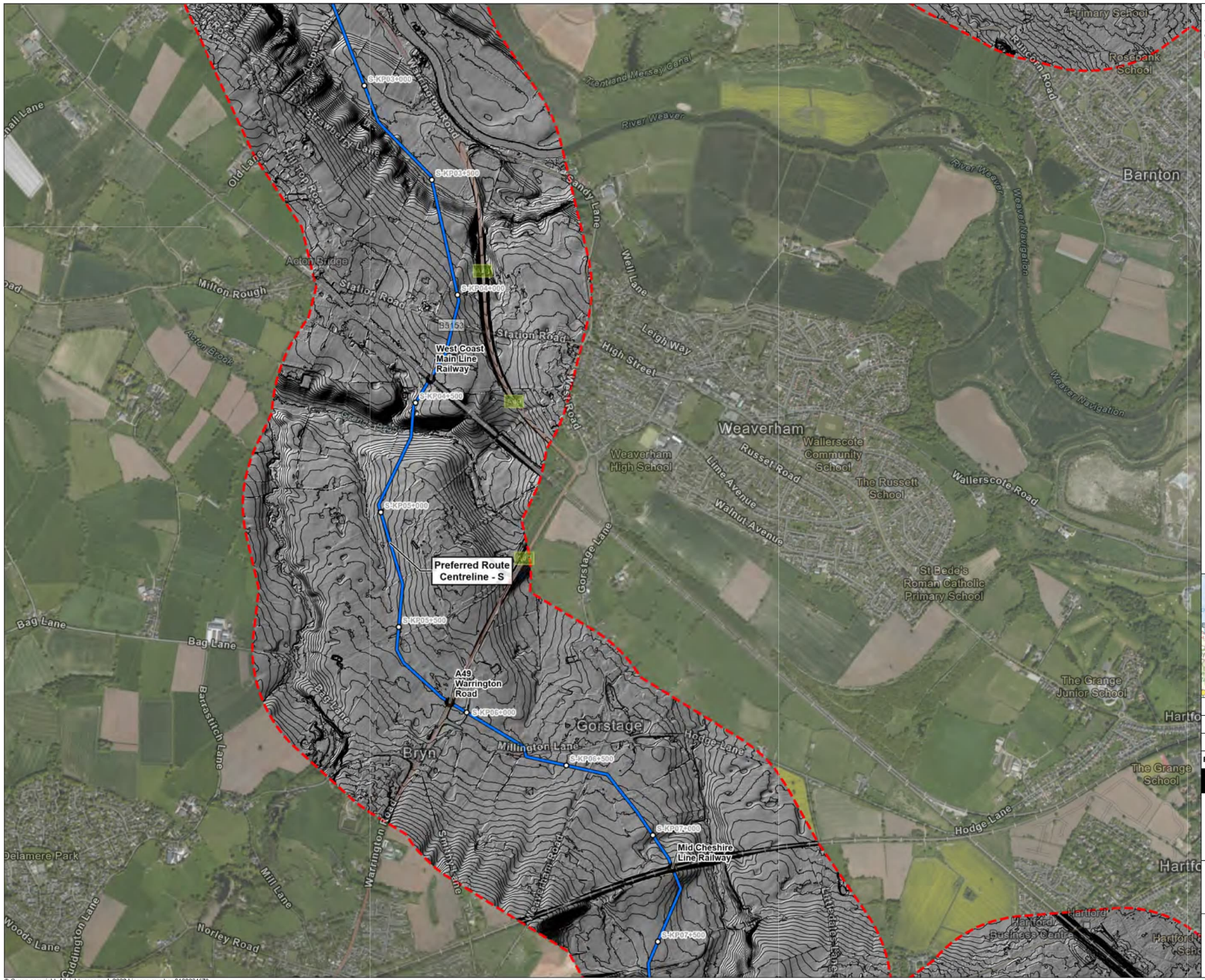
0 200 400
Metres
SCALE: 1:15,000 @ A3

N W E S

REV 00

Document Path: C:\Users\droberts\Desktop\Workings\322968 NW Construction Project\01 - GIS\11 - ArcPro\322968 - Drawing 4 - Hynet Geohazards Desk Study - DTM and Topographic Contours - Sheets 1 to 18.aprx

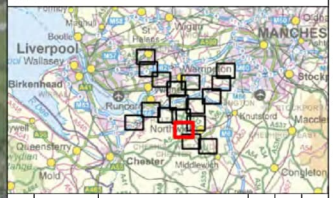
© Crown copyright, All rights reserved. 2023 License number 0100031673
Hybrid Reference Layer: Esri Community Maps Contributors, Esri UK, Esri, HERE, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS
World Imagery (Clarity): Source: Esri, Maxar, Earthstar Geographics, IGN, and the GIS User Community
SURVEY\LIDAR_Composite_1m_DTM_2022_Hillshade:



Legend:

- Preferred Route Centreline
- Groundsure Site Index
- Preferred Route Centreline KP Marker
- Trenchless Crossing Points

Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936
Units: Meter



Rev	Date	Description	Drn	Chk	App
02	11/07/2023	Description Change	AA	AA	AA
01	11/07/2023	Description Change	AA	AA	AA
00	11/07/2023	First Draft	DR	MK	MK

322968 - HyNet NW
United Living Energy Services

RSK GEOSCIENCES

TITLE: 322968 - Drawing 4
Hynet Geohazards Desk Study
DTM and Topographic Contours
Sheet 5 of 18

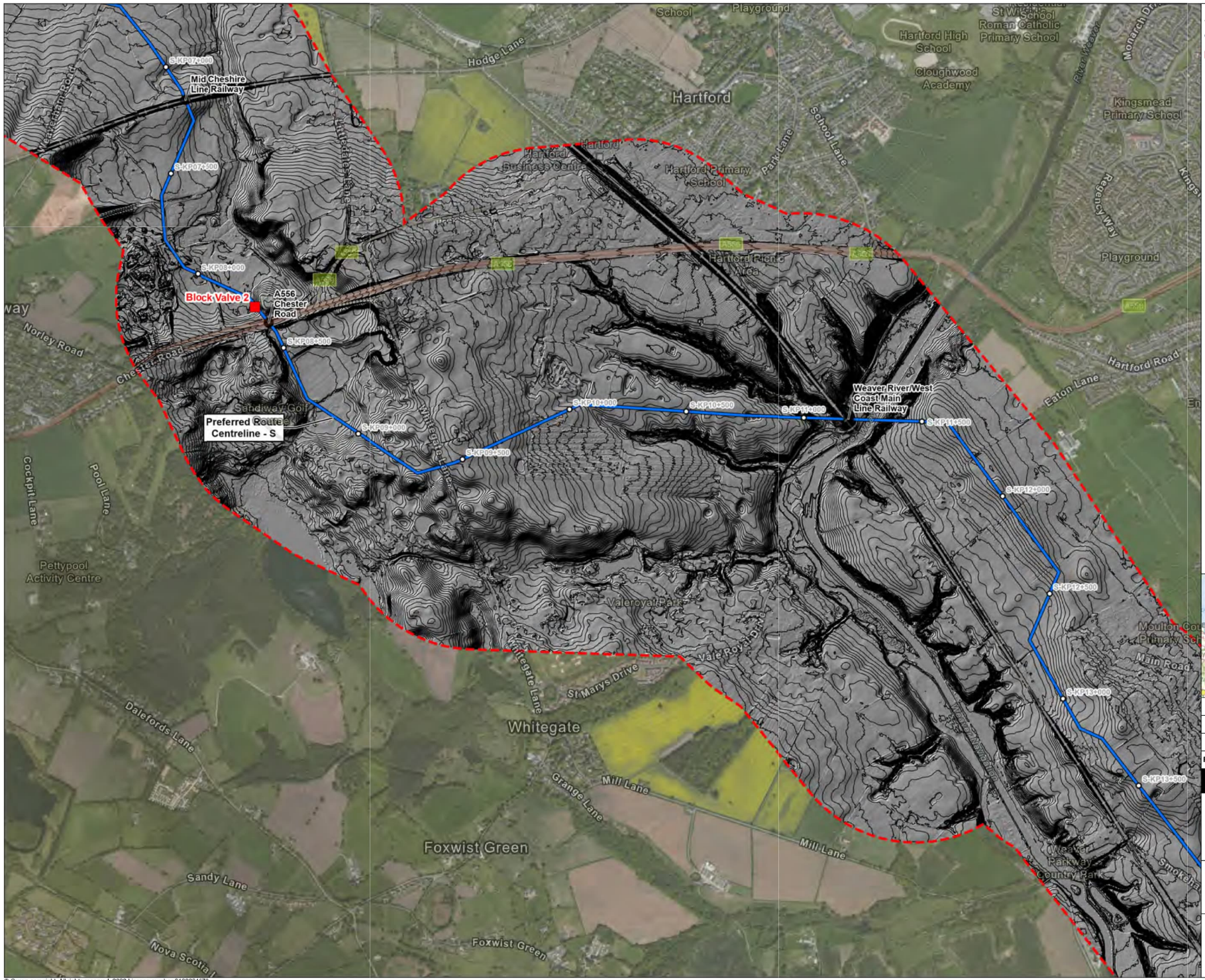
0 200 400
Metres
SCALE: 1:15,000 @ A3

N W E S

REV 00

Document Path: C:\Users\droberts\Desktop\Workings\322968 NW Construction Project\01 - GIS\11 - ArcPro\322968 - Drawing 4 - Hynet Geohazards Desk Study - DTM and Topographic Contours - Sheets 1 to 18.aprx

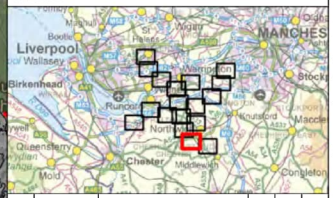
© Crown copyright, All rights reserved. 2023 License number 0100031673
Hybrid Reference Layer: Esri Community Maps Contributors, Esri UK, Esri, HERE, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS
World Imagery (Clarity): Source: Esri, Maxar, Earthstar Geographics, IGN, and the GIS User Community
SURVEY\LIDAR_Composite_1m_DTM_2022_Hillshade:



Legend:

- Preferred Route Centreline
- Groundsure Site Index
- Preferred Route Centreline KP Marker
- Trenchless Crossing Points
- Block Valve Centroids

Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936
Units: Meter



Rev	Date	Description	Drn	Chk	App
02	11/07/2023	Description Change	AA	AA	AA
01	11/07/2023	Description Change	AA	AA	AA
00	11/07/2023	First Draft	DR	MK	MK

322968 - HyNet NW
United Living Energy Services

RSK GEOSCIENCES

TITLE: 322968 - Drawing 4
Hynet Geohazards Desk Study
DTM and Topographic Contours
Sheet 6 of 18

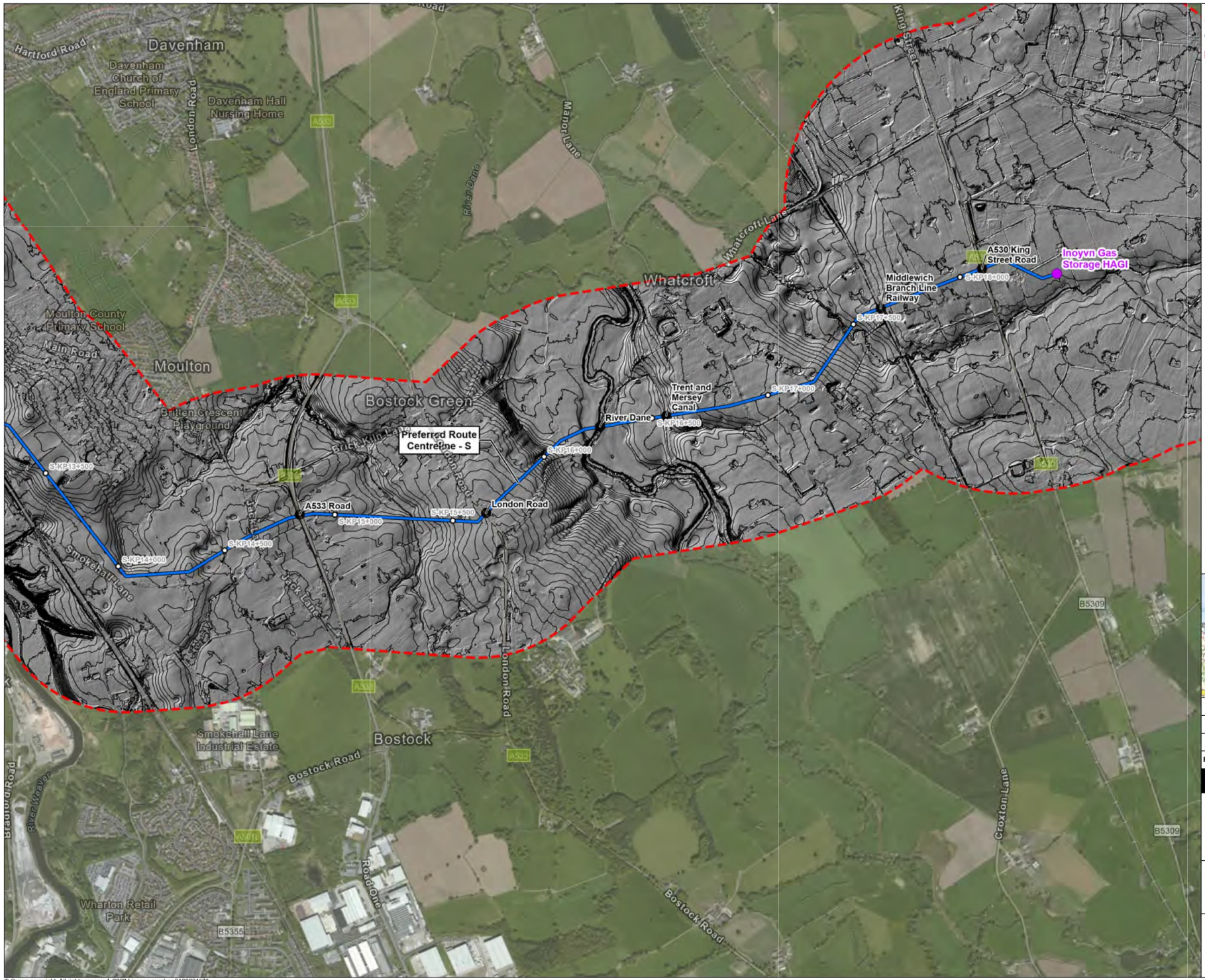
0 200 400
Metres
SCALE: 1:15,000 @ A3

N W E S

REV 00

Document Path: C:\Users\droberts\Desktop\Workings\322968 NW Construction Project\01 - GIS\11 - ArcPro\322968 - Drawing 4 - Hynet Geohazards Desk Study - DTM and Topographic Contours - Sheets 1 to 18.aprx

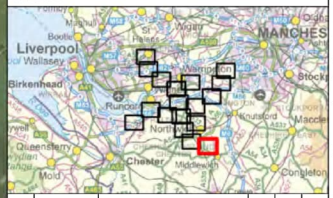
© Crown copyright, All rights reserved. 2023 License number 0100031673
Hybrid Reference Layer: Esri Community Maps Contributors, Esri UK, Esri, HERE, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS
World Imagery (Clarity): Source: Esri, Maxar, Earthstar Geographics, IGN, and the GIS User Community
SURVEY\LIDAR_Composite_1m_DTM_2022_Hillshade:



Legend:

- Preferred Route Centreline
- Groundsure Site Index
- Preferred Route Centreline KP Marker
- HAGI Locations
- Trenchless Crossing Points

Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936
Units: Meter



Rev	Date	Description	Drn	Chk	App
02	11/07/2023	Description Change	AA	AA	AA
01	11/07/2023	Description Change	AA	AA	AA
00	11/07/2023	First Draft	DR	MK	MK

322968 - HyNet NW
United Living Energy Services

RSK GEOSCIENCES

TITLE: 322968 - Drawing 4
Hynet Geohazards Desk Study
DTM and Topographic Contours
Sheet 7 of 18

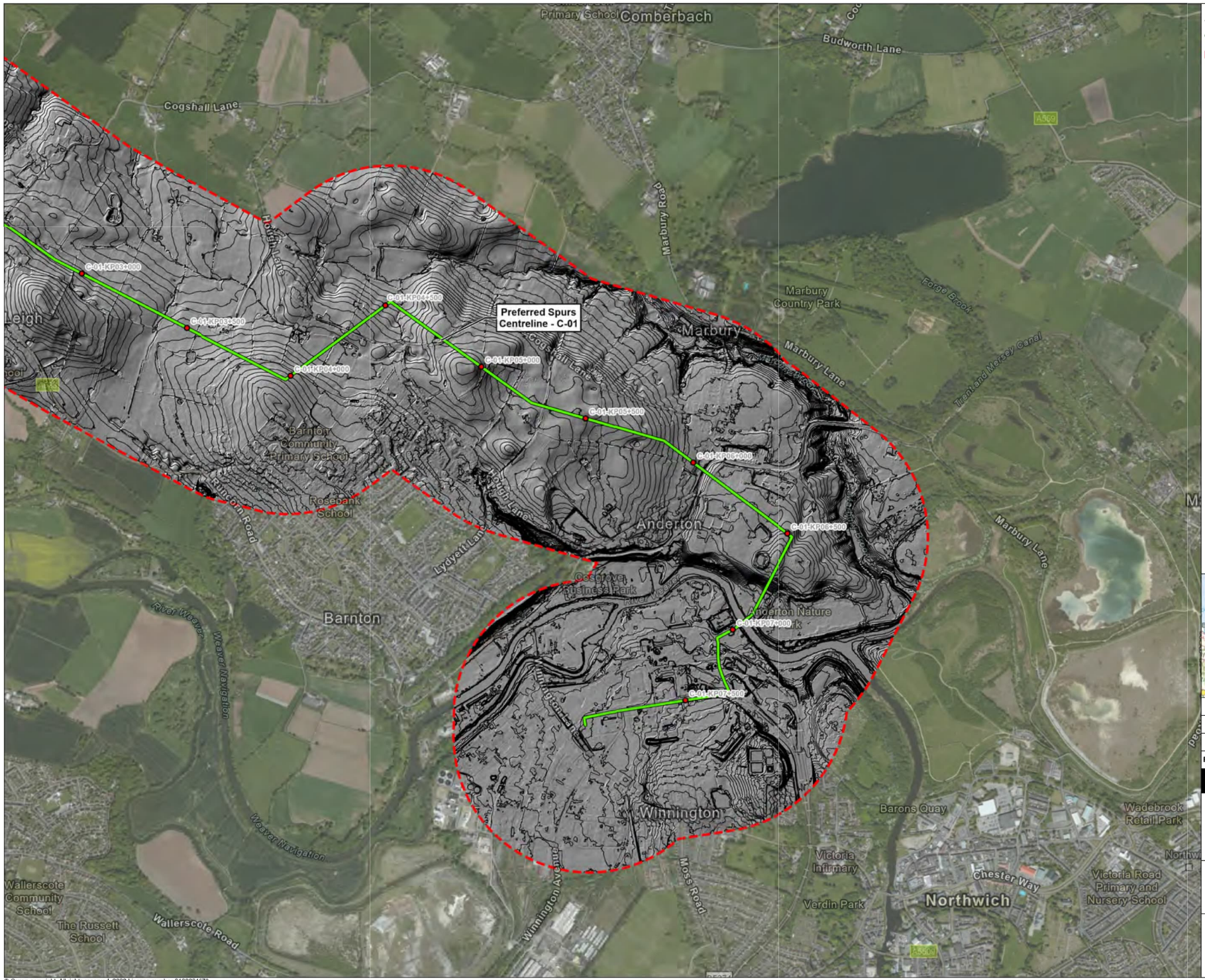
0 200 400
Metres
SCALE: 1:15,000 @ A3

N W E S

REV 00

Document Path: C:\Users\droberts\Desktop\Workings\322968 NW Construction Project\01 - GIS\11 - ArcPro\322968 - Drawing 4 - Hynet Geohazards Desk Study - DTM and Topographic Contours - Sheets 1 to 18.aprx

© Crown copyright, All rights reserved. 2023 License number 0100031673
Hybrid Reference Layer: Esri Community Maps Contributors, Esri UK, Esri, HERE, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS
World Imagery (Clarity): Source: Esri, Maxar, Earthstar Geographics, IGN, and the GIS User Community
SURVEY\LIDAR_Composite_1m_DTM_2022_Hillshade:



Rev	Date	Description	Drn	Chk	App
02	11/07/2023	Description Change	AA	AA	AA
01	11/07/2023	Description Change	AA	AA	AA
00	11/07/2023	First Draft	DR	MK	MK

322968 - HyNet NW
United Living Energy Services

RSK GEOSCIENCES

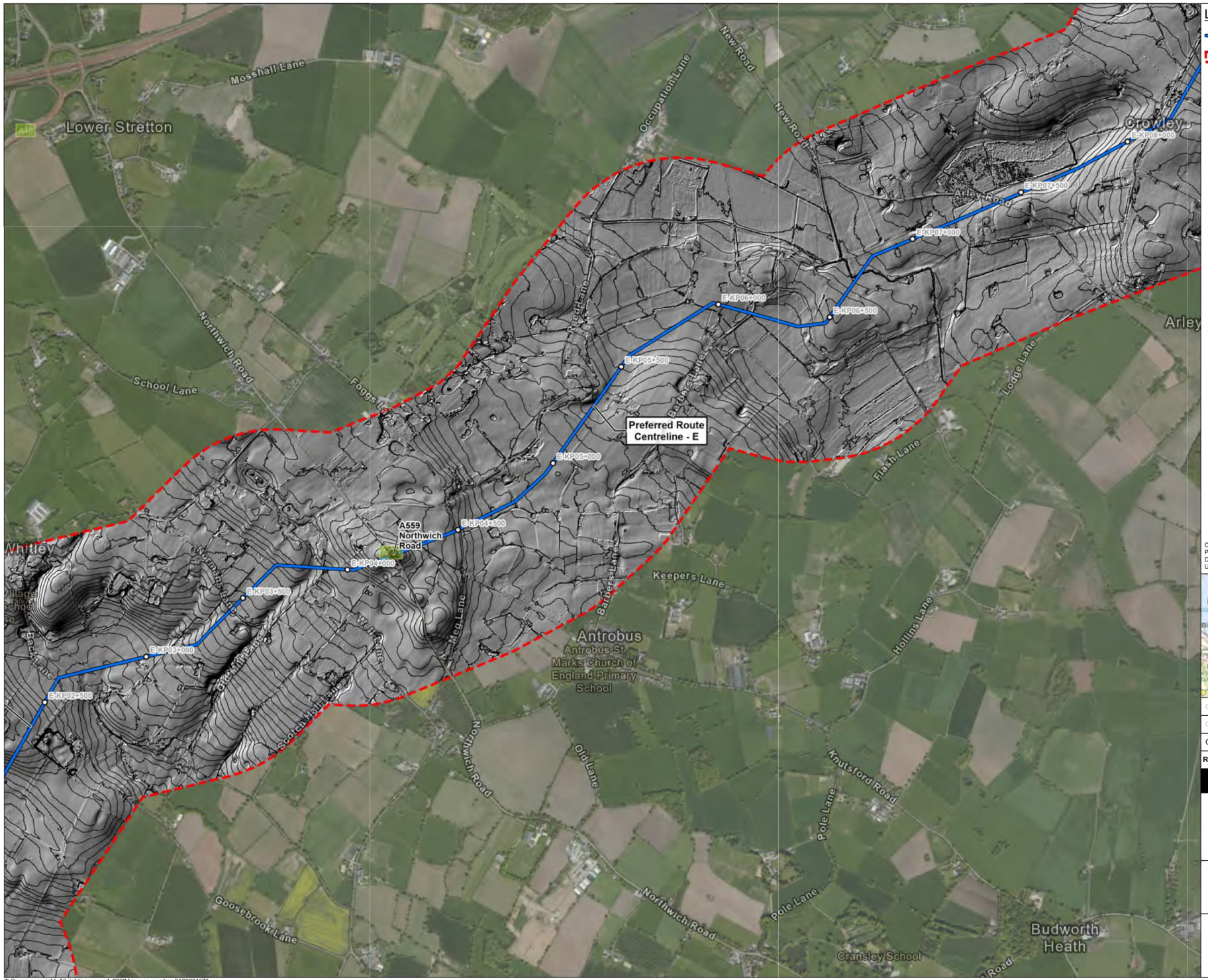
TITLE: 322968 - Drawing 4
Hynet Geohazards Desk Study
DTM and Topographic Contours
Sheet 8 of 18

0 200 400
Metres
SCALE: 1:15,000 @ A3

REV 00

Document Path: C:\Users\droberts\Desktop\Workings\322968 NW Construction Project\01 - GIS\11 - ArcPro\322968 - Drawing 4 - Hynet Geohazards Desk Study - DTM and topographic Contours - Sheets 1 to 18.aprx

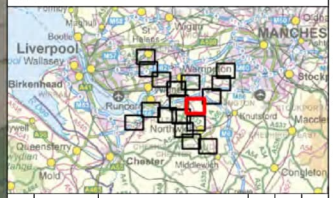
© Crown copyright, All rights reserved. 2023 License number 0100031673
Hybrid Reference Layer: Esri Community Maps Contributors, Esri UK, Esri, HERE, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS
World Imagery (Clarity): Source: Esri, Maxar, Earthstar Geographics, IGN, and the GIS User Community
SURVEY\LIDAR_Composite_1m_DTM_2022_Hillshade:



Legend:

- Preferred Route Centreline
- Groundsure Site Index
- Preferred Route Centreline KP Marker
- Trenchless Crossing Points

Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936
Units: Meter



Rev	Date	Description	Drn	Chk	App
02	11/07/2023	Description Change	AA	AA	AA
01	11/07/2023	Description Change	AA	AA	AA
00	11/07/2023	First Draft	DR	MK	MK

322968 - HyNet NW
United Living Energy Services

RSK GEOSCIENCES

TITLE: 322968 - Drawing 4
Hynet Geohazards Desk Study
DTM and Topographic Contours
Sheet 9 of 18

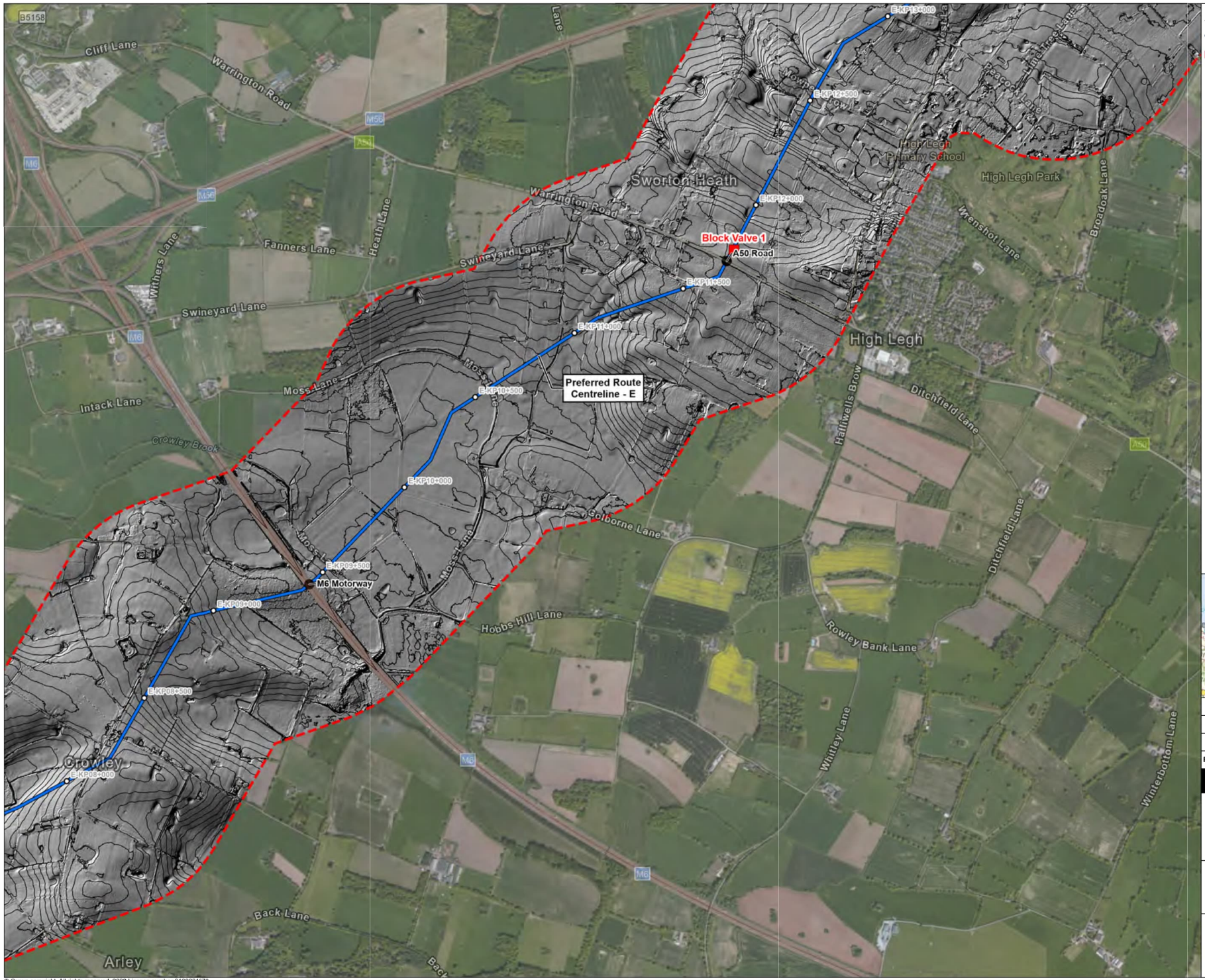
0 200 400
Metres
SCALE: 1:15,000 @ A3

N W E S

REV 00

Document Path: C:\Users\droberts\Desktop\Workings\322968 NW Construction Project\01 - GIS\11 - ArcPro\322968 - Drawing 4 - Hynet Geohazards Desk Study - DTM and Topographic Contours - Sheets 1 to 18.aprx

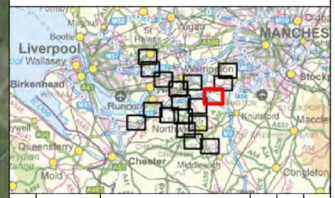
© Crown copyright, All rights reserved. 2023 License number 0100031673
Hybrid Reference Layer: Esri Community Maps Contributors, Esri UK, Esri, HERE, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS
World Imagery (Clarity): Source: Esri, Maxar, Earthstar Geographics, IGN, and the GIS User Community
SURVEY\LIDAR_Composite_1m_DTM_2022_Hillshade:



Legend:

- Preferred Route Centreline
- Groundsure Site Index
- Preferred Route Centreline KP Marker
- Trenchless Crossing Points
- Block Valve Centroids

Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936
Units: Meter



Rev	Date	Description	Drn	Chk	App
02	11/07/2023	Description Change	AA	AA	AA
01	11/07/2023	Description Change	AA	AA	AA
00	11/07/2023	First Draft	DR	MK	MK

322968 - HyNet NW
United Living Energy Services

RSK GEOSCIENCES

TITLE: 322968 - Drawing 4
Hynet Geohazards Desk Study
DTM and Topographic Contours
Sheet 10 of 18

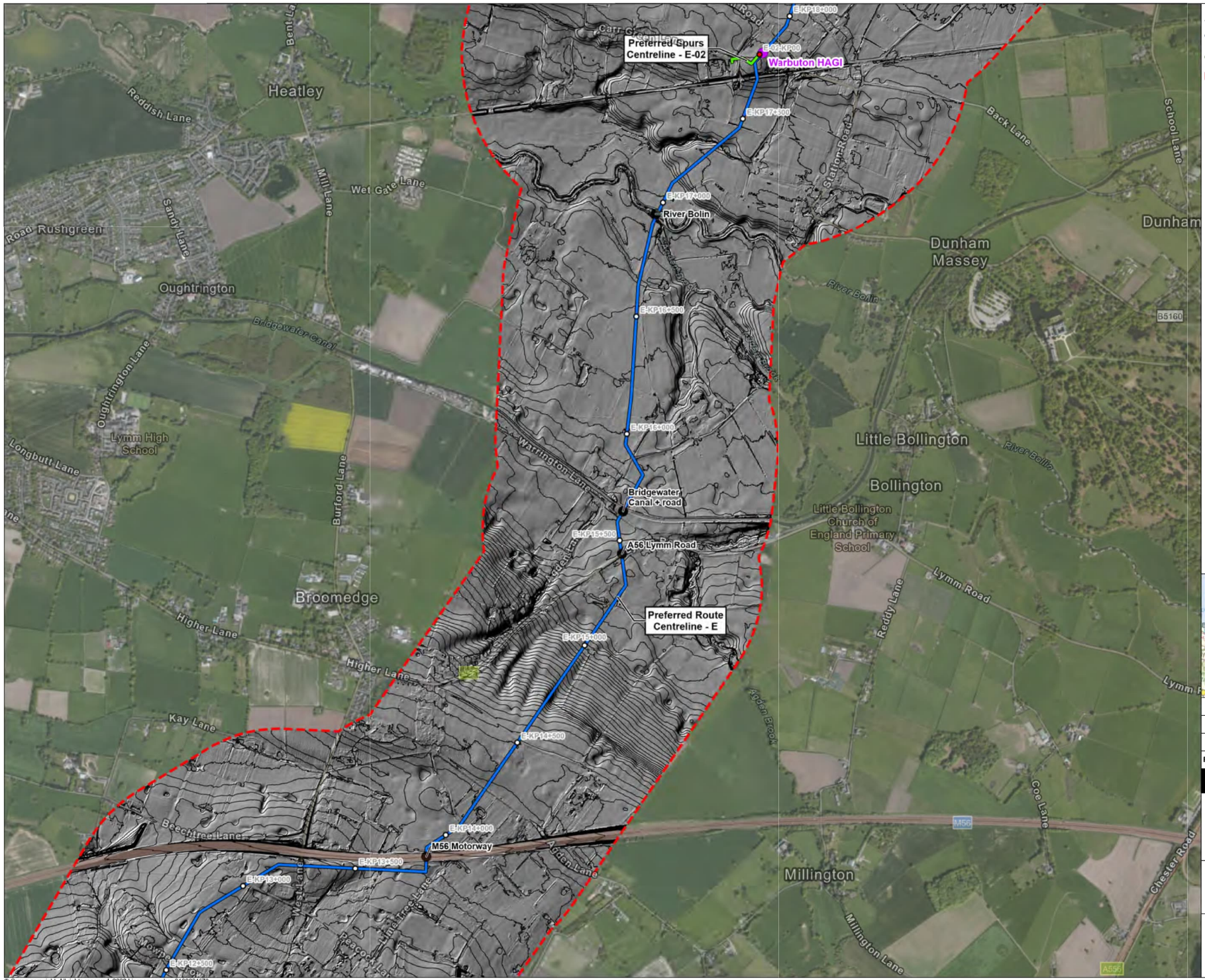
0 200 400
Metres
SCALE: 1:15,000 @ A3

N W E S

REV 00

Document Path: C:\Users\droberts\Desktop\Workings\322968 NW Construction Project\01 - GIS\11 - ArcPro\322968 - Drawing 4 - Hynet Geohazards Desk Study - DTM and topographic Contours - Sheets 1 to 18.aprx

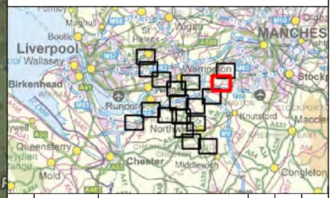
© Crown copyright, All rights reserved. 2023 License number 0100031673
Hybrid Reference Layer: Esri Community Maps Contributors, Esri UK, Esri, HERE, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS
World Imagery (Clarity): Source: Esri, Maxar, Earthstar Geographics, IGN, and the GIS User Community
SURVEY\LIDAR_Composite_1m_DTM_2022_Hillshade:



Legend:

- Preferred Route Centreline
- Preferred Spurs Centreline
- Groundsure Site Index
- Preferred Route Centreline KP Marker
- Preferred Spurs Centreline KP Marker
- HAGI Locations
- Trenchless Crossing Points

Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936
Units: Meter



Rev	Date	Description	Drn	Chk	App
02	11/07/2023	Description Change	AA	AA	AA
01	11/07/2023	Description Change	AA	AA	AA
00	11/07/2023	First Draft	DR	MK	MK

322968 - HyNet NW
United Living Energy Services

RSK GEOSCIENCES

TITLE: 322968 - Drawing 4
Hynet Geohazards Desk Study
DTM and Topographic Contours
Sheet 11 of 18

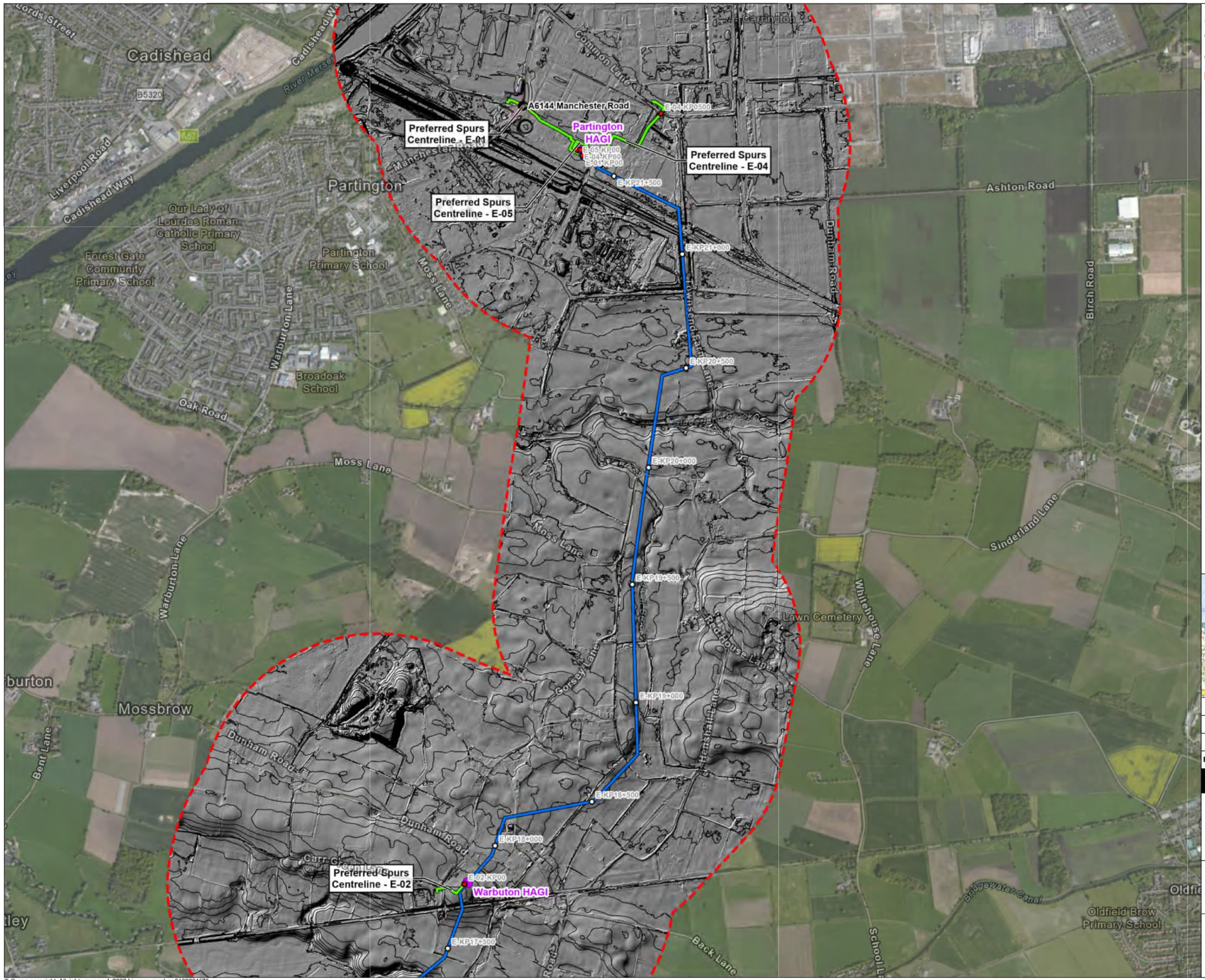
0 200 400
Metres
SCALE: 1:15,000 @ A3

N W E S

REV 00

Document Path: C:\Users\droberts\Desktop\Workings\322968 NW Construction Project\01 - GIS\11 - ArcPro\322968 - Drawing 4 - Hynet Geohazards Desk Study - DTM and topographic Contours - Sheets 1 to 18.aprx

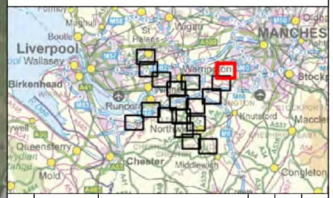
© Crown copyright, All rights reserved. 2023 License number 0100031673
Hybrid Reference Layer: Esri Community Maps Contributors, Esri UK, Esri, HERE, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS
World Imagery (Clarity): Source: Esri, Maxar, Earthstar Geographics, IGN, and the GIS User Community
SURVEY\LIDAR_Composite_1m_DTM_2022_Hillshade:



Legend:

- Preferred Route Centreline
- Preferred Spurs Centreline
- Groundsure Site Index
- Preferred Route Centreline KP Marker
- Preferred Spurs Centreline KP Marker
- HAGI Locations
- Trenchless Crossing Points

Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936
Units: Meter



Rev	Date	Description	Drn	Chk	App
02	11/07/2023	Description Change	AA	AA	AA
01	11/07/2023	Description Change	AA	AA	AA
00	11/07/2023	First Draft	DR	MK	MK

322968 - HyNet NW
United Living Energy Services

RSK GEOSCIENCES

TITLE: 322968 - Drawing 4
Hynet Geohazards Desk Study
DTM and Topographic Contours
Sheet 12 of 18

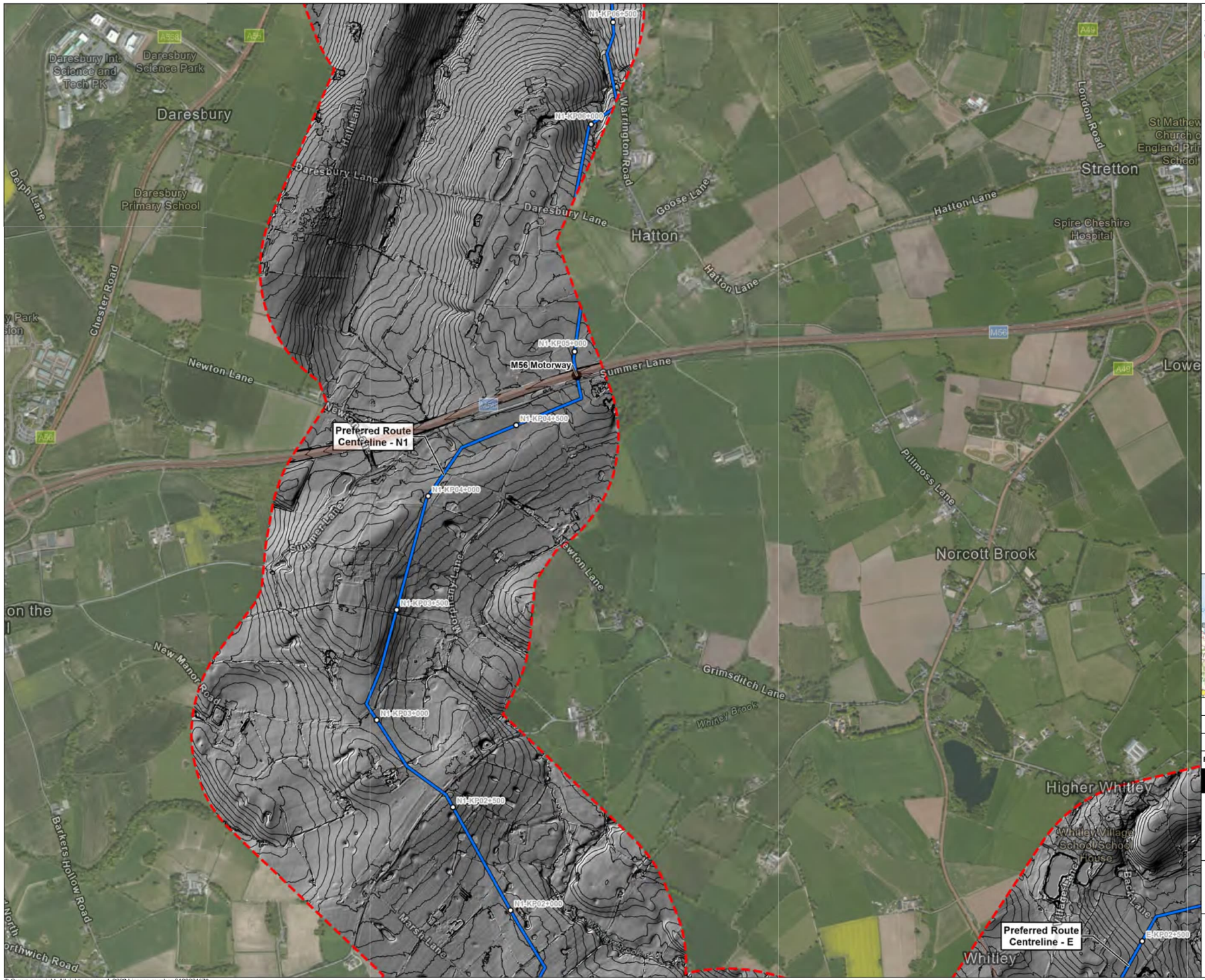
0 200 400
Metres
SCALE: 1:15,000 @ A3

N W E S

REV 00

Document Path: C:\Users\droberts\Desktop\Workings\322968 NW Construction Project\01 - GIS\11 - ArcPro\322968 - Drawing 4 - Hynet Geohazards Desk Study - DTM and topographic Contours - Sheets 1 to 18.aprx

© Crown copyright, All rights reserved. 2023 License number 0100031673
Hybrid Reference Layer: Esri Community Maps Contributors, Esri UK, Esri, HERE, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS
World Imagery (Clarity): Source: Esri, Maxar, Earthstar Geographics, IGN, and the GIS User Community
SURVEY\LIDAR_Composite_1m_DTM_2022_Hillshade:



Legend:

- Preferred Route Centreline
- Groundsure Site Index
- Preferred Route Centreline KP Marker
- Trenchless Crossing Points

Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936
Units: Meter

Rev	Date	Description	Drn	Chk	App
02	11/07/2023	Description Change	AA	AA	AA
01	11/07/2023	Description Change	AA	AA	AA
00	11/07/2023	First Draft	DR	MK	MK

322968 - HyNet NW
United Living Energy Services

RSK GEOSCIENCES

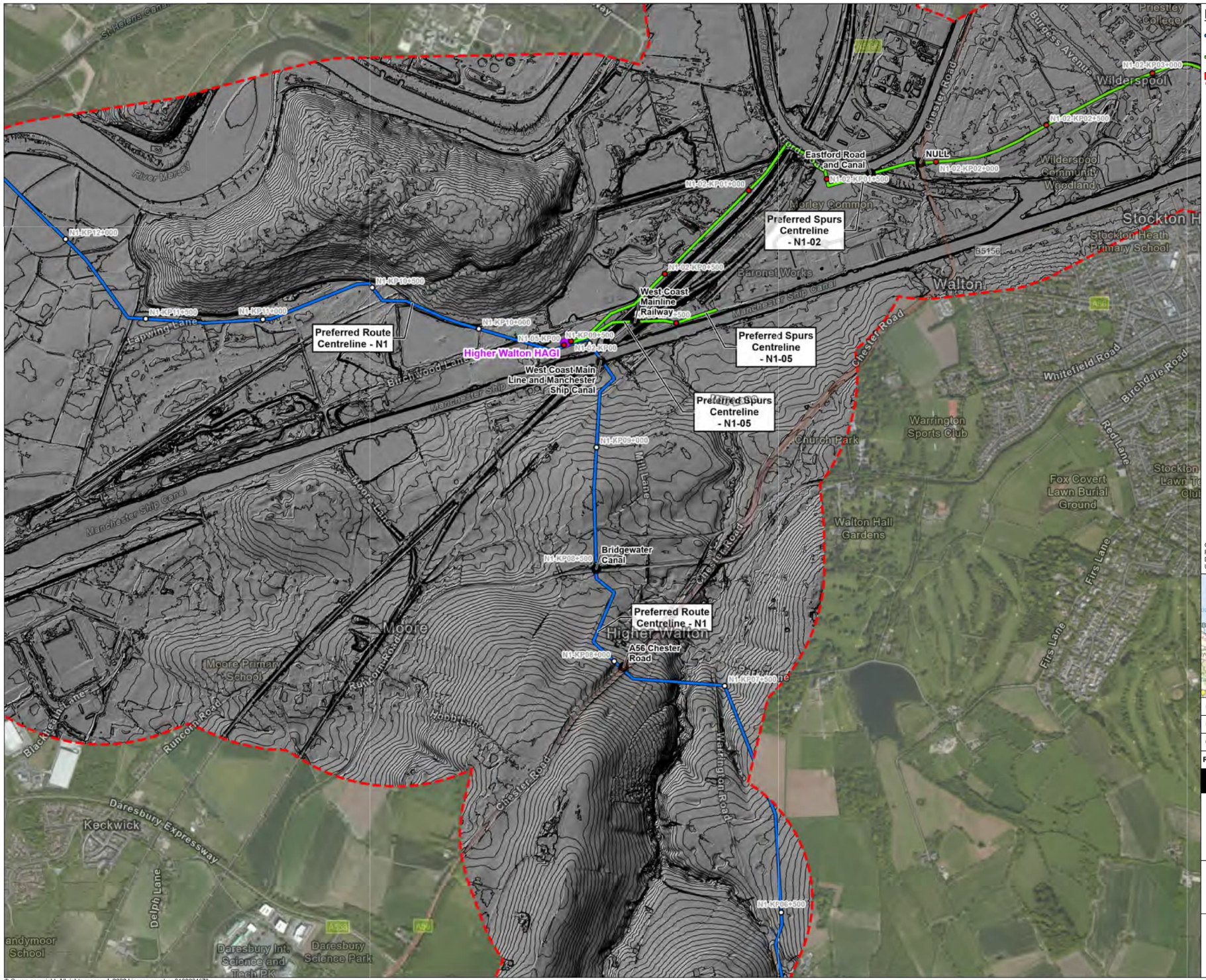
TITLE: 322968 - Drawing 4
Hynet Geohazards Desk Study
DTM and Topographic Contours
Sheet 13 of 18

0 200 400
Metres
SCALE: 1:15,000 @ A3

REV 00

Document Path: C:\Users\droberts\Desktop\Workings\322968 NW Construction Project\01 - GIS\11 - ArcPro\322968 - Drawing 4 - Hynet Geohazards Desk Study - DTM and topographic Contours - Sheets 1 to 18.aprx

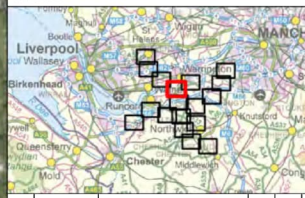
© Crown copyright, All rights reserved. 2023 License number 0100031673
Hybrid Reference Layer: Esri Community Maps Contributors, Esri UK, Esri, HERE, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS
World Imagery (Clarity): Source: Esri, Maxar, Earthstar Geographics, IGN, and the GIS User Community
SURVEY\LIDAR_Composite_1m_DTM_2022_Hillshade:



Legend:

- Preferred Route Centreline
- Preferred Spurs Centreline
- Groundsure Site Index
- Preferred Route Centreline KP Marker
- Preferred Spurs Centreline KP Marker
- HAGI Locations
- Trenchless Crossing Points

Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936
Units: Meter



Rev	Date	Description	Drn	Chk	App
02	11/07/2023	Description Change	AA	AA	AA
01	11/07/2023	Description Change	AA	AA	AA
00	11/07/2023	First Draft	DR	MK	MK

322968 - HyNet NW
United Living Energy Services

RSK GEOSCIENCES

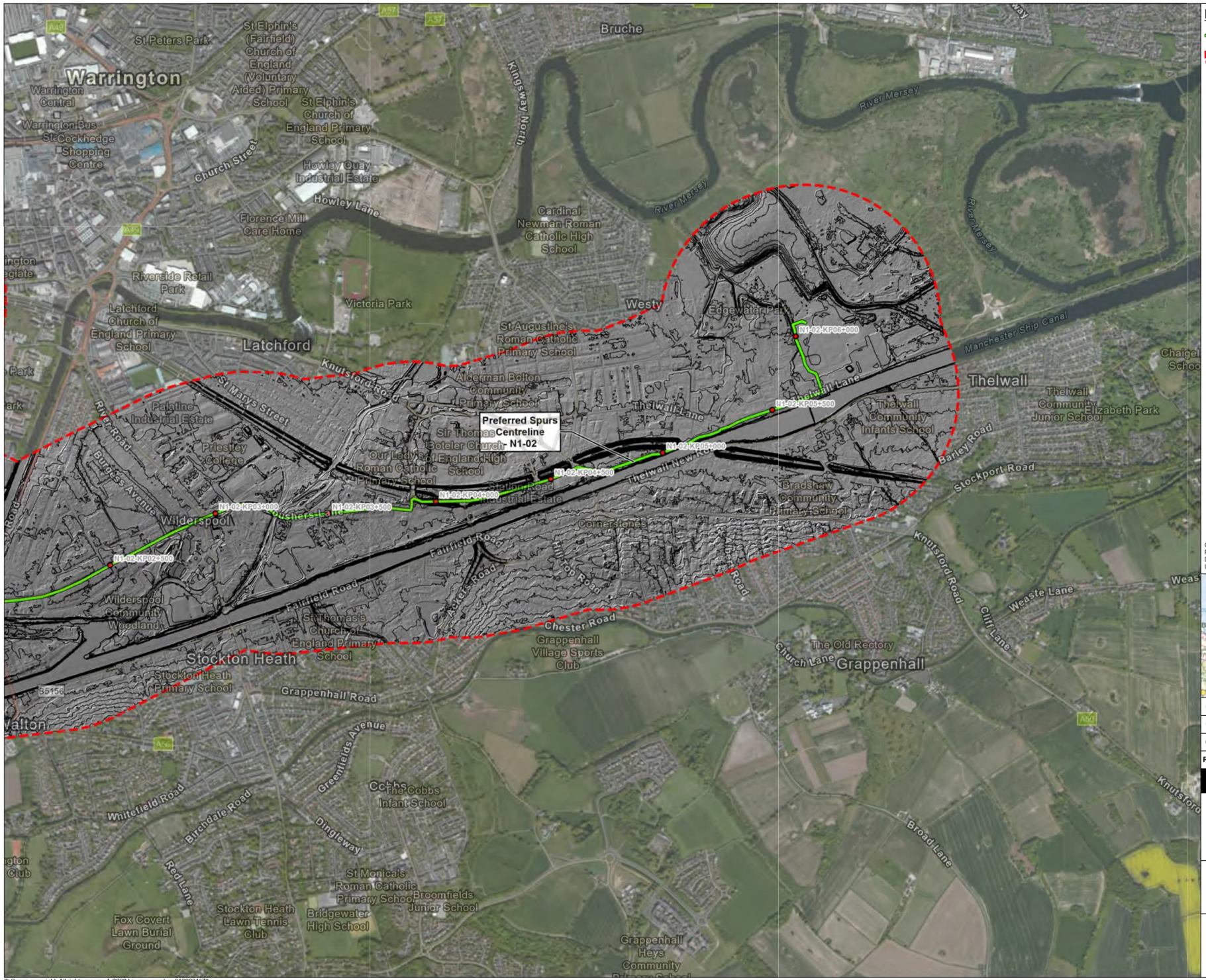
TITLE: 322968 - Drawing 4
Hynet Geohazards Desk Study
DTM and Topographic Contours
Sheet 14 of 18

0 200 400
Metres
SCALE: 1:15,000 @A3

REV 00

Document Path: C:\Users\droberts\Desktop\Workings\322968 NW Construction Project\01 - GIS\11 - ArcPro\322968 - Drawing 4 - Hynet Geohazards Desk Study - DTM and Topographic Contours - Sheets 1 to 18.aprx

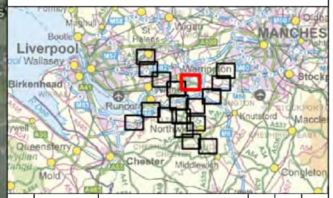
© Crown copyright, All rights reserved. 2023 License number 0100031673
Hybrid Reference Layer: Esri Community Maps Contributors, Esri UK, Esri, HERE, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS
World Imagery (Clarity): Source: Esri, Maxar, Earthstar Geographics, IGN, and the GIS User Community
SURVEY\LIDAR_Composite_1m_DTM_2022_Hillshade:



Legend:

- Preferred Spurs Centreline
- Groundsure Site Index
- Preferred Spurs Centreline KP Marker

Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936
Units: Meter



Rev	Date	Description	Drn	Chk	App
02	11/07/2023	Description Change	AA	AA	AA
01	11/07/2023	Description Change	AA	AA	AA
00	11/07/2023	First Draft	DR	MK	MK

322968 - HyNet NW
United Living Energy Services

RSK GEOSCIENCES

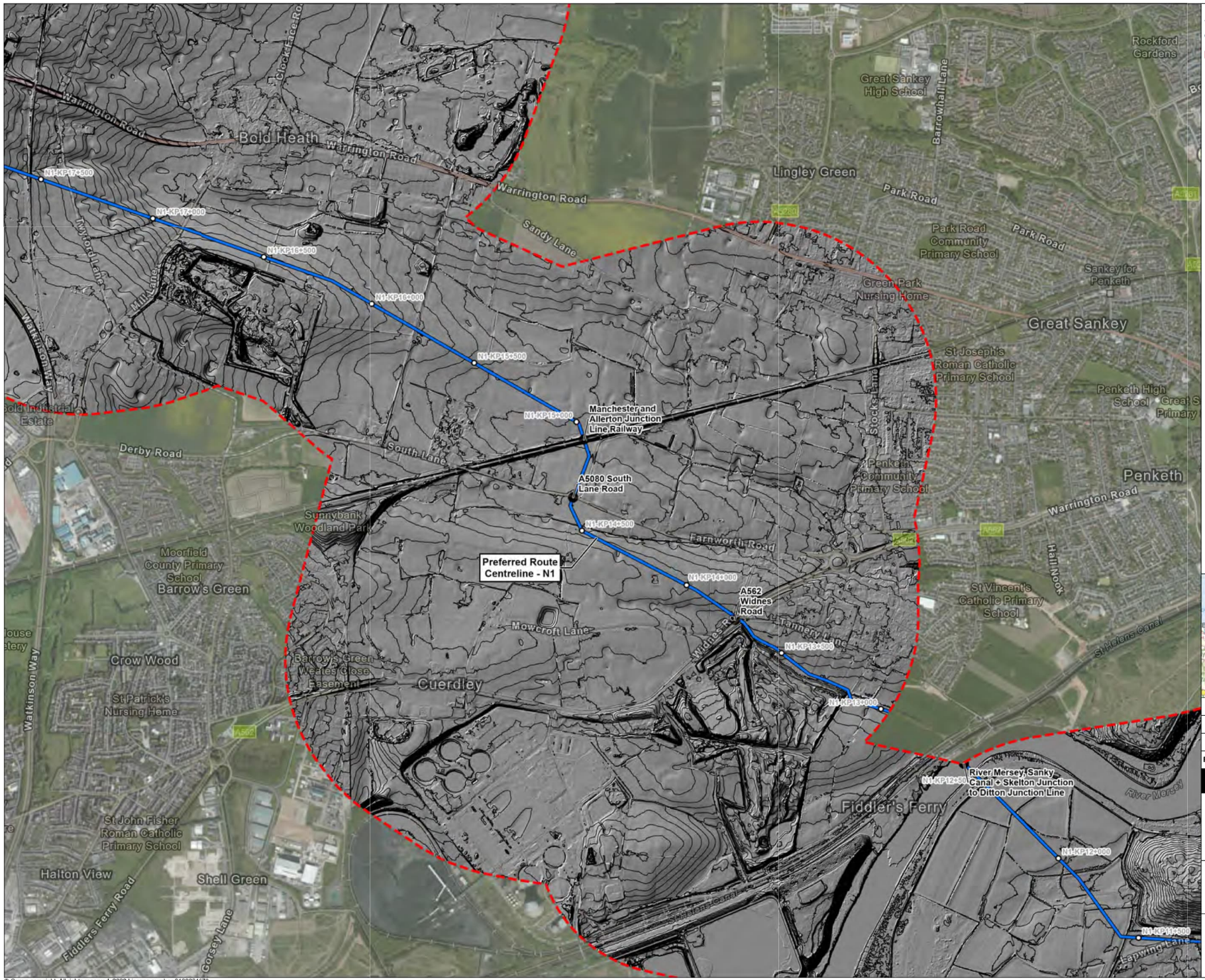
TITLE: 322968 - Drawing 4
Hynet Geohazards Desk Study
DTM and Topographic Contours
Sheet 15 of 18

0 200 400
Metres
SCALE: 1:15,000 @ A3

REV 00

Document Path: C:\Users\droberts\Desktop\Workings\322968 NW Construction Project\01 - GIS\11 - ArcPro\322968 - Drawing 4 - Hynet Geohazards Desk Study - DTM and Topographic Contours - Sheets 1 to 18.aprx

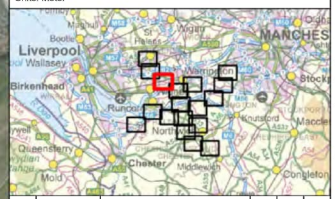
© Crown copyright, All rights reserved. 2023 License number 0100031673
Hybrid Reference Layer: Esri Community Maps Contributors, Esri UK, Esri, HERE, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS
World Imagery (Clarity): Source: Esri, Maxar, Earthstar Geographics, IGN, and the GIS User Community
SURVEY\LIDAR_Composite_1m_DTM_2022_Hillshade:



Legend:

- Preferred Route Centreline
- Groundsure Site Index
- Preferred Route Centreline KP Marker
- Trenchless Crossing Points

Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936
Units: Meter



Rev	Date	Description	Drn	Chk	App
02	11/07/2023	Description Change	AA	AA	AA
01	11/07/2023	Description Change	AA	AA	AA
00	11/07/2023	First Draft	DR	MK	MK

322968 - HyNet NW
United Living Energy Services

RSK GEOSCIENCES

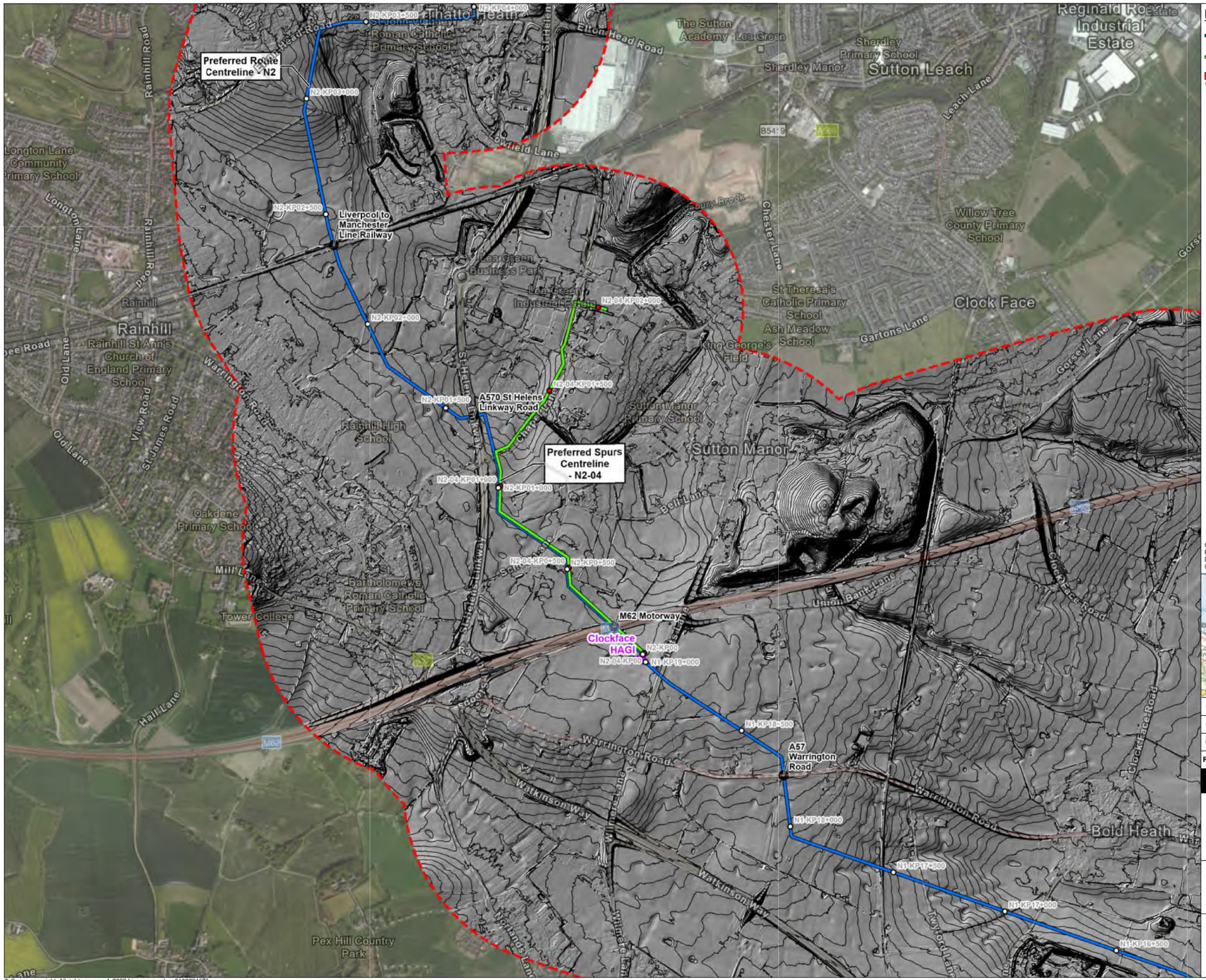
TITLE: 322968 - Drawing 4
Hynet Geohazards Desk Study
DTM and Topographic Contours
Sheet 16 of 18

0 200 400
Metres
SCALE: 1:15,000 @ A3

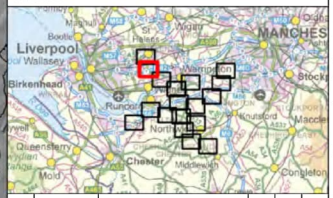
REV 00

Document Path: C:\Users\droberts\Desktop\Workings\322968 NW Construction Project\01 - GIS\11 - ArcPro\322968 - Drawing 4 - Hynet Geohazards Desk Study - DTM and Topographic Contours - Sheets 1 to 18.aprx

© Crown copyright, All rights reserved. 2023 License number 0100031673
Hybrid Reference Layer: Esri Community Maps Contributors, Esri UK, Esri, HERE, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS
World Imagery (Clarity): Source: Esri, Maxar, Earthstar Geographics, IGN, and the GIS User Community
SURVEY\LIDAR_Composite_1m_DTM_2022_Hillshade:



Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936
Units: Meter



Rev	Date	Description	Drn	Chk	App
02	11/07/2023	Description Change	AA	AA	AA
01	11/07/2023	Description Change	AA	AA	AA
00	11/07/2023	First Draft	DR	MK	MK

322968 - HyNet NW
United Living Energy Services

RSK GEOSCIENCES

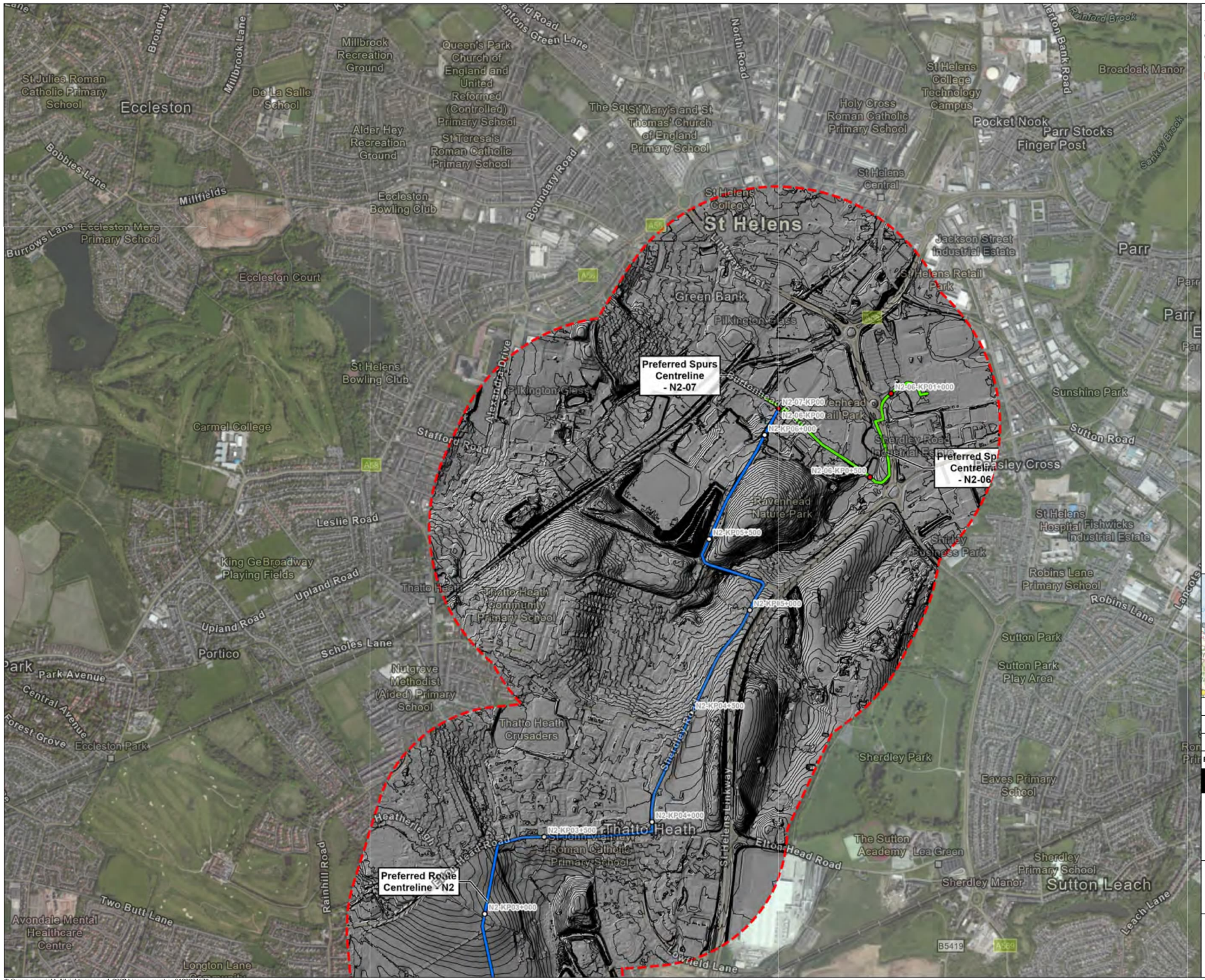
TITLE: 322968 - Drawing 4
Hynet Geohazards Desk Study
DTM and Topographic Contours
Sheet 17 of 18

0 200 400
Metres
SCALE: 1:15,000 @ A3

REV 00

Document Path: C:\Users\droberts\Desktop\Workings\322968 NW Construction Project\01 - GIS\11 - ArcPro\322968 - Drawing 4 - Hynet Geohazards Desk Study - DTM and Topographic Contours - Sheets 1 to 18.aprx

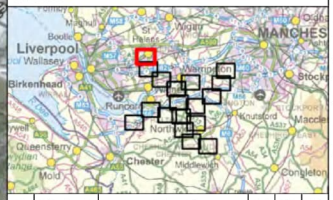
© Crown copyright, All rights reserved. 2023 License number 0100031673
Hybrid Reference Layer: Esri Community Maps Contributors, Esri UK, Esri, HERE, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS
World Imagery (Clarity): Source: Esri, Maxar, Earthstar Geographics, IGN, and the GIS User Community
SURVEY\LIDAR_Composite_1m_DTM_2022_Hillshade:



Legend:

- Preferred Route Centreline
- Preferred Spurs Centreline
- Groundsure Site Index
- Preferred Route Centreline KP Marker
- Preferred Spurs Centreline KP Marker

Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936
Units: Meter



Rev	Date	Description	Drn	Chk	App
02	11/07/2023	Description Change	AA	AA	AA
01	11/07/2023	Description Change	AA	AA	AA
00	11/07/2023	First Draft	DR	MK	MK

322968 - HyNet NW
United Living Energy Services

RSK GEOSCIENCES

TITLE: 322968 - Drawing 4
Hynet Geohazards Desk Study
DTM and Topographic Contours
Sheet 18 of 18

0 200 400
Metres
SCALE: 1:15,000 @A3

N W E S

REV 00

Document Path: C:\Users\droberts\Desktop\Workings\322968 NW Construction Project\01 - GIS\11 - ArcPro\322968 - Drawing 4 - Hynet Geohazards Desk Study - DTM and Topographic Contours - Sheets 1 to 18.aprx

© Crown copyright, All rights reserved. 2023 License number 0100031673
Hybrid Reference Layer: Esri Community Maps Contributors, Esri UK, Esri, HERE, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS
World Imagery (Clarity): Source: Esri, Maxar, Earthstar Geographics, IGN, and the GIS User Community
SURVEY\LIDAR_Composite_1m_DTM_2022_Hillshade:

APPENDIX B
BACKGROUND INFORMATION

Note: Groundsure Enviro + Geo Insight Reports are not included in this appendix due to the large file size and because they are already in the clients possession, having been provided to RSK by the client for this study.

Included herein:

- Selected referenced BGS Borehole records
- Ian Farm Associated Borehole and Trial Records

(Note: Not all included boreholes have been referenced / used in derivation of ground models and presented depth ranges, but are included as they may have been used to derive information pertaining the superficial and / or bedrock geology in the wider area)

APPENDIX B
BOREHOLE RECORDS FOR N1 PIPELINE

CONTRACT. LANCASHIRE YORKSHIRE MOTORWAY M62

LOCATION. TARBOCK TO CROFT (Site 14) BHN° B123

SHEET No. 1

No. of sheets. 1

CLIENT. SJ 58 NW/126
5139 8959
MINISTRY OF TRANSPORT

PERCUSSION U D
S.P.T.
B

Casing. Size to. Size to.
Hand Auger

Ground level. 190.58

Commenced. 4/3/68

Completed. 4/3/68

Weather. FINE

ROTARY Cored runs
O/H

STRATUM (Scale: ¼ inch to 1 foot) 1 Thickness	Depth 2	Sample No. 3	S.P.T. Blow Count (N) LL/PL/PI 4	M.C. % Core Rec. % 6	Type of Test 7	GRADING % PASSING SIEVE 3" N.7	1½" 25	¾" 52	⅜" 100	#7/16" 200	TAQ. or U.C.T. Bulk Density p.c.f. Shear /o° p.s.f.	Dev. Stress p.s.i.	Lat. U.C.T. Pres. Stren. p.s.i. p.s.f. Shear/L° p.s.f.	WATER REMARKS 10
Top soil 2'0"	2'0"	M1												
Firm brown sandy stony clay	4'6"	U1½s 1, 2.		12.3 15.7	UCT						U2 138.0		1801	
7'0"	8'6" 9'0"	U1½s 3, 4.		11.6 7.8										
			BOREHOLE COMPLETED											Water table not encountered

REMARKS:

Sample	Depth	M.C. % D.W.	SG	C. B. R. Air Voids	Type	TOP 0.1	TOP 0.2	BOTTOM 0.1	BOTTOM 0.2	Value	COMPACTION B.S. 1377 No	Max. Dry Density	Optn M.C

British Geological Survey

SJ 58 NW 130

...L SURVEYS LTD
...HESTER

BOREHOLE No. 5 CORE...
Ref:-

PROVISIONAL BORING RECORD

SITE St. Helens Site Ref :- 73/83

Boring Method Rotary Ground Level ____ O.D.

DATE	DEPTH OF CASING BELOW G.L. (m)	WATER LEVEL MORNING & EVENING	DEPTH OF STRATA BELOW G.L.	STRATA APPROX. SCALE	NO. OF SAMP	TYPE OF SAMP	PENETRATION OF SAMPLER OR CORE BARREL (metres) FROM	TO	NO. OF BLOWS	CORE RECOVERY
10.5.73			18.6	Red and light brown weathered bunter sandstone with pebble inclusions			18.6	21.7		1.7
							21.7	24.4		1.1
			21.7				24.4	27.5		2.9
				Red and light brown bunter sandstone with pebble incls			27.5	30.0		2.1
			25.4							
				Light brown bunter sandstone with occasional marl fissures and pebble incls.						
10.5.73	18.0		30.0							

Samples shown thus: Disturbed D. Undisturbed U. Standard Pen. Test X. Water W. Bulk B.

WATER OBSERVED AT THE FOLLOWING DEPTHS *-overnight seepage	DEPTH OF CASING WHEN SEALED (N.S. – NOT SEALED)	ESTIMATED SEEPAGE	WATER ADDED AT FOLLOWING DEPTHS TO ASSIST BORING	WATER LEVEL IN CASED / UNCASED BOREHOLE ON COMPLETION		
				DATE	WATER LEVEL	DEPTH OF CASING
1.						
2.						
3.						

Undisturbed U. Standard Pen. Test X. Water W. Bulk B.

WATER OBSERVED AT THE FOLLOWING DEPTHS * - Overnight seepage	DEPTH OF CASING WHEN SEALED (N.S. – NOT SEALED)	ESTIMATED SEEPAGE	WATER ADDED AT FOLLOWING DEPTHS TO ASSIST BORING	WATER LEVEL IN CASED / UNCASED BOREHOLE ON COMPLETION		
				DATE	WATER LEVEL	DEPTH OF CAS
1.						
2.						
3.						
4.						
5.			DIA. OF CASING		m.m. to depth of	
6.						

SJ58NW 130

...L SURVEYS LTD
...HESTER

SJ 5130 8972

BOREHOLE No. 5
Ref:-

PROVISIONAL BORING RECORD

SITE St. Helens Site Ref :- 73/83

Boring Method Rotary Ground Level ____ O.D.

DATE	DEPTH OF CASING BELOW G.L. (m)	WATER LEVEL MORNING & EVENING	DEPTH OF STRATA BELOW G.L.	STRATA APPROX. SCALE	NO. OF SAMP	TYPE OF SAMP	PENETRATION OF SAMPLER OR CORE BARREL (metres) FROM	PENETRATION TO	NO. OF BLOWS	CORE RECOVERY
8.5.73	NK		0.5	Topsoil						
				Brown clay with pockets and bands of sand with cobble & pebble inclusions						
8.5.73 9.5.73	9.4									
9.5.73 10.5.73	18.0		18.0							
			18.6	Weathered red & light brown hunter sandstone						

cont'd.....

Samples shown thus: Disturbed D. Undisturbed U. Standard Pen. Test X. Water W. Bulk B.

WATER OBSERVED AT THE FOLLOWING DEPTHS *-overnight seepage	DEPTH OF CASING WHEN SEALED (N.S. – NOT SEALED)	ESTIMATED SEEPAGE	WATER ADDED AT FOLLOWING DEPTHS TO ASSIST BORING	WATER LEVEL IN CASED / UNCASED BOREHOLE ON COMPLETION		
				DATE	WATER LEVEL	DEPTH OF CASING
1.						
2.						
3.						

WATER OBSERVED AT THE FOLLOWING DEPTHS * - overnight seepage	DEPTH OF CASING WHEN SEALED (N.S. – NOT SEALED)	ESTIMATED SEEPAGE	WATER ADDED AT FOLLOWING DEPTHS TO ASSIST BORING	WATER LEVEL IN CASED / UNCASED BOREHOLE ON COMPLETION		
				DATE	WATER LEVEL	DEPTH OF CASING
1.						
2.						
3.						

Disturbed D. Undisturbed U. Standard Pen. Test X. Water W. Bulk B.

REMARKS

CONTRACT. LANCASHIRE YORKSHIRE MOTORWAY M62 | SHEET No.1

LOCATION. TARBOCK TO CROFT (Site 14) BH N° B125 | No. of sheets 1

CLIENT. SJ 59 SW/119 5144.9003 MINISTRY OF TRANSPORT | Ground level. 189.38

PERCUSSION U D | S.P.T. | B | Casing. Size 6" to. Size to.

Commenced. 29/2/68

Completed. 29/2/68

Weather. FAIR

ROTARY Cored runs | O/H

STRATUM (Scale: ¼ inch to 1 foot) 1 Thickness	Depth 2	Sample No. 3	S.P.T. Blow Count (N) LL/PL/PI 4	M.C. % Core Rec. % 6	Type of Test 7	GRADING % PASSING SIEVE 3" N.7	1½" 25	¾" 52	⅜" 100	#7/16" 200	TAQ. or U.C.T. Bulk Density p.c.f. Shear /o° p.s.f.	Dev. Stress p.s.i.	Lat. Pres. p.s.i. U.C.T. Stren. p.s.f. Shear/L° p.s.f.	WATER REMARKS 10
Top soil and brick, ashes fill 2'6"	2'6"													Damp
Soft to firm dark brown sandy clay	3'0"	M1		32.3										
	3'6"	U1		14.4		-	-	-	-	100				
2'6"	5'0"	A1				100	98	83	46	24				Damp
Stiff brown sandy stony clay with pockets of fine wet sand	6'0"	M2		13.7										Wet
	8'6"	U2	30/12/18 (CL)	13.5	UCT						141.7		5991	BHS @ 8'6"
				13.9							142.5		7461	
	10'0"	A2		-							-		-	
	12'0"	M3		12.9										
	13'6"	U3		14.6	UCT						140.1		5652	
				15.5							140.1		4861	
10'0"	15'0"	A3		15.0							138.1		5878	Wet
Compact small to medium wet sandy gravel, some clay	15'6"	P1	3.2.4.5. (14)	15.9		SO_3 W 8.9 pH 7.5								WS @ 15'0" SWL 9'0" WL - 9'0"
2'0"	17'0"													Wet
BOREHOLE COMPLETED														OCB @ 17'0" Cas @ 8'6" SWL 9'0" DWC.SWL 7'6

REMARKS:

Sample	Depth	M.C. % D.W.	S.G.	C. B. R. Air Voids	Type	TOP 0.1	TOP 0.2	BOTTOM 0.1	BOTTOM 0.2	Value	COMPACTION B.S. 1377 No	Max. Dry Density	Optm M.C.

CONTRACT. LANCASHIRE YORKSHIRE MOTORWAY M62

LOCATION. TARBOCK TO CROFT (Site 14) BH No BIZG

SHEET No. 1

No. of sheets 1

CLIENT. SJ 5950/120
5146.9009
MINISTRY OF TRANSPORT

Ground level. 187.79

Commenced. 29/2/68

Completed. 29/2/68

Weather. FAIR

PERCUSSION U D S.P.T. B

ROTARY Cored runs O/H

Casing. Size to. Size to. 6"

STRATUM (Scale: ½ inch to 1 foot) 1 Thickness	Depth 2	Sample No. 3	S.P.T. Blow Count (N) LL/PL/PI 4	LEGEND 5	M.C. % Core Rec. % 6	Type of Test 7	GRADING % PASSING SIEVE 3" N.7 / 1½" 25 / ¾" 52 / ⅜" 100 / No 200	TAQ. or U.C.T. Bulk Density p.c.f. Shear /o° p.s.f. / Dev. Stress p.s.i. / Lat. Pres. p.s.i. U.C.T. Stren. p.s.f. Shear/L° p.s.f.	8 RESULTS OF ANY OTHER TESTS. 9	WATER REMARKS 10
Top soil and brick, ashes fill										
3'0"	3'0"									Damp
Stiff brown mottled sandy stony clay	3'6"	M1			24.9					
	4'0"	U1			19.5	UCT		137.4	4635	
					19.9			133.3	3843	
		A1			19.1			137.1	4635	
3'0"	6'0"									Damp
Stiff brown sandy stony clay	7'0"	M2			18.4					
	9'0"	U2	33/13/20 (CL)		16.4	UCT		140.4	10174	
					14.1			140.3	8930	
					14.3			140.2	8817	
	10'6"	A2								
	12'0"	M3			14.3					
	14'0"	U3			15.4	UCT		140.0	6782	
					14.6			135.2	7122	
	15'6"	A3			16.8			140.0	6669	
	17'6"	M4			14.2					
	19'0"	U4			14.4	UCT		141.2	3730	
					14.9			141.5	3843	
					13.7			142.9	3956	
	21'6"	A4								
	22'0"	M5			12.9					
							SO_3W 11.0 pH 7.5			
	23'6"	U5			17.1	UCT		137.8	3391	
					15.2			140.7	4182	
19'0"	25'0"				15.1			140.8	4182	Damp
			BOREHOLE COMPLETED							DCB @ 25'0" Cas @ 10'0" Water nil DMC.SWL 22'6" WL - 22'6"

REMARKS:

Sample	Depth	M.C. % D.W.	S.G.	C. B. R. Air Voids	Type	TOP 0.1	TOP 0.2	BOTTOM 0.1	BOTTOM 0.2	Value	COMPACTION B.S. 1377 No	Max. Dry Density	Optm M.C.

CONTRACT. LANCASHIRE YORKSHIRE MOTORWAY M62

LOCATION. TARBOCK TO CROFT (Site 14) BHN° 5721/4

CLIENT. SJ 59 SW/124
5150.9014
MINISTRY OF TRANSPORT

SHEET No.2
No. of sheets. 2

Ground level. 182.44

Commenced. 12/3/68

Completed. 13/3/68

PERCUSSION U D S.P.T. B — Casing. Size 6" to. Size to.

ROTARY Cored runs O/H — LEGEND

Weather. FAIR

STRATUM (Scale: ¼ inch to 1 foot) 1 Thickness	Depth 2	Sample No. 3	S.P.T. Blow Count (N) LL/PL/PI 4	M.C. % Core Rec. % 6	Type of Test 7	GRADING % PASSING SIEVE 3" N.7	1½" 25	¾" 52	⅜" 100	⅝" 200	TAQ. or U.C.T. Bulk Density p.c.f. Shear /o° p.s.f.	Dev. Stress p.s.i.	Lat. Pres. p.s.i. U.C.T. Stren. p.s.f. Shear/L° p.s.f.	8 RESULTS OF ANY OTHER TESTS. 9	WATER REMARKS 10
	30'0"														
Firm to stiff brown sandy stony clay with small pockets of fine wet sand	31'6"	M7		14.3											
	33'6"	U7		14.4	TAQ						137.1	35.8	20		
				14.1							137.3	36.3	40		
	35'0"	A7		14.7							133.4	25.0	60		
													2333/0°		
	37'0"	M8		13.7											
	38'6"	U8		25.9	TAQ						123.1	22.8	20		
				25.3							123.6	32.3	40		
	40'0"	A8		27.5							121.1	30.9	60		
													2059/0°		
	42'0"	M9		17.3											
	43'6"	U9		25.5	TAQ						125.1	25.5	20		
				26.7							123.5	12.4	40		
	45'0"	A9		26.2							123.5	19.1	60		
													1368/0°		
	46'6"	M10		12.3											Wet
															12/3/68
	48'6"	U10		11.4	TAQ						142.0	45.6	20		BH @ 50'0"
				11.3							140.9	47.5	40		Cas @ 15'0"
20'0"	50'0"	A10		10.8							140.6	62.2	60		SWL 47'0"
													2448/7.5°		13/3/68
Firm to stiff brown sandy stony clay	51'6"	M11		11.6											SWL 28'0"
	53'6"	U11	23/12/11	11.6	TAQ						141.2	37.8	20		
				11.5							141.1	43.2	40		
5'0"	55'0"	A11		11.6							141.2	48.1	60		Wet
													2016/7.0°		
Firm to stiff brown sandy stony clay with small layers of compact sandy gravel	55'6"	P1	75 for 10" (total)	10.8											
	57'6"	M12		11.6											
	58'6"	U12		11.6	TAQ						140.7	34.7	20		Wet
				10.3							142.2	51.3	40		OCB @ 60'0"
5'0"	60'0"	A12		10.5							142.7	39.9	60		Cas @ 35'0"
			BOREHOLE COMPLETED										3024/0°		SWL 28'0"
															DWC SWL 27'0"

REMARKS:

Sample	Depth	M.C. % D.W.	S.G.	C. B. R. Air Voids	Type	TOP 0.1	TOP 0.2	BOTTOM 0.1	BOTTOM 0.2	Value	COMPACTION B.S. 1377 No	Max. Dry Density	Optm M.C.

CONTRACT. LANCASHIRE YORKSHIRE MOTORWAY M62 — SHEET No. 1

LOCATION. TARBOCK TO CROFT (Site 14) BH No 5721/4 — No. of sheets. 2

CLIENT. SJ 59 SW 5150.9014 MINISTRY OF TRANSPORT — Ground level. 182.44

Commenced. 12/3/68

Completed. 13/3/68

PERCUSSION U D — SPT. — B

Casing. Size 6" to. Size to.

ROTARY Cored runs — O/H

Weather. FAIR

STRATUM (Scale: ½ inch to 1 foot) 1 Thickness	Depth 2	Sample No. 3	SPT. Blow Count (N) LL/PL/PI 4	M.C. % Core Rec. % 6	Type of Test 7	GRADING % PASSING SIEVE 3" N.7	1½" 25	¾" 52	⅜" 100	#10 200	TAQ. or U.C.T. Bulk Density p.c.f. Shear /o° p.s.f.	Dev. Stress p.s.i.	Lat. Pres. p.s.i. U.C.T. Stren. p.s.f. Shear/Lo p.s.f.	WATER REMARKS 10
Top soil 1'6"	1'6"													Damp
Firm to stiff brown sandy stony clay with small pockets of fine wet sand	2'6"	M1		16.2										
	3'6"	U1		13.2	TAQ						133.5	64.5	20	
				12.9							130.0	51.4	40	
	5'0"	A1		13.2							134.9	48.1	60	
													3931/0°	
	6'0"	B1		15.1										
	7'0"	M2		14.7										
	8'6"	U2	28/12/16 (CL)	13.6	TAQ						135.8	11.8	20	
				13.7							137.2	45.8	40	
	10'0"	A2		-							-	-	-	
													0/19.0°	WS @ 10'6"
						SO_3 W 13.0 pH 7.5								SWL 9'6"
	11'6"	M3		16.7										WL - 9'6"
														Wet
	13'6"	U3		14.2	TAQ						134.5	34.2	20	
				14.2							135.7	31.5	40	
	15'0"	A3		14.1							137.4	34.2	60	BHS @ 15'0"
													2405/0°	
	17'0"	M4		14.8										
	18'6"	U4		14.3	TAQ						135.3	21.6	20	
				13.8							138.9	27.5	40	
	20'0"	A4		13.6							137.0	27.6	60	
													1843/0°	
	21'6"	M5		14.2										
	23'6"	U5		13.8	TAQ						137.2	30.5	20	
				14.4							138.3	22.6	40	
	25'0"	A5		14.2							142.5	22.8	60	
													1829/0°	
	26'6"	M6		13.6										
	28'6"	U6	22/10/12 (CL)	12.3	TAQ						141.1	28.5	20	
				11.9							138.1	25.1	40	
28'6"	30'0"	A6		12.2							138.6	26.6	60	Damp
													1930/0°	

Continued on sheet 2.

REMARKS:

Sample	Depth	M.C. % D.W.	S.G.	C. B. R. Air Voids	Type	TOP 0.1	TOP 0.2	BOTTOM 0.1	BOTTOM 0.2	Value	COMPACTION B.S. 1377 No	Max. Dry Density	Optm M.C.

FIG 5.

GROUNDWATER

DATE RECEIVED 11 · 3 · 96

J.P.WHITTER

(WATER WELL ENGINEERS) LTD
LANGATE INDUSTRIAL ESTATE
WIGAN ROAD
BRYN WN4 0QZ
TEL: 0942 722706
24 HOUR: 0942 893660
FAX: 0942 719008

RECORD OF BOREHOLE

NUMBER OF BOREHOLE: 257/32-95 SJ57/72

BOREHOLE SUNK FOR: BARON TURKEYS CONSENT Nº 840

ADDRESS OF BOREHOLE: THATCHED HOUSE FARM, DUTTON, WARRINGTON, WA4 4JH

NATIONAL GRID REFERENCE: SJ 587 798

PURPOSE OF BOREHOLE: AGRICULTURAL

DATE OF SINKING: OCTOBER 1995

BOREHOLE SUNK BY: JP WHITTER (WLW ENG) LTD MACHINE: DANDO 800

INFORMATION FROM: UNIT 21 LANDGATE IND EST, WIGAN ROAD, BRYN, NR WIGAN, LANCASHIRE, WN4 0QZ

ADDITIONAL NOTES AND PUMP DETAILS:
52mt of 6" slotted, 8mt of plain plastic tube.
GRAVEL PACKED TO 8m FROM GL
GROUTED FROM 8mt TO 1mt FROM GL
THE REST WATER LEVEL IS 7mt FROM GL

DESCRIPTION OF STRATA	THICKNESS		DEPTH	
	METRE	FEET	METRE	FEET
BACKFILL	50cm		50cm	
BROWN CLAY	6·0		6·5	
GREY BOULDER CLAY	3·5		10·0	
HARD BROWN BOULDER CLAY	14·0		24·0	
GREY MATTED GRAVEL	3·0		27·0	
VERY FINE BROWN MATTED GRAVEL	4·0		31·0	
BROWN MATTED GRAVEL	3·0		33·0	
GREY MATTED GRAVEL	2·0		35·0	
BLUE CLAY	3·0		38·0	
GREY MATTED GRAVEL	3·0		41·0	
BROWN MATTED GRAVEL	5·0		46·0	
HARD BROWN MARL & SANDSTONE	14·0		60·0	

SJ58SE 777

ALLIED EXPLORATION & GEOTECHNICS LTD

BOREHOLE RECORD

Status:- FINAL
Date:- 07/03/96

Project: NMCS2 Communications System in Cheshire - MS2 Cantilever Sites - M56
BOREHOLE No: BH-31
Client: The Highways Agency
Location: 36/0 +45A (359449 381786)
Method & Equipment: Cable Percussion using a Pilcon Wayfarer 1500
Ground Level(m(AOD)): 72.34
Date: 06-12-95
Sheet: 1 of 1

SAMPLES & TESTS			Water	STRATA				Instrument Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION	
						(0.70)	(1) TOPSOIL.	
				71.64		0.70		
0.80-1.20	B1						Soft to firm red brown veined grey sandy CLAY with some gravel and occasional cobbles. Gravel is fine to coarse subangular to subrounded and consists of sandstone, mudstone and occasionally coal. Cobbles consist of sandstone. (Glacial Till)	
1.50-1.95	U2	(50)				(1.80)	between c.0.70 and 1.20m BGL ... occasionally mottled grey and orange brown.	
2.00	J3						at c.2.00m BGL ... pockets of clayey fine to medium sand.	
2.01-2.40	B4			69.84		2.50		
2.50-2.95	U5	(75)					Very stiff friable thinly laminated red brown CLAY with some gravel. Gravel is fine to medium angular to subangular and consists of mudstone lithorelicts. (Mercia Mudstone - Zone III)	
3.00	J6	50 for 180mm				(1.50)	between c.3.00 and 3.45m BGL ... red brown friable mudstone very weak with laminae of green grey siltstone.	
3.01-3.45	SJ7							
3.50-3.90	B8			68.34		4.00		
4.00-4.45	SJ9	50 for 150mm					Red brown friable thinly laminated slightly weathered MUDSTONE weak. (Mercia Mudstone - Zone II)	
5.10-5.55	CB10	50 for 43mm				(2.00)	between c.4.00 and 5.00m BGL ... very thin bed of blue grey fine grained slightly weathered silty sandstone weak.	
				66.34		6.00		
6.00-6.30	J11					(0.50)	Red brown thinly laminated slightly weathered MUDSTONE weak with occasional very thin beds of very stiff red brown clay. (Mercia Mudstone - Zone II)	
6.30-6.50	B12			65.84		6.50		
6.50	S13	50 for 37mm*					Borehole complete at 6.50m BGL.	

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date		Depth	Casing	Casing Dia	Water Depth	From	To	Hours	From	To	
06.12.95		0.00	0.00			3.40	3.50	0.50	3.00	6.50	1) Description derived from driller's daily report. 2) Inspection pit dug (1.0 x 1.0 x 1.20m).
06.12.95		6.50	6.50	150mm	4.70	4.70	4.90	0.75			
						5.00	5.10	0.50			
						6.30	6.50	1.00			

All dimensions in metres Scale 1:50	For Explanation of Symbols and Abbreviations see Key Sheets	Checked By: AL	Logged By: A. Latimer	Contract No. 1568

Date Printed:- 08/03/96

Form AEG21/2

SJ5885-778

ALLIED EXPLORATION & GEOTECHNICS LTD

BOREHOLE RECORD

Status:- **FINAL**
Date:- **07/03/96**

Project: NMCS2 Communications System in Cheshire - MS2 Cantilever Sites - M56			BOREHOLE No BH-32
Client: The Highways Agency	Location: 35/7 +95B S9688 81885		
Method & Equipment: Cable Percussion using a Pilcon Wayfarer 1500	Ground Level(m(AOD)): 71.00	Date: 17-11-95	Sheet: 1 of 1

SAMPLES & TESTS			Water	STRATA				Instrument/Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION	
						(0.60)	(1) MADE GROUND (Roadstone and topsoil).	
				70.40		0.60		
0.70-1.05	J1					(0.80)	MADE GROUND (Stiff red brown sandy clay with some gravel and occasional sandstone cobbles. Gravel is fine to coarse subangular and consists of mudstone, siltstone and sandstone).	
				69.60		1.40		
1.35-1.85	B2						MADE GROUND (Medium dense red brown clayey coarse sandy fine to coarse angular to rounded gravel. Gravel consists of sandstone, mudstone and occasionally clinker).	
2.00-2.45	CB3	N24				(1.85)	between c.2.55 and 2.95m BGL (1) pushing cobble.	
3.00-3.45	SJ4	N35		67.75		3.25		
3.01-3.45	B5						Very stiff thinly to thickly interlaminated red brown and green grey CLAY and SILT with some gravel. Gravel is fine to coarse subangular and consists of mudstone and siltstone lithorelicts. (Mercia Mudstone - Zone III)	
4.00-4.45	SJ6	N67					between c.4.00 and 4.80m BGL ... green grey and red brown thinly to thickly interlaminated slightly weathered SILTSTONE and MUDSTONE very weak. (Mercia Mudstone - Zone II)	
4.01-4.45	B7					(2.85)		
4.80	J8							
5.10-5.30	SJ9	50 for					between c.5.10 and 5.85m BGL ... green grey silt with much gravel. Gravel is fine to medium subangular and consists of siltstone lithorelicts. (Mercia Mudstone - Zone III)	
5.11-5.50	B10	69mm						
5.85	J11						below c.5.85m BGL ... becoming very stiff friable red brown and green grey clay with occasional to some gravel. Gravel is fine subangular and consists of mudstone and siltstone lithorelicts. (Mercia Mudstone - Zone III)	
6.05-6.16	SJ12	50 for		64.90		6.10		
6.06-6.50	B13	60mm					Red brown thinly to thickly laminated slightly weathered MUDSTONE weak. (Mercia Mudstone - Zone II)	
6.80	J14					(1.30)	between c.6.05 and 6.80m BGL ... green grey and red brown fine grained thinly to thickly interlaminated slightly weathered SANDSTONE and MUDSTONE weak. (Mercia Mudstone - Zone I)	
7.05-7.10	SJ15	50 for 52mm		63.60		7.40		
							Borehole complete at 7.40m BGL	

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date		Depth	Casing	Casing Dia	Water Depth	From	To	Hours	From	To	
17/11/95		0.00	0.00			7.10	7.40	1.00			1) Description derived from driller's daily report. 2) Inspection pit dug prior to drilling (0.8 x 0.8 x 1.2m).
17/11/95		5.00	4.05	150mm	dry						
20/11/95		5.00	4.05	150mm	dry						
20/11/95		7.40	4.05	150mm	dry						

All dimensions in metres Scale 1:50	For Explanation of Symbols and Abbreviations see Key Sheets	Checked By: AL	Logged By: A. Latimer	Contract No. 1568

Date Printed:- 08/03/96

Form AEG21/2

PROJECT: WARRINGTON NEW TOWN

LOCATION : Acton Grange

GROUND LEVEL : I4.4 DIA. OF CASING: I54 mm. to metres

INCLINATION : Vertical mm. to metres

SCALE OF LOG : I:50 DATE DRILLED: 6.4.7I.

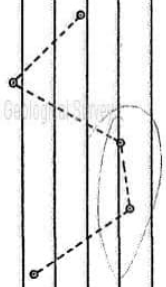
TYPE OF BORING : Shell and Auger

Reduced Level	Depth	Legend	Sampling Type	Sampling Depth	Soil Description	Key to Laboratory Tests
			D		TOPSOIL - dark, sandy	
I3.4	I.0		U4	I.0		
					CLAY - very sandy	
I2.9	I.5		S(I9)	I.5		
			D	2.0	SAND - medium dense, fine /medium grained, red/ brown	
			D	2.5		
II.4	3.0		S(4.5)*	3.0		
					SANDSTONE - hard	
I0.9	3.5				BOTTOM OF BOREHOLE	

Moisture Content and plot of Atterberg Limits

Percent

10 20 30 40



Ground water encountered at

Quantity

SHEET I OF I

Borehole No. 355

British Geological Survey

PROJECT: WARRINGTON NEW TOWN

LOCATION: Acton Grange Foul Sewer 2nd Stage

GROUND LEVEL: 14.5 DIA. OF CASING: 154 mm. to 3.0 metres

INCLINATION: Vertical mm. to 7.60 metres

SCALE OF LOG: 1:50 DATE DRILLED: 8,9.6.72.

TYPE OF BORING: Trial Pit to 1.0m, Shell and Auger and Rotary

Reduced Level	Depth	Legend	Sampling Type	Sampling Depth	Soil Description	Key to Laboratory Tests
			D	0.5	FILL - brown, sand, ashes, clayey, organic	
			D	1.0		
13.0	1.50		D N(16)	1.50		
			D	2.00	SAND - red brown, medium to fine grained, clayey	
12.3	2.20		D	2.50	SANDSTONE - brown/pink to red, medium to coarse grained, becoming finer towards the base. RQD 12½%. Joints at 60°. Locally friable espec. The base where RQD drops to 4½%	
			D	3.00		
					94% Core recovery	
				4.60		
					33% Core recovery	
6.9	7.60			7.60		
					BOTTOM OF BOREHOLE	

Moisture Content and plot of Atterberg Limits

Percent 10 20 30 40

Ground water encountered at

Quantity

Piezometer installed depth to bottom 6.81 m.

SHEET 1 OF 1

Borehole No. 395

5. STRATA

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS		DEPTH		DEPTH
		FEET	IN.	FEET	IN.	METRES
	Bunter sandstone					
Glacial	Drift	39	–	39	–	
Bunter	Red sandstone	361	–	400	–	

British Geological Survey

(*11932) Wt.80370/0370 10,000 9/[illegible] & E.W.Ltd. Gp.685

SJ 58 NW 39

231

1. Name and Number of Shaft or Bore given by Geological Survey: Trial bore at BOLD HEATH, South of St Helens Lancashire

County LANCASHIRE

6" Quarter Sheet 108SW

108SW 5.

GEOLOGICAL CLASSIFICATION	DESCRIPTION	THICKNESS			DEPTH		
3532/2490	No. 3 Bore. {Horsfield Estate. Sutton Manor Colliery bore.						
	280 yards S.S.W. of Bold Cross and Crossroads.						
	Site shown on 6" field slip; Lancashire 108SW.E						
	1" map: 97 (Runcorn)						
	6" map: Lancashire 108SW						
	Surface 93·24 ft. O.D.						
	Cores examined by D.A. Wray 10/ix/1943.						
	Boring commenced 31/VIII/1943						
	completed 10/ix/1943						
	Borers: Messrs J. Thom & Co. Patricroft, Manchester.						
Drift 15ft. 4·57	Soil	0·30	1	0	0·30	1	0
	Brown sand and clay	0·30	1	0	0·61	2	0
	Brown clay	2·44	8	0	3·05	10	0
	Brown clay with stones	0·91	3	0	3·96	13	0
	Red sand	0·61	2	0	4·57	15	0
(Pebble Beds)	Soft red sandstone	1·52	5	0	6·10	20	0
	Red sandstone	3·35	11	0	9·45	31	0
	Red and grey sandstone with a few quartzite pebbles	0·30	1	0	9·75	32	0
	Red sandstone with pebbles	0·91	3	0	10·67	35	0
	Red and yellow sandstone with a few pebbles	0·61	2	0	11·28	37	0
	Red sandstone with a few pebbles	1·52	5	0	12·80	42	0
	Strongly falsebedded red sandstone with a few pebbles	1·52	5	0	14·33	47	0
	Yellowish sandstone with red bands	0·30	1	0	14·63	48	0
	Red sandstone	1·52	5	0	16·15	53	0
	Red sandstone with a few pebbles of quartzite	0·30	1	0	16·46	54	0
	Red sandstone	0·91	3	0	17·37	57	0
	Soft red and yellow variegated sandstone with a few rounded pebbles of quartzite and pellets of marl	0·91	3	0	18·29	60	0
	Soft red sandstone	0·30	1	0	18·59	61	0
	Soft grey sandstone, rather coarse in grain	0·30	1	0	18·90	62	0
	Variegated red and yellow sandstone	0·61	2	0	19·51	64	0

SD 58 NE/4 Lancashire

~~WELL~~ BORING at Fowles Farm, RENKETH County [redacted]

SJ 58 NE 23

Geol. map [illegible] in. map Lancs 115 N.E.

Made by Poppleton & Harrop

Sunk feet. Bored feet.

Communicated by Major A. Trimmer, Runcorn, Dec. 1936

Height above Ordnance Datum Rest level of water 5636 8681

Yield

Quality (with copy of analysis on separate sheet)

GEOLOGICAL FORMATION.	NATURE OF STRATA.	THICKNESS. Feet.	THICKNESS. Metres	DEPTH. Feet.	DEPTH. Metres
Glacial, etc.	Drift	97	29.57	97	29.57
Bunter.	Red sandstone	28	8.53	125	38.10

British Geological Survey

GEOLOGICAL SURVEY AND MUSEUM, JERMYN STREET, LONDON, S.W. 1.

(B10619). Wt. 15824—S123. 2500. 11/25. Gp. 166

177 SJ 58 NE 35 No. 8988.

REPORT. Copy sent to Manchester D.G. 9.2.61 SJ58NE/35 RUNCORN 2338

E. TIMMINS & SONS LTD.,
WATERWORKS CONTRACTORS,
RUNCORN, CHESHIRE.

91222/16/3550

Name of Client Warrington Canners Ltd. Date 16th April, 1959.

Client's Ref. 97/24

Site River Side Works, Fiddlers Ferry, Penketh. six inch quarter sheet. 5600 8654

Borehole No. 1 Level of ground above O.D. feet.

Strata.	Thickness.		Depth.	
	Metres. Thickness	Depth		
	0.61	0.61	2' 0"	
Made up ground	0.30	0.91	3' 0"	
Brown boulder clay	4.88	5.79	19' 0"	
Silt	5.18	10.97	36' 0"	
Brown boulder clay	1.22	12.19	40' 0"	
Gravel	6.10	18.29	60' 0"	
Brown boulder clay	6.10	24.39	80' 0"	
Red sand	4.57	28.96	95' 0"	
Boulder clay	3.20	32.16	105' 6"	
Red sandy marl	44.04	76.20	250' 0"	
Red sandstone.				

TOTAL DEPTH OF BOREHOLE 250' 0"

WATER LEVELS

	FEET BELOW SURFACE
REST WATER LEVEL ON COMPLETION	9' 6"
DEPRESSED WATER LEVEL WHEN PUMPING 1350 G.P.H.	16' 10"

DETAILS OF TUBES INSERTED.

Inside Dia. Inches.	Length of Tube.	Base of Tube Below Surface.	Remarks :
10½"		9' 6"	
8"		107' 0"	

UNLINED BOREHOLE.

Size of Tools Inches.	Type of Tool.	From Feet Below Surface	To Feet Below Surface	= Feet of Drilling.
8"	Percussion	107'	250'	143' 0"

Sited with O on 6" Lanes. 115 NE/W 7.2.61 RPP.
Station 6. 2887/2/64.

UNDISTURBED SAMPLES .....

BOTTLED SAMPLES .....

M.S.C.

SJ58/140

Owner		Licence No.		Nat. Grid Ref. 5814 8542		
Occupier		IGS Ref. No.		Status		
Ground Level	m OD		ft. OD	Aquifer		
Level of Well Top	m OD		ft. OD			
Rest Water Level	m bwt		ft. bwt	Summary of Geological Section	Thickness	Depth
(Date)	m OD		ft. OD	Sand Yo		2'
Construction				Peat Yo		5'
Depth bwt / Dia. / Linings (below well top): From / To / Dia. / Type				Red clay Yo		8'
				Sand Yo		12'
				Red sst Yo		19
Abstraction Rates	Type of Pump					
gph	Chem./Bact. Anal. YES NO					
gpd	Well Driller					

If insufficient space has been allowed, continue in 'Notes' overleaf.

M.S.C.

SJ58/139

Owner		Licence No.		Nat. Grid Ref. 5895 8568		
Occupier		IGS Ref. No.		Status		
Ground Level	m OD		ft. OD	Aquifer		
Level of Well Top	m OD		ft. OD			
Rest Water Level	m bwt		ft. bwt	Summary of Geological Section	Thickness	Depth
(Date)	m OD		ft. OD	Sand Yo		2'
Construction				Coarse gravel Yo		8'
Depth bwt / Dia. / Linings (below well top): From / To / Dia. / Type				Red sst Yo		14'
Abstraction Rates	Type of Pump					
gph	Chem./Bact. Anal. YES NO					
gpd	Well Driller					

If insufficient space has been allowed, continue in 'Notes' overleaf.

PROJECT: WARRINGTON NEW TOWN

LOCATION: Acton Grange

GROUND LEVEL: 13.7

INCLINATION: Vertical

SCALE OF LOG: 1:50

DIA. OF CASING: 154 mm. to metres

mm. to metres

DATE DRILLED: 2.4.71.

TYPE OF BORING: Shell and Auger

Reduced Level	Depth	Legend	Sampling Type	Sampling Depth	Soil Description	Key to Laboratory Tests
			D		CLAY - brown, very sandy	
			U4	0.5		
12.7	1.0		S(14)	1.0		
			D	1.5	SAND - red/grey/brown, medium dense	
			D	2.0		
11.2	2.5		S(14)	2.5		
					red/brown, medium dense	
10.7	3.0		S(4.5)*	3.0		
					SANDSTONE - very dense	
10.2	3.5					
					BOTTOM OF BOREHOLE	

Moisture Content and plot of Atterberg Limits

Percent

10 20 30 40

Ground water encountered at

Quantity

SHEET 1 OF 1

Borehole No. 358

PROJECT: WARRINGTON NEW TOWN

LOCATION: Acton Grange

GROUND LEVEL: 11.7 m.

DIA. OF CASING: 154 mm. to metres

INCLINATION: Vertical

mm. to metres

SCALE OF LOG: 1:50

DATE DRILLED: 24/25.2.71.

TYPE OF BORING: Shell and Auger

Reduced Level	Depth	Legend	Sampling Type	Sampling Depth	Soil Description	Key to Laboratory Tests
			D		TOPSOIL - black, sandy	
11.2	0.5		C(7)	0.5	SAND - grey/brown, fine grained, loose	
10.7	1.0		D	1.0	CLAY - firm, red/brown, sandy	
			D	1.5		
			D			
			U4	2.0		Tx
9.2	2.5		D	2 5		
		C			MARL - red/grey, weathered	
		C	D	3.0		
8.4	3.3	C	D			
8.2	3.5	C	S(78)	3.5	red, weathered	
			D	4.0	SANDSTONE - very dense, red, weathered	
7.2	4.5		D	4.5		
					SANDSTONE - red, unweathered	
					BOTTOM OF BOREHOLE	

Moisture Content and plot of Atterberg Limits

Percent

10 20 30 40

Ground water encountered at

Quantity

SHEET 1 OF 1.

Borehole No.352

PROJECT: WARRINGTON NEW TOWN

LOCATION : Acton Grange

GROUND LEVEL : 12.6

INCLINATION : Vertical

SCALE OF LOG : 1:50

DIA. OF CASING: 154 mm. to metres

mm. to metres

DATE DRILLED: 13/14.4.71.

TYPE OF BORING : Shell and Auger

Reduced Level	Depth	Legend	Sampling Type	Sampling Depth	Soil Description	Key to Laboratory Tests
			S(13)	1.0	SAND - grey, medium dense	
			D	1.5		
10.6	2.0		S(20)	2.0		
10.1	2.5		S(13)	2.5	CLAY - very stiff, sandy	
9.6	3.0		S(4)*	3.0	SAND - red/brown, medium dense	
9.1	3.5				SANDSTONE - red, dense	
					BOTTOM OF BOREHOLE	

Moisture Content and plot of Atterberg Limits

Percent

10 20 30 40

Ground water encountered at

Quantity

SHEET 1 OF 1

Borehole No. 359

3063 Wt. 22438/0384 10M 7/45 (51) F.&S.

RECORD OF SHAFT ~~OR~~ BORE FOR MINERALS

(For Survey use only)
1-inch Map Registered No.
SJ58NW/13

Name and Number of Shaft or Bore SUTTON MANOR COLLIERY
Underground bore - upwards

For Messrs. N.C.B. (West Lancs. Area)

Town or Village

County Lancs. Six-inch quarter sheet Lancs. 1" 97 SW

6-inch Map Registered No. SJ-58-NW/

Exact site SJ - 5201986390
at 1290 O.D. in forming tunnel

Attach a tracing from a map, or a sketch-map, if possible.

Purpose for which made exploration

Level at which shaft bore commenced relative to O.D. -1290 O.D. State if shaft bore is up, down, horizontal or inclined; in latter cases give angle of inclination and direction

Made by

Information from N.C.B. Date of Sinking 1961

Specimens

Additional Notes in Space Overleaf

(For Survey use only) Geological Classification	Nature of Strata	Thickness Metres			Depth ~~Depth~~ Length	
	TOP OF BORE				41.76	137 0
	Coal but mostly sandstone (Six)	0.30	1	0	41.45	136 0
	Coal & dirt	0.61	2	0	41.15	135 0
	COAL, bright	1.22	4	0	40.54	133 0
	Carbonaceous shale, black	0.30	1	0	39.32	129 0
	Mudstone, soft black; with coal bands	1.22	4	0	39.01	128 0
	Mudstone, soft grey; with coal bands		13	0		124 0
	Shale, grey	4.57	15	0		111 0
	Coal, fine	0.30	1	0	29.26	96 0
	Shale, grey; coal band	1.22	4	0	28.96	95 0
	Shale, grey; with pyrite stick-nodules	0.30	1	0	27.74	91 0
	Shale, grey	2.74	9	0	27.43	90 0
	Dirt - becoming dirty near roof	1.22	4	0	24.69	81 0
	Shale, grey; with ironstone bands	7.32	24	0	23.47	77 0
	(Coal but very dirty?) soft grey metal	0.91	3	0	16.15	53 0
	Mudstone, black; with coal trace	0.30	1	0	15.24	50 0
	Mudstone, dark grey	0.30	1	0	14.94	49 0
	Rock, hard	0.61	2	0	14.63	48 0
	Limestone, grey	0.91	3	0	14.02	46 0
	Sandstone	0.91	3	0	13.11	43 0
	Limestone, grey	1.83	6	0	12.19	40 0
	Limestone, light grey	0.91	3	0	10.36	34 0
	Limestone, with ironstone bands	1.22	4	0	9.45	31 0
	Shale, grey; with ironstone bands	0.91	3	0	8.23	27 0
	Shale, grey; with coal bands	0.30	1	0	7.32	24 0
	COAL	1.07	3	6	7.01	23 0
	Grey metal, soft	2.59	8	6	5.94	19 6
	(Grey metal, hard light=pale)	0.46	1	6	3.35	11 0
	Soft dark metal with ironstone bands	2.90	9	6	2.90	9 6

Continued Overleaf

Start of BH 1278 O.D., 12ft above floor of Tunnel & 20ft above floor of Ince Trencherseam.

Geological Survey and Museum,	Date received	Correspondence File No.	1" N.S. Map No.	1" O.S. Map No.	Site marked (use symbol) on 1" Map	on 6" Map

South Kensington,
London, S.W.7.

FORM P 70
SERIES 680

SJ 58 NW / 66

COMMERCIAL IN CONFIDENCE 30 OCT 1973

6-INCH MAP (County, Sheet and Qtr.)	B/H REGD. No.
SJ 58 NW (Nat. Grid, Sheet & Qtr.)	520

Attach tracing from a map or sketch map if possible

Section of Sutton Manor No 70 Underground Borehole (Sm/ug/70): 3½° from vertical bearing S 19°04' E

Purpose Proving strata UPWARDS

Exact Site National Grid Co-ordinates
E 353298
N. 388891

Level at which ~~shaft~~ bore ~~drift~~ commenced relative to O.D. 7060·15 ~~feet~~ ft*

Date of sinking or boring 1973

Sinker or borer N C B
National Coal Board: Regional Geological Service Stoke-on-Trent

*Delete as appropriate

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS ft	THICKNESS in	DEPTH ft	DEPTH in
	Borehole starts 5ft above the roof of the Wigan Four Feet Seam.				
	Mudstone, grey, laminated; ironstone band 1in at 6in; ξ	0·81	2	2	80·81
	Mudstone, dark grey, sideritic for 1in at 2ft 11in and at 3ft 9in; becoming stronger above 4ft 6in to 4ft 9in; rare plant fragments; occasional siderite bands up to 3in thick; micaceous and silty in top 9in	2·34	7	8	10 43·15
	Sandstone, pale grey, fine grained, dark laminae	0·13	5	10	93·28
	Siltstone, grey, rare plant fragments, micaceous, ~~pale~~ ~~sand~~ with more sand from 11ft 8in interlaminated; with increased sand from 12ft 7in to 13ft 7in; siderite from 14ft 5in to 15ft.	1·55	5	1 15	104·83
	Mudstone, grey/dark grey, rare plant fragments; silty for 6in at 16ft 5in; ironstone nodules at 18ft; occasional siderite bands; ironstone band 2½in at 18ft 8in	0·94	3	1 18	115·77
	Mudstone, grey, silty,	0·13	5	19	45·89
	Mudstone, grey; siderite patches 19ft 7in; plants more abundant above 20ft 10in, blocky fracture	0·71	2	4 21	86·60
	Coaly mudstone	0·10	4	22	06·71
	Seatearth, grey, fissile, listric	1·09	3	6 25	67·77
WIGAN FIVE FEET	COAL,	1·30	4	3 29	99·07
	Sandstone, pale grey, massive to 30ft 10in, interlaminated with ~~the~~ grey siltstone above; siltstone less above 35ft 2in; thicker sandstone bands; few fractures; more massive from 42ft 9in to 45ft 4in; interlaminated above;	5·99	9 6	49	315·01
	Siltstone, grey, pale sandy wisps and laminae, plant fragments; passing into	0·33	1	50	415·34
	Sandstone, pale grey, laminated, ~~in~~ bedded, ~~#~~ unjointed; parting at 57ft 4in	2·49	8 10	59	218·05
	Siltstone, grey, interbedded with pale grey sandstone; passing into	0·99	3	62	519·02
	Mudstone, grey, silty, plants; ironstone bands passing into	0·61	2 0	64	519·63
	Siltstone, grey; passing to	0·05	2	64	719·68
	Sandstone, pale grey,	0·56	1 10	66	520·24
	Siltstone, grey/dark grey; laminated with pale sandy wisps; plants	0·48	1 7	68	020·7
	Mudstone, grey, silty, well preserved plants; passing into	0·99	3 3	71	321·79
	Siltstone, grey, plant fragments; passing into	0·63	2 1	73	422·36
	Mudstone, grey, silty, plant fragments; sideritic band 3in at 75ft 6in; bedded; 5½ ironstone band at 77ft 9in	1·65	5	78	924·00

BGS ID: 168357 : BGS Reference: SJ58NW71
British National Grid (27700) : 354586,387095
Report an issue with this borehole

FORM P 70
SERIES 680

CONFIDENTIAL

6-INCH MAP	B/H REGD. No.
SJ 58 NW (County, Sheet and Qtr.)	71
SJ 58 NW (Nat. Grid, Sheet & Qtr.)	523

Section of FOUR OAK BOREHOLE
Sutton Manor Colliery

Purpose
Non-conf May 1984.

Exact Site Mowcroft Lane, Cuerdley, Cheshire.

N.G. Co-ordinates:-
E.354586.8; N.387095.6;

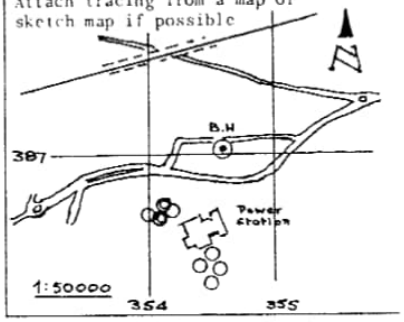
5-NOV 1980

Level at which ~~shaft~~ ~~xxxx~~ bore ~~daxx~~ commenced relative to O.D. 23.26 m or ~~X~~ft*

Date of sinking or boring Commenced 29th April 1979
Completed 20th May 1979

Sinker or borer Kenting Drilling Services Ltd
for National Coal Board, Western Area.

Attach tracing from a map or sketch map if possible



*Delete as appropriate

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS m or ~~X~~ft*	THICKNESS cm or ~~X~~in*	DEPTH m or ~~X~~ft*	DEPTH cm or ~~X~~in*
	From examination of cuttings samples taken every two metres.				
	Surface			3	60
	Clay with pebbles	2	60	6	
	" " "	2		8	
	Pebbles small mixed	2		10	
	"	2		12	
	Sand with gravel	2		14	
	Sand, brown	2		16	
	" grey and white	2		18	
	" " " with pebbles	2		20	
	Sand, coarse, mixed red, grey	2		22	
	"	2		24	
	"	2		26	
	"	1		27	
	"	1		28	
	"	2		30	
	Gravel, grey	2		32	
	"	2		34	
	"	2		36	
Base of Drift 41m	"	2		38	
	"	2		40	
	Sandstone, red, cemented.	2		42	
	"	2		44	
	"	2		46	
	"	2		48	
	Sandstone, red, fine grain, pebble bands.	2		50	
	"	2		52	
	"	2		54	
	Sandstone, red, uncemented, fine grain	2		56	
	"	2		58	
	"	2		60	
	"	2		62	
	"	2		64	
	"	2		66	
	"	2		68	
	"	2		70	
	"	2		72	
	"	2		74	
	"	2		76	

CONTRACT. LANCASHIRE YORKSHIRE MOTORWAY M62

LOCATION. TARBOCK TO CROFT (Site 14) BHN° B124

SHEET No. 1

No. of sheets. 1

CLIENT. SJ 58 NW /127

5140.8995

MINISTRY OF TRANSPORT

PERCUSSION U D S.P.T. B

Casing. Size to. Size to.

Hand Auger

Ground level. 190.00

Commenced. 4/3/68

Completed. 4/3/68

Weather. FINE

ROTARY Cored runs O/H

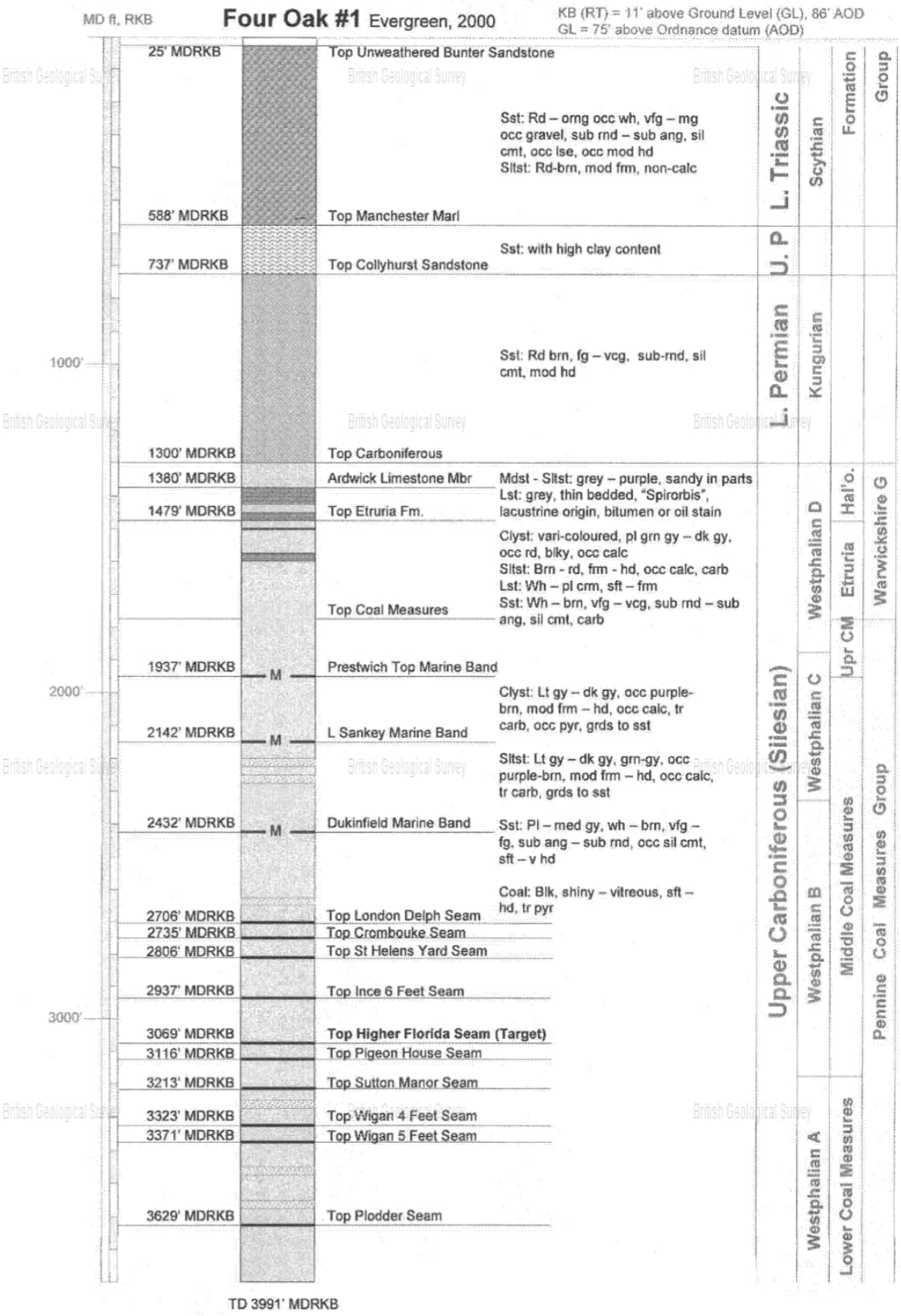
LEGEND

STRATUM (Scale: ½ inch to 1 foot) 1 Thickness	Depth 2	Sample No. 3	S.P.T. Blow Count (N) LL/PL/PI 4	M.C. % Core Rec. % 6	Type of Test 7	GRADING % PASSING SIEVE 3" N.7	1½" 25	¾" 52	⅜" 100	⅞" 200	TAQ. or U.C.T. Bulk Density p.c.f. Shear /o° p.s.f.	Dev. Stress p.s.i.	Lat. Pres. p.s.i.	U.C.T. Stren. p.s.f. Shear/L° p.s.f.	8 RESULTS OF ANY OTHER TESTS. 9	WATER REMARKS 10
Top soil 2'0"	2'0"	M1		26.6												
Firm brown sandy stony clay	4'6"	U1½s 1, 2.		15.4 12.5	UCT					U1	141.0			2762		
7'0"	8'6" 9'0"	U1½s 3, 4		13.3 13.7												
			BOREHOLE COMPLETED													Water table not encountered

REMARKS:

Sample	Depth	M.C. % D.W.	S.G.	C. B. R. Air Voids	Type	TOP 0.1	TOP 0.2	BOTTOM

British Geological Survey


MD ft, RKB
Four Oak #1 Evergreen, 2000
KB (RT) = 11' above Ground Level (GL), 86' AOD
GL = 75' above Ordnance datum (AOD)
25' MDRKB
Top Unweathered Bunter Sandstone
Sst: Rd – orng occ wh, vfg – mg occ gravel, sub rnd – sub ang, sil cmt, occ lse, occ mod hd
Siltst: Rd-brn, mod frm, non-calc
588' MDRKB
Top Manchester Marl
737' MDRKB
Top Collyhurst Sandstone
Sst: with high clay content
1000'
Sst: Rd brn, fg – vcg, sub-rnd, sil cmt, mod hd
1300' MDRKB
Top Carboniferous
1380' MDRKB
Ardwick Limestone Mbr
Mdst - Siltst: grey – purple, sandy in parts
Lst: grey, thin bedded, "Spirorbis", lacustrine origin, bitumen or oil stain
1479' MDRKB
Top Etruria Fm.
Clyst: vari-coloured, pl grn gy – dk gy, occ rd, blky, occ calc
Siltst: Brn - rd, frm - hd, occ calc, carb
Lst: Wh – pl crm, sft – frm
Sst: Wh – brn, vfg – vcg, sub rnd – sub ang, sil cmt, carb
Top Coal Measures
1937' MDRKB
M
Prestwich Top Marine Band
2000'
Clyst: Lt gy – dk gy, occ purple-brn, mod frm – hd, occ calc, tr carb, occ pyr, grds to sst
2142' MDRKB
M
L Sankey Marine Band
Siltst: Lt gy – dk gy, grn-gy, occ purple-brn, mod frm – hd, occ calc, tr carb, grds to sst
2432' MDRKB
M
Dukinfield Marine Band
Sst: Pl – med gy, wh – brn, vfg – fg, sub ang – sub rnd, occ sil cmt, sft – v hd
Coal: Blk, shiny – vitreous, sft – hd, tr pyr
2706' MDRKB
Top London Delph Seam
2735' MDRKB
Top Crombouke Seam
2806' MDRKB
Top St Helens Yard Seam
2937' MDRKB
Top Ince 6 Feet Seam
3000'
3069' MDRKB
Top Higher Florida Seam (Target)
3116' MDRKB
Top Pigeon House Seam
3213' MDRKB
Top Sutton Manor Seam
3323' MDRKB
Top Wigan 4 Feet Seam
3371' MDRKB
Top Wigan 5 Feet Seam
3629' MDRKB
Top Plodder Seam
TD 3991' MDRKB
L. Triassic
U. P
L. Permian
Upper Carboniferous (Silesian)
Scythian
Kungurian
Westphalian D
Westphalian C
Westphalian B
Westphalian A
Formation
Hal'o.
Etruria
Upr CM
Middle Coal Measures
Lower Coal Measures
Group
Warwickshire G
Pennine Coal Measures Group
British Geological Survey

Version 2.0.6.7

BGS ID: 168924 : BGS Reference: SJ58SE9
British National Grid (27700) : 359950,384950
Report an issue with this borehole

<< < Prev Page 1 of 6 Next > >>

(N° 6)

WELL BORING at Sir Gilbert Greenall Walton Hall near WARRINGTON

County Cheshire Lancs 115SE.

Geol. map 1 in. map New Series 97 6 in. map 165E.

Made by Messrs J. Matthews & Co. Date 1904

165E 1

Sunk - feet. - Bored - feet.

Communicated by Messrs J. Matthews & Co. Pendleton. Manchester.

Height above Ordnance Datum Rock level at mouth

Yield -

Quality (with copy of analysis on separate sheet) -

SJ 58 SE 9

NGR 5995 8495

GEOLOGICAL FORMATION.	NATURE OF STRATA.	THICKNESS. Feet.	THICKNESS. Inches.	DEPTH. Feet.	DEPTH. Inches.
	Surface soil, &c.	9	0	9	0
	Marl	10	6	19	6
	Shale	9	6	29	0
	Red sandstone	94	0	123	0

Sunk in Yard behind Hall for supply Gardens, &c.

	Metres.		
2	74	2	74
3	20	5	94
2	90	8	84
28	65	37	49

GEOLOGICAL SURVEY AND MUSEUM
JERMYN STREET, LONDON S.W. 1.

(B10619). Wt. 15824—S123. 2500. 11/25. Gp. 160. O.A.

BLACK JANE FARM, NEWTON
-OLD BOREHOLE

SJ 58/ 40 A

Owner		Licence No.	Nat. Grid Ref. SJ 5979 8082
Occupier		IGS Ref. No. SJ58SE 4	Status BOREHOLE/WELL - LOST.
Ground Level	m OD 225	ft. OD	Aquifer MERCIA MUDSTONES.
Level of Well Top	m OD	ft. OD	
Rest Water Level	m bwt	ft. bwt	
(Date)	m OD	ft. OD.	

Construction

Depth bwt	Dia.	Linings (below well top) From	To	Dia.	Type

Abstraction Rates	Type of Pump
gph	Chem./Bact. Anal. YES NO
gpd	Well Driller

If insufficient space has been allowed, continue in 'Notes' overleaf

Summary of Geological Section	Thickness	Depth
Kemper marl-chocolate to coloured with bands of sandstone		36' 10.97m

BH LOG AVAILABLE

'Good' supply of hard water

Name of site

BLACK JANE FARM ABH.

W R B No.

SJ58/40B.

Owner		Licence no. Appn no. CW 2831 Cancelled	Nat. grid ref. SJ 5966 8083
Occupier		IGS ref. no.	Status BOREHOLE - LICENSED.
Ground Level	m OD	ft. OD	Aquifer MERCIA MUDSTONES?
Level of well top	m OD	ft. OD	Code BDT ZZ.
Rest water level 13.6m.	m bwt	ft. bwt	
(Date)	m OD	ft. OD	
Construction: Method		Date Oct '89	

Depth bwt	Dia.	Linings (below well top) From	To	Dia.	Type
GL-100m	7"	GL	80'	7"	Steel

Abstraction rates	Type of pump
gph PWL	Chem./bact. anal. YES/NO
gpd	Well driller J.P. WHITTER.

If insufficient space has been allowed, continue in 'Notes' overleaf

Summary of geological section	Thickness	Depth
Top Soil		0.91m.
Stiff brown CLAY		6.66
"CLAY + sand & boulders - MM?		20.90
Deep red SANDSTONE - MM? KW?		100.00.
BOREHOLE LOG AVAILABLE.		

Lockie 162

British Geological Survey

[redacted]

CONTRACT. LANCASHIRE YORKSHIRE MOTORWAY M62

LOCATION. TARBOCK TO CROFT (Site 13) BH No 8117

SHEET No. 1

No. of sheets 1

CLIENT. SJ 59 SW/113

5114.9009.

MINISTRY OF TRANSPORT

PERCUSSION U D

S.P.T.

B

ROTARY Cored runs

O/H

Casing. Size to. Size to.

Hand Auger

Ground level. 184.05

Commenced. 7/3/68

Completed. 7/3/68

Weather. FINE

STRATUM (Scale: ½ inch to 1 foot) 1 Thickness	Depth 2	Sample No. 3	S.P.T. Blow Count (N) LL/PL/PI 4	5 LEGEND	M.C. % Core Rec. % 6	Type of Test 7	GRADING % PASSING SIEVE 3" N.7	1½" 25	¾" 52	⅜" 100	⅛" 200	T.A.Q. or U.C.T. Bulk Density p.c.f. Shear /o° p.s.f.	Dev. Stress p.s.i.	Lat. Pres. p.s.i.	U.C.T. Stren. p.s.f. Shear/L° p.s.f.	8 RESULTS OF ANY OTHER TESTS 9	WATER REMARKS 10
Top soil 2'0"	2'0"	N1			23.4												
Stiff brown sandy stony clay	4'6"	U1½s 1,2,3			20.6 18.1 16.5	UCT						U3 130.5			3002		
7'0"	8'6" 9'0"	U1½s 4,5,6			20.6 21.2 17.8												
				BOREHOLE COMPLETED													Water table not encountered

REMARKS:

Sample	Depth	M.C. % D.W.	S.G.	C. B. R. Air Voids	Type	TOP 0.1	TOP 0.2	BOTTOM 0.1	BOTTOM 0.2	Value	COMPACTION B.S. 1377 No	Max. Dry Density	Optr M.C

British Geological Survey

SHELL AND AUGER BORING DAILY REPORT

SJ 68 SW 12.

Site Location: Bringewood Reservoir / Woodstock

Initial diameter of borehole: 15"

Depth of casing (at completion of B.H. or end of shift): 12" to ..... 10" to .....
8" to ..... 6" to .....

STRATA RECORD

Depth at start	
0.00	Top Soil.
0.35	Reddish Brown & Grey Clay
0.90	Grey & Soft Layers of Red Marl
	Weak Rock Head at 2.10.
2.50	

Depth at finish

UNDISTURBED SAMPLES:

Sample depth (top)	0.35		2.00					
No. of blows	2		3	4 25				
Length of sample	5		5					
Casing depth								

PENETRATION TESTS:

Starting depth									
Blows per 3"	1	2							
	3	4							
	5	6							
Casing depth									
Cone or spoon									

DISTURBED SAMPLES (Bulk; Small Jar; Water)

Depth	0.90	1.25	2.40					
Type	J	J	J					

DISTURBED SAMPLES (continued)

Depth								
Type								

Water Levels:

	Water level	Casing depth		Water level	Casing depth
(a) Morning			(c) After lunch		
(b) Before lunch			(d) Evening		
			(e) On pulling casing		

REMARKS (Including explanation of standing time and visits by non Central Laboratory Staff)

Difficulty in Boring Off Water in Bh 2005.

At what levels was water encountered? None

Did the level rise?

If so, how much and how fast?

Water added to assist boring? Yes

If so, at what depths? 0.30 2.10.

At what depths was water cut off by casing?

If standpipe inserted, to what depth?

TIME SPENT:

Total (this sheet)	5	hrs.	Boring	2½ hrs.
Moving (including pulling casing) from BH	2005	to BH	2006	½ hrs.
Chiselling between		and		hrs.
Chiselling between		and		hrs.
Chiselling between		and		hrs.

Standing times (i) hrs. (ii) hrs. (iii) hrs.

NOTE: If more than one water level is encountered give details of them all.

Rig No. 24L Vehicle No. Ford [illegible]

Ganger [illegible]

Crew [illegible]

Crew [illegible]

Date [illegible] Date [illegible] BH No. 2000

N.W.N.A. Central.

ACCN NO! - 400

SJ68SW 64 60072-84588

WARRINGTON

WALTON HALL GOLF COURSE

~~SJ68/85~~.

97 ~~SJ68SW~~

Owner		Licence no. / Appn no. / Cancelled / IGS ref. no.	
Occupier	W. B. Council		
Ground level	37.434 m OD	~~ft OD~~	
Level of well top	38.214 m OD	~~ft OD~~	
Rest water level	m bwt	ft. bwt	
(Date 28.01.88)	37.424 m OD	~~ft OD~~	
Construction: Method		Date	

Depth bwt	Dia.	Linings (below well top) From	To	Dia.	Type

Abstraction rates	Type of pump NA
NA gph PWL	Chem./bact. anal. YES/NO
NA gpd	Well driller

If insufficient space has been allowed, continue in 'Notes' overleaf. P.T.O

Nat. grid ref. ~~SJ 60072~~, 84588

Status DISUSED WELL

Aquifer HELSBY SSTN. Fm. (KEUPER S. STN) ?

Code

Summary of geological section	Thickness	Depth
Red-Brown Stony CLAY Till	1.5 (VERY APPROX) M. JWR Dec 92	?
TARPORLEY SILTSTONE Fm. (WS)		?
HELSBY SANDSTN Fm. (KS)		?

1/5/79/207

RECEIVED N.G.D.C.
DATE: 08/03/89
SIG:

British Geological Survey

RECORD OF BOREHOLE 2006

Ground level: 57.65m. Above O.D. Dia. of boring: 0.15m.

Method of boring: Shell and Auger Lining tubes: 0.15m. to 2.50m.

Daily Progress	Samples Depth m	Samples Type	Change of Strata Legend	Change of Strata Depth m	Change of Strata O.D. Level	Description of Strata
				0.35	57.30	TOPSOIL
	0.50-0.95	U (4)				Firm mottled brown and grey sandy silty CLAY with occasional fine to coarse gravel.
	0.95	D		0.95	56.70	
	1.25	D				Weathered weakly cemented laminated red-brown shaly micaceous SILTSTONE and fine grained SANDSTONE.
	2.00-2.25	U (4)*		2.10	55.55	
9.3.74.	2.25	D				Weakly cemented laminated red-brown micaceous shaly SILTSTONE and fine grained SANDSTONE.
	2.70-3.00	BD				
11.3.74.	3.00-3.05	C (50)⊕		3.00	54.65	

Key to type of sample:

- **U(4)** — 102mm (4in.) dia. undisturbed sample
- **D** — disturbed sample
- **BD** — bulk disturbed sample
- **V** — vane test
- **S ( )** — standard penetration test
- **C ( )** — dynamic cone penetration test

Figure in brackets is No. of blows for penetration given in depth column (see Notes, page 1).

Remarks: (Observations on ground-water, etc.)

Ground-water was not encountered during boring.

*Full penetration of sampler not attained.

⊕ Seating blows only.

Lab. Ref. No. S/ 10509

WARRINGTON - BRIDGEWATER DISTRICT 1.

FIG. 11.

APPENDIX B
BOREHOLE RECORDS FOR N2 PIPELINE

Version 2.0.6.7

BGS ID: 172963 : BGS Reference: SJ59SW3
British National Grid (27700) : 350980,391000
Report an issue with this borehole

<< < Prev Page 1 of 1 Next > >>

SJ 59 SW 3

GEOLOGICAL SURVEY AND MUSEUM. BOREHOLES AND SHAFTS.

NGR 5098 9100

BORE ~~or SHAFT~~ Borehole A of Sutton Manor Collieries ~~Works~~ Brook Works

County Lancs

6-in. Map 108SW

GSM 108SW 1.

BROOK WORKS, MICKLEHEAD GREEN.

Surface level 180 ft. O.D. One-inch Map 97 ST HELENS.

Communicated 24 June 1935 by Sutton Manor Collieries

Date of sinking 1897 Borer A. Timmis & Co

Specimens Bore for water

Description.	THICKNESS. Feet.	THICKNESS. Inches.	DEPTH. Feet.	DEPTH. Inches.
Surface				
Red clay	40	6	40	6
Grit & sand	1	6	42	-
Red clay	6	-	48	-
Grit & sand	4	-	52	-
Blue shale	69	-	121	-
Grey stone	10	6	131	6
Grey shale	2	6	134	-
Coarse grit	2	-	136	-
Grey grit	20	-	156	-
Dark grit	3	-	159	-
Stone grit	11	-	170	-
Shale	-	6	170	6
Grit	2	-	172	6
Grey marl	21	6	194	-
Dark shale	2	-	196	-
Blue shale	2	6	198	6
Grey shale	8	6	207	-
Light shale	10	-	217	-
Black shale	2	-	219	-
Coal	2	-	221	-
Shale	1	-	222	-
Coal	1	-	223	-
Grey shale	18	-	241	-
Light shale	25	-	266	-
Rock	2	-	268	-
Limestone	3	-	271	-
Grey rock	12	-	283	-
Red gritstone.	5	-	288	-

Thickness metric		Thickness	
12	34	12	34
0	46	12	80
1	83	14	63
1	22	15	85
21	03	36	88
3	20	40	08
0	76	40	84
0	61	41	45
6	10	47	55
0	91	48	46
3	35	51	81
0	15	51	96
0	61	52	57
6	55	59	12
0	61	59	73
0	76	60	49
2	59	63	08
3	05	66	13
0	61	66	74
0	61	67	35
0	31	67	66
0	31	67	97
5	49	73	46
7	62	81	08
0	61	81	69
0	91	82	60
3	66	86	26
1	52	87	78

(B12860) Wt. 13119—0014 5000 9/27 Gp. 160 O.A.

CONTRACT. LANCASHIRE YORKSHIRE MOTORWAY M62 | SHEET No. 1

LOCATION. TARBOCK TO CROFT (Site 13) BH No 8117 | No. of sheets 1

CLIENT. SJ 59 SW/113 5114.9009. MINISTRY OF TRANSPORT

PERCUSSION U D | S.P.T. | B

Casing. Size to. Size to. Hand Auger

Ground level. 184.05

Commenced. 7/3/68

Completed. 7/3/68

Weather. FINE

ROTARY Cored runs | O/H

5 LEGEND

STRATUM (Scale: ½ inch to 1 foot) 1 Thickness	Depth 2	Sample No. 3	S.P.T. Blow Count (N) LL/PL/PI 4	M.C. % Core Rec. % 6	Type of Test 7	GRADING % PASSING SIEVE 3" N.7	1½" 25	¾" 52	⅜" 100	#14 200	TAQ. or U.C.T. Bulk Density p.c.f. Shear /o° p.s.f.	Dev. Stress p.s.i.	Lat. Pres. p.s.i. U.C.T. Stren. p.s.f. Shear/L° p.s.f.	WATER REMARKS 10
						8 RESULTS OF ANY OTHER TESTS								9
Top soil 2'0"	2'0"	M1		23.4										
Stiff brown sandy stony clay	4'6"	U1½s 1,2,3		20.6 18.1 16.5	UCT						U3 130.5		3002	
	8'6"	U1½s		20.6										
7'0"	9'0"	4,5,6		21.2										
				17.8										
			BOREHOLE COMPLETED											Water table not encountered

REMARKS:

Sample	Depth	M.C. % D.W.	S.G.	C. B. R. Air Voids	Type	TOP 0.1	TOP 0.2	BOTTOM 0.1	BOTTOM 0.2	Value	COMPACTION B.S. 1377 No	Max. Dry Density	Optr M.C

British Geological Survey

SJ 59 SW 187

SUB SOIL SURVEYS LTD
MANCHESTER

BOREHOLE No. 2
Ref:-

EXPLORATORY BORING RECORD

SITE St. Helens 5119 9007 Site Ref:- 73/03

Boring Method Shell Ground Level O.D.

DATE	DEPTH OF CASING BELOW G.L. (m)	WATER LEVEL MORNING & EVENING	DEPTH OF STRATA BELOW G.L.	STRATA (APPROX. SCALE)	NO. OF SAMP	TYPE OF SAMP	PENETRATION OF SAMPLER OR CORE BARREL (metres) FROM	TO	NO. OF BLOWS	CORE RECOVERY
26.6.73	0"		0.6	Sandy Topsoil	1	D	1.1			
					2	D	2.0			
				Stiff light brown sandy clay with stone inclusions	3	W	2.5			
					4	D	3.1			
					5	D	4.2			
			2.8		6	D	5.0			
					7	D	6.2			
					8	D	7.1			
				Stiff and very stiff brown clay with stone inclusions	9	D	8.3			
26.6.73	4.5	Dry			10	D	9.1			
27.6.73		Dry			11	D	10.0			
					12	D	11.2			
					13	D	12.0			
					14	D	13.2			
					15	D	14.3			
					15	W	15.4			
					17	D	16.3			
					18	D	17.0	17.2	0 94	
27.6.73	4.5	Dry								
28.6.73		10.6	15.0							
				Very stiff/hard brown sandy clay with stone inclusions						
			16.6							
				Lightly cemented red brown fine grained slightly micaceous sandstone with thin bands of marl						
28.6.73	4.5	13.2	17.2							

Samples shown thus: Disturbed D. Undisturbed U. Standard Pen. Test X. Water W. Bulk B.

WATER OBSERVED AT THE FOLLOWING DEPTHS * - overnight seepage	DEPTH OF CASING WHEN SEALED (N.S. – NOT SEALED)	ESTIMATED SEEPAGE	WATER ADDED AT FOLLOWING DEPTHS TO ASSIST BORING
1. 2.5	4.0	medium	
2.			
3.			
4.			
5.			
6.			

WATER LEVEL IN CASED / UNCASED BOREHOLE ON COMPLETION

DATE	WATER LEVEL	DEPTH OF CASING

DIA. OF CASING ____ m.m. to depth of ____ metres
____ m.m. to depth of ____ metres
____ m.m. to depth of ____ metres

REMARKS:

i) Waiting for engineer to confirm position of borehole (peg removed) 2 hrs

ii) Time spent chiselling – 4½ hours

SJ 58 NW 1/29

L SURVEYS LTD
HESTER

BOREHOLE No. 4 contd...
Ref:-

PROVISIONAL BORING RECORD

SITE St. Helens Site Ref :- 73/83

Boring Method Rotary Ground Level ____ O.D.

DATE	DEPTH OF CASING BELOW G.L. (m)	WATER LEVEL MORNING & EVENING	DEPTH OF STRATA BELOW G.L.	STRATA APPROX. SCALE	NO. OF SAMP	TYPE OF SAMP	PENETRATION OF SAMPLER OR CORE BARREL (metres) FROM	TO	NO. OF BLOWS	CORE RECOVERY
2.5.73			11.0	Hard red bunter sandstone with pebble inclusions			14.6	17.4		2.1
							17.4	20.2		2.8
							20.2	23.0		2.2
							23.0	26.1		2.3
							26.1	29.2		2.5
2.5.73	11.0		14.6				29.2	30.5		NR
3.5.73				Hard red bunter sandstone with pebble incls. & Occ small soft red marl fissures						
3.5.73	11.0		30.5							

Samples shown thus: Disturbed D. Undisturbed U. Standard Pen. Test X. Water W. Bulk B.

WATER OBSERVED AT THE FOLLOWING DEPTHS *-overnight seepage	DEPTH OF CASING WHEN SEALED (N.S. – NOT SEALED)	ESTIMATED SEEPAGE	WATER ADDED AT FOLLOWING DEPTHS TO ASSIST BORING	WATER LEVEL IN CASED / UNCASED BOREHOLE ON COMPLETION		
				DATE	WATER LEVEL	DEPTH OF CASING
1.						
2.						
3.						

Undisturbed U. Standard Pen. Test X. Water W. Bulk B.

AT THE FOLLOWING DEPTHS * - overnight seepage	DEPTH OF CASING WHEN SEALED (N.S. – NOT SEALED)	ESTIMATED SEEPAGE	WATER ADDED AT FOLLOWING DEPTHS TO ASSIST BORING	WATER LEVEL IN CASED / UNCASED BOREHOLE ON COMPLETION		
				DATE	WATER LEVEL	DEPTH OF CASING
1.						
2.						
3.						
4.						
5.						
6.			DIA. OF CASING ____ m.m. to depth			

SJ 5 8 NW 129

... SURVEYS LTD
...ESTER

SJ 5111 8975 BOREHOLE No. 4
Ref:-

PROVISIONAL BORING RECORD

SITE St. Helens Site Ref :- 73/83

Boring Method Rotary Ground Level ____ O.D.

DATE	DEPTH OF CASING BELOW G.L. (m)	WATER LEVEL MORNING & EVENING	DEPTH OF STRATA BELOW G.L.	STRATA APPROX. SCALE	NO. OF SAMP	TYPE OF SAMP	PENETRATION OF SAMPLER OR CORE BARREL (metres) FROM	TO	NO. OF BLOWS	CORE RECOVERY
1.5.73	H		0.5	Topsoil						
				Clay with frequent pockets and bands of sand						
1.5.73	9.15		9.15							
2.5.73				Clay with bands & pockets of sand with pebble & cobble inclusions			11.0	11.5		0.5
							11.5	14.6		3.1
			11.0							

contd.....

Samples shown thus: Disturbed D. Undisturbed U. Standard Pen. Test X. Water W. Bulk B.

WATER OBSERVED AT THE FOLLOWING DEPTHS - overnight seepage	DEPTH OF CASING WHEN SEALED (N.S. – NOT SEALED)	ESTIMATED SEEPAGE	WATER ADDED AT FOLLOWING DEPTHS TO ASSIST BORING	WATER LEVEL IN CASED / UNCASED BOREHOLE ON COMPLETION		
				DATE	WATER LEVEL	DEPTH OF CASING

Samples shown thus: Disturbed D. Undisturbed U. Standard Pen. Test X. Water W. Bulk B.

WATER OBSERVED AT THE FOLLOWING DEPTHS - overnight seepage	DEPTH OF CASING WHEN SEALED (N.S. – NOT SEALED)	ESTIMATED SEEPAGE	WATER ADDED AT FOLLOWING DEPTHS TO ASSIST BORING	WATER LEVEL IN CASED / UNCASED BOREHOLE ON COMPLETION		
				DATE	WATER LEVEL	DEPTH OF CASING
1.						
2.						
3.						
4.						
5.						
6.						

REMARKS:

DIA. OF CASING ____ m.m. to depth of

SJ 59 SW 196

SUB SOIL SURVEYS LTD
MANCHESTER

BOREHOLE No. 1
Ref:-

PROVISIONAL BORING RECORD

SITE St. Helens 5140 9023 Site Ref :- 73/83

Boring Method Shell Ground Level ____ O.D.

DATE	DEPTH OF CASING BELOW G.L. (m)	WATER LEVEL MORNING & EVENING	DEPTH OF STRATA BELOW G.L.	STRATA (APPROX. SCALE)	NO. OF SAMP	TYPE OF SAMP	PENETRATION OF SAMPLER OR CORE BARREL (metres) FROM	TO	NO. OF BLOWS	CORE RECOVERY
7.6.73	8"		0.6	Clayey topsoil						
			1.2	Firm brown and grey sandy clay with lenses of sand	1A	D	1.0			
					2A	D	1.4			
				Stiff brown sandy clay with stone inclusions	3A	D	2.3			
					4A	D	3.0			
			2.8		5A	D	4.1			
					6A	D	5.2			
					7A	D	5.2			
				Stiff/very stiff brown sandy clay with stone inclusions	8A	D	6.3			
7.6.73	1.0	Dry			9A	D	7.2			
8.6.73		1.6			10A	D	8.4			
					11A	D	9.3			
					1	D	7.0			
					2	D	8.0			
					3	D	9.0			
					4	D	10.0			
					5	D	11.0			
					6	D	12.0			
					7	D	13.0			
8.6.73	2.5	1.6			8	D	14.0			
11.6.73		1.3			9	D	14.5			
11.6.73	2.5	1.3			10	D	15.5			
12.6.73		1.5	14.5		11	D	16.5			
				Stiff brown laminated clay	12	D	17.5			
			15.5		13	D	18.5			
12.6.73	9.0	NIL			14	D	19.5			
13.6.73		NIL		Hard brown sandy clay with stone inclusions	15	D	20.5			
			22.0		16	D	21.5			
13.6.73	22.0	6.0	22.5	Sand and gravel	17	D	22.0			

Samples shown thus: Disturbed D. Undisturbed U. Standard Pen. Test X. Water W. Bulk B.

WATER OBSERVED AT THE FOLLOWING DEPTHS *-overnight seepage	DEPTH OF CASING WHEN SEALED (N.S. – NOT SEALED)	ESTIMATED SEEPAGE	WATER ADDED AT FOLLOWING DEPTHS TO ASSIST BORING	WATER LEVEL IN CASED / UNCASED BOREHOLE ON COMPLETION		
				DATE	WATER LEVEL	DEPTH OF CASING
1. 1.6*	8.0	slow				
2. 22.0	N.S	slow				
3.						
4.			DIA. OF CASING	____ m.m. to depth of ____ metres		
5.				____ m.m. to depth of ____ metres		
6.				____ m.m. to depth of ____ metres		

REMARKS: 'This is a copy of drillers daily logs. It will require modification when all disturbed and undisturbed samples have been inspected by our qualified soils engineers'.

Standing waiting to see Engineer regarding next B.H. position 4 hours

Jars 1A – 11A only examined. Remainder at Roughdales Brick Works

Norwest Holst Soil Engineering Ltd.

Borehole No. G8

BOREHOLE LOG

Contract No. F5795
Location Elton Head, St. Helens
Client N.C.B.
Method of Boring Percussion
Diameter of Borehole 150 mm

49944. 92153
SJ49SE 139

Sheet 1 of 1
Co-ords E349948 N392064
Ground Level 164.60 m.A.O.D.
Date 25/11/83

Description of Strata	Legend	Depth Below G.L.(m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	"N"/ R.Q.D.%	Daily Progress
TOPSOIL: Soft black to grey peaty clay.		0.50	164.10				
Firm to stiff brown sandy CLAY.		0.85	163.75		0.50 (140)	-	
Red-brown moderately to highly weathered medium grained SANDSTONE weak to very weak.		2.00	162.60	1.60	1.00 S	50for 15mm	
Red-brown moderately weathered medium grained SANDSTONE, weak.		3.00	161.60		2.00 S	50* for 100mm	
					3.00 C	50* for 60mm	

Type of Sample

S	S.P.T.	■	Undisturbed
Ic.	C.P.T.	×	Vane
O	Jar	Δ	Water
●	Bulk		Piezometer

Remarks (Observations of Ground Water etc.)

( ) U100 Blow Count.
*Seating blows only.
Groudwatre not encountered during boring.
Water added to assist boring 2.00 m to 3.00 m.
Chiselling from 2.00 m to 3.00 m - 1½ hrs.

British Geological Survey

Norwest Holst Soil Engineering Ltd.

Borehole No. G11

BOREHOLE LOG

Contract No. F5795
Location Elton Head, St. Helens
Client N.C.B.
Method of Boring Percussion
Diameter of Borehole 150 mm

SJ49SE 142 Co-ords E349846 N392329
49790 92359
Ground Level 173.75 m.A.O.D.
Date 24/11/83
Sheet 1 of 1

Description of Strata	Legend	Depth Below G.L.(m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	"N"/ R.Q.D.%	Daily Progress
TOPSOIL: Soft very peaty clay with occasional sand and gravel.		0.50	173.25		0.50		
Soft to firm brown very sandy gravelly CLAY.		0.90	172.85		(14)	-	
		1.30	172.45	1.50	1.00	71for 150mm	
Red-brown moderately to highly weathered medium grained SANDSTONE, weak to very weak.					2.00	50* for 100mm	
Red-brown moderately weathered medium grained SANDSTONE, weak.		3.00	170.75		3.00	50* for 25mm	

Type of Sample

Is S.P.T. ■ Undisturbed
Ic. C.P.T. × Vane
O Jar Δ Water
● Bulk ▓ Piezometer

Remarks (Observations of Ground Water etc.) ( ) U100 Blow Count.

*Seating blows only.
Groundwater not encountered during boring.
Water added to assist boring, 1.30 m to 3.00 m.
Chiselling from 2.00 m to 3.10 m, 1½ hrs.

British Geological Survey

Norwest Holst Soil Engineering Ltd.

Borehole No. G7

BOREHOLE LOG

Contract No. F5795
Location Elton Head, St. Helens
Client N.C.B.
Method of Boring Percussion
Diameter of Borehole 150 mm

49829 92029
SJ49SE 138

Sheet 1 of 1
Co-ords E349822 N392015
Ground Level 163.90 m.A.O.D.
Date 28/11/83

Description of Strata	Legend	Depth Below G.L.(m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	"N"/ R.Q.D.%	Daily Progress
TOPSOIL: Soft to firm brown silty clay with occasional gravel.		0.35	163.55		0.50 (67)	-	
Firm light brown gravelly sandy CLAY with traces of organic material, very silty in parts.		1.90	162.00	2.00	1.50 (131)		
Red-brown moderately to highly weathered fine to medium grained SANDSTONE, very weak to weak.		3.30	160.60		2.00 S 3.30 S	82for 150mm 50* for 100mm	
Red-brown moderately weathered medium grained SANDSTONE, weak.		4.50	159.40		4.30 S	50* for 45mm	

Type of Sample

Is	S.P.T.	▮	Undisturbed
Ic.	C.P.T.	×	Vane
O	Jar	Δ	Water
●	Bulk		Piezometer

Remarks (Observations of Ground Water etc.)( ) U100 blow count.
*Seating blows only.
Groundwater not encountered during boring.
Chiselling from 3.30 m to 4.50 m, 2 hours.
Water added to assist boring.

Water levels are subject to seasonal or tidal variations and should not be taken as constant

British Geological Survey

Norwest Holst Soil Engineering Ltd.

Borehole No. G8

BOREHOLE LOG

Contract No. E5795
Location Elton Head, St. Helens
Client N.C.B.
Method of Boring Percussion
Diameter of Borehole 150 mm

49944. 92153
SJ49SE 139

Sheet 1 of 1
Co-ords E349948 N392064
Ground Level 164.60 m.A.O.D.
Date 25/11/83

Description of Strata	Legend	Depth Below G.L.(m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	"N"/ R.Q.D.%	Daily Progress
TOPSOIL: Soft black to grey peaty clay.		0.50	164.10				
Firm to stiff brown sandy CLAY.		0.85	163.75		0.50 (140)	-	
Red-brown moderately to highly weathered medium grained SANDSTONE weak to very weak.		2.00	162.60	1.60	1.00 S	50for 15mm	
Red-brown moderately weathered medium grained SANDSTONE, weak.		3.00	161.60		2.00 S	50* for 100mm	
					3.00 C	50* for 60mm	

Type of Sample

- Is S.P.T.
- Undisturbed
- Ic. C.P.T.
- × Vane
- O Jar
- Δ Water
- ● Bulk
- Piezometer

Remarks (Observations of Ground Water etc.)

( ) U100 Blow Count.
*Seating blows only.
Groudwatre not encountered during boring.
Water added to assist boring 2.00 m to 3.00 m.
Chiselling from 2.00 m to 3.00 m - 1½ hrs.

British Geological Survey

Norwest Holst Soil Engineering Ltd.

Borehole No. G11

BOREHOLE LOG

Contract No. F5795
Location Elton Head, St. Helens
Client N.C.B.
Method of Boring Percussion
Diameter of Borehole 150 mm

SJ49SE 142 Co-ords E349846 N392329
49790 92359
Ground Level 173.75 m.A.O.D.
Date 24/11/83
Sheet 1 of 1

Description of Strata	Legend	Depth Below G.L.(m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	"N"/ R.Q.D.%	Daily Progress
TOPSOIL: Soft very peaty clay with occasional sand and gravel.		0.50	173.25		0.50		
Soft to firm brown very sandy gravelly CLAY.		0.90	172.85		(14)	-	
		1.30	172.45	1.50	1.00	71for 150mm	
Red-brown moderately to highly weathered medium grained SANDSTONE, weak to very weak.					2.00	50* for 100mm	
Red-brown moderately weathered medium grained SANDSTONE, weak.		3.00	170.75		3.00	50* for 25mm	

Type of Sample

Is S.P.T. ■ Undisturbed
Ic. C.P.T. × Vane
O Jar Δ Water
● Bulk ▓ Piezometer

Remarks (Observations of Ground Water etc.) ( ) U100 Blow Count.

*Seating blows only.
Groundwater not encountered during boring.
Water added to assist boring, 1.30 m to 3.00 m.
Chiselling from 2.00 m to 3.10 m, 1½ hrs.

British Geological Survey

Norwest Holst Soil Engineering Ltd.

Borehole No. G12

BOREHOLE LOG

Contract No. F5785
Location Elton Head, St. Helens
Client N.C.B.
Method of Boring Percussion
Diameter of Borehole 150 mm

SJ49SE 143, 49846 92574. Co-ords E349904 N392608

Sheet 1 of 1
Ground Level 170.60 m.A.O.D.
Date 24/11/83

Description of Strata	Legend	Depth Below G.L. (m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	"N"/ R.Q.D.%	Daily Progress
TOPSOIL: Firm black clay, peaty slightly gravelly with occasional roots.		0.35	170.25				
Red-brown moderately to highly weathered medium grained SANDSTONE weak to very weak.		0.90	169.70		0.50	78for 125mm	
Red-brown moderately weathered medium grained SANDSTONE, weak.				2.00	2.00	79* for 125mm	
		3.00	167.60		3.00	50* for 45mm	

Type of Sample

- Is S.P.T.
- Ic. C.P.T.
- O Jar
- ● Bulk
- ■ Undisturbed
- × Vane
- Δ Water
- Piezometer

Remarks (Observations of Ground Water etc.)

*Seating blows only.
Groundwater not encountered during boring.
Water added to assist boring from 2.00 m to 3.00 m.
Chiselling from 1.00 m to 3.00 m, 2 hours.

British Geological Survey

Norwest Holst Soil Engineering Ltd.

Borehole No. G4

BOREHOLE LOG

Contract No. E5795
Location Elton Head, St. Helens
Client N.C.B.
Method of Boring Percussion
Diameter of Borehole 150mm

SJ595W 221 Co-ords E350044 N391779
5004 0.91782

Sheet 1 of 1
Ground Level 162.00 m.A.O.D.
Date 24/11/83

Description of Strata	Legend	Depth Below G.L.(m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	"N"/ R.Q.D.%	Daily Progress
TOPSOIL; firm brown silty clay, slightly sandy with occasional roots.		0.50	161.50		0.50		
Stiff red-brown gravelly sandy CLAY, with some roots.		2.60	159.40		(67) 1.50 (100) 2.65	71 for 150mm	
Red-brown moderately to highly weathered medium grained SANDSTONE, weak.		4.65	157.35	3.00	3.50 4.50	50* for 100mm 50* for 90mm	

Type of Sample

Is S.P.T. ■ Undisturbed
Ic. C.P.T. × Vane
O Jar Δ Water
● Bulk ▓ Piezometer

Remarks (Observations of Ground Water etc.) ( ) U100 Blow Count.

*Seating blows only.
24/11/83 Groundwater not encountered during boring.
Water added to assist boring 2.95m to 4.50m.
Chiselling from 2.95m to 4.50m, 1½hrs.

SJ 59 SW 27

(B1657) Wt. 17862—8154—5,000 12/26 Gp. 160. O.A.

SECTION OF Trial borings for clay at Messrs Doultons field Sutton Heath St. Helens. 14

In a straight line NGR 5068 9295

Maps: One-inch 97 Six-inch 108 NW(W) County Lancs.

Height above O.D. about 230' (Nos 23-25) Latitude Longitude

Communicated by A. E. Marshall, Esq. Royal Doulton Potteries St. Helens. Date of Sinking

Made by Dip of Strata

From east to west in order.

	Thickness.			Depth from Surface.		
	Metres.			Metres.		
No. 27. 165 ft. from Col. Hughes fence [to East.]						
Rubbish	1.37	4	6	1.37	4	6
Brown shale	1.12	3	8	2.49	8	2
White clay	3.05	10	-	5.54	18	2
White stone	0.31	1	-	5.85	19	2
Rock	0.10		4	5.95	19	6
White stone	0.61	2	-	6.56	21	6
Rock	0.10		4	6.66	21	10
White stone	0.96	4	2	7.62	26	-
Shale		-	-			
No. 26. 56 ft. from No 27. 220 ft. from Col. Hughes' fence.						
Rubbish	2.90	9	6	2.90	9	6
Stone bed	0.10		4	3.00	9	10
Shale	6.10	20	-	9.10	29	10
Coal	0.76	2	6	9.86	32	4
Bass or dark clay	0.46	1	6	10.32	33	10
Clay	0.61	2'	+	10.93	35	10
No. 25. 56 ft. from No 27. 276 ft. from fence						
Rubbish	2.44	8	-	2.44	8	-
Shale	1.98	6	6	4.42	14	6
Coal	0.76	2	6	5.18	17	-
Bass	0.46	1	6	5.64	18	6
Clay	2.13	7	-	7.77	25	6
Coal	0.23		9	8.00	26	3
Clay	0.38	1	3	8.38	27	6
Bass	0.03		1	8.41	27	7

Norwest Holst Soil Engineering Ltd.

Borehole No. G1

BOREHOLE LOG

Contract No. F5795
Location Elton Head, St. Helens
Client N.C.B.
Method of Boring Percussion
Diameter of Borehole 150mm

SJ59SW/218 Co-ords E350355 N392532
503 46 92 58
Sheet 1 of 1
Ground Level 162.50 m.A.O.D.
Date 23/11/83

Description of Strata	Legend	Depth Below G.L.(m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	"N"/ R.Q.D.%	Daily Progress
MADE GROUND: Soft black very clayey peaty topsoil, red brick gravel and coal fragments in parts.		1.00	161.50		0.50	11	
Stiff yellowish-brown mottled CLAY with laminated mudstone fragments.		2.05	160.45		1.00 (100)		
Yellow-brown moderately to highly weathered SANDSTONE, very weak becoming weak with depth with clay partings.		4.20	158.30	3.00	2.00 (120) 2.50	86 for 110mm	
					3.50	50* for 90mm	
					4.20	50* for 60mm	

Type of Sample

Is	S.P.T.	■	Undisturbed
Ic.	C.P.T.	×	Vane
O	Jar	Δ	Water
●	Bulk		Piezometer

Remarks (Observations of Ground Water etc.) ( ) U100 Blow Count.

*Seating blows only.
Groundwater not encountered during boring.
Water added to assist boring from 3.60m to 4.20m.
Chiselling from 3.40m to 4.20m, 1½hrs.

British Geological Survey

Norwest Holst Soil Engineering Ltd.

Borehole No. G5

BOREHOLE LOG

Contract No. F5795
Location Elton Head, St. Helens
Client N.C.B.
Method of Boring Percussion
Diameter of Borehole 150mm

SJ49SE 136
49850 91729

Sheet 1 of 1
Co-ords E349841 N391756
Ground Level 161.65 m.A.O.D.
Date 25/11/83

Description of Strata	Legend	Depth Below G.L.(m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	"N"/ R.Q.D.%	Daily Progress
Soft to firm grey to black slightly sandy clayey TOPSOIL, with roots.		0.40	161.25				
Firm to stiff grey to red-brown gravelly sandy silty CLAY with occasional small pockets of sand.		2.80	160.85		0.50 (52) 1.50 (140) 2.50 (200)	-	
Red-brown moderately to highly weathered medium grained SANDSTONE, weak to very weak.		4.80	156.85		3.00 S 4.00 C	50* for 70mm 50* for 55mm	
Red-brown moderately weathered medium grained SANDSTONE, weak.		5.00	156.65		5.00 C	50* for 50mm	

Type of Sample

- Is S.P.T. — Undisturbed
- Ic. C.P.T. — Vane
- O Jar — Δ Water
- ● Bulk — Piezometer

Remarks (Observations of Ground Water etc.) ( ) U100 Blow Count.

*Seating blows only.
Groundwater not encountered during boring.
Water added to assist boring from 4.00m to 5.00m.
Chiselling from 4.00m to 5.00m, 1½hrs.

Water levels are subject to seasonal or tidal variations and should not be taken as constant

Norwest Holst Soil Engineering Ltd.

Borehole No. G12

BOREHOLE LOG

Contract No. F5795
Location Elton Head, St. Helens
Client N.C.B.
Method of Boring Percussion
Diameter of Borehole 150 mm

SJ49SE 143, 49846 92514. Co-ords E349904 N392608

Sheet 1 of 1
Ground Level 170.60 m.A.O.D.
Date 24/11/83

Description of Strata	Legend	Depth Below G.L.(m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	"N"/ R.Q.D.%	Daily Progress
TOPSOIL: Firm black clay, peaty slightly gravelly with occasional roots		0.35	170.25				
Red-brown moderately to highly weathered medium grained SANDSTONE weak to very weak.		0.90	169.70		0.50	78for 125mm	
Red-brown moderately weathered medium grained SANDSTONE, weak.				2.00	2.00	79* for 125mm	
		3.00	167.60		3.00	50* for 45mm	

Type of Sample

- Is S.P.T.
- Ic. C.P.T.
- O Jar
- ● Bulk
- ■ Undisturbed
- × Vane
- Δ Water
- Piezometer

Remarks (Observations of Ground Water etc.)

*Seating blows only.
Groundwater not encountered during boring.
Water added to assist boring from 2.00 m to 3.00 m.
Chiselling from 1.00 m to 3.00 m, 2 hours.

British Geological Survey

IGS 1972 (1933) 5000 5/75

Institute of Geological Sciences

RECORD OF SHAFT OR BOREHOLE

6-in or 1:10 000 Map Registration No.

SJ 59 SW/76

Name and Number of Shaft or Borehole:

P 25 BORE

National Grid Reference

SJ 5101 9427

For whom made Pilkington Bros

Town or Village St Helens *County* Lancs

Exact site (reference to a fixed point on 1-in or 1:50 000 Map)

Greengate Project

1-in or 1:50 000 New Series Map No.

84

Enter 'C' if Confidential

Purpose for which made

Ground level at shaft / bore *relative to O.D.* 41.50 *m. If not ground level give O.D. of beginning of* shaft / bore ____ *m.*

Made by ____ *Date of sinking* 1975

Information from K Wardell *Examined by* J I Chisholm

Specimen Numbers and Additional Notes

Spec. of burrowed sst at 15.70

Fossils EWJ 18-27

Geological Classification	Description of Strata	Thickness *metres*	Depth *metres*
No core to 15.35	Fill-mudstone, shale and coal	11.00	11.00
	Sst w. slt. stripes, pale grey	1.25	12.25
	Siltstone w. sst bands, grey/light grey, hard, sublaminated	3.10	15.35
	Sst w. slt bands, grey and pale grey, bioturbated throughout, Sharp base	0.81	16.16
	Mdst, grey, bedded	0.14	16.30
	Coal St Helens Yard	0.70	17.00
	Seatclay, grey with sphaerosiderite, passage base	2.00	19.00
	Mudstone, grey, planty with some roots	1.90	20.90
	Shale, black with coal laminae	0.20	21.10
	Mudstone, grey, planty	0.59	21.69
	Ironstone	0.06	21.75
	Sst, pale grey fine grained, ripple lam.d, passage base	1.43	23.18
		C/F	23.18

IGS 1428 (1533) 3000 8/75

Institute of Geological Sciences

Name and Number of Shaft or Borehole :

6-in or 1:10 000 Map Registration No.
SJ 59 SW/76

National Grid Reference

Page 2

Geological Classification	Description of Strata	Thickness *metres*	Depth *metres*
	Brought Forward		23.18
	Sst with striped sdy slt bands; all ripple-		
	lam.d and laminated, sparse burrows. Passage	0.62	23.80
	Siltst, grey, sdy, striped; passage base	2.20	25.00
	Mudst. grey striped & silty @ top: occ ironst.		
	bands.	5.70	30.70
	Cannel with fish debris	0.06	30.76
	Coal	0.14	30.90
	Seatclay, grey	0.20	31.10
	Coal New Mine	0.20	31.30
	Seatclay, grey	0.20	31.50
	Coal	0.50	32.00
	Seatearth, grey, silty & clay, passage base	1.40	33.40
	Siltstone, grey poorly bedd, planty; rare		
	sdy lam.d zones; passage base	3.20	36.60
	Slt. Sst, sdy, lam.d & ripple-lam.d.	3.70	39.30
	Sst., pale grey ripple lam.d,	0.60	39.90
	Slt. Sst as above; occ burrows and diffuse sid'c patches;		
	passage	4.60	44.50
	Mdst, grey with occ. silty bands	1.10	45.60
	Mdst, black, with abundant bivalves (SPECS)	0.30	45.90
	Mdst, grey, w. occ. bivalves	0.25	46.15
	Ironstone, silty, mottled	0.07	46.22
	Mdst, black w brown sideritic laminae and occ.		
	mussels	0.14	46.36
	Coal	0.03	46.39
	Seatearth, grey, mainly clay, some silt	1.01	47.40
	Coal Bottom Yard	0.80	48.20
	Shale, black, coaly, sdy laminae at base	0.10	48.30
	Seatearth grey, clay @ top, silty below, passage		
	base	2.00	50.30
	Silst., grey roughly bedd, planty; ironst		
	nodules and roots occasional	24.00	52.30
	Silst, grey, w. lam.d. sst bands	1.00	53.30
	Sst, pale grey fine grained, ripple lam.d. sharp		
	base	2.05	55.35
		C/F	55.35

British Geological Survey

IGS 1428 (1938) 3000 8/75

Institute of Geological Sciences

Name and Number of Shaft or Borehole :

6-in or 1:10 000 Map Registration No.
SJ 59 SW/76

National Grid Reference

Page 3

Geological Classification	Description of Strata	Thickness *metres*	Depth *metres*
	Brought Forward		55.35
	Siltst. grey, sdy, lam.d. & ripple-lam.d occ. burrows.	1.28	56.63
	Sst., pale grey, fine grained, ripple lam.d.	5.02	60.65

British Geological Survey

B.H. No. P28
Page 1

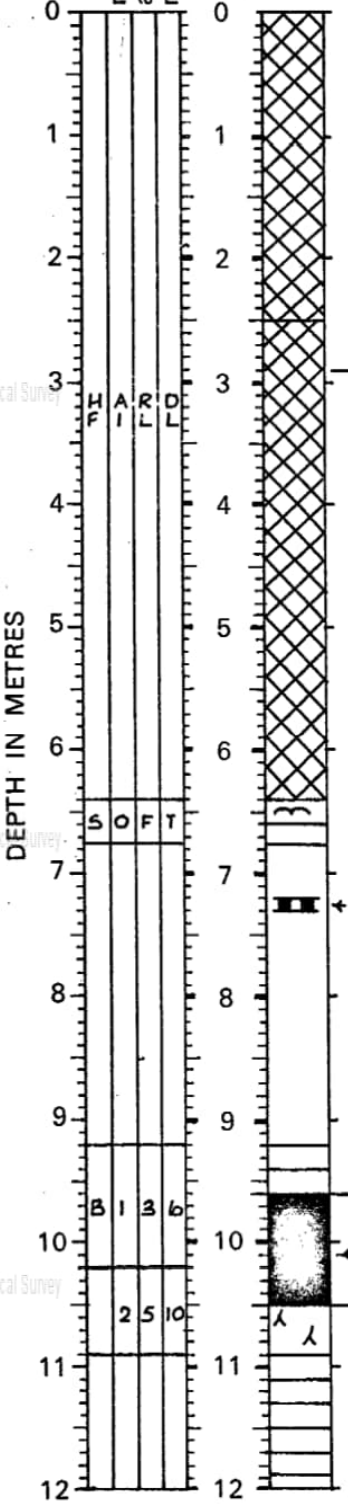
K. WARDELL & PARTNERS - LOG SHEET

SJ 59 SW 78

CLIENT: PILKINGTON BROTHERS LTD.

JOB: UK5 PROJECT GREENGATE JOB No. 3540/5

B.H. No. P28 HEIGHT A.O.D. 41·97 m. 5084 9429.



FILL, GREY, FIRM.

DRY CORE DRILLING.
DIAMOND DRILLING.

BRICK, FILL.

CLAY, RED-BROWN, FIRM,
MUDSTONE, GREY, FRIABLE, VERY WEATHERED.

← IRONSTONE BAND (5cm)

MUDSTONE, SILTY, GREY, VERY WEATHERED.

MUDSTONE, GREY, HARD, SUBLAMINATED.

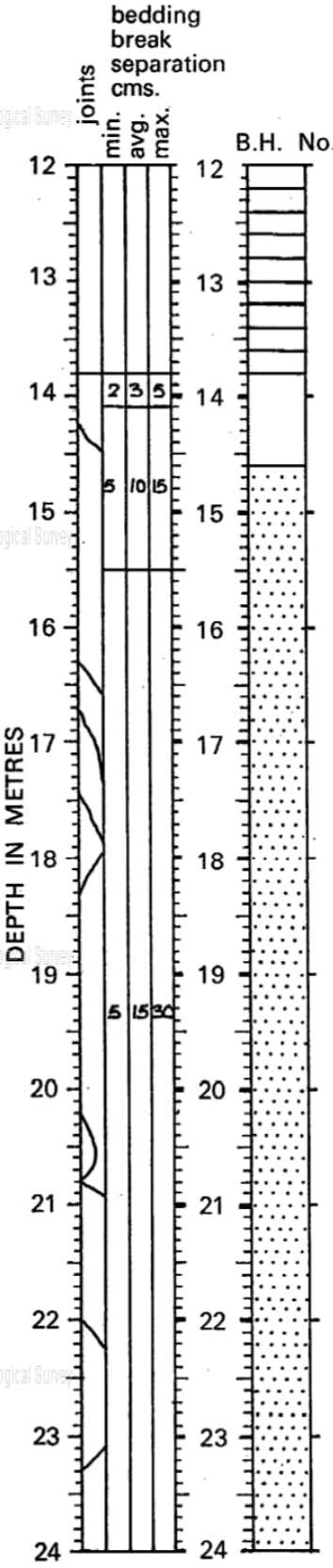
← DIRT BAND.
COAL 80cm SEEN INTACT. BOTTOM YARD MINE.

MUDSTONE - SEAT EARTH, GREY, HARD-FRIABLE,
NON-LAMINATED, ROOTS.

MUDSTONE, SILTY, GREY, PLANT DEBRIS.

British Geological Survey

SJ 59 SW/78



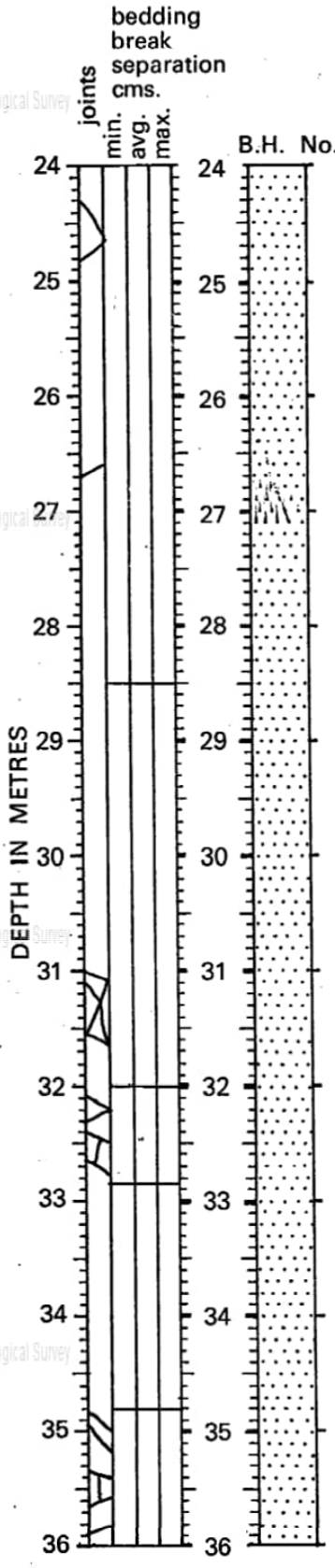
MUDSTONE, SILTY, GREY, PLANT, DEBRIS.

MUDSTONE, SILTY, GREY, VERY HARD, SUBLAMINATED.

SANDSTONE, WITH BANDS OF SILTSTONE & MUDSTONE, GREY/LIGHT GREY, VERY HARD, SUBLAMINATED/NON-LAMINATED, PEMBERTON ROCK.

British Geological Survey

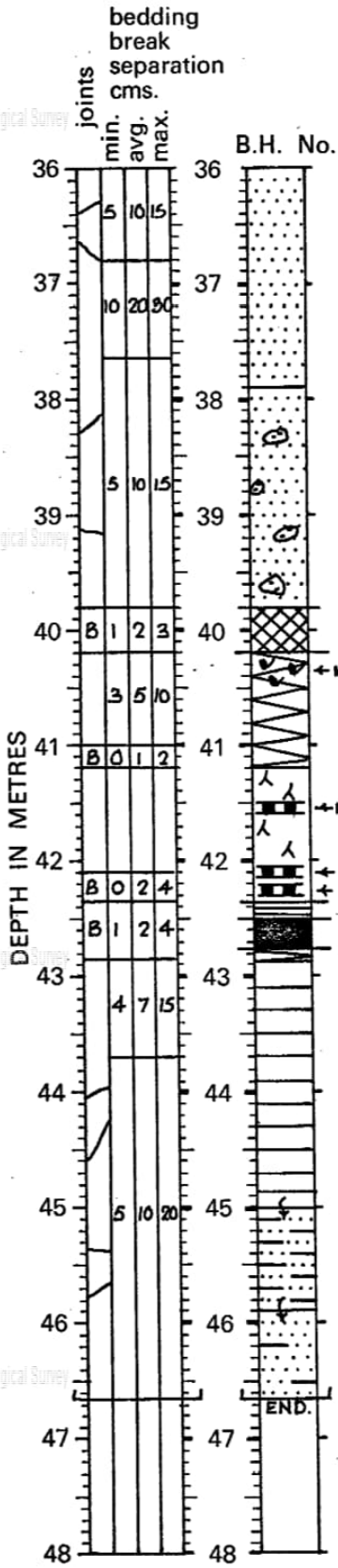
SS 59 SW 178.



SANDSTONE WITH BANDS OF SILTSTONE & MUDSTONE, GREY / LIGHT GREY, VERY HARD, SUBLAMINATED / NON-LAMINATED, PEMBERTON ROCK.

British Geological Survey

SJ 59 SW/18



SANDSTONE WITH BANDS OF SILTSTONE & MUDSTONE, GREY/LIGHT GREY, VERY HARD, SUBLAMINATED/NON-LAMINATED, PEMBERTON ROCK.

SANDSTONE WITH SILTSTONE CLASTS, LIGHT GREY/GREY, VERY HARD, NON-LAMINATED.

OLD WORKINGS IN HIGHER FLORIDA MINE.
SANDSTONE, SHALE, MUDSTONE & COAL FRAGMENTS.

SHALE, DARK GREY, VERY HARD, SUBLAMINATED.

MUDSTONE - SEAT EARTH, GREY, SOFT - FRIABLE, SUBLAMINATED, ROOTS, THIN IRONSTONE BANDS.

CANNEL COAL 15 cm (BROKEN) SEEN. CANNEL
COAL 25 cm (BROKEN) SEEN. MINE.
SHALE, DARK GREY - BLACK, HARD, SUBLAMINATED, CARBONACEOUS.

MUDSTONE, GREY, VERY HARD, NON-LAMINATED.

SILTSTONE, GREY, VERY HARD, NON-LAMINATED.

SANDSTONE WITH SILTSTONE STRIPES, LIGHT GREY/GREY, VERY HARD, NON-LAMINATED.

K. WARDELL & PARTNERS - LOG SHEET

B.H. No. P46
Page 1

SJ59SW 89

CLIENT: PILKINGTON BROTHERS LTD.

JOB: UKS PROJECT- GREENGATE JOB No. 3540/5.

5065 9388

B.H. No. P46 HEIGHT A.O.D. 52·71 m.

bedding break separation cms. joints min. avg. max.

DEPTH IN METRES

LOST WATER RETURN. → 7

5 15 30

CLAY, BROWN, STIFF.

SILTSTONE, BROWN, STIFF, VERY WEATHERED.

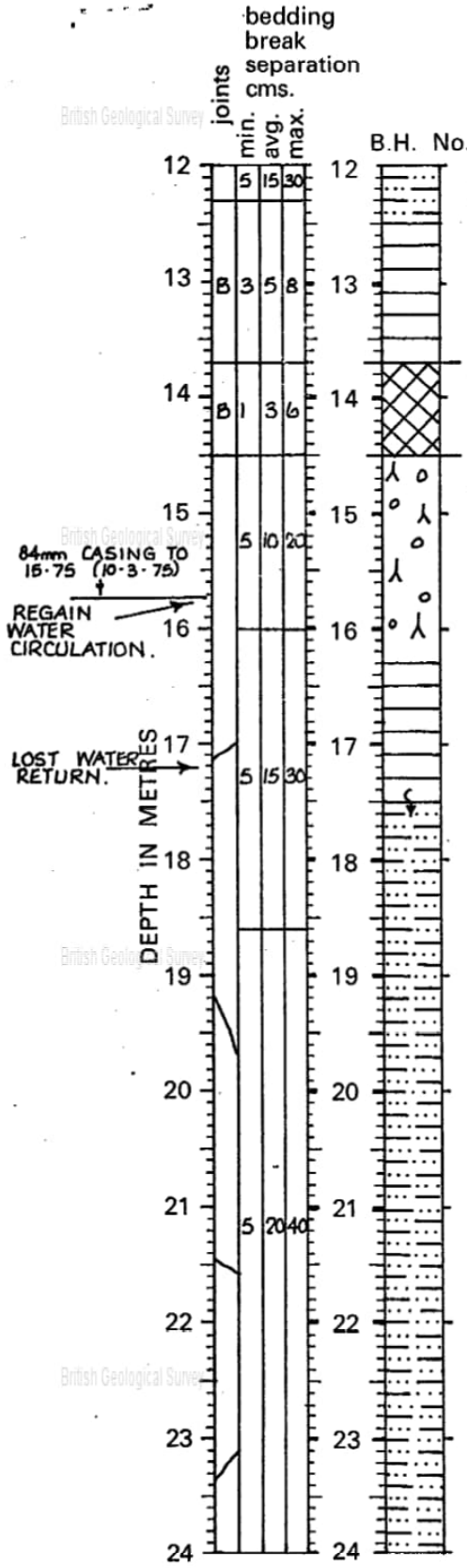
SILTSTONE, GREY, IRON STAINING, VERY WEATHERED.

SILTSTONE WITH MUDSTONE & SANDSTONE BANDS, GREY, HARD.

SILTSTONE WITH SANDSTONE STRIPES & BANDS, GREY, VERY HARD, SUBLAMINATED.

British Geological Survey

SJ 59 SW/89



SILTSTONE WITH SANDSTONE STRIPES & BANDS, GREY, VERY HARD, SUBLAMINATED.

MUDSTONE, SILTY, GREY, HARD, NON-LAMINATED, BROKEN.

OLD WORKINGS IN NEW MINE.
MUDSTONE, SILTSTONE & COAL FRAGMENTS, 10cm PIECE OF WOOD.

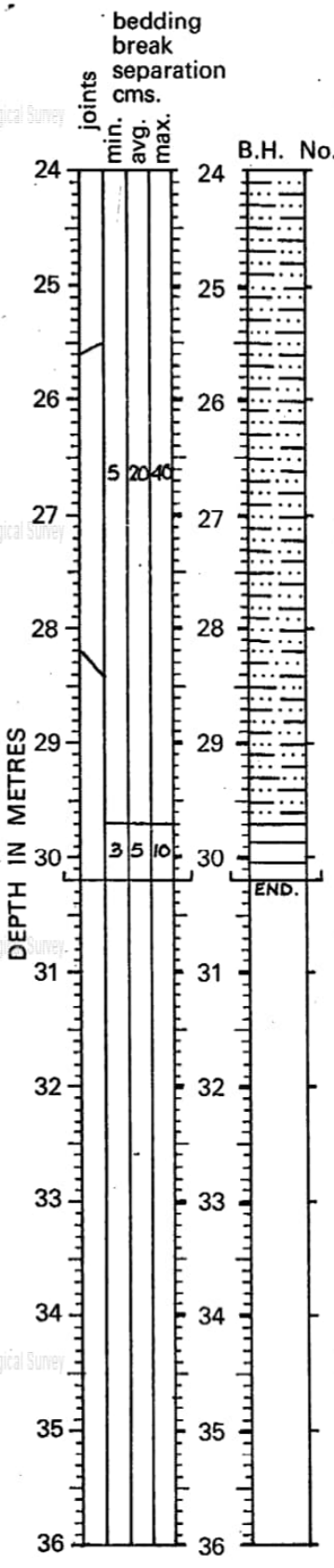
MUDSTONE, SILTY, GREY, VERY HARD, NON-LAMINATED, ROOTS, PLANT DEBRIS, IRONSTONE NODULES.

MUDSTONE, SILTY, GREY, VERY HARD, SUBLAMINATED.

SILTSTONE WITH SANDSTONE STRIPES & BANDS, GREY, VERY HARD, SUBLAMINATED, OCCASIONAL THIN IRONSTONE BANDS.

British Geological Survey

SJ 59 SW /89



SILTSTONE WITH SANDSTONE STRIPES & BANDS
GREY VERY HARD SUBLAMINATED
OCCASIONAL THIN IRONSTONE BANDS.

MUDSTONE GREY VERY HARD SUBLAMINATED/
LAMINATED.

British Geological Survey

BGS ID: 173069 : BGS Reference: SJ59SW91
British National Grid (27700) : 350800,393830
Report an issue with this borehole

IGS 1372 (1335) 5000 5/75

Institute of Geological Sciences

RECORD OF SHAFT OR BOREHOLE

6-in or 1:10 000 Map Registration No.: SJ 59 SW/91

Name and Number of Shaft or Borehole: P 48 BORE

National Grid Reference: SJ 5080 9383

For whom made PILKINGTON BROS. LTD

Town or Village ST. HELENS *County* LANCS

1-in or 1:50 000 New Series Map No.: 97

Enter 'C' if Confidential:

Exact site (reference to a fixed point on 1-in or 1:50 000 Map) Greengate Project

Purpose for which made

Ground level at shaft/bore relative to O.D. 51.05 *m. If not ground level give O.D. of beginning of shaft/bore* ____ *m.*

Made by *Date of sinking* 1975

Information from K Wardell *Examined by* D Mundy

Specimen Numbers and Additional Notes

Fossil EWJ 54

Geological Classification	Description of Strata	Thickness *metres*	Depth *metres*
(Wardell's log) CORE NOT SEEN	SOIL	.10	0.10
	Mudstone, grey, hard laminated	1.80	1.90
	Siltstone grey, with Ironstones c 10 cm at 5.9, 6.3 and 6.6	6.15	8.05
	Mudstone	0.15	8.20
	Old Workings in 'potato Delf', soft mudstone; grey, and coal fragments	0.60	8.80
	Mudstone, grey, vague lamination	0.60	9.40
	Mudstone grey, vague lamination, Ironstone nodules	1.60	11.00
	Siltstone with sandstone stripes, grey to dark grey, vague lamination	1.00	12.00
	Sandstone with siltstone stripes, light grey, massive to non laminated	1.60	13.60
		C/F	13.60

IGS 1428 (1335) 5000 8/75

Institute of Geological Sciences

6-in or 1:10 000 Map Registration No. SJ 59 SW 91

Page

Name and Number of Shaft or Borehole : BH NO 48

National Grid Reference

Geological Classification	Description of Strata	Thickness *metres*	Depth *metres*
	Brought Forward	B/F	13.60
	Sandstone, fine grained, with interlaminated siltstones. Carbonaceous micaceous films with plant fragments	0.46	14.06
	Sandstone fine to med grained, vague laminae, often carbonaceous, ? small scale x-bedding, thin sideritic discontinuous bands	1.47	15.53
	Laminated siltstone, medium grey, carbonaceous films and plant fragments	0.27	15.80
	Compact grey brown mudstone, slightly silty in part. ? Burrows iron stained (up to 1 cm long 2 mm wide) at 18.05	2.38	18.18
	Seatearth, mudstone with listric surfaces (2 cm black fissile mudstone at base)	0.22	18.40
	Coal	0.30	18.70
	Seatearth, mudstone dark-med grey, plant fragments and listric surfaces and roots	0.50	19.20
	Coal	0.44	19.64
	Seatearth mudstone, listric surfaces plant frags.	0.22	19.86
	Coal	0.49	20.35
	Seatearth, mudstone, finely laminated, listric surfaces, with thin coal films at 20.69	1.65	22.00
	Sandy siltstones medium grey finely laminated, plant fragments scattered throughout. Small scale X lamination. Convolute lamination at 24.14. Micaceous laminae common	2.80	24.80
		C/F	24.80

British Geological Survey

IGS 1428 (1955) 3000 8/75

Institute of Geological Sciences

Name and Number of Shaft or Borehole :

BH NO 48

6-in or 1:10 000 Map Registration No.

SJ 59 SW/91

National Grid Reference

Page 3

Geological Classification	Description of Strata	Thickness *metres*	Depth *metres*
	Brought Forward	B/F	24.80
	Section of core missing between 24.80 and 30.48. According to drilling log viz:- Siltstone with occasional thin sandstone vague lamination	5.68	30.48
	Sandstone fine grained, vague carbonaceous laminae, with plant fragments, appears bioturbated	0.28	30.76

British Geological Survey

BGS ID: 173072 : BGS Reference: SJ59SW94
British National Grid (27700) : 351080,393740
Report an issue with this borehole

IGS 1372 (1355) 5000 5/75

Institute of Geological Sciences

RECORD OF SHAFT OR BOREHOLE

6-in or 1:10 000 Map Registration No.

SJ 59 SW/94

Name and Number of Shaft or Borehole:

P 51 BORE

National Grid Reference

SJ 5108 9374

For whom made Pilkington Bros

Town or Village St Helens *County* Lancs

Exact site (reference to a fixed point on 1-in or 1:50 000 Map)

Greengate Project

1-in or 1:50 000 New Series Map No.: 97

Enter 'C' if Confidential:

Purpose for which made

Ground level at shaft / bore *relative to O.D.* 44.25 *m. If not ground level give O.D. of beginning of* shaft / bore ____ *m.*

Made by ____ *Date of sinking* 1975

Information from K Wardell *Examined by* J I Chisholm

Specimen Numbers and Additional Notes

Geological Classification	Description of Strata	Thickness metres	Depth metres
No cores to 9.18	Fill	0.80	0.80
	Clay, silty, brown stiff	0.80	1.60
	Mudstone grey silty	2.20	3.80
	Sst pale grey	0.35	4.15
	Siltstone pale grey	5.03	9.18
	Mudstone grey planty; ironstone nodules, passage base	1.02	10.20
	Siltstone grey, poorly bedded but with sandy lam; inshon passage base	8.30	18.50
	Siltstone grey sandy, laminated and ripple-laminated	13.40	31.90

CONTRACT. LANCASHIRE YORKSHIRE MOTORWAY M62 | SHEET No. 1 | No. of sheets. 1

LOCATION. TARBOCK TO CROFT (Site 13) BH No. B118

CLIENT. SJ 59 50/11 4 5123.9011 MINISTRY OF TRANSPORT

PERCUSSION U D | S.P.T. | B

Casing. Size to. Size to. Hand Auger

Ground level. 182.30

Commenced. 7/3/68

Completed. 7/3/68

Weather. FINE

ROTARY Cored runs | O/H

5 LEGEND

STRATUM (Scale: ½ inch to 1 foot) 1 Thickness	Depth 2	Sample No. 3	S.P.T. Blow Count (N) LL/PL/PI 4	M.C. % Core Rec. % 6	Type of Test 7	GRADING % PASSING SIEVE 3" N.7	1½" 25	⅜" 52	⅜" 100	⅛" 200	TAQ. or U.C.T. Bulk Density p.c.f. Shear /o° p.s.f.	Dev. Stress p.s.i.	Lat. Pres. p.s.i. Shear/L° p.s.f.	U.C.T. Stren. p.s.i.	WATER REMARKS 10
Top soil															
2'0"	2'0"	M1		21.6											
Firm brown sandy stony clay															
	4'6"	U1½s 1,2,3		19.6											
				19.6	UCT						U2	129.9		1801	
				18.2	UCT						U3	133.8		2522	
	8'6"	U1½s		18.9	UCT						U4	131.5		2762	
7'0"	9'0"	4,5,6		18.3											
				18.7	UCT						U6	131.5		2050	
			BOREHOLE COMPLETED												Water table not encountered

8 RESULTS OF ANY OTHER TESTS. 9

REMARKS:

Sample	Depth	M.C. % D.W.	S.G.	C. B. R. Air Voids	Type	TOP 0.1	TOP 0.2	BOTTOM 0.1	BOTTOM 0.2	Value	COMPACTION B.S. 1377 No	Max. Dry Density	Opt M.C.

British Geological Survey

SJ 507 927 SJ 59/116

(B1[illegible]) Wt. 17852—5154—5,000 12/26 Sp. 100. O.A.

SECTION OF Trial borings for clay at Messrs Doulton's field Sutton Heath, St. Helens.
In a straight line

Maps: One-inch 97 Six-inch 108 NW(4) County Lancs.

Height above O.D. about 230' (Ins 23-25) Latitude Longitude

Communicated by A. E. Marshall, Esq. Royal Doulton Potteries St. Helens. Date of Sinking

Made by Dip of Strata

From east to west in order.	Thickness.		Depth from Surface.	
No. 27. 165 ft. from Col. Hughes fence [E End]				
Rubbish	4	6		
Brown shale	3	8		
White clay	10	-		
White stone	1	-		
Rock		4		
White stone	2	-		
Rock		4		
White stone	4	2	26	-
Shale	-	-		
No. 26. 56 ft. from No 27. 220 ft. from Col. Hughes's fence.				
Rubbish	9	6		
Stone bed		4		
Shale	20	-		
Coal	2	6		
Bass or dark clay	1	6		
Clay	2	+	35	10
No. 25. 56 ft. from No 27. 276 ft. from fence				
Rubbish	8	-		
Shale	6	6		
Coal	2	6		
Bass	1	6		
Clay	7	-		
Coal		9		
Clay	1	3		
Bass		1		

Version 2.0.6.7

BGS ID: 172963 : BGS Reference: SJ59SW3
British National Grid (27700) : 350980,391000
Report an issue with this borehole

<< < Prev Page 1 of 1 Next > >>

SJ 59 SW 3

GEOLOGICAL SURVEY AND MUSEUM. BOREHOLES AND SHAFTS.

17

Drawn 27 Rec'd 27

NGR 5098 9100

County Lancs

BORE ~~or SHAFT~~ Borehole A of Sutton Manor Collieries ~~Works~~ Brook Works

6-in. Map 108SW

108SW 1.

GSM

BROOK WORKS, MICKLEHEAD GREEN.

Surface level 180 ft. O.D. One-inch Map 97 ST HELENS.

Communicated 24 June 1935 by Sutton Manor Collieries

Date of sinking 1897 Borer A. Timmis & Co

Specimens Bore for water

Description.	THICKNESS. Feet.	THICKNESS. Inches.	DEPTH. Feet.	DEPTH. Inches.
Surface				
Red clay	40	6	40	6
Grit & sand	1	6	42	-
Red clay	6	-	48	-
Grit & sand	4	-	52	-
Blue shale	69	-	121	-
Grey stone	10	6	131	6
Grey shale	2	6	134	-
Coarse grit	2	-	136	-
Grey grit	20	-	156	-
Dark grit	3	-	159	-
Stone grit	11	-	170	-
Shale	-	6	170	6
Grit	2	-	172	6
Grey marl	21	6	194	-
Dark shale	2	-	196	-
Blue shale	2	6	198	6
Grey shale	8	6	207	-
Light shale	10	-	217	-
Black shale	2	-	219	-
Coal	2	-	221	-
Shale	1	-	222	-
Coal	1	-	223	-
Grey shale	18	-	241	-
Light shale	25	-	266	-
Rock	2	-	268	-
Limestone	3	-	271	-
Grey rock	12	-	283	-
Red gritstone.	5	-	288	-

metric		metric	
12	34	12	34
0	46	12	80
1	83	14	63
1	22	15	85
21	03	36	88
3	20	40	08
0	76	40	84
0	61	41	45
6	10	47	55
0	91	48	46
3	35	51	81
0	15	51	96
0	61	52	57
6	55	59	12
0	61	59	73
0	76	60	49
2	59	63	08
3	05	66	13
0	61	66	74
0	61	67	35
0	31	67	66
0	31	67	97
5	49	73	46
7	62	81	08
0	61	81	69
0	91	82	60
3	66	86	26
1	52	87	78

(B12460) Wt. 13119—0014 5000 9/27 Gp. 160 O.A.

Version 2.0.6.7

BGS ID: 173176 : BGS Reference: SJ59SW194
British National Grid (27700) : 351300,391700
Report an issue with this borehole

<< < Prev Page 1 of 4 Next > >>

CHESTER LANE C 12 5150 4170

Sub Soil Surveys Ltd., Manchester

Ground Level | Site Reference: 78/45 | Borehole No. C 12 | Sheet 1 of 4

Boring Method: 5 7/8" Rockbit and H Corebarrel

Site: SJ 59 SW/194 Roughdale

Drilling and Casing Progress	Penetration of Core Barrel From	To	R.Q.D. %	Core Recovery %	Depth B.G.L. / O.D.	Description of Strata	Dip on Sample	Symbolic Log
3.4.78	2.5	3.5		1.0	2.4	Sand and Clay Drift		
casing								
casing	3.5	6.8		3.3	3.4	Grey sandy fissured Mudstone		
	6.8	9.8		3.0	6.8	Grey Shale and Mudstone		
.4.78								
.4.78	9.8	11.6		1.8		Grey Shale and Mudstone with bands of Dark grey Shale		
	11.6	14.2		2.6				

REMARKS:

Moving to Borehole 2 2½ hours

Scale. 1 : 50

SJ59SW 5113 9133

STRATA SURVEYS LTD.,
HOLMES CHAPEL ROAD,
MIDDLEWICH, CHESHIRE. CW10 0JB
Telephone: 0606 834637 Fax: 0606 836657

Trial Pit No. : 7

Sheet No. 1 Of 1.
Depth 0 to 4 metres.

Dates : 2 Sept 92

Job Number : 6690 Location : Lea Green, St Helens.

Client : Ken Shone Associates.

Equipment and Methods
JCB 3CX Hydraulic Excavator

Engineer : GH

Description of Strata	Red. Level	Legend	Thick -ness	Depth m	Sample Depths	Sample Types	NMC	Cu	Remarks
	55.06			0.00					
Grass over dark brown sandy TOPSOIL			(0.30)						
	54.76			0.30	0.35	B 1			
Stiff brown light brown mottled sandy CLAY with sand lenses and fine to medium gravel.			(0.40)						
	54.36			0.70	0.70	D 1			Roots to a depth of 0.60m
Stiff brown mottled grey sandy CLAY, with some fine to coarse gravel and occasional cobbles, bands and lenses of light brown and green sand.					1.20	D 2			
			(2.20)						
End of Trial Pit	52.16			2.90					End of Pit

Key

Pp Pocket Penetrometer

Sample Types
U Undisturbed
D Disturbed
B Bulk Disturbed
W Water

Progress / Water Levels
Borehole Depth
Water Level
Water Strike

In-Situ Tests
V Vane Test
Pb Plate Bearing Test
CBR In-Situ CBR Test

General Remarks
No water encountered during excavation.
Sides of the pit stable

Sketch/Plan

British Geological Survey

SJ 59 SW 10 3

Card catalogue 84/98.

(B1) Wt. 17852—5154—5,000 12/26 Gp. 160. O.A. NGR 5161 9465

SECTION OF Boring for Water at Sherdley Glass Works, St. Helens

? Location

Maps: One-inch N.S. 84 Six-inch 108 N.W.(W) County Lancs.

Height above O.D. about 80 ft. Latitude _____ Longitude _____

Communicated by William Matthews & Co. Ltd. Date of Sinking 1929-30

Made by Artesian Well Engineers, Widnes Dip of Strata _____

NOT DRAWN UP NOT ENTERED ON MAP

	Thickness. Metres.			Depth from Surface. Metres.		
Made ground	3.66	12	-	3.66	12	-
Clay & Sand	5.79	19	-	9.45	31	-
Sand & Gravel	0.61	2	-	10.06	33	-
Light blue shale	8.84	29	-	18.90	62	-
Dirt & coal	0.46	1	6	19.36	63	6
Fire Clay	3.51	11	6	22.87	75	-
Light blue shale	2.44	8	-	25.31	83	-
Shale & Fire Clay	3.05	10	-	28.36	93	-
Light Blue Shale	7.32	24	-	35.68	117	-
Dark Blue Shale S.B.	0.61	2	-	36.29	119	-
Fire Clay	3.05	10	-	39.34	129	-
Light Blue Shale	7.93	26	-	47.27	155	-
Kennell	0.53	1	9	47.80	156	9
Fire Clay	0.91	3	-	48.71	159	9
Light blue shale	8.61	28	3	57.32	188	-
Hard flaggy sandstone	1.30	4	3	58.62	192	3
Light blue shale with Ironstone Bands	8.15	26	9	64.77	219	-
Ironstone	0.31	1	-	65.08	220	-
Light blue shale	0.91	3	-	65.99	223	-
Black shale with shells [Carbonicola band]	0.61	2	-	66.60	225	-
Light blue sandy shale	1.83	6	-	68.43	231	-
Coal 6" rest Linsey	0.76	2	6	69.19	233	6
Grey sandstone	3.35	11	-	72.54	244	6
Grey linsey	0.92	3	-	75.44	247	6
Grey flaggy rock	4.11	13	6	79.55	261	-
Grey linsey	2.13	7	-	81.68	268	-
Grey sandstone	4.27	14	-	85.95	282	-
Grey linsey	1.22	4	-	87.17	286	-

Sherdley Glass Works, St. Helens

GEOLOGICAL SURVEY AND MUSEUM. BOREHOLES AND SHAFTS.

SJ 59 SW 163

Folio

County Lancs.

6 in. Map 10 NW

Description.	THICKNESS. Feet.	THICKNESS. Inches.	DEPTH. Feet.	DEPTH. Inches.
Grey Sandstone	(8.23m) 27	(95.A08.)3	—	
Hard Broken Rock	(0.91m) 3	(96.3 1m) 3 1 6	-	

British Geological Survey

(B12267) Wt. 13119A—0014 5000 9.27 Gp. 160 O.A.

NGR SJ 5159 9464

84 SJ59/103

(Revised) : Wt. 17562—6154—5,000 12/36 Gp. 105. O.A.

SECTION OF Boring for Water at Sherdley Glass Works, St. Helens

Maps: One-inch N.S. 84 Six-inch 100 N.W.(W) County Lancs.

Height above O.D. about 80ft. Latitude Longitude

Communicated by William Matthews & Co. Ltd. Date of Sinking 1929-30

Made by Artesian Well Engineers, Widnes Dip of Strata

NOT DRAWN UP NOR ENTERED ON MAP

		Thickness.		Depth from Surface.	
MADE GROUND	Made ground	12	-	12	-
	Clay & Sand			31	-
DRIFT	Sand & Gravel			33	-
	Light blue shale			62	-
	Dirt & coal			63	6
	Fire Clay			75	-
	Light blue shale			83	-
	Shale & fire clay			93	-
	Light Blue Shale			117	-
	Dark Blue Shale S.B.			119	-
	Fire Clay			129	-
M	Light Blue Shale			155	-
	Kennell			156	9
	Fire Clay			159	9
	Light Blue shale			188	—
	Hard flaggy sandstone			192	3
	Light blue shale with Ironstone Bands			219	-
	Ironstone			220	—
	Light blue shale			223	-
	Black shale with shells [Carbonicola band]			225	-
	Light blue sandy shale			231	—
	Coal 6" rest Limey			233	6
	Grey sandstone			264	6
	Grey limey			267	6
	Grey flaggy rock			281	-
	Grey limey			288	—
	Grey sandstone			292	-
	Grey limey			296	-

Sherdley Glass Works, St. Helens

84 SJ59/103

GEOLOGICAL SURVEY AND MUSEUM. BOREHOLES AND SHAFTS.

98

Folio 2 | County Lancs.

6 in. Map 100 N/W

Description.	THICKNESS. Feet.	Inches.	DEPTH. Feet.	Inches.
Grey Sandstone Hard Broken Rock			313	—
			316	-

91. (84/98). St. Helens: Sherdley Glass Works for Messrs. United Glass Bottle Manufacturers Ltd. Industrial supply. Surface 80 O.D. Bore 316. (Matthews, W., 1929-30).

Drift (sand, clay & gravel)	33		33
Mainly shale ...	155		188
Flaggy sandstone ...	4		192
Mainly shale ...	41½		233½
Mainly sandstone ...	82½		316

(B12267) Wt. 18119A—6914 5000 9.27 Gp. 160 O.A.

(B11857) Wt. 17852—S154—5,000 12/26 Gp. 166. O.A.

SJ 59 SW 18

NGR SJ 5141 9434

SECTION OF No 10 Pit at Ravenhead Colliery

(widened from 10ft. 6 in. to 15 ft. diameter)

5

Maps: One-inch N.S. 84 Six-inch 108NW(W) County Lancs.

Height above O.D. 115·38 (Surface of ground) Latitude Longitude

111·38 is surface of ground.

Communicated by St. Helens Collieries Ltd. Date of Sinking

Made by Dip of Strata

			Thickness.			Depth from Surface.		
			Metres.			Metres.		
Filled up Stuff			1.22	4	–	1.22	4	–
Clay			2.13	7	–	3.35	11	–
Shale			7.62	25	–	10.97	36	–
Coal	}		0.23		9	11.20	36	9
Warrant			3.43	11	3	14.63	48	–
Sandstone			6.65	21	10	21.28	69	10
Shale			3.66	12	–	24.94	81	10
Coal	} Lyons Delf		1.22	4	–	26.16	85	10
Shale			4.19	13	9	30.35	99	7
Coal	}		0.99	3	3	31.34	102	10
Warrant	} London Delf		0.36	1	2	31.70	104	0
Coal	}		0.46	1	6	32.16	105	6
Warrant			3.25	10	8	35.41	116	–
Shale			6.40	21	–	41.81	137	–
Bass			0.18		7	41.99	137	7
Coal	} Tiem Delf.		0.56	1	10	42.55	139	5
Warrant			0.31	1	–	42.86	140	5
Shale			2.90	9	6	45.76	149	11
Sandstone			1.82	4	–	46.98	153	11
Shale			7.11	23	4	54.09	177	3
Coal	POTATO DELF	67·85 – O.D	1.83	6	–	55.92	183	3
Warrant			2.08	6	10	58.00	190	1
Sandstone			0.69	2	3	58.69	192	4
Shale			5.64	18	–	64.33	210	4
Coal	}		0.43	1	5	64.76	211	9
Bass	} 99·12 – O.D	EARTHY DELF	0.25		10	65.01	212	7
Coal	}		0.58	1	11	65.59	214	6
Black Bass			0.38	1	3	65.97	215	9

Version 2.0.6.7

BGS ID: 172985 : BGS Reference: SJ59SW18
British National Grid (27700) : 351410,394340
Report an issue with this borehole

<< < Prev Page 2 of 4 Next > >>

Newstead Coll. No. 10

GEOLOGICAL SURVEY AND MUSEUM. BOREHOLES AND SHAFTS.

SJ 59 SW 105

Folio 2 County

6 in. Map

Description.	Thickness Feet.	Thickness Inches.	Depth Feet.	Depth Inches.
Warrant	1	4	217	1
Shale	67	7	284	8
Coal	2	7	287	3
Warrant	1	9	289	-
Sandstone	1	7	290	7
Shale	30	6	321	1
Bass		2	321	3
Cannel		4	321	7
Coal		5	322	-
Bass		8	322	8
Coal		10	323	6
Bass		9	324	3
Coal	1	7	325	10
Bass NEW MINE 211·62-0 D.		8	326	8
Coal		6	327	- [1]
Warrant	3	7	330	7
Shale Strong	26	-	356	7
Warrant	2	11	359	6
Bass		6	360	-
Warrant	1	4	361	4
Bass + Coal		5	361	9
Warrant	2	4	364	1
Coal	1	2	365	3
Bass 25·2·04 BOTTOM YARD COAL		1	365	4
Coal	2	1	367	5
Warrant	2	4	369	9
Shale	14	4	384	1
Limsty	6	6	390	7
Sandstone	17	1	407	8
Limsty with Bands of Sandstone	55	-	462	8
Sandstone	10	-	472	8
Shale	3	-	475	8
Sandstone	5	8	481	4
Coal (Crushed) 372·74-0 D. St. Helens Main Delf	6	10	488	2
Shale	10	5	498	7
Shale with Pebbles		9	499	4
Bass		3	499	7
Cannel 387·55 CANNEL MINE	3	4	502	11
Shale	4	9	507	8
Bass	1	3	508	11
Coal 397·04 FOUR FEET MINE	3	6	512	5
Warrant	1	6	513	11
Sandstone	2	-	515	11
Shale	22	7	538	6
Sandstone	7	8	546	-
Shale	22	6	568	6
Coal 454·12 HIGHER PIGEON HOUSE MINE	1	-	569	6
Shale	7	-	576	6
Coal 463·62 LOWER PIGEON HOUSE MINE (only one seam worked)	2	6	579	-
Shale	20	-	599	—

Thickness		Depth	
0	41	66	17
20	60	86	77
0	79	87	56
0	46	88	02
0	55	88	57
9	30	97	87
0	05	97	92
0	10	98	02
0	13	98	15
0	20	98	35
0	25	98	60
0	23	98	83
0	48	99	31
0	20	99	51
0	15	99	66
1	09	100	75
8	08	108	83
0	75	109	58
0	15	109	73
0	41	110	14
0	13	110	27
0	71	110	98
0	36	111	34
0	03	111	37
0	64	112	01
0	71	112	72
4	37	117	09
1	98	119	07
5	21	124	28
16	76	141	04
3	05	144	09
0	89	144	98
1	73	146	71
2	08	148	79
0	18	151	97
0	08	152	05
1	02	153	07
0	22	153	29
0	45	154	74
0	38	155	12
1	06	156	18
0	46	156	64
0	61	157	25
6	88	164	13
2	34	166	47
6	86	173	33
0	31	173	64
2	13	175	77
0	76	176	53
6	10	182	63

(B12267) Wt. 18119A—0014 5000 9.27 Gp. 160 O.A.

Ravenhead Ry. 60 P. 3

GEOLOGICAL SURVEY AND MUSEUM BOREHOLES AND SHAFTS.

SJ 59 SW 18 5.

Folio 3 County

6 in. Map

Description.	THICKNESS. Feet.	Inches.	DEPTH. Feet.	Inches.	Thickness metric		Depth metric	
Sandstone	4	3	603	3	1	29	183	87
Shale	29	9	633	-	9	07	192	94
Burr	2	-	635	-	0	61	193	55
Shale	4	6	639	6	1	37	194	92
Sandstone	13	6	653	-	4	12	199	04
Shale	23	-	676	-	7	01	206	05
Coal 562·70 BOTTOM PIGEON HOUSE MINE	2	1	678	1	0	64	206	69
Warrant	12	7	690	8	3	83	210	52
Shale with Bands of Linsty	27	4	718	-	8	33	218	85
Linsty	32	2	750	2	9	80	228	65
Sandstone	15	-	765	2	4	57	233	22
Linsty	6	-	771	2	1	83	235	05
Sandstone	24	4	795	6	7	41	242	46
Linsty	1	5	796	11	0	43	242	89
Sandstone	40	6	837	5	12	34	255	23
Shale	9	7	847	-	2	94	258	17
Ydon of Mouthing RAVENHEAD HIGHER	23	-	851	-	1	22	259	39
Rubbish 754·62-OD. & MAIN DELFS.	23	-	870	-	5	79	265	18
Shale	23	11	893	11	7	29	272	47
Sandstone, very hard	5	3	899	2	1	60	274	07
Shale	39	2	938	4	11	93	286	00
Coal BASTIAN MINE 828·45 -O.D.	5	6	943	10	1	68	287	68
Warrant	6	7	950	5	1	88	289	68
Coal		7	951	-	[illegible]		289	87
Bass		4	951	4	0	10	289	97
Coal TOP ROGER MINE 840·37 -OD.	4	5	955	9	1	35	291	32
Warrant	1	1	956	10	0	33	291	65
Bass		8	957	6	0	20	291	85
Warrant	13	11	971	5	4	24	296	09
Shale	4	5	975	10	1	35	297	44
Sandstone	4	-	979	10	1	22	298	66
Inlet-Sheets [for winding boxes] Ydon of Mouthing			987	3			300	91
Linsty	39	2	1019	-	9	68	310	59
Shale	4	6	1023	6	1	87	311	96
Ydon of mouthing			1113	5			345	57
Sandstone with pebbles	17	6 ?	1141	-			347	78
Sandstone	4	6	1145	6	1	37	349	15
Shale	9	4	1154	10	2	84	351	99
Coal	1	10	1156	8	0	56	352	55
Bassy Coal } FLAGGY DELF		5	1157	1	0	13	352	68
Coal	2	-	1159	1	0	61	353	29
Warrant	2	1	1161	2	0	63	353	92
Sandstone Sandstone of Yarnton? White Stone Quarry?	14	-	1175	2	4	27	358	19
Sandstone very hard	96	10	1272	-	29	52	387	71
Sandstone streaks of shale	1	-	1273	-	0	31	388	02
Sandstone	18	2	1291	2	5	54	388	56
Coal		2	1291	4	0	05	388	61
Sandstone streaks of shale	3	-	1294	4	0	91	389	52
Coal		5	1294	9	0	13	389	65
Sandstone streaks of shale	8	1	1302	10	2	46	392	11

(B12267) Wt. 18119A—0014 5000 9.27 Gp. 160 O.A.

Version 2.0.6.7

BGS ID: 172985 : BGS Reference: SJ59SW18
British National Grid (27700) : 351410,394340
Report an issue with this borehole

<< < Prev Page 4 of 4 Next > >>

Ravenhead No. 10. P.4 77

GEOLOGICAL SURVEY AND MUSEUM. BOREHOLES AND SHAFTS.

SJ 59 SW 18 5.

Folio County

6 in. Map

Description.	THICKNESS. Feet.	Inches.	DEPTH. Feet.	Inches.	Thickness metric		Depth metric	
Shale	12	—	1314	10	3	66	400	76
Linsty	3	—	1317	10	0	91	401	67
Shale soft	32	—	1349	10	9	75	411	42
Warrant	3	—	1352	10	0	91	412	33
Shale	4	—	1356	10	1	22	413	55
Sandstone band of shale	22	6	1379	4	6	86	420	41
Shale	5	6	1384	10	1	68	422	09
Shale soft	47	4	1432	2	14	13	436	52
Shale bands of coal	7	4	1439	6	2	23	438	75
Shale	1	1	1440	7	0	33	439	08
Flag	1	—	1441	7	0	31	439	39
Shale	15	6	1457	1	4	72	444	11
Linsty	22	6	1479	7	6	86	450	97
Shale	16	9	1496	4	5	10	456	07
Coal		4	1496	8	0	10	456	17
Warrant	3	6	1500	2	1	07	457	24
Linsty	4	9	1504	5	1	30	457	54
Warrant	3	—	1507	5	0	91	458	45
Shale	14	11	1522	4	4	55	463	00
Cockle Shell Bed	2	3	1524	7	0	69	463	69
Shale	2	—	1526	7	0	61	464	30
Warrant	5	—	1531	7	1	52	464	82
Shale	20	6	1552	1	6	25	471	07
Linsty	3	—	1555	1	0	91	471	98
Sandstone	9	6	1564	7	2	90	474	88
Shale	2	—	1566	7	0	61	475	49
Sandstone	21	—	1587	7	6	40	481	89
Floor of mouthing			1586	3				
Shale	4	—	1591	7	1	22	485	11
Rushy Park Waste RUSHY PARK MINE [represents 4' 6"]		9	1592	4	0	23	485	34
Warrant	8	—	1600	4	2	44	487	78
Sandstone	1	6	1601	10	0	46	488	24
Shale	18	9	1620	7	5	72	493	96
Coal		8	1621	3	0	20	494	16
Warrant	3	1	1624	4	0	94	495	10
Coal		2	1624	6	0	05	495	15
Black Bass		5	1624	11	0	13	495	28
Warrant	1	9	1626	8	0	53	495	81
Sandstone [end of sump]	2	9	1629	5	0	84	496	65

(B12267) Wt. 18119A—0014 5000 9.27 Gp. 160 O.A.

SJ514 94276 SJS9SW 264

STRATA SURVEYS LTD.,
HOLMES CHAPEL ROAD,
MIDDLEWICH, CHESHIRE. CW10 0JB
Telephone: 0606 84 4637 Fax: 0606 84 6657

Borehole Number : 2
Sheet 1 of 2.
Scale 0 to 10 metres

Dates : 21-22 February 90

Job Number : 5321 Location : St Helens
Client : Roy Billington Associates

Dia. & Drilling Methods
150mm Diameter light cable percussion.
drilled by R.C.
Logged by I.W.

Description of Strata	Red. Level	Legend	Thick -ness	Depth m	Sample Depths	Sample Types	N Value	Cu	ø	Water Level	Pie -zo	Daily Prog.
				0.00	0.00 - 0.30	U 1						
MADE GROUND (topsoily with some broken concrete, medium dense to base.)			(0.60)		0.30 - 0.50	B 1						
				0.60	0.50 - 0.95	S 1	N 32					
MADE GROUND (medium dense, dry black gravelly topsoily ash broken mudstone fill.)					1.00 - 1.30	U 2						
					1.30 - 1.50	B 2						
					1.50 - 1.95	S 2	N 26					
					2.00	D 1						
			(3.40)		2.50 - 2.95	S 3	N 13					
					3.00	D 2						
					3.50 - 3.95	S 4	N 24					
				4.00	4.00	D 3						
MADE GROUND (dense becoming medium dense grey gravel size mudstone very weak to moderately strong with some ash and coal fragments.)					4.50 - 4.95	S 5	N 33					
					5.00	D 4						
			(3.50)		6.00 - 6.45	S 6	N 29					21/2
					6.50	D 5						
				7.50	7.50 - 7.90	U 3						
Firm brown sandy slightly gravelly CLAY.			(0.80)		8.00	D 6						
				8.30	8.50 - 8.90	U 4						
Firm to stiff, stiff in places silty sandy slightly gravelly CLAY with occasional cobbles.			(4.70)		9.00	D 7						
				10.00								
Borehole Continued												

Key :

Sample Types
U Undisturbed
D Disturbed
B Bulk Disturbed
W Water
P Piston
S SPT

In-Situ Tests
N N Value
+ Sampler Sank

Progress / Water Levels
Borehole Depth
Casing Depth
Water Level
Water Strike

Piezometer Level

General Remarks :
Temporary standing water level at 10.80m.
Methane monitoring pipe installed at 7.5m, 1 hour.

SJ59SW 264

STRATA SURVEYS LTD.,
HOLMES CHAPEL ROAD,
MIDDLEWICH, CHESHIRE. CW10 0JB
Telephone: 0606 84 4637 Fax: 0606 84 6657

Borehole Number : 2
Sheet 2 of 2.
Scale 10 to 20 metres

Dates : 21-22 February 90

Job Number : 5321 Location : St Helens
Client : Roy Billington Associates

Dia. & Drilling Methods
150mm Diameter light cable percussion.
drilled by R.C.
Logged by I.W.

Description of Strata	Red. Level	Legend	Thick -ness	Depth m	Sample Depths	Sample Types	N Value	Cu	ø	Water Level	Pie -zo	Daily Prog.
Firm to stiff, stiff in places silty sandy slightly gravelly CLAY with occasional cobbles. (Boulder Clay)				10.00	10.00 - 10.40	U 5		71	0			
					10.50	D 8				▽ TSI		
			(4.70)		11.50	U 6						
					12.00 - 12.45	S 7	N 44					
					12.50 - 12.90	U 7						
				13.00								22/2
Borehole Completed												

Key :

Sample Types
U Undisturbed
D Disturbed
B Bulk Disturbed
W Water
P Piston
S SPT

In-Situ Tests
N N Value
+ Sampler Sank

Progress / Water Levels
___ Borehole Depth
_ _ Casing Depth
▽ Water Level
▼ Water Strike

◊ Piezometer Level

General Remarks :
Temporary standing water level at 10.80m.
Methane monitoring pipe installed at 7.5m, 1 hour.

British Geological Survey

Name of site: BUCTONHEAD ROAD BH 6

W R B No.: SJ59/167

Owner: Waste Management Ltd

Occupier: 4

Licence no.
Appn no.
Cancelled
IGS ref. no.

Nat. grid ref.: SJ 5126 9436

Status: Obh (Waste Disposal)

Aquifer: Coal Measures.

Code: 103

Ground level: 33.61 m OD ft. OD

Level of well top: m OD ft. OD

Rest water level: m bwt ft. bwt

(Date) m OD ft. OD

Construction: Method Shell & Auger Date March 1980.

Depth bwt	Dia.	Linings (below well top) From	To	Dia.	Type
10.0	150	GL	9.0	100	Plastic drain pipe with gravel pack.

Abstraction rates: gph PWL / gpd

Type of pump

Chem./bact. anal. YES/NO

Well driller: Advance Drilling

Summary of geological section	Thickness	Depth
Fill		7.3
Clay on Shale		10.3

If insufficient space has been allowed, continue in 'Notes' overleaf.

1/5/79/207

Name of site: DAISYFIELD TIP BOREHOLE

W R B No.: SJ59/168

Owner:

Occupier:

Licence no.
Appn no.
Cancelled
IGS ref. no.

Nat. grid ref.: SJ 5159 9176.

Status: Obh (Waste Disposal)

Aquifer: Coal Measures

Code: 103.

Ground level: m OD ft. OD

Level of well top: m OD ft. OD

Rest water level: m bwt ft. bwt

(Date) m OD ft. OD

Construction: Method Date

Depth bwt	Dia.	Linings (below well top) From	To	Dia.	Type
~25	100	GL	?	100	Steel

Abstraction rates: gph PWL / gpd

Type of pump

Chem./bact. anal. YES/NO

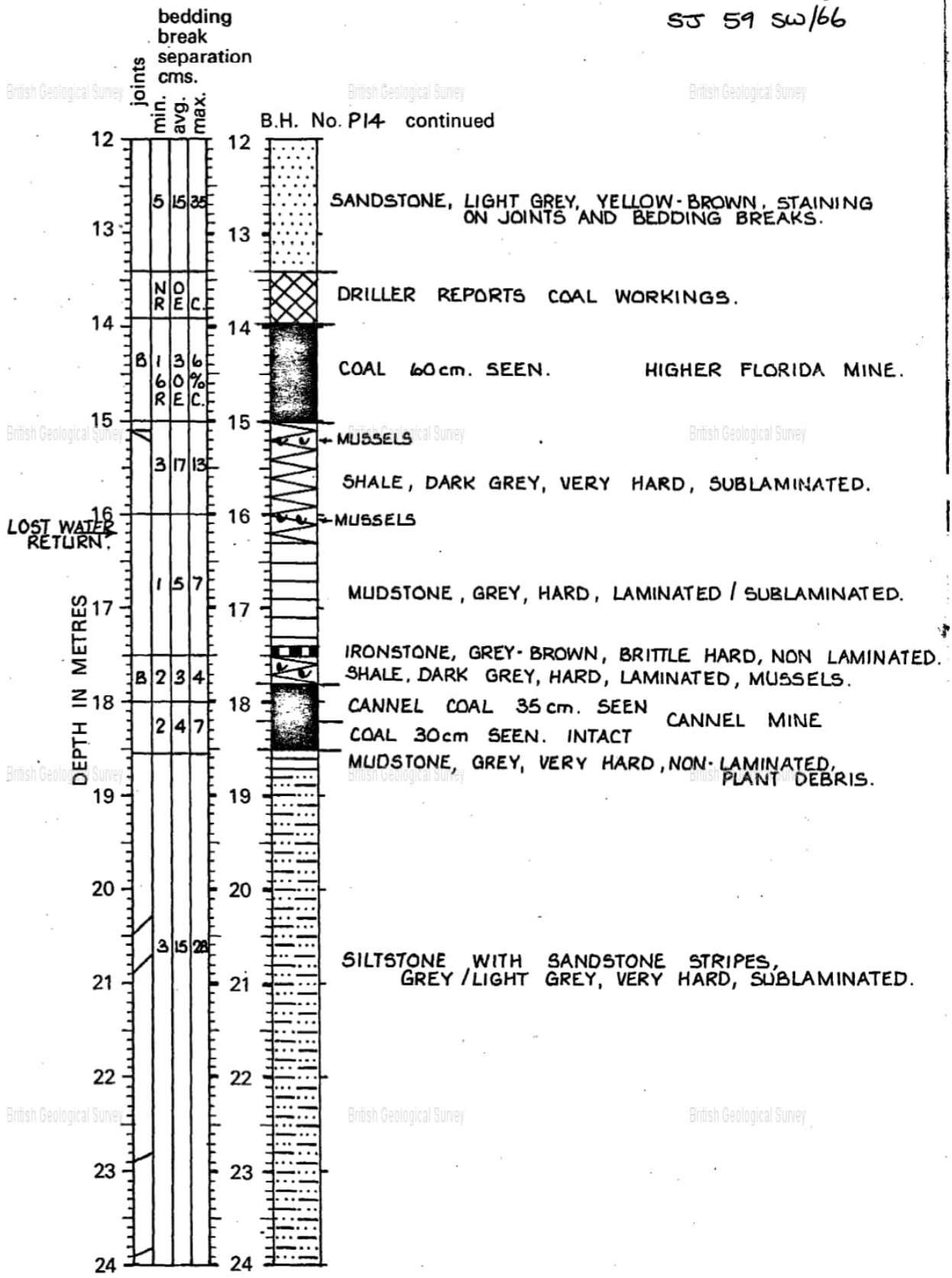
Well driller: ?

Summary of geological section	Thickness	Depth
Unknown - probably Ardwick Limestone		

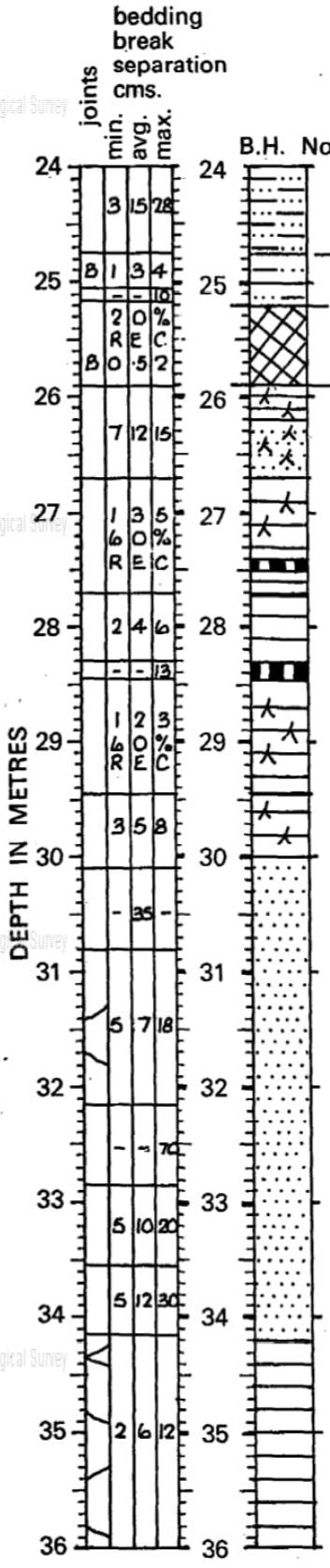
If insufficient space has been allowed, continue in 'Notes' overleaf.

1/5/79/207

SJ 59 SW/66


bedding break separation cms.
joints
min. avg. max.
B.H. No. P14 continued
DEPTH IN METRES
LOST WATER RETURN.
5 15 35
NO REC.
B 160 REC. 136 %
3 17 13
1 5 7
B 2 3 4
2 4 7
3 15 28
SANDSTONE, LIGHT GREY, YELLOW-BROWN, STAINING ON JOINTS AND BEDDING BREAKS.
DRILLER REPORTS COAL WORKINGS.
COAL 60cm. SEEN. HIGHER FLORIDA MINE.
MUSSELS
SHALE, DARK GREY, VERY HARD, SUBLAMINATED.
MUSSELS
MUDSTONE, GREY, HARD, LAMINATED / SUBLAMINATED.
IRONSTONE, GREY-BROWN, BRITTLE HARD, NON LAMINATED.
SHALE, DARK GREY, HARD, LAMINATED, MUSSELS.
CANNEL COAL 35cm. SEEN
COAL 30cm SEEN. INTACT
CANNEL MINE
MUDSTONE, GREY, VERY HARD, NON-LAMINATED, PLANT DEBRIS.
SILTSTONE WITH SANDSTONE STRIPES, GREY/LIGHT GREY, VERY HARD, SUBLAMINATED.

SJ 59 SW/66



B.H. No. P14 continued

SILTSTONE, WITH SANDSTONE STRIPES. GREY/LIGHT GREY, VERY HARD, SUBLAMINATED.

SILTSTONE, GREY, VERY HARD, SUBLAMINATED.

SILTSTONE, DARK GREY, VERY HARD, NON-LAMINATED.

DRILLER REPORTS COAL WORKINGS.

COAL & SHALE FRAGMENTS 15 cm. SEEN.

LOWER FLORIDA MINE.

MUDSTONE, GREY, HARD, SUBLAMINATED, PLANT DEBRIS, ROOTS.

SANDSTONE, GREY, VERY HARD, NON-LAMINATED, ROOTS.

MUDSTONE, GREY, HARD, SUBLAMINATED, PLANT DEBRIS, ROOTS.

IRONSTONE, BROWN, BRITTLE HARD, NON-LAMINATED.

MUDSTONE, DARK GREY, HARD, SUBLAMINATED WITH COAL PARTINGS.

MUDSTONE, GREY, HARD, SUBLAMINATED, PLANT DEBRIS.

IRONSTONE, BROWN, BRITTLE HARD, NON-LAMINATED.

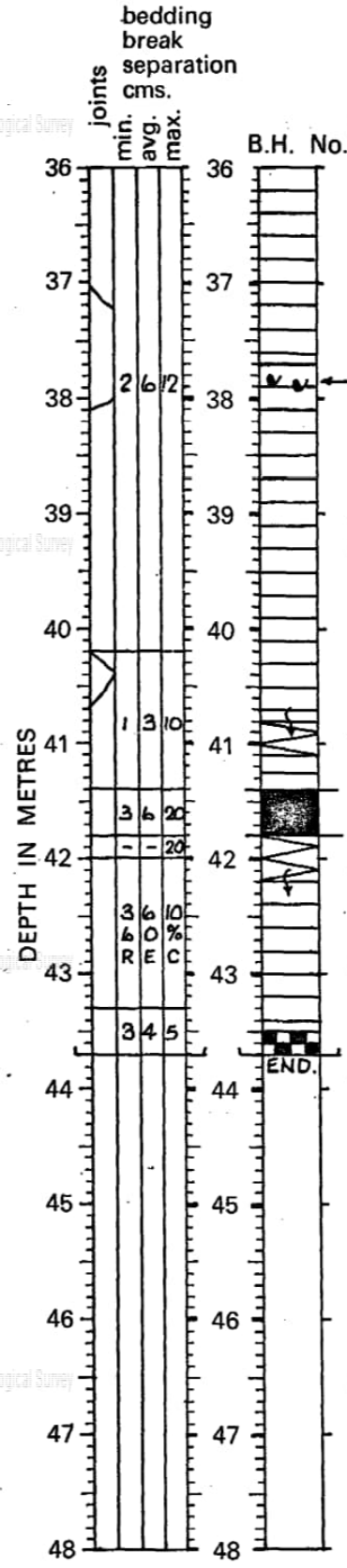
MUDSTONE, GREY/DARK GREY, HARD-FRIABLE / SOFT-FRIABLE, NON-LAMINATED, PLANT DEBRIS, ROOTS.

MUDSTONE, GREY/DARK GREY, HARD/FRIABLE, NON-LAMINATED, PLANT DEBRIS, ROOTS.

SANDSTONE, WITH SILTSTONE & MUDSTONE BANDS, LIGHT GREY, VERY HARD, NON-LAMINATED/SUBLAMINATED.

MUDSTONE, SILTY, GREY, VERY HARD, LAMINATED/SUBLAMINATED.

SJ 59 SW/66



B.H. No. P14 continued

MUDSTONE, SILTY, GREY, VERY HARD, LAMINATED/ SUBLAMINATED.

← MUSSELS.

MUDSTONE, DARK GREY, VERY HARD, LAMINATED/ SUBLAMINATED.

SHALE, DARK GREY, VERY HARD, LAMINATED.

MUDSTONE, GREY, HARD, NON-LAMINATED, PLANT DEBRIS, ROOTS.

COAL 40cm SEEN INTACT. PIGEON HOUSE MINE.

SHALE, DARK GREY, VERY HARD, LAMINATED.

MUDSTONE, DARK GREY, VERY HARD, LAMINATED/ SUBLAMINATED.

IRONSTONE, BROWN, BRITTLE HARD, NON-LAMINATED.

END.

K. WARDELL & PARTNERS - LOG SHEET

SJ59SW 67

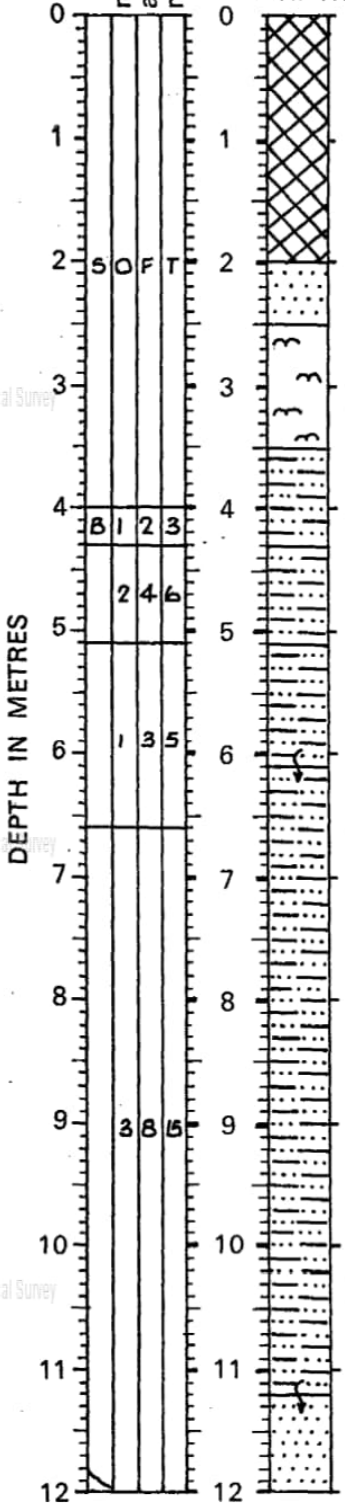
B.H. No. P15
Page 1

CLIENT: PILKINGTON BROTHERS LTD.

JOB: UK5 PROJECT: GREENGATE JOB No. 3540/5

5097 9442

B.H. No. P15 HEIGHT A.O.D. 32·77 m.



FILL, BLACK, SOFT, FRIABLE.

SAND, BROWN, SOFT.

CLAY, BROWN, SOFT / STIFF.

SILTSTONE, GREY/BROWN, SOFT · FRIABLE, VERY WEATHERED.
DRY CORE DRILLING
DIAMOND DRILLING.

SILTSTONE, GREY, HARD-FRIABLE / SOFT · FRIABLE, WEATHERED.

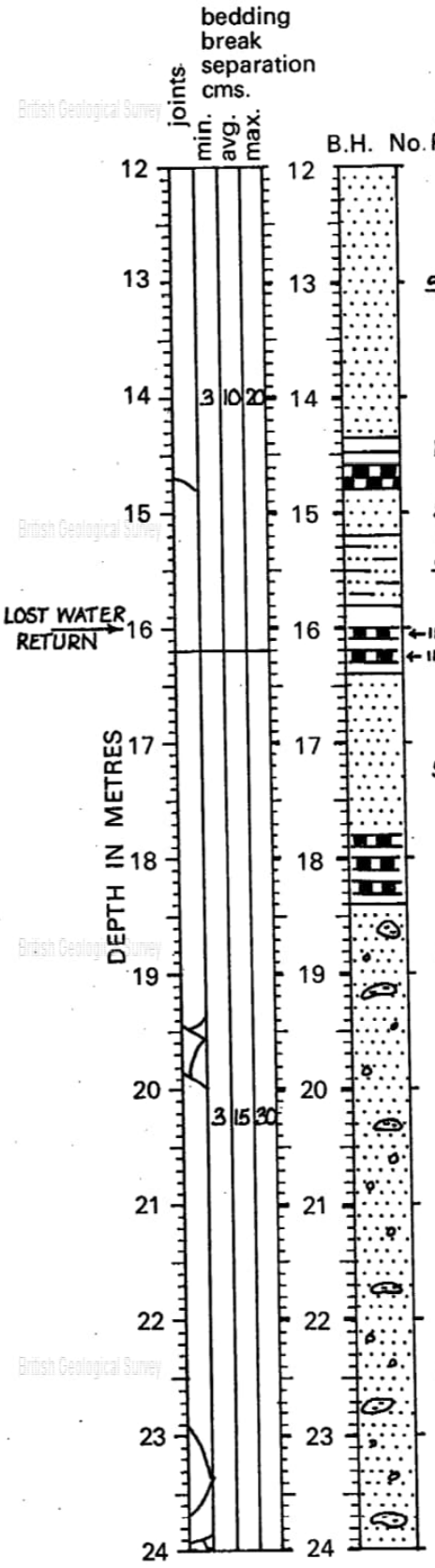
SILTSTONE WITH SANDSTONE STRIPES, GREY, HARD/ FRIABLE, LAMINATED/ SUBLAMINATED.

SILTSTONE WITH SANDSTONE STRIPES, GREY, VERY HARD, LAMINATED / SUBLAMINATED.

SANDSTONE WITH SILTSTONE STRIPES, LIGHT GREY, VERY HARD, SUBLAMINATED.

British Geological Survey

SJ59 SW/67



SANDSTONE WITH SILTSTONE STRIPES, LIGHT GREY, VERY HARD, SUBLAMINATED.

MUDSTONE, GREY, VERY HARD, SUBLAMINATED.

SANDSTONE, LIGHT GREY, VERY HARD, SUBLAMINATED.

SILTSTONE, GREY, VERY HARD, NON-LAMINATED.

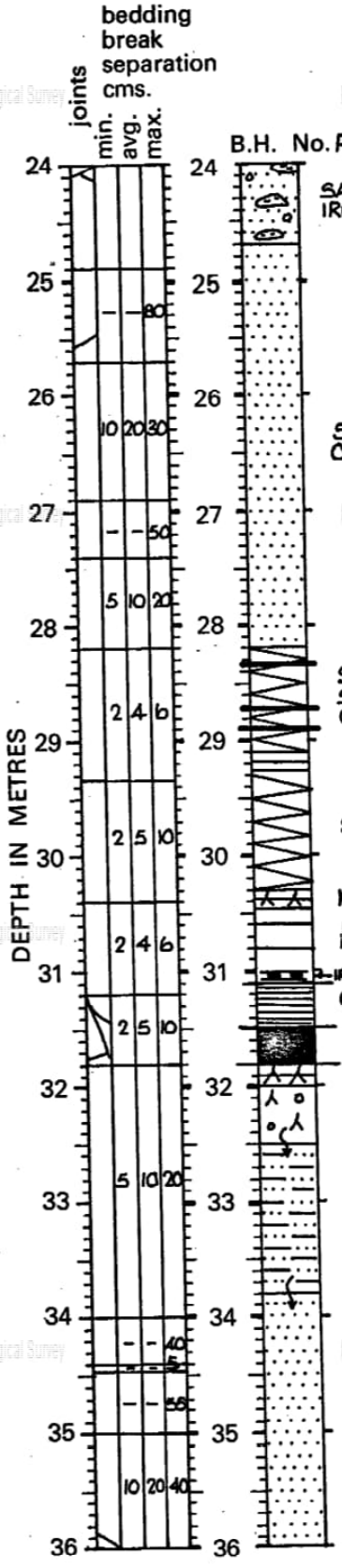
MUDSTONE, SILTY, GREY, VERY HARD, SUBLAMINATED.

SANDSTONE, GREY/LIGHT GREY, VERY HARD, NON-LAMINATED.

SANDSTONE WITH SILTSTONE CLASTS & BANDS AND IRONSTONE NODULES, LIGHT GREY/GREY, VERY HARD, NON-LAMINATED.

British Geological Survey

SJ 59 SW/67



SANDSTONE WITH SILTSTONE CLASTS & BANDS AND IRONSTONE NODULES, LIGHT GREY/GREY, VERY HARD, NON-LAMINATED.

SANDSTONE, LIGHT GREY, VERY HARD, NON-LAMINATED, OCCASIONAL SILTSTONE CLASTS & IRONSTONE NODULES.

SHALE, DARK GREY-BLACK, VERY HARD, LAMINATED/SUBLAMINATED, CARBONACEOUS WITH THIN BANDS OF COAL

HIGHER FLORIDA MINE.

MUDSTONE, DARK GREY, HARD/FRIABLE, SUBLAMINATED.

SHALE, DARK GREY-BLACK, VERY HARD, SUBLAMINATED. PLANT DEBRIS.

MUDSTONE - SEAT EARTH, GREY, HARD-FRIABLE, NON-LAMINATED, ROOTS.

MUDSTONE, GREY, HARD-VERY HARD, SUBLAMINATED, PLANT DEBRIS.

CANNEL COAL 30cm. SEEN INTACT. CANNEL MINE.

COAL 30cm SEEN INTACT.

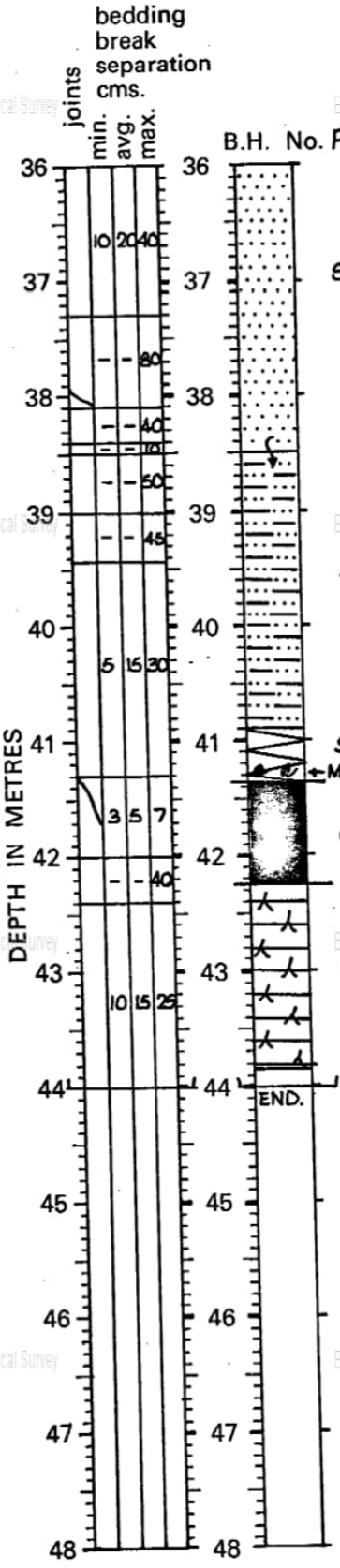
MUDSTONE - SEAT EARTH, GREY, HARD-FRIABLE, NON-LAMINATED, ROOTS.

MUDSTONE, GREY, VERY HARD, NON-LAMINATED, ROOTS, IRONSTONE NODULES.

SILTSTONE, GREY, VERY HARD, SUBLAMINATED.

SANDSTONE, WITH SILTSTONE STRIPES, LIGHT GREY, VERY HARD, SUBLAMINATED/NON LAMINATED

SJ59SW/67



SANDSTONE WITH SILTSTONE STRIPES, LIGHT GREY, VERY HARD, SUBLAMINATED; NON-LAMINATED

SILTSTONE WITH SANDSTONE STRIPES, GREY, VERY HARD, NON-LAMINATED/SUBLAMINATED

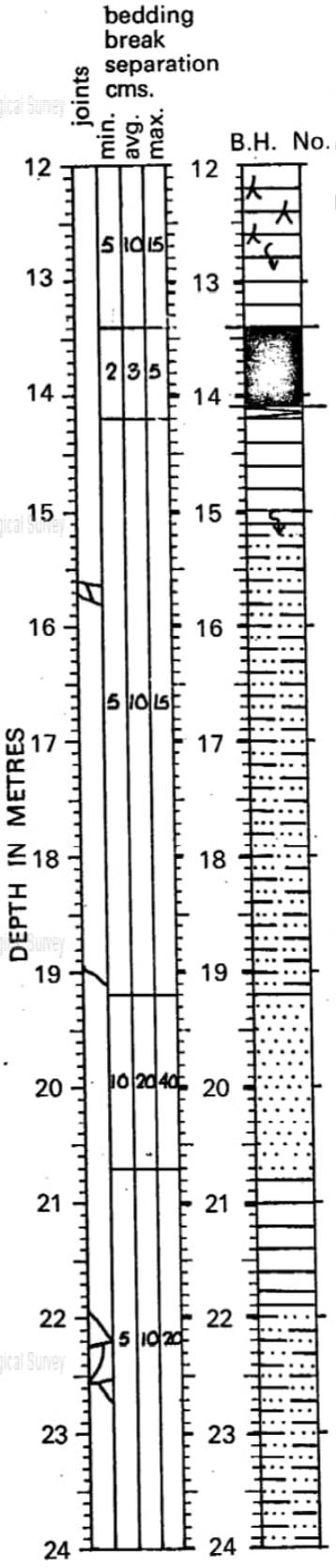
SHALE, DARK GREY, VERY HARD, LAMINATED/SUBLAMINATED.

COAL 85cm SEEN INTACT. LOWER FLORIDA MINE.

MUDSTONE, GREY, HARD/FRIABLE, NON-LAMINATED, ROOTS, PLANT DEBRIS.

MUDSTONE, GREY-DARK GREY, VERY HARD, SUBLAMINATED, PLANT DEBRIS.

SJ59SW/69



MUDSTONE - SEAT EARTH, GREY, HARD - FRIABLE, NON-LAMINATED ROOTS.

MUDSTONE, GREY, HARD, SUBLAMINATED.

COAL 70cm SEEN INTACT. BOTTOM YARD MINE.

SHALE, BLACK, HARD, LAMINATED, CARBONACEOUS WITH COAL STREAKS.

MUDSTONE, GREY, VERY HARD. SUBLAMINATED.

SILTSTONE WITH SANDSTONE STRIPES & BANDS, GREY, VERY HARD, NON-LAMINATED/ SUBLAMINATED, PLANT DEBRIS, OCCASIONAL IRONSTONE NODULES.

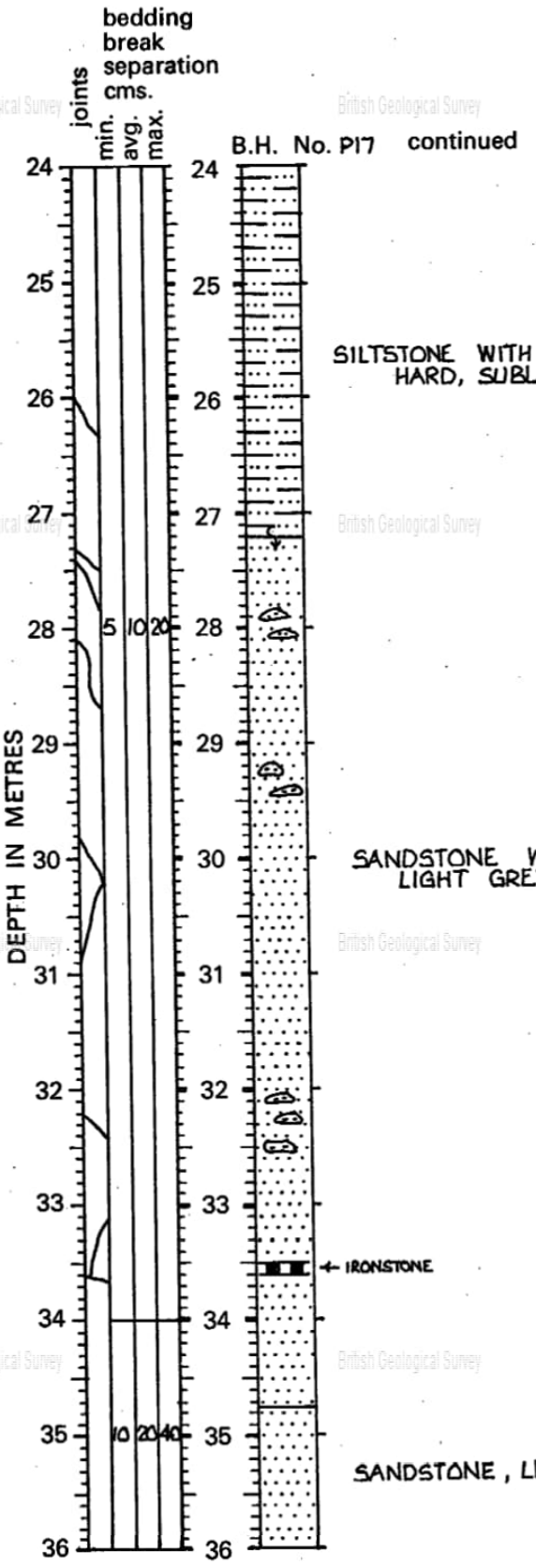
SANDSTONE, LIGHT GREY, VERY HARD, NON-LAMINATED.

MUDSTONE, GREY, HARD/VERY HARD, SUBLAMINATED.

SILTSTONE WITH SANDSTONE STRIPES, GREY, VERY HARD, SUBLAMINATED.

British Geological Survey

SJ 59 SW/69

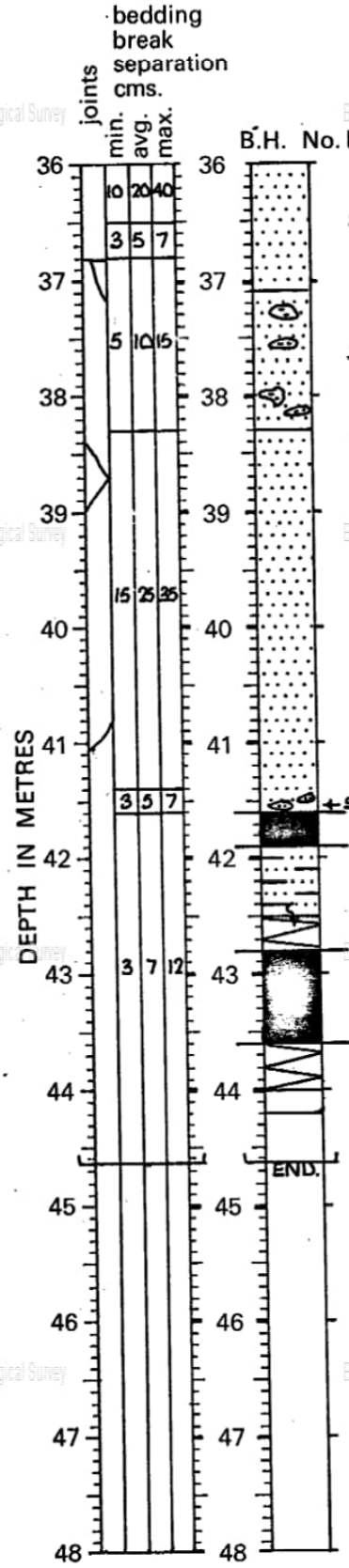


SILTSTONE WITH SANDSTONE STRIPES, GREY, VERY HARD, SUBLAMINATED.

SANDSTONE WITH SILTSTONE BANDS & CLASTS, LIGHT GREY / GREY, VERY HARD, NON-LAMINATED/ SUBLAMINATED.

SANDSTONE, LIGHT GREY, VERY HARD, NON-LAMINATED

SJ 59 SW/69



B.H. No. PI7 continued

SANDSTONE, LIGHT GREY, VERY HARD, NON-LAMINATED.

SANDSTONE WITH SILTSTONE BANDS & CLASTS, LIGHT GREY/GREY, VERY HARD, NON-LAMINATED.

SANDSTONE, LIGHT GREY, VERY HARD, NON-LAMINATED.

+ SILTSTONE CLASTS.

COAL 30 cm SEEN INTACT.

SILTSTONE WITH SANDSTONE STRIPES, DARK GREY, CARBONACEOUS WITH COAL STREAKS, VERY HARD, SUBLAMINATED.

SHALE, DARK GREY/BLACK, VERY HARD, LAMINATED.

COAL 80 cm SEEN INTACT. HIGHER FLORIDA MINE.

SHALE, DARK GREY, VERY HARD, SUBLAMINATED.

MUDSTONE, GREY, HARD/FRIABLE, NON-LAMINATED.

MUDSTONE, GREY, VERY HARD, SUBLAMINATED.

END.

British Geological Survey

APPENDIX B
BOREHOLE RECORDS FOR EAST PIPELINE

SJ68SE 44

67782 82355

Sampling					Strata			
Drill Run	TCR (SCR)	Casing (RQD)	Date/ Water	FI	Description	Depth (Thickness)	Level	Legend
					MADE GROUND** [Made Ground]	G.L. (1.20)	53.80	
					Sandy BOULDER CLAY** [Glacial Till]	1.20 (2.10)	52.60	
3.50				NI	Grey MARL** (Assumed) [Mercia Mudstone]	3.30 3.50	50.50 50.30	
	88% (82%)	(47%)		4 NI 3 NI 5 NI 6 NI 9 >20 NR	Red-brown, occasionally grey-green thinly and thickly laminated silty MUDSTONE. Very weak to weak, with frequent sub-horizontal planar discontinuities [Mercia Mudstone - WG IIIa occ. IIIb] 4.30m: water softened, sub-horizontal discontinuity. From 5.38m to 6.47m: with occasional thin bands of clayey siltstone upto 25mm wide			
6.00				4 2 7	Becoming mainly red-brown below 6.47m			
	100% (96%)	(47%)		NI 9 6	Below 7.49m: with occasional sub-horizontal discontinuous gypsum bands upto 12mm wide			
9.00				NI 5	8.70m to 9.00m: tight, sub-vertical discontinuity. (Mercia Mudstone - WG IIIa becoming IIIa to II) 9.57m to 9.67m: sub-vertical discontinuity 9.74m to 9.90m: sub-vertical discontinuity 9.88m to 9.95m: 70mm wide gypsum band.			

Equipment: Top Drive Rotary Rig

Borehole Dia (mm) S to 20.50m

Casing Dia (mm) S to 3.50m

Groundwater
No. Struck Behaviour Sealed

Ground Level 53.80 m OD
Coordinates 107789.0 mE
102352.3 mN

Drilled by MO'R
Logged by JW
Checked by

Remarks

See key sheet and appendices for explanations.

Form 1/0

Borehole Record

Exploration Associates

Project
M6 Widening Junctions 16 to 20
Department of Transport
Motorway Widening Unit

Contract D2200

Borehole 407(1 of 3)

SJ68SE 44

Sampling					Strata			
Drill Run	TCR (SCR)	Casing (RQD)	Date/ Water	FI	Description	Depth (Thickness)	Level	Legend
	100% (93%)	(41%)		8	(See previous sheet - MUDSTONE) 10.11m to 10.14m: thin band of sandstone 10.32m to 10.35m: thin band of sandstone. 10.54m to 10.57m: thin band of sandstone Below 10.85m: with frequent sub-horizontal discontinuous gypsum bands upto 6mm wide 10.97m to 14.46m: open sub-vertical discontinuity			
				8				
12.00								
				16	12.12m to 12.20m: open sub-vertical discontinuity 12.23m to 12.47m: closed sub-vertical discontinuity 12.95m to 13.05m: closed sub-vertical discontinuity			
	97% (97%)	(61%)		3	13.70m: 12mm wide sub-horizontal gypsum band			
				3	14.47m: 25mm wide sub-horizontal gypsum band.			
15.00					(WG - II) 15.10m to 15.15m: 50mm wide sub-horizontal gypsum band			
				2				
	95% (89%)	(89%)		1	16.56m to 16.70m: gypsum filled sub-vertical discontinuity Below 16.72m: mainly grey-green with rare siltstone bands upto 25mm wide			
				3				
17.50				8	17.69m: 15mm wide sub-horizontal gypsum band			
				NI				
				1				
	100% (100%)	(89%)		1	Below 18.91m: becoming thinly interlaminated silty mudstones and clayey siltstones (upto 20mm wide) with frequent sub-horizontal gypsum bands upto 50mm wide 19.50m to 19.55m: 50mm wide gypsum band			
				1				

Equipment: Top Drive Rotary Rig

Borehole Dia (mm) S to 20.50m

Casing Dia (mm) S to 3.50m

Groundwater
No. Struck Behaviour Sealed

Ground Level 53.80 m OD
Coordinates 107789.0 mE
102352.3 mN

Drilled by MO'R
Logged by JW
Checked by

Remarks

See key sheet and appendices for explanations.

Form 1/0

Borehole Record

Exploration Associates

Project
M6 Widening Junctions 16 to 20
Department of Transport
Motorway Widening Unit

Contract D2200

Borehole 407(2 of 3)

SJ68SE44

Sampling

Drill Run	TCR (SCR)	Casing (RQD)	Date/ Water	FI
20.50				

Strata

Description	Depth (Thickness)	Level	Legend
(See previous sheet - MUDSTONE) 20.14m to 20.17m: 30mm wide gypsum band Below 20.28m: with occasional green reduction spots.	20.50	33.30	
End of Borehole.			

Equipment: Top Drive Rotary Rig

Borehole Dia (mm): S to 20.50m

Casing Dia (mm): S to 3.50m

Groundwater

No. Struck Behaviour Sealed

Ground Level 53.80 m OD
Coordinates 107789.0 mE
102352.3 mN

Drilled by MO'R
Logged by JW
Checked by

Remarks

See key sheet and appendices for explanations.

Form 1/0

Borehole Record

Exploration Associates

Project
M6 Widening Junctions 16 to 20
Department of Transport
Motorway Widening Unit

Contract D2200

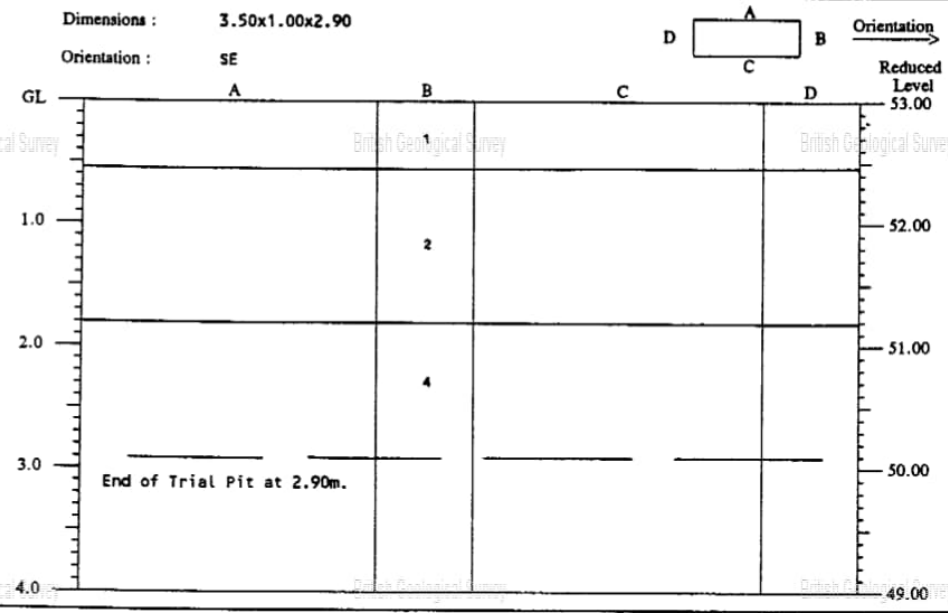
Borehole 407(3 of 3)

British Geological Survey

67221 82418 SJ685E64

Dimensions : 3.50x1.00x2.90

Orientation : SE



Strata			Samples and Tests		
Depth (m)	No.	Description	Depth (m)	Type	Results
0.00-0.55	1	Loose dark brown clayey fine and medium SAND with occasional gravel, cobbles and rootlets. [Topsoil]			
0.55-1.80	2	Firm light orange-brown mottled grey slightly sandy CLAY with occasional gravel. Below 0.80m: with some sub-angular to sub-rounded fine, medium and coarse gravel. [Glacial Till]	0.75 0.75 0.75 0.75-0.90 1.45 1.45	HV HP D B HV HP	44, 44, 44, 53 1.0, 1.0, 1.2, 1.1 44, 44 0.8, 0.8, 1.0
1.80-2.90	3	Firm to stiff friable red-brown silty CLAY with some angular mudstone lithorelicts. [Mercia Mudstone WG IV] Below 2.10m: WG IIIb - IIIa. Below 2.50m: WG IIIa.	1.90 2.10-2.30	D B	

Date of Excavation 13/04/93
Equipment JCB 3CX
Stability Stable throughout

Groundwater
No. Struck Behaviour
Trial Pit Dry

Ground Level 53.00 m OD
Coordinates 107725.10 mE
102415.40 mN

Logged by JJ
Checked by

Remarks

See key sheet and appendices for explanations.

Form 2/0

Trial Pit Record

Exploration Associates

Project
M6 Widening Junctions 16 to 20
Department of Transport
Motorway Widening Unit

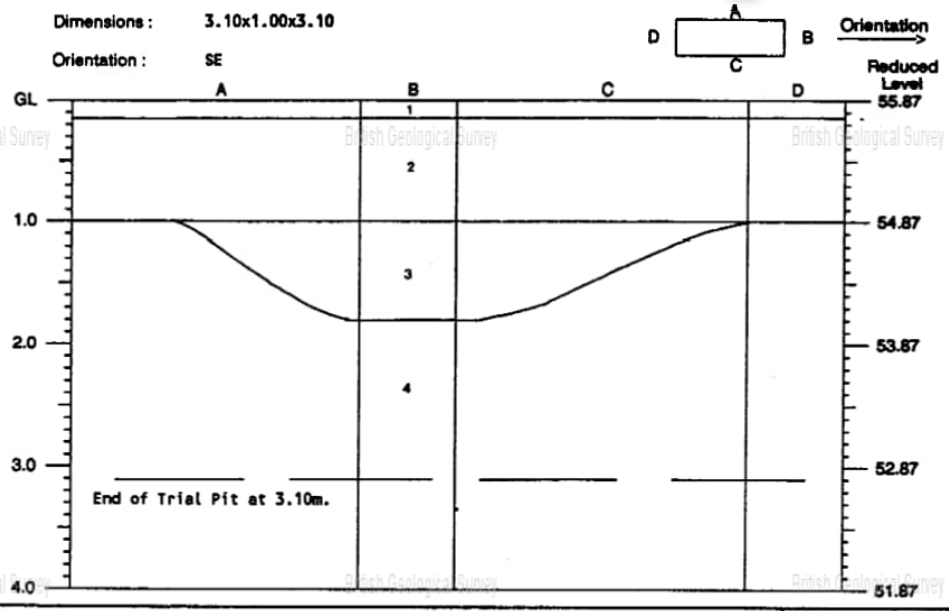
Contract D2200

Trial Pit TP081

67565 82618 SJ 685 666

Dimensions : 3.10x1.00x3.10

Orientation : SE



Strata

Depth (m)	No.	Description
0.00-0.15	1	Loose dark brown clayey fine and medium SAND with occasional gravel, cobbles and rootlets. [Topsoil]
0.15-1.00	2	MADE GROUND: Soft to firm brown sandy clay with some gravel of sub-angular to sub-rounded fine, medium and coarse brick and concrete fragments, occasional boulder sized concrete fragments, sub-rounded sandstone cobbles and boulders. [Made Ground]
1.00-1.80	3	MADE GROUND: Soft grey-brown organic silty clay with wood fragments, cobbles occasional sandstone boulders and brick fragments. [Made Ground] Below 1.40m: probably natural (pond deposits) [Organic CLAY]
1.80-3.10	4	Stiff friable red-brown silty CLAY with numerous sub-angular mudstone lithorelicts, occasionally mottled grey. [Mercia Mudstone WG IV - IIIb] Below 2.50m: WG IIIb - IIIa

Samples and Tests

Depth (m)	Type	Results
0.30	D	
0.30-0.50	B	
1.00	D	
1.00-1.20	B	
1.00	HP	1.0, 1.0, 1.0
1.00	HV	44, 63, 72, 49
1.50	HV	33, 30, 30, 34
1.50	HP	06, 0.7, 0.6, 1.0
1.80	D	
2.10-2.50	B	
2.80-3.10	B	

Date of Excavation 13/04/93
Equipment JCB 3CX
Stability Stable throughout

Groundwater

No.	Struck	Behaviour
1		Slight seepage face A from bricks and cobbles.
2	1.40	Slight seepage from faces A, B and D

Ground Level 55.87 m OD
Coordinates 107572.60 mE
102614.70 mN
Logged by JJ
Checked by

Remarks

See key sheet and appendices for explanations.

Form 2/0

Trial Pit Record

Exploration Associates

Project
M6 Widening Junctions 16 to 20
Department of Transport
Motorway Widening Unit

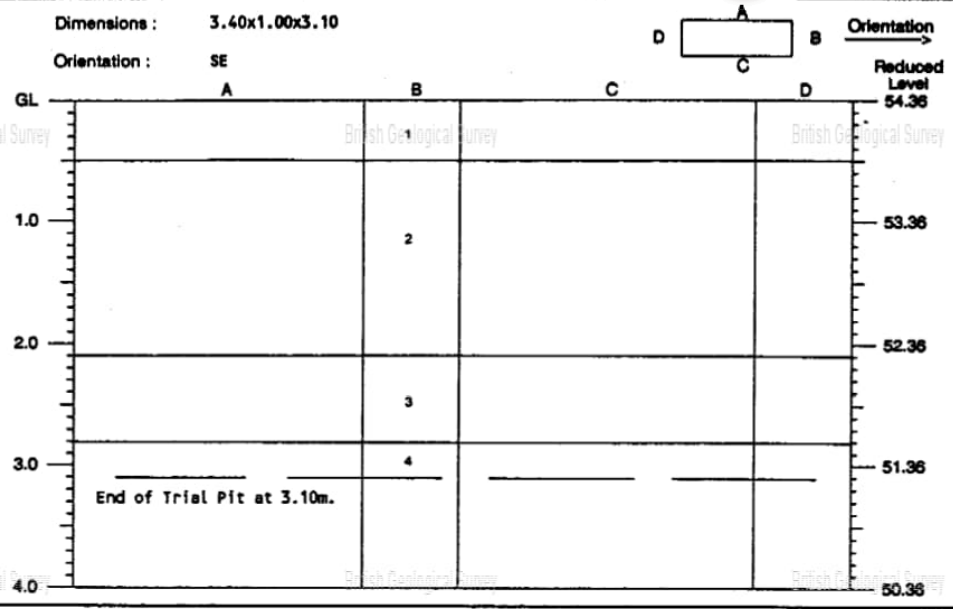
Contract D2200

Trial Pit TP083

67400 82823 SJ 68 SE 67

Dimensions : 3.40x1.00x3.10

Orientation : SE



Strata

Depth (m)	No.	Description
0.00-0.50	1	Loose dark brown clayey fine and medium SAND with occasional gravel, cobbles and rootlets. [Topsoil]
0.50-2.10	2	Very stiff yellow mottled red-brown sandy CLAY with a little to some sub-angular to sub-rounded fine, medium and coarse gravel with occasional cobbles and numerous large roots. [Glacial Till]
2.10-2.80	3	Very stiff red-brown mottled grey silty sandy CLAY with numerous mudstone lithorelicts. Probably disturbed down to 2.80m Below 2.80m: Mercia Mudstone WG IIIb. [Glacial Till]
2.80-3.10	4	Mercia MUDSTONE WG IIIb

Samples and Tests

Depth (m)	Type	Results
0.70	D	
0.70-0.90	B	
0.70	HV	110, 104, 92
0.70	HP	3.1, 2.8, 4.4
1.30	HV	85, 140+, 96, 140+
1.30	HP	2.0, 2.0, 2.3, 2.0
2.30-2.50	B	
2.50	D	
2.90-3.10	B	

Date of Excavation 13/04/93
Equipment JCB 3CX
Stability Stable throughout

Groundwater
No. Struck Behaviour
Trial Pit Dry

Ground Level 54.36 m OD
Coordinates 107403.40 mE
102820.50 mN

Logged by JJ
Checked by

Remarks

See key sheet and appendices for explanations.

Form 2/0

Trial Pit Record

Exploration Associates

Project
M6 Widening Junctions 16 to 20
Department of Transport
Motorway Widening Unit

Contract D2200

Trial Pit TP084

British Geological Survey

Section of Boring at Agden, Lymm

No. 2 Bore AGDEN near Bollington County Cheshire

SJ78NW/6 17NE

One-inch (N.S.) map 98.

6 inch 17NE

O.D. Patent 66 ft.

8.

	THICKNESS. Feet.	Inches.	DEPTH. Feet.	Inches.	
Sand & Gravel	12	–	12	–	3·65
Soft Sandy Clay	11	–	23	–	7·01
Clay & Stones	41	–	64	–	19·50
Loamy Sand	50	–	114	–	34·74
Sand & Gravel	47	–	161	–	49·07
Fine Sand	23	–	184	–	56·08
Gravel	12	–	196	–	59·74
Grey Marl & Gypsum	8	–	204	–	62·17
Variegated Marls with Gypsum	86	–	290	–	83·39
			317	–	96·62
Hard Grey Bind	4	–	321		97·84
Shaly Variegated Marls with Salt	33	–	354	–	107·89
Soft " "	18	–	372	–	113·38
Variegated Marls with bands of Gypsum	120	–	492	–	149·96
Red Sandstone	9	–	501	–	152·70
Variegated Marls	36	–	537	–	163·67
Hard Grey Marl with Salt	6	–	543	–	165·50
Saltrock with bands of hard Marl	49	–	592	–	180·46

Water Level after Borehole struck Sandstone at 492ft. = 20ft. about [Below surface]

Tubes to 520ft. about.

692 ft ?

But see attached slip for completed bore to 692ft. 7 ins. Supplied by J. Thornton in 1934.

98 STOCKPORT. T Charsley.

0614260112

BLAIR CONTRACTORS LTD 061 426 0112 18/05/94 18:28:13 P.01

Central hs.
North West NRA

ACCESSION NUMBER 98 22237

FORM WR-38

National Rivers Authority
North West Region
BOREHOLE RECORD

SJ 78/57

NRA No. 55

(Please type)

A. SITE DETAILS CONSENT NO 827 SJ78NW 55

Borehole drilled for	J. PRIESTNER PARTNERSHIP
Location	PETER HOUSE FARM CORSEY LANE
NGR (8 fig.)	SJ 68/78 7280 8925 Please attach site plan
Ground Level (if known) ..	
Drilling Company	BLAIR DRILLING
Date of drilling	Commenced: 30/5/95 Completed: 6/6/95

B. CONSTRUCTION DETAILS

Borehole datum (if not ground level)..... FLANGE (WELLCAP) above m below GL
(point from which all measurements of depth are taken eg flange, edge of chamber, etc)

Borehole drilled diameter ..... 250 mm from 0 to 5.3 m/depth
175 mm from 5.3 to 65 m/depth
____ mm from ____ to ____ m/depth

Casing material STEEL diameter 200 mm from 0 to 5.3 m/depth
and type (eg plain steel, plastic slotted)
PLASTIC diameter 125 mm from 0 to 65 m/depth
____ diameter ____ mm from ____ to ____ m/depth
____ diameter ____ mm from ____ to ____ m/depth

Grouting details 5.3

Water struck at 6 METRES ____ m (depth below datum - mbd)
____ m (depth below datum - mbd)

Rest water Level on completion ..... 2.38 mbd

C. TEST PUMPING SUMMARY (Please supply full details on Forms WR-39)

Test Pumping Datum (if different from borehole datum) ____ above m below borehole datum (mbd)

Pump Suction Depth ..... 50 METRES ____ mbd

Water Level (Start of Test) ..... 2.38 mbd

Water Level (End of Test) ..... 2.37 mbd

Pumping rate ..... 4.4 cu per hr. m³/d : l/s

for 48 HRS days/hours

Recovery to 2.37 mbd in ____ mins : hrs : days
(from end of pumping)

Date(s) of measurements ..... 29TH 30TH JUNE 1ST JULY

RECEIVED N.W.R.C.
DATE: 19 MAY 1995
SWIS Road

SJ78NW/55

WRB No SJ78/57

FORM WR-38 (cont.)

NRA No.	

(Please type)

D. STRATA LOG

Geological Classification (BGS only)	Description of strata	Thickness m	Depth m
	TOP SOIL	0.2	0.2
	CLAY (CONTAINING SAND)	0.3	0.5
Shirdley Hill Sand	SAND (WET) B.S OF CLAY	4.6	5.1
? Helsby Sst fm	WEAKLY FRACTURED SANDSTONE	26.96	32.06
	STEEL LINER AT 5.3M		
(map suggests	LAYER OF WATERSTONE	0.08	32.14
	MEDIUM SANDSTONE	6.2	38.34
Tarporley Silt st fm.	(VERY) HARD SANDSTONE	12.1	50.44
	LAYER OF WATERSTONE	0.16	50.60
	HARD SANDSTONE	14.4	65m

A Howard 1/12/97

[continue on separate page if necessary]

Other Comments (eg gas encountered, saline water intercepted, etc)

FOR OFFICIAL USE ONLY

FILE ..... CONSENT NO

SJ 68NW 65

Norwest Holst Soil Engineering Ltd.

Borehole No. **5**

BOREHOLE LOG

7173 8791

Contract No. F5805
Location Warburton - Holford Pipeline
Client North West Gas
Method of Boring Percussion
Diameter of Borehole 150mm

Sheet 1 of 2
Chainage
Ground Level m.A.O.D.
Date 25/11/83-28/11/83

Description of Strata	Legend	Depth Below G.L.(m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	"N"/ R.Q.D.%	Daily Progress
TOPSOIL		0.30					
Loose brown SAND.		1.05			0.55	3	
Soft brown silty sandy CLAY.		1.90			1.55 (19)		
Soft grey very sandy CLAY.		2.30					
Soft brown fibrous PEAT.		3.50			2.55 (12)		
Soft grey very sandy CLAY with sand partings.		4.90			3.55	3	
					4.55 (12)		
Brown SAND.		5.75					
Firm to stiff brown silty CLAY.					6.05 (32)		
					7.55 (29)		
					9.05 (34)		

Type of Sample

Is	S.P.T.	■	Undisturbed
Ic.	C.P.T.	×	Vane
O	Jar	Δ	Water
●	Bulk		Piezometer

Remarks (Observations of Ground Water etc.) (19) U100 blows.

Water struck at 3.40m.
Level rose after 20mins to 2.90m.
Final standing level 0.85m.

Water levels are subject to seasonal or tidal variations and should not be taken as constant

British Geological Survey

SJ78NW 196

ALLIED EXPLORATION & GEOTECHNICS LTD

BOREHOLE RECORD

Status:- **FINAL**
Date:- **07/03/96**

Project: **NMCS2 Communications System in Cheshire - MS2 Cantilever Sites - M56**	BOREHOLE No **BH-45A**
Client: The Highways Agency	Location: 24/5 +05A
Method & Equipment: Percussion/Rotary using a Pilcon Wayfarer 1500	Ground Level(m(AOD)): 60.77 / Date: 11-12-95 / Sheet: 1 of 1

SAMPLES & TESTS			Water	STRATA				Instrumentation/Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION	
						(3.00)	(1) MADE GROUND (Granular fill).	
				57.77		3.00		
3.00-3.20	B1					(0.30)	MADE GROUND (Red brown occasionally mottled green grey silt with occasional gravel. Gravel is fine subround and consists of quartzite and basalt).	
3.30-3.75	SJ2	N25		57.47		3.30		
						(0.60)	MADE GROUND (Firm friable red occasionally thinly laminated red brown and green grey clay with occasional gravel. Gravel is fine angular and consists of mercia mudstone and siltstone).	
3.80-4.20	B3			56.87		3.90		
						(0.30)		
				56.57		4.20	MADE GROUND (Stiff friable occasionally thinly laminated clay with much gravel. Gravel is medium occasionally coarse angular to subangular and consists of mercia mudstone, sandstone and limestone).	
4.50	SJ4	25 for 10mm				(0.50)		
				56.07		4.70		
							Stiff friable occasionally thinly laminated red brown sandy CLAY. (Mercia Mudstone - Zone IVb)	

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date		Depth	Casing	Casing Dia	Water Depth	From	To	Hours	From	To	
11/12/95		0.00	0.00						0.00	4.70	1) Description derived from driller's daily report.
11/12/95		4.70	4.70	200mm	3.70						

All dimensions in metres Scale 1:50	For Explanation of Symbols and Abbreviations see Key Sheets	Checked By: AR	Logged By: A. Latimer	Contract No. 1568

Date Printed:- 11/03/96

Form AEG21/2

British Geological Survey

SJ78NW 196

ALLIED EXPLORATION & GEOTECHNICS LTD

Status:- **FINAL**
Date:- **07/03/96**

DRILLHOLE LOG

Project: NMCS2 Communications System in Cheshire - MS2 Cantilever Sites - M56	DRILLHOLE No BH-45A
Client: The Highways Agency	Location: 24/5 +05A
Method & Equipment: Percussion/Rotary using a Pilcon Wayfarer 1500	Ground Level(m(AOD)): 60.77
Date: 11-12-95	Sheet: 1 of 1

RUN DETAILS			STRATA					Geology	Instrument/ Backfill
Date Depth	TCR (SCR) RQD	(SPT) Fracture Index	Red'cd Level	Legend	Depth Thick-ness)	DESCRIPTION Discontinuities	Detail	Main	
	21 (0) 0	NR	56.07		4.70 (0.75)	4.70-5.45m ... Core loss.		Boring complete at 4.70m - continued by rotary coring (1) Red brown MUDSTONE weak.	
5.65		35	55.32 55.12		5.45 (0.20) 5.65	5.45-5.68m ... Very closely to extremely closely spaced subhorizontal (5-10 degrees) undulose tight clean smooth discontinuities.		Red brown thinly laminated slightly to moderately weathered MUDSTONE weak to very weak. (Mercia Mudstone - Zone II)	
6.20	95 (33) 0	12				5.68-8.00m ... Closely to very closely spaced horizontal and subhorizontal (10 degrees) planar and undulose tight clean smooth discontinuities.		Red brown thinly to thinly laminated slightly weathered MUDSTONE weak with thin laminae of brown fine grained sandstone and green grey siltstone. (Mercia Mudstone - Zone I)	
6.70	100 (52) 0				(2.35)	5.82-6.00m ... Vertical to subvertical (80 degrees) undulose tight and open clean smooth fracture.		between c.5.84 and 5.87m BGL ... green grey thinly laminated slightly weathered siltstone moderately weak with thin laminae of green grey mudstone.	
8.00	86 (41) 19		52.77		8.00	6.30-6.40m ... Subvertical (85 degrees) planar tight clean smooth fracture.		between c.7.65 and 7.69m BGL ... recovered as very soft brown clayey gravel.	
						6.75-6.94m ... Subvertical (80-85 degrees) undulose tight and open clean smooth fracture.		Drillhole complete at 8.00m BGL.	
						7.42-7.60m ... Subvertical (80 degrees) planar and irregular open clean smooth and rough fracture.			
						7.65-7.71m ... Inclined (60 degrees) undulose open infilled smooth fracture. Infilling of clay.			

Drilling Progress and Water Observations

Date		Depth	Casing	Core Dia mm	Water Strike	Water Standing	Flush Type	Flush Returns
12.12.95		4.70	4.50			4.00		
12.12.95		8.00	4.50			dry	air	100%

GENERAL REMARKS

1) Description derived from driller's daily report.

All dimensions in metres Scale 1:50	For Explanation of Symbols and Abbreviations see Key Sheets	Checked By: AR	Logged By: A. Latimer	Contract No. 1568

Date Printed:- 11/03/96

Form AEG22

British Geological Survey

SJ79SW

29-34

29 Hole 35 29

12.3.1945

From	To	METRES	
0	- 1'3"	0·38	Black Soil
1'3"	- 8'	2·44	Light & Dark Peat
8'	- 10'	3·05	Brown & Grey Sand
10'	- 19'	5·79	Sand & Gravel
19'	- 20'	6·10	Brown Clay
20'	- 21'	6·40	Stiff Brown Clay
21'	- 25'	7·62	Stiff Brown Clay
25'	- 27'6"	8·38	Red Loamy Sand
27'6"	- 29'6"	8·99	Soft Red Sandstone
29'- 6"			Red Sandstone
			Finish 29'-6"

30 Hole 39 30

3.8.1945

0'	- 2'	0·61	Soil & Sand
2'	- 9'	2·74	Brown Peat
9'	- 23'	7·01	Sand & Gravel
23'	- 34'	10·36	Stiff Brown Clay
34'	- 37'	11·28	Sand & Gravel
37'	- 38'	11·53	Red Sandstone
			Finish 38'0"

31 Hole 40 31

8.8.1945

0'	- 2'	0·61	Soil & Sand
2'	- 9'	2·74	Brown Peat
9'	- 11'	3·35	Grey Sand
11'	- 22'	6·71	Sand & Gravel
22'	- 34'	10·36	Stiff Brown Clay
34'	- 39'3"	11·96	Red Loamy Sand
39'3"	- 40'	12·19	Red Sandstone
			Finish 40'0"

32 Hole 41 32

17.8.1945

0'	- 2'	0·61	Cinders Soil & Sand
2'	- 11'	3·35	Brown Peat
11'	- 18'	5·49	Sand & Gravel
18'	- 26'	7·92	Stiff Brown Clay
26'	- 39'6"	12·04	Red Loamy Sand & Stones
39'6"	- 40'	12·19	Red Sandstone
			Finish 40'0"

33 Hole 42 33

23.8.1945

0'	- 2'	0·61	Cinders Soil & Sand
2'	- 10'	3·05	Brown Peat
10'	- 13'	3·96	Brown Sand
13'	- 17'	5·18	Sand & Gravel
17'	- 27'	8·23	Stiff Brown Clay
27'	- 34'	10·36	Red Loamy Sand & Stones
34'	- 35'	10·67	Red Sandstone
			Finish 35'0"

34 Hole 38 34

24.1.1945

From	To		
0'	- 1'	0·30	Black Soil
1'	- 3'	0·91	Dark Peat
3'	- 7'	2·13	Light Brown Peat
7'	- 7.6'	2·29	Brown Sand
7.6'	- 9'	2·74	Brown Sand
9'	- 10'	3·05	Yellow Sand
10'	- 15'	4·57	Sand & Gravel
15'	- 17'	5·18	Sandy Brown Clay
17'	- 24'	7·32	Boulder Clay
24'	- 26'	7·92	Gravel & Sand
26'	- 28'	8·53	Loamy Sand
28'	- 34'	10·36	Red Loamy Sand & Green Sand
23'			Soft Red Sandstone
34.6			Red Sandstone
			Finish 34.6

Manchester Gas Corpn. Sec 11.

SJ 79/107 K

Owner		Licence No.		Nat. Grid Ref.	7312 9144
Occupier		IGS Ref. No.	SJ 79 SW 56	Status	
Ground Level	m OD		ft. OD	Aquifer	
Level of Well Top	m OD		ft. OD		
Rest Water Level	m bwt		ft. bwt		
(Date)	m OD		ft. OD		

Construction

Depth bwt	Dia.	Linings (below well top) From	To	Dia.	Type

Summary of Geological Section	Thickness	Depth
Peat	9'	
Sand & gravel	5	
Stiff clay	3	
Gravel & clay	6	
Red silt	1	

Abstraction Rates	Type of Pump		
gph	Chem./Bact. Anal.	YES	NO
gpd	Well Driller		

If insufficient space has been allowed, continue in 'Notes' overleaf.

SJ79SW/70

BOREHOLE LOG

81.496
(Mandale Grid)

Site Partington
Client N. W. G. B.
Borehole No. 1
Ground Level Existing

Job No. S.I. 1146
Date Sep. 1967
Diameter
Scale 1/4 in = 1 ft.

Description	Depth	Legend	Sample	'N' Value	Core recovery %	Water Levels
Existing Ground ▼	0'-0"					
Fill – fly ash (p.f.a.)	7'-6" (2.29m)				Nil	Entry
Compact red sand with lumps of weathered sandstone	15'-0" (4.57m)				Nil	
Coarse grained sandstone with seams of mudstone	19'-3" (5.81m)				63	
	22'-1" (6.73m)				100	
	27'-1" (8.25m)				88	

MATTHEWS & MUMBY (FOUNDATIONS) LTD MANCHESTER

BOREHOLE LOG SJ79SW/70

Site Partington
Client N. W. G. B.
Borehole No. 1
Ground Level Existing

Job No. S.I. 1146
Date Sep. 1967
Diameter
Scale ¼ in = 1 ft.

(contd.)

Description	Depth	Legend	Sample	'N' Value	Core recovery %	Water Levels
					61	
	32'-0" (9·75m)					
					70	
	34'-10" (10·62m)					
Coarse grained sandstone with seams of mudstone					80	
	39'-10" (12·14m)					
					72	
	45'-0" (13·72m)					
					57	
	50'-0" (15·24m)					
Very soft sandstone					7	
	55'-0" (16·76m)					
Coarse grained sandstone					Nil	

BOREHOLE LOG SJ79SW/70

Site Partington — Job No. S.I. 1146

Client N.W.G.B. — Date Sep. 1967

Borehole No. 1 — Diameter

Ground Level Existing — Scale 1/4 in = 1 ft

(contd.)

Description	Depth	Legend	Sample	'N' Value	Core recovery %	Water Levels
Coarse grained sandstone with seams of mudstone	80-0 (24.38m)				Drilling without core recovery	
	85-0 (25.91m)				100	
					Drilling without core recovery	

SJ79SW 21-24

21 Hole 59 21

5.6.1945

From	To	METRES	
0	- 8'	2·44	Black Canal Silt
8	- 9'	2·74	Sand & Gravel
9	- 10'	3·05	Brown Sand
10	- 12	3·66	Stiff Brown Clay
12	- 14	4·27	" " "
14	- 19	5·79	" " "
19	- 25	7·62	" " "
25	- 27	8·23	Boulder Clay
27	- 30	9·14	" "
30	- 37	11·28	Sandy Clay & Boulders
37	- 47	14·33	Loamy Sandy Clay & stones
47	- 54	16·46	Red Loamy sand
54			Red Sandstone
			Finish 54'0"

22 Hole 61 22

4.5.1945

0'	- 4'	1·22	Brown Sand & Stones
4'	- 10'	3·05	Yellow Sandy Clay
10'	- 12'	3·66	Brown Sand
12'	- 13'	3·96	Sand & Gravel
13'	- 23'	7·01	Brown Clay
23'	- 29'	8·84	Brown Clay & Stones
29'	- 31'	9·45	Clay & Stones
31'	- 35'	10·67	Sand & Boulders
35'	- 43'	13·11	Sand & Gravel
43'	- 48'	14·63	Brown Sand & Stones
48'	- 52'6"	16·00	Sand & Stones
52'6"			Red Sandstone
			Finish 52'6"

23 Hole 33 23

5.2.1945

0	- 1'	0·30	Black Soil
1'	- 2'	0·61	Black Peat
2'	- 3'	0·91	Yellow Sand
3'	- 10'	3·05	Sand & Gravel
10'	- 18'	5·49	Brown Sandy Clay
18'	- 19.8'	6·00	Sandy Clay & Stones
19.8'	- 22'	6·71	Boulder Clay
22'	- 26'	7·92	Large Stoned Gravel & Sand
26'	- 28'	8·53	Loamy Sand
28'	- 29'	8·84	Soft Red Sandstone
29'	- 3	9·14	Red Sandstone
			Finish 29-3

24 Hole 32 24

13.2.1945

0	- 1	0·30	Black Soil
1	- 2	0·61	Brown Peat
2	- 3	0·91	Brown Sand
3	- 4	1·22	Yellow Sand
4	- 6	1·83	Grey Loamy Sand
6	- 14	4·22	Sand & Gravel
14	- 19	5·79	Brown Clay
19	- 22	6·71	Loamy Sand & Stones
22	- 27	8·23	Sand & Gravel
27	- 30.6	9·30	Sand & Gravel
30.6	- 30.9	9·37	Soft Red Sandstone
30.9			Red Sandstone
			Finish 30-9

Norwest Holst Soil Engineering Ltd.

Borehole No. **87**

BOREHOLE LOG

Contract No. F9349
Location Warburton to Audley Pipeline
Client British Gas plc
Method of Boring Cable Percussion
Diameter of Borehole 150mm

SJ78NW/83

Sheet 1 of 1
Co-ords 72102E 88444N
Ground Level 19.70 m.A.O.D.
Date 5/11/91

Description of Strata	Legend	Depth Below G.L.(m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	"N"/ R.Q.D.%	Daily Progress
TOPSOIL.		0.35	19.35				
Grey medium SAND. ...0.60m: becoming brown. (Drillers description)		1.00	18.70		1.00-1.45	"11"	
Soft to firm reddish brown silty slightly sandy CLAY with occasional fine rounded gravel.					s 1.50-1.95 (25) 2.00		
...2.50m: firm to stiff					2.50-2.95 (38) 3.00		
					3.50-3.95 (28) 4.00		
...4.50m: firm					4.50-4.95 (30) 5.00		
		5.90	13.80		5.90		
Loose reddish brown very clayey very silty fine to medium SAND with occasional fine rounded gravel.					6.00-6.50 6.00-6.45 s	"7"	
					7.50-8.00 7.50-7.95 s	"9"	
		8.80	10.90				
Firm reddish-brown laminated silty CLAY with some thin layers of fine sandy silt. Borehole Complete at 9.50m.		9.50	10.20		9.00-9.45 (31) 9.50		

Type of Sample

Is	S.P.T.	■	Undisturbed
Ic	C.P.T.	x	Vane
0	Jar	△	Water
●	Bulk		Piezometer

Remarks (Observations of Ground Water etc.) ( ) U100 blows

Water struck at 5.90m, casing to 1.00m, rising to 2.80m after 20 minutes standing.

Final standing water level 2.40m.

British Geological Survey

SJ79SW 21-24

21 Hole 59 21

5.6.1945

From	To	METRES	
0	- 8'	2·44	Black Canal Silt
8	- 9'	2·74	Sand & Gravel
9	- 10'	3·05	Brown Sand
10	- 12	3·66	Stiff Brown Clay
12	- 14	4·27	" " "
14	- 19	5·79	" " "
19	- 25	7·62	" " "
25	- 27	8·23	Boulder Clay
27	- 30	9·14	" "
30	- 37	11·28	Sandy Clay & Boulders
37	- 47	14·33	Loamy Sandy Clay & stones
47	- 54	16·46	Red Loamy sand
54			Red Sandstone
			Finish 54'0"

22 Hole 61 22

4.5.1945

0'	- 4'	1·22	Brown Sand & Stones
4'	- 10'	3·05	Yellow Sandy Clay
10'	- 12'	3·66	Brown Sand
12'	- 13'	3·96	Sand & Gravel
13'	- 23'	7·01	Brown Clay
23'	- 29'	8·84	Brown Clay & Stones
29'	- 31'	9·45	Clay & Stones
31'	- 35'	10·67	Sand & Boulders
35'	- 43'	13·11	Sand & Gravel
43'	- 48'	14·63	Brown Sand & Stones
48'	- 52'6"	16·00	Sand & Stones
52'6"			Red Sandstone
			Finish 52'6"

23 Hole 33 23

5.2.1945

0	- 1'	0·30	Black Soil
1'	- 2'	0·61	Black Peat
2'	- 3'	0·91	Yellow Sand
3'	- 10'	3·05	Sand & Gravel
10'	- 18'	5·49	Brown Sandy Clay
18'	- 19.8'	6·00	Sandy Clay & Stones
19.8'	- 22'	6·71	Boulder Clay
22'	- 26'	7·92	Large Stoned Gravel & Sand
26'	- 28'	8·53	Loamy Sand
28'	- 29'	8·84	Soft Red Sandstone
29'	- 3	9·14	Red Sandstone
			Finish 29-3

24 Hole 32 24

13.2.1945

0	- 1	0·30	Black Soil
1	- 2	0·61	Brown Peat
2	- 3	0·91	Brown Sand
3	- 4	1·22	Yellow Sand
4	- 6	1·83	Grey Loamy Sand
6	- 14	4·22	Sand & Gravel
14	- 19	5·79	Brown Clay
19	- 22	6·71	Loamy Sand & Stones
22	- 27	8·23	Sand & Gravel
27	- 30.6	9·30	Sand & Gravel
30.6	- 30.9	9·37	Soft Red Sandstone
30.9			Red Sandstone
			Finish 30-9

BGS ID: 802719 : BGS Reference: SJ79SW53
British National Grid (27700) : 372697,391750

Report an issue with this borehole

SJ 79 SW 44-53

BORINGS MADE BY THE MANCHESTER GAS CORPORATION ENGINEERING DEPARTMENT 1944

	Depth in Feet			Type of Strata	Date
	From	To			
				44 Bore Hole No.1	
	0'	2'	0·91	Surface Soil	
2-12	2	6'	1·83	Sand	
10-21	10	21'	6·40	Stiff Clay	
	21'			Red Sandstone	
				-	
				45 Bore Hole No.3	
	0	1'6"	0·46	Surface Soil	
	1'6"	9'6"	2·90	Sand	
	9'6"	23'6"	7·16	Stiff Clay	
	23'6"	24'6"	7·47	Clay	
	24'6"			Red Sandstone	
				-	
				46 Bore Hole No.2	
	0	1'6"	0·46	Surface soil	
	1'6"	9'6"	2·90	Sand & Gravel	
	9'6"	18'6"	5·64	Stiff Clay	
	18'6"			Red Sandstone	
				47 Bore Hole No.4	
	0'	1'6"	0·46	Surface Soil	
	1'6"	9'6"	2·90	Sand	
	9'6"	27'6"	8·38	Stiff Clay	
	27'6"			Red Sandstone	
				-	
				48 Bore Hole No.5	
	0'	1'6"	0·46	Surface soil	
	1'6"	6'	1·83	Sand & Gravel	
	6'	23'	7·01	Stiff Clay	
	23'			Red Sandstone	
				-	
				50 Bore Hole No.6	
	0'	2'6"	0·76	Surface soil	
	2'6"	6'6"	1·98	Sandy Clay	
	6'6"	12'6"	3·81	Stiff Clay	
	12'6"	17'6"	5·33	Sand	
	17'6"	33'	10·06	Red Sandstone	
				-	
				51 Bore Hole No.7	
	0	2'6"	0·76	Surface soil	
	2'6"	6'6"	1·98	Sand	
	6'6"	16'	4·88	Stiff Clay	
	16'	24'6"	7·47	Stoney Clay	
	24'6"			Red Sandstone	
				-	
				53 Bore Hole No.8	
	0	1'6"	0·46	Surface Soil	
	1'6"	9'6"	2·90	Sand	
	9'6"	24'6"	7·47	Clay & Gravel	
	24'6"			Red Sandstone	

SJ 78 NW 196

ALLIED EXPLORATION & GEOTECHNICS LTD

BOREHOLE RECORD

Status:- **FINAL**
Date:- **07/03/96**

Project: NMCS2 Communications System in Cheshire - MS2 Cantilever Sites - M56			BOREHOLE No BH-45
Client: The Highways Agency	Location: 24/5 +05A 70315 85174		
Method & Equipment: Cable Percussion using a Pilcon Wayfarer 1500	Ground Level(m(AOD)): 60.77	Date: 08-12-95	Sheet: 1 of 1

SAMPLES & TESTS			Water	STRATA				
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION	Industry-standard backfill
0.50-1.50	B1						MADE GROUND (Loose grey coarse angular to subangular gravel. Gravel consists of limestone, basalt and conglomerate).	
						(2.95)		
1.50-1.95	CB2	N8						
2.20	J3							
2.50-2.95	CB4	N11					below c.2.50m BGL ... becoming medium dense.	
				57.82		(0.10) 2.95		
				57.72		3.05	(1) MADE GROUND (Concrete).	
							Borehole terminated at 3.05m BGL due to presence of concrete drain.	

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date		Depth	Casing	Casing Dia	Water Depth	From	To	Hours	From	To	
08.12.95		0.00	0.00								1) Description derived from driller's daily report. 2) Inspection pit dug (1.0 x 1.0 x 1.50m).
08.12.95		3.05	3.00	200mm	dry						

All dimensions in metres Scale 1:50	For Explanation of Symbols and Abbreviations see Key Sheets	Checked By: AR	Logged By: A. Latimer	Contract No. 1568

Date Printed:- 08/03/96

Form AEG21/2

British Geological Survey

SJ 78 NW 68

Norwest Holst Soil Engineering Ltd.

Borehole No. **15**

BOREHOLE LOG

7099 8522

Contract No. F5805
Location Warburton-Holford Pipeline
Client North West Gas
Method of Boring Percussion
Diameter of Borehole 200mm

Sheet 1 of 1
Chainage
Ground Level m.A.O.D.
Date 7/2/84

Description of Strata	Legend	Depth Below G.L.(m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	"N"/ R.Q.D.%	Daily Progress
TOPSOIL		0.25					
Pale yellow slightly clayey SAND		1.20			0.40 (29)		
Soft brown silty very sandy CLAY		3.00			1.30 (35) 2.30 (44)		
Stiff brown sandy CLAY with gravel		7.00			3.40 (85) 4.55 (62) 5.70 (73) 6.50 (123)		
Weathered red/brown silty MARL		9.10			7.10 8.00 9.00	70 129 83 for 75mm*	

Type of Sample

- S.P.T. — Undisturbed
- C.P.T. — Vane
- Jar — Water
- Bulk — Piezometer

Remarks (Observations of Ground Water etc.) (29) – U100 blows

Borehole dry during drilling
Overnight standing level 4.00m (borehole at 7.80m)
Chiselled 8.20m to 9.00m – 2 hours

* Seating blows only

Water levels are subject to seasonal or tidal variations and should not be taken as constant

British Geological Survey

SJ78NW 197

ALLIED EXPLORATION & GEOTECHNICS LTD

BOREHOLE RECORD

Status:- **FINAL**
Date:- **07/03/96**

Project: NMCS2 Communications System In Cheshire - MS2 Cantilever Sites - M56			BOREHOLE No BH-46
Client: The Highways Agency	Location: 23/7 +45B 71078 85218		
Method & Equipment: Percussion/Rotary using a Pilcon Wayfarer 1500	Ground Level(m(AOD)): 59.02	Date: 22-11-95	Sheet: 1 of 1

SAMPLES & TESTS			Water	STRATA				Instrument/Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION	
				58.82		(0.26) 0.20	(1) MADE GROUND (Hardcore fill).	
							Soft to firm brown occasionally mottled greenish grey sandy CLAY with some gravel and occasional cobbles. Gravel is fine to coarse rounded to subangular and consists of mudstone and sandstone. Cobbles are subangular and consist of sandstone. (Glacial Till)	
1.20-1.50	B1							
1.50-1.95	B2 U*	(50)						
2.00-2.45	SJ3	N7						
2.50-2.95	U4	(25)				(4.80)		
3.00	J5	N9						
3.01-3.46	SJ6							
3.02-3.90	B7							
3.50-3.95	U8	(50)						
4.00	J9	N10						
4.01-4.45	SJ10							
4.02-4.40	B11							
4.50-4.95	U12	(50)						
				54.02		5.00		
5.00	J13						Red brown fine to medium grained very thinly bedded slightly weathered SANDSTONE moderately weak. (Mercia Mudstone - Zone I) between c.5.40 and 5.70m BGL ... driller notes soft sand. below c.6.00m BGL ... occasional very thin beds of green fine grained grey slightly weathered sandstone moderately weak to moderately strong.	
5.30-5.75	CB14	50 for 165mm				(1.20)		
6.00-6.45	SJ15	50 for		52.82		6.20		
6.01-6.20	B16	33mm						
6.20	C17*						Drillhole complete continued by Rotary Coring.	

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date		Depth	Casing	Casing Dia	Water Depth	From	To	Hours	From	To	
22.11.95		0.00	0.00			5.00	5.20	0.75	4.00	6.20	1) Description derived from driller's daily report. 2) Inspection pit dug (1.0 x 1.0 x 1.2m) 3) Slight seepage at 2.40m BGL.
22.11.95		4.00	3.65	200mm	3.80	6.20	0.00	1.00			
23.11.95		4.00	3.65	200mm	2.90						
23.11.95		6.20	6.20	200mm	5.10						

All dimensions in metres Scale 1:50	For Explanation of Symbols and Abbreviations see Key Sheets	Checked By: AN	Logged By: A. Latimer	Contract No. 1568

Date Printed:- 29/03/96

Form AEG21/2

SJ78NW 197

ALLIED EXPLORATION & GEOTECHNICS LTD

DRILLHOLE LOG

Status:- **FINAL**
Date:- **07/03/96**

Project: **NMCS2 Communications System in Cheshire - MS2 Cantilever Sites - M56**	DRILLHOLE No **BH-46**
Client: **The Highways Agency**	Location: **23/7 +45B**
Method & Equipment: **Percussion/Rotary using a Pilcon Wayfarer 1500**	Ground Level(m(AOD)): **59.02** / Date: **22-11-95** / Sheet: **1 of 1**

RUN DETAILS			STRATA					
						DESCRIPTION		
Date Depth	TCR (SCR) RQD	(SPT) Fracture Index	Red'cd Level	Legend	Depth Thick-ness)	Discontinuities / Detail	Main	Geology / Instrument / Backfill
6.20 6.45 6.20	100 (98) 98	5	52.82		6.20	6.20-8.25m ... Closely to medium spaced horizontal and subhorizontal (10 degrees) undulose tight clean smooth discontinulties.	Drillhole complete continued by Rotary Coring. Red brown fine grained slightly weathered SANDSTONE moderately weak to moderately strong. (Mercia Mudstone - Zone I) between c.6.20-6.25m BGL ... grey. between c.6.35-6.44m BGL ... green grey with occasional lenses of red brown mudstone and some fine gravel sized gypsum crystals. between c.6.55-6.63m BGL ... green grey with occasional fine gravel sized gypsum crystals. between c.6.69-7.09m BGL ... green grey with fine gravel sized gypsum crystals. below c.7.31m BGL ... occasional thin lenses of red brown mudstone and occasional fine gravel sized gypsum crystals and vugs <1cm.	
7.20	98 (92) 74				(2.11)			
		20	50.71		8.31	8.25-8.91m ... Closely to very closely spaced horizontal and subhorizontal (10 degrees) undulose occasionally irregular tight clean smooth discontinulties. 8.65-8.69m ... Non-intact. below c.8.69m ... Closely to extremely closely spaced. 8.91-10.05m ... Closely spaced horizontal planar and undulose tight clean occasionally infilled smooth discontinuities. Infilling of clayey fine gravel.	Red brown thinly to thickly laminated slightly weathered MUDSTONE weak with occasional thin laminae of brown fine grained sandstone. (Mercia Mudstone - Zone I) between c.8.43-8.49m BGL ... Red brown coarse angular mudstone clasts with sandstone infill. Red brown thinly laminated slightly weathered MUDSTONE weak with occasional laminae of brown fine grained sandstone. (Mercia Mudstone - Zone I) Red brown thinly laminated slightly weathered MUDSTONE weak with occasional thin to thick laminae of green grey siltstone and brown fine grained sandstone. (Mercia Mudstone - Zone i) between c.9.69-9.73m BGL ... green grey thinly laminated highly weathered siltstone very weak. Borehole complete at 10.05m BGL.	
8.65			50.32		(0.39) 8.70			
	97 (81) 44	9			(0.89)			
			49.43		9.59			
10.05			48.97		(0.46) 10.05			

Drilling Progress and Water Observations

Date		Depth	Casing	Core Dia mm	Water Strike	Water Standing	Flush Type	Flush Returns
12.12.95		6.20	6.20			4.00		
12.12.95		7.20	6.20			4.00	air	100%
16.12.95		7.20	6.20			6.20		
16.12.95		10.05	0.00			9.00	air/mist	100%

GENERAL REMARKS

1) Description derived from driller's daily report. 2) Inspection pit dug (1.0 x 1.0 x 1.2m) 3) Slight seepage at 2.40m BGL.

All dimensions in metres Scale 1:50	For Explanation of Symbols and Abbreviations see Key Sheets	Checked By: AR	Logged By: A. Latimer	Contract No. 1568

Date Printed:- 08/03/96

Form AEG22

British Geological Survey

SJ 78 NW 65

Norwest Holst Soil Engineering Ltd.

Borehole No. **7**

BOREHOLE LOG

7166 8681

Contract No. F5805
Location Warburton - Holford Pipeline
Client North West Gas
Method of Boring Percussion
Diameter of Borehole 150mm

Sheet 1 of 1
Chainage
Ground Level m.A.O.D.
Date 28/11/83

Description of Strata	Legend	Depth Below G.L.(m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	"N"/ R.Q.D.%	Daily Progress
TOPSOIL		0.35					
Firm brown very sandy CLAY.		0.80			0.55 (31)		
Medium dense brown medium SAND.		3.30			1.55 2.55	20 14	
Stiff brown slightly laminated silty CLAY.		5.50			3.55 (61) 5.05 (63)		

Type of Sample

Is S.P.T. ■ Undisturbed
Ic. C.P.T. × Vane
O Jar △ Water
● Bulk ⊕ Piezometer

Remarks (Observations of Ground Water etc.) (61) U100 blows.

Water struck at 1.50m.
Standing level 2.40m.

Water levels are subject to seasonal or tidal variations and should not be taken as constant

British Geological Survey

SJ 78 NW 66

Norwest Holst Soil Engineering Ltd.

7171 8665

BOREHOLE LOG

Borehole No. **8**

Contract No. F5805
Location Warburton - Holford Pipeline
Client North West Gas
Method of Boring Percussion
Diameter of Borehole 150mm

Sheet 1 of 1
Chainage
Ground Level m.A.O.D.
Date 29/11/83

Description of Strata	Legend	Depth Below G.L.(m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	"N"/ R.Q.D.%	Daily Progress
TOPSOIL		0.30					
Medium dense dark brown SAND.		1.20			0.55	15	
Medium dense pale brown medium SAND.		3.40			1.55 2.55	21 13	
Soft to firm brown very silty occasionally laminated CLAY.		7.80			3.55 (58) 5.05 (56) 6.55 (55)		
Firm to stiff brown silty laminated CLAY with sand and silt partings.		10.00			8.05 (48) 9.55 (41)		

Type of Sample

- S.P.T. — Undisturbed
- C.P.T. — Vane
- Jar — Water
- Bulk — Piezometer

Remarks (Observations of Ground Water etc.) (58) U100 blows.
Water seepage from 1.50m.
Water added from 2.00m.

Water levels are subject to seasonal or tidal variations and should not be taken as constant

SJ78NW/55

WRB No. ~~SJ78/57~~

FORM WR-38 (cont.)

NRA No.	

(Please type)

D. STRATA LOG

Geological Classification (BGS only)	Description of strata	Thickness m	Depth m
Shirdley Hill Sand	TOP SOIL	0.2	0.2
	CLAY (CONTAINING SAND)	0.3	0.5
	SAND (WET) B.S of CLAY	4.6	5.1
? Helsby Sst fm (map suggests Tarporley Siltst fm.	WEAKLY FRACTURED SANDSTONE STEEL LINER AT 5.3m	26.96	32.06
	LAYER OF WATERSTONE	0.08	32.14
	MEDIUM SANDSTONE	6.2	38.34
	(VERY) HARD SANDSTONE	12.1	50.44
	LAYER OF WATERSTONE	0.16	50.60
	HARD SANDSTONE	14.4	65m
A Howard 1/12/97			

[continue on separate page if necessary]

Other Comments (eg gas encountered, saline water intercepted, etc)

FOR OFFICIAL USE ONLY

FILE ..... CONSENT NO.

SJ79SW

29-34

29 Hole 35

From	To	METRES	
0	- 1'3"	0·38	Black Soil
1'3"	- 8'	2·44	Light & Dark Peat
8'	- 10'	3·05	Brown & Grey Sand
10'	- 19'	5·79	Sand & Gravel
19'	- 20'	6·10	Brown Clay
20'	- 21'	6·40	Stiff Brown Clay
21'	- 25'	7·62	Stiff Brown Clay
25'	- 27'6"	8·38	Red Loamy Sand
27'6"	- 29'6"	8·99	Soft Red Sandstone
29'- 6"			Red Sandstone
			Finish 29'-6"

22.7.1945

30 Hole 39

0'	- 2'	0·61	Soil & Sand
2'	- 9'	2·74	Brown Peat
9'	- 23'	7·01	Sand & Gravel
23'	- 34'	10·36	Stiff Brown Clay
34'	- 37'	11·28	Sand & Gravel
37'	- 38'	11·53	Red Sandstone
			Finish 38'0"

3.8.1945

31 Hole 40

0'	- 2'	0·61	Soil & Sand
2'	- 9'	2·74	Brown Peat
9'	- 11'	3·35	Grey Sand
11'	- 22'	6·71	Sand & Gravel
22'	- 34'	10·36	Stiff Brown Clay
34'	- 39'3"	11·96	Red Loamy Sand
39'3"	- 40'	12·19	Red Sandstone
			Finish 40'0"

8.8.1945

32 Hole 41

0'	- 2'	0·61	Cinders Soil & Sand
2'	- 11'	3·35	Brown Peat
11'	- 18'	5·49	Sand & Gravel
18'	- 26'	7·92	Stiff Brown Clay
26'	- 39'6"	12·04	Red Loamy Sand & Stones
39'6"	- 40'	12·19	Red Sandstone
			Finish 40'0"

17.8.1945

33 Hole 42

0'	- 2'	0·61	Cinders Soil & Sand
2'	- 10'	3·05	Brown Peat
10'	- 13'	3·96	Brown Sand
13'	- 17'	5·18	Sand & Gravel
17'	- 27'	8·23	Stiff Brown Clay
27'	- 34'	10·36	Red Loamy Sand & Stones
34'	- 35'	10·67	Red Sandstone
			Finish 35'0"

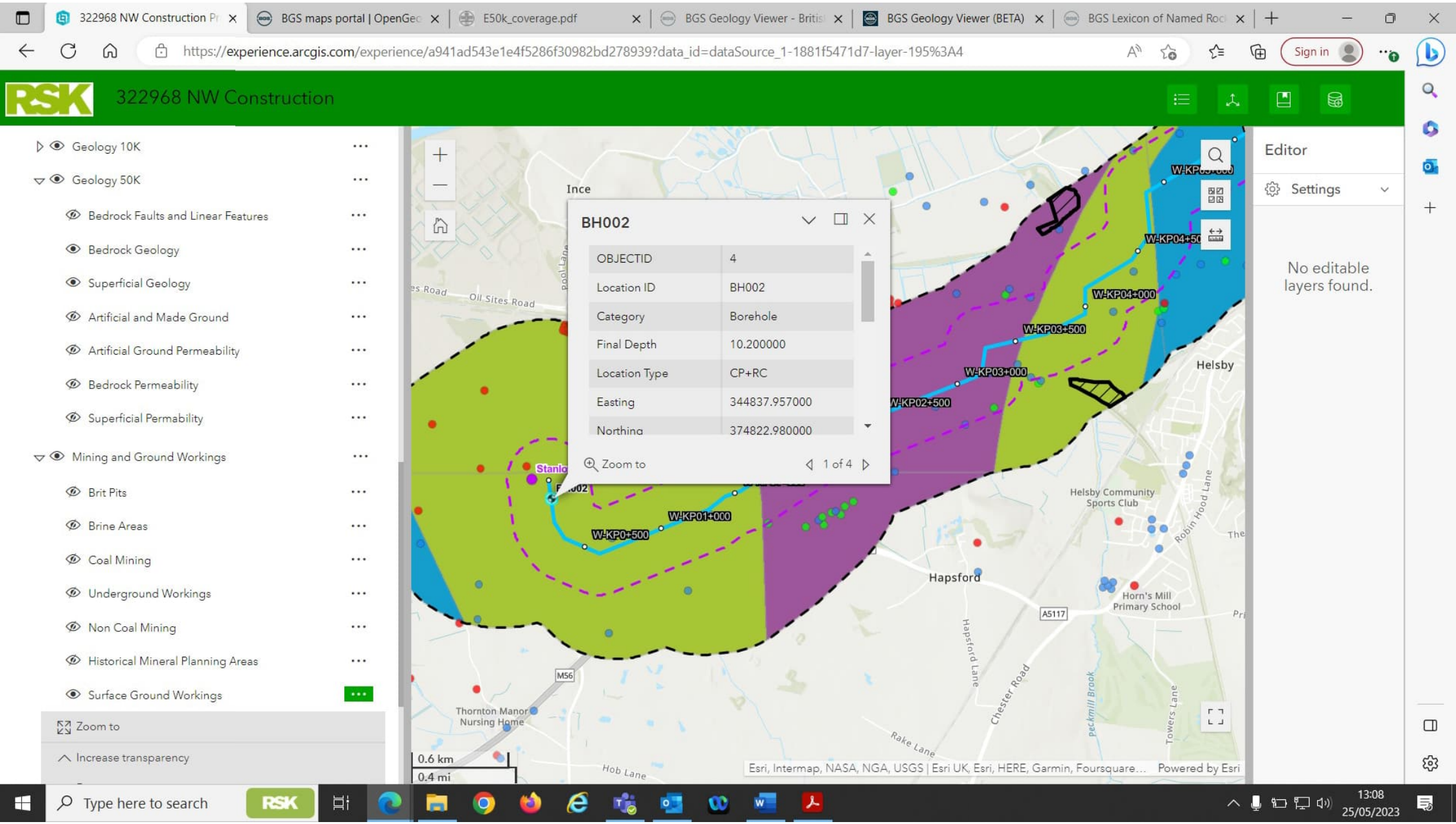
23.8.1945

34 Hole 38

From	To		
0'	- 1'	0·30	Black Soil
1'	- 3'	0·91	Dark Peat
3'	- 7'	2·13	Light Brown Peat
7'	- 7.6'	2·29	Brown Sand
7.6'	- 9'	2·74	Brown Sand
9'	- 10'	3·05	Yellow Sand
10'	- 15'	4·57	Sand & Gravel
15'	- 17'	5·18	Sandy Brown Clay
17'	- 24'	7·32	Boulder Clay
24'	- 26'	7·92	Gravel & Sand
26'	- 28'	8·53	Loamy Sand
28'	- 34'	10·36	Red Loamy Sand & Green Sand
23'			Soft Red Sandstone
34.6			Red Sandstone
			Finish 34.6

24.1.1945

APPENDIX B
BOREHOLE RECORDS FOR WEST PIPELINE


322968 NW Construction
Geology 10K
Geology 50K
Bedrock Faults and Linear Features
Bedrock Geology
Superficial Geology
Artificial and Made Ground
Artificial Ground Permeability
Bedrock Permeability
Superficial Permability
Mining and Ground Workings
Brit Pits
Brine Areas
Coal Mining
Underground Workings
Non Coal Mining
Historical Mineral Planning Areas
Surface Ground Workings
Zoom to
Increase transparency
BH002
OBJECTID 4
Location ID BH002
Category Borehole
Final Depth 10.200000
Location Type CP+RC
Easting 344837.957000
Northing 374822.980000
Zoom to
1 of 4
Editor
Settings
No editable layers found.
Ince
Helsby
Hapsford
Helsby Community Sports Club
Horn's Mill Primary School
Thornton Manor Nursing Home
W-KP0+500
W-KP01+000
W-KP02+500
W-KP03+000
W-KP03+500
W-KP04+000
A5117
M56
Chester Road
Hapsford Lane
Rake Lane
Hob Lane
Robin Hood Lane
Towers Lane
0.6 km
0.4 mi
Esri, Intermap, NASA, NGA, USGS | Esri UK, Esri, HERE, Garmin, Foursquare...
Powered by Esri
Type here to search
13:08
25/05/2023

NGR 4469 7503 (No.1.) 47NW/24 66 97

1" N.S. 1" O.S. Grid Ref. 32NW

RECORD OF WELL (SHAFT OR BORING) No.6 Well. SJ 47 NW 1.

At The Shell Refining and Marketing Co Ltd

Town or Village ELTON County CHESHIRE Six-inch quarter sheet 32NW

Exact site NO. 6. WELL. ¾ mile south east of Elton Station in parish of 24.

(Give a reference to a road, and if possible a sketch-map or a bearing from a fixed point is very desirable)

Level of ground surface above sea-level (O.D.) 36 ft. If well starts below ground surface, state how far ft.

Shaft ft., diameter ft. Bore 500 ft. Diameter of bore: ~~at top~~ 15½ ins.; ~~at bottom~~ ins.

Details of permanent lining tubes (internal diameters preferred) Lining tubes to 15 x 15½ in.

~~Water-bearing beds and depths (flow)~~ Open hole 485ft.

Rest-level of water ~~above~~ below top of well 48 [redacted] Suction at feet. Yield on hours' days' test 16000 gallons per hour (with pump of capacity [redacted] g.p.h.); depressing water level to 50 feet below top. Time of recovery hrs. Amount normally [redacted] daily g.p.h. for hours.

Quality (attach copy of analysis if available)

Sunk by Timmins & Co for Mr. Shell Refineries Date of well 1940

Information from A.E. Gunther. Shell Refineries.

(For Survey use only). GEOLOGICAL CLASSIFICATION.	NATURE OF STRATA (and any additional remarks).	THICKNESS Feet.	THICKNESS Inches.	DEPTH Feet.	DEPTH Inches.
	Drift	(1.52m) 5	-	5	-
f2	Dull grey and light red hard sandstones with quartzite pebbles abundant at many horizons. Two small faults met with.	(150.88m) 495	-	(152.40m) 500	0
	First pebbles at 200ft. Very abundant from 300ft. downwards.				
	380ft. Yellow sandstone well jointed.				
	(10.97m) Surface 36ft. O.D.				
	Rest water level + 23ft. O.D = 13ft. from surface.				
	O.W.L. +17ft. O.D = 19 ft. from surface.				
	Total hardness. 23.4:				
	Temporary hardness 15.3:				
	Permanent hardness 8.1:				
	Alkalinity $NaHCO_3$ 25.7 grains per gallon.				
	Chloride NaCl 3.5 grains per gallon.				
	Sulphate Na_2SO_4 11.8 grains per gallon				
	Dissolved CO_2 0.50 grains per gallon.				
	Total solids 25.6 grains per gallon.				

For Survey use only

Date received	G.S.M. Office File No.	Site marked on 1" map (use symbol)

GEOLOGICAL SURVEY AND MUSEUM, SOUTH KENSINGTON, LONDON, S.W.7.

(*11815) Wt.29053/O.369 10,000 9/39 A.& E.W.,Ltd. Gp.686

British Geological Survey

4624
7501 SJ47NE 42

BeWT | STRATA SURVEYS LIMITED

MACHINE EXCAVATED TRIAL PIT

Location Runcorn Industrial Supply | Job No. 8156/81 | Project Ref 9-00-05-949 | Ground Level (m AOD) | Co-ordinates E N | Trial Pit No. TP7

Field Records Samples: Cohesion(kN/m2)	Depth (m)	Type & No.	DESCRIPTION OF STRATA	Reduced Level m AOD	Strata Legend	Depth (Thickness) m
140+	0.40 0.50	B 1	Grass over TOPSOIL with some roots			0.30
			Very stiff dark brown/grey slightly sandy CLAY with a little fine to coarse gravel becoming friable below 1.50m			
	1.40	D 1				
140+	2.30					
	2.40	D 2				
			Trial Pit Complete			2.50

Scale 1:50

Trial Pit excavated using a mechanical excavator.

Remarks:
1) No groundwater encountered during excavation.
2) Sides of pit stable.

Plan

Logged By	GL	DATE 18-11
Checked By:		
Approved By:		
FIG No.		

British Geological Survey

45 NE
7472 SJ47SE 19

BeWT

MACHINE EXCAVATED TRIAL PIT

Location Runcorn Industrial Supply | Job No. 8156/81 | Project Ref 9-00-05-949 | Ground Level (m AOD) | Co-ordinates E N | Trial Pit No. TP6

Field Records Samples Cohesion(kN/m2) Depth (m) Type & No.	DESCRIPTION OF STRATA	Reduced Level m AOD	Strata Legend	Depth (Thickness) m
	Grass over TOPSOIL.			0.40
140+ 0.50 B 1 0.60	Very stiff dark brown/grey slightly sandy CLAY with a little fine to coarse gravel becoming friable below 1.50m			(1.20)
1.60 B 1	Trial Pit Complete			1.60

Scale 1:50

Trial Pit excavated using a mechanical excavator.

Remarks
1) Land drain hit at 0.90m.
2) No groundwater encountered during excavation.
3) Sides of pit stable.

Plan

Logged By	G.L.	DATE 14-11
Checked By:		
Approved By:		
FIG No.		

British Geological Survey

ALLIED EXPLORATION & GEOTECHNICS LTD

BOREHOLE RECORD

Status:- **FINAL**
Date:- **07/03/96**

Project: NMCS2 Communications System In Cheshire - MS2 Cantilever Sites - M56	BOREHOLE No BH-09 SJ 47 NE/82
Client: The Highways Agency	Location: SJ 47517 75341 50/1 +76B
Method & Equipment: Cable Percussion using a Pilcon Wayfarer 1500	Ground Level(m(AOD)): 7.09
Date: 21-12-95	Sheet: 1 of 2

SAMPLES & TESTS			Water	STRATA				
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION	Instrument backfill
				6.59		(0.50) 0.50	(1) TOPSOIL.	
0.70	J1					(1.30)	MADE GROUND (Brown slightly clayey slightly sandy fine to coarse angular gravel. Gravel consists of foundry slag).	
1.30-1.75	CB2	N79		5.29		1.80		
2.30	CB3	N78				(1.00)	MADE GROUND (Very dense brown fine to coarse angular gravel with occasional pockets of soft brown sandy clay. Gravel consists of foundry slag).	
2.50	J4			4.29		2.80		
3.00	J5						Dense red brown medium to coarse sandy fine to coarse angular to subangular GRAVEL. Gravel consists of sandstone. (Possible Made Ground)	
3.30-3.75	SJ6	N47						
4.00	J7							
4.30	CB8	N32					between c.4.30 and 5.30m BGL ... gravelly sand.	
5.30-5.75	CB9	N31				(5.50)		
6.30	J10							
6.80-7.25	CB11	N22					below c.6.80m BGL ... becoming medium dense.	
7.70	J12						at c.7.70m BGL ... occasional cobble sized wood fragments.	

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date		Depth	Casing	Casing Dia	Water Depth	From	To	Hours	From	To	
21.12.95		0.00	0.00						3.00		1) Description derived from driller's daily report. 2) Inspection pit dug prior to drilling (1.0 x 1.0 x 1.20m).
21.12.95		15.00	15.00	200mm	4.65						

All dimensions in metres Scale 1:50	For Explanation of Symbols and Abbreviations see Key Sheets	Checked By: AR	Logged By: A. Latimer	Contract No. 1568

Date Printed:- 08/03/96

Form AEG21/2

British Geological Survey

ALLIED EXPLORATION & GEOTECHNICS LTD

BOREHOLE RECORD

Status:- **FINAL** Date:- 07/03/96

Project: NMCS2 Communications System in Cheshire - MS2 Cantilever Sites - M56			BOREHOLE No BH-09
Client: The Highways Agency	Location: 50/1 +76B SJ47 NE		82.
Method & Equipment: Cable Percussion using a Pilcon Wayfarer 1500	Ground Level (m(AOD)): 7.09	Date: 21-12-95	Sheet: 2 of 2

SAMPLES & TESTS			Water	STRATA				Instrument/Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION	
							(As sheet 1 of 2)	
				-1.21		8.30		
8.30-8.75	CB13	N17					Dense brown slightly gravelly fine to coarse SAND. Gravel is fine to medium angular to subangular and consists of sandstone. (Fluvio-glacial)	
9.40	J14					(2.45)		
9.80-10.25	CB15	N30						
				-3.66		10.75		
10.80	J16						Stiff thinly laminated brown CLAY with occasional lenses of orange brown fine sand and silt. (Glacio-lacustrine)	
11.20-11.65	U17	(90)				(1.55)		
11.70	J18							
				-5.21		12.30		
12.40	J19					(0.60)	Very dense brown slightly clayey slightly gravelly fine to medium SAND. Gravel is medium to coarse, occasionally fine, subangular to subrounded and consists of basalt and sandstone. (Fluvio-glacial)	
12.70-13.15	CB20	N57		-5.81		12.90		
							Stiff brown sandy CLAY with occasional gravel. Gravel is fine to medium subangular to subrounded and consists of sandstone, basalt and quartzite. (Glacial Till)	
13.30-13.80	B21					(2.10)		
14.00-14.45	U22	(90)						
14.50	J23							
				-7.91		15.00		
							Borehole complete at 15.00m BGL.	

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date		Depth	Casing	Casing Dia	Water Depth	From	To	Hours	From	To	
21.12.95		0.00	0.00						3.00		1) Description derived from driller's daily report. 2) Inspection pit dug prior to drilling (1.0 x 1.0 x 1.20m).
21.12.95		15.00	15.00	200mm	4.65						

All dimensions in metres Scale 1:50	For Explanation of Symbols and Abbreviations see Key Sheets	Checked By: AR	Logged By: A. Latimer	Contract No. 1568

Date Printed:- 08/03/96

Form AEG21/2

British Geological Survey

Window Sampler Hole Log

Soil Mechanics

Drilled	RT	Start	22/03/2010	Equipment, Methods and Remarks	Depth from	to	Diameter	Casing Depth	Ground Level	+4.89 mOD
Logged	DAS	End		Competitor 130					Coordinates	E 348365.08
Checked	NH		22/03/2010	Hand Dug Inspection Pit to 1.20m. Windowless Sampling to 5.00m					National Grid	N 376151.69
									Chainage	

Samples and Tests					Strata			
Depth	Type & No	Records	Date Casing	Time Water	Description	Depth, Level (Thickness)	Legend	Backfill/ Instruments
					Grass onto soft to firm brown sandy slightly gravelly CLAY. (TOPSOIL)	(0.30) 0.30 +4.59		
					Soft to firm brown mottled orange brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine and medium of sandstone. Occasional pockets of fine to coarse sand.	(1.70)		
					Soft to firm grey slightly sandy silty CLAY with frequent black organic lenses. Slight organic odour.	2.00 +2.89 (0.80)		
					Spongy dark red brown fibrous PEAT with frequent vegetable matter. Strong organic odour.	2.80 +2.09 (2.20)		
					EXPLORATORY HOLE ENDS AT 5.00 m	5.00 -0.11		SP
Depth	Type & No	Records	Date Casing	Time Water				

Groundwater Entries				Depth Related Remarks *	Chiselling		
No.	Struck (m)	Post strike behaviour	Depth sealed (m)	From to (m)	Depths (m)	Time	Tools used
1	2.80	damp	-				

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column

Scale 1:50

(c) ESGL www.esgl.co.uk

Project	Ince Marshes
Project No.	F0604-10
Carried out for	Entec UK Ltd

Borehole **DP4**

Sheet 1 of 1

British Geological Survey

Institute of Geological Sciences

RECORD OF SHAFT OR BOREHOLE

6-in or 1:10 000 Map Registration No.: SJ 47 NE/4

National Grid Reference: 4863 7635

1-in or 1:50 000 New Series Map No.:

Enter 'C' if Confidential:

Name and Number of Shaft or Borehole: 6" TRIAL BOREHOLE

For whom made IMPERIAL CHEMICAL INDUSTRIES LTD.

Town or Village WESTON POINT / RUNCORN *County* CHESHIRE

Exact site (reference to a fixed point on 1-in or 1:50 000 Map)

6" QUARTER SHEET XXXII NW. RAKE LANE, HALSBY

Purpose for which made WATER

Ground level at shaft / bore *relative to O.D.* 4.42 *m. If not ground level give O.D. of beginning of* shaft / bore _____ *m.*

Made by JENNINGS & SONS LTD *Date of sinking* _____

Information from _____ *Examined by* _____

Specimen Numbers and Additional Notes

Geological Classification		Description of Strata	Thickness metres	Depth metres
		TOP SOIL	0.23	0.23
		MOTTLED CLAY	0.68	0.91
		PEAT	3.05	3.96
		SILT	3.36	7.32
		PEAT	1.21	8.53
		GREY SAND	1.22	9.75
		RUNNING SAND	0.92	10.67
		SANDY CLAY	8.53	19.20
		RUNNING SAND	2.75	21.95
		STIFF CLAY	3.04	24.99
		SANDY CLAY	8.54	33.53
		HARD PACKED SAND	3.05	36.58
		SANDY MARL WITH A LITTLE CLAY & STONES	16.76	53.34
		SANDSTONE (DRILLED BY PERCUSSION)	8.23	61.57
		SANDSTONE (DRILLED BY ROTARY TOOLS)	1.98	63.55
		NO CORE.		

N4722

REPORT.

FROM
E. TIMMINS & SONS LTD.,
WATERWORKS CONTRACTORS.
RUNCORN, CHESHIRE.

TEL. NO.
RUNCORN 2338.

British Geological Survey

Name of Client Imperial Chemical Industries, Ltd., Weston Point, Runcorn, Ches. Date Client's Ref.

Site Rake Lane, Helsby. six inch quarter sheet. XXall N.W.

Borehole No. 6" Trial Borehole. Level of ground above O.D. 14.50 feet.

Strata.	Thickness.	Depth.
Top Soil	9"	9"
Mottled Clay	2'-3"	3'-0"
Peat	10'-0"	13'-0"
Silt	11'-0"	24'-0"
Peat	4'-0"	28'-0"
Grey Sand	4'-0"	32'-0"
Running Sand	3'-0"	35'-0"
Sandy Clay	28'-0"	63'-0"
Running Sand	9'-0"	72'-0"
Stiff Clay	10'-0"	82'-0"
Sandy Clay	28'-0"	110'-0"
Hard Packed Sand	10'-0"	120'-0"
Sandy Marl with a little Clay and Stones	55'-0"	175'-0"
Sandstone (Drilled by Percussion)	27'-0"	202'-0"
Sandstone (Drilled by Rotary Tools) No Core	6'-6"	208'-6"

TOTAL DEPTH OF BOREHOLE. 208'-6"

WATER LEVELS

FEET
above ~~BELOW~~ SURFACE
REST WATER LEVEL 7'-5"

~~DEPRESSED WATER LEVEL WHEN PUMPING~~ ..... 450 G.P.H. g.p.h.

Overflow at surface level on completion

The Borehole yielded a little water at 3'-0", 35'-0" and 63'-0"

Commenced to overflow at 165'-0"

DETAILS OF TUBES INSERTED.

Inside Dia. Inches.	Length of Tube.	Base of Tube Below Surface.	Remarks :
6"	120'-0"	120'-0"	

UNLINED BOREHOLE.

Size of Tools Inches.	Type of Tool.	From Feet Below Surface.	To Feet Below Surface.	=	Feet of Drilling
6"	Percussion	120'-0"	202'-0"		82'-0"
5"	Rotary	202'-0"	208'-6"		6'-6"

NOTE

Rec. 13.1.53.

SJ. 4863 7635

N4722

REPORT.

FROM

E. TIMMINS & SONS LTD.,
WATERWORKS CONTRACTORS.
RUNCORN, CHESHIRE.

TEL. NO. RUNCORN 2338

47/NE/4
SJ47/35
10

Name of Client Imperial Chemical Industries, Ltd., Weston Point, Runcorn, Ches. Date

Client's Ref.

Site Rake Lane, Helsby. six inch quarter sheet. XXall N.W.

Borehole No. 6" Trial Borehole. Level of ground above O.D. 14.50 feet.

	Strata.	Thickness.	Depth.
DRIFT	Top Soil	9"	9"
	Mottled Clay	2'-3"	3'-0"
	Peat	10'-0"	13'-0"
	Silt	11'-0"	24'-0"
	Peat	4'-0"	28'-0"
	Grey Sand	4'-0"	32'-0"
	Running Sand	3'-0"	35'-0"
	Sandy Clay	28'-0"	63'-0"
	Running Sand	9'-0"	72'-0"
	Stiff Clay	10'-0"	82'-0"
	Sandy Clay	28'-0"	110'-0"
	Hard Packed Sand	10'-0"	120'-0"
	Sandy Marl with a little Clay and Stones	55'-0"	175'-0"
PERMO-TRIAS SHERWOOD Sst. Gp.	Sandstone (Drilled by Percussion)	27'-0"	202'-0"
	Sandstone (Drilled by Rotary Tools) No Core	6' -6"	208'-6"

TOTAL DEPTH OF BOREHOLE. 208'-6"

WATER LEVELS

REST WATER LEVEL FEET above ~~BELOW~~ SURFACE 7'-3"

~~DEPRESSED WATER LEVEL WHEN PUMPING~~ ..... G.P.H.

Overflow at surface level on completion 450 g.p.h.

The Borehole yielded a little water at 3'-0", 35'-0" and 63'-0"

Commenced to overflow at 165'-0"

DETAILS OF TUBES INSERTED.

Inside Dia. Inches.	Length of Tube.	Base of Tube Below Surface.	Remarks :
6"	120'-0"	120'-0"	

UNLINED BOREHOLE.

Size of Tools Inches.	Type of Tool.	From Feet Below Surface.	To Feet Below Surface.	=	Feet of Drilling
~~6"~~	~~Percussion~~	~~120'-0"~~	~~202'-0"~~		~~82'-0"~~
5"	Rotary	206'-0"	208'-6"		6'-6"

FOR E. TIMMINS & SONS LTD.

Rec. 13.11.53.

ALLIED EXPLORATION & GEOTECHNICS LTD

BOREHOLE RECORD

Status:- **FINAL**
Date:- **07/03/96**

Project: **NMCS2 Communications System in Cheshire - MS2 Cantilever Sites - M56**

BOREHOLE No **BH-14**

Client: **The Highways Agency**

Location: 46/9 +05B SJ 50212 77244 SJ57NW / 14

Method & Equipment: **Cable Percussion using a Pilcon Wayfarer 1500**

Ground Level(m(AOD)): **6.32**

Date: **20-12-95**

Sheet: **1 of 2**

SAMPLES & TESTS			Water	STRATA				Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION	
						(0.60)	(1) MADE GROUND (Topsoil with black/brown sandy ash fill).	
				5.72		0.60		
0.70-1.00	B1						MADE GROUND (Medium dense brown to grey brown silty slightly gravelly fine to medium sand with occasional cobbles. Gravel is fine to medium occasionally coarse subangular to subrounded and consists of sandstone, quartzite and concrete. Cobbles consist of sandstone. Occasional rootlets).	
1.10-1.50	B2							
1.50-1.95	SJ3	N19				(2.70)	below c.1.50m BGL ... becoming clayey with a slight organic odour.	
2.20-2.60	B4							
2.70-3.15	SJ5	N15					below c.2.70m BGL ... becoming grey brown clayey fine to medium sand with small lenses of very soft grey clay and dark brown peaty clay.	
				3.02		3.30		
3.30	J6					(0.30)	Soft grey sandy CLAY. Slight organic odour. (Alluvium)	
3.50-3.95	B7 U*	(30)		2.72		3.60		
							Medium dense light brown slightly gravelly fine to coarse SAND. Gravel is fine subangular to subrounded and consists of sandstone. (Fluvio-glacial)	
4.20-4.65	SJ8	N21						
4.80-5.20	B9							
5.20-5.65	SJ10	N26						
5.80-6.20	B11					(5.20)		
6.60-7.05	SJ12	N26						
7.40-7.80	B13							

Boring Progress and Water Observations					
Date		Depth	Casing	Casing Dia	Water Depth
20.12.95		0.00	0.00		
20.12.95		14.75	13.70	200mm	9.40

Chiselling			Water Added	
From	To	Hours	From	To
9.00	9.20	0.50	2.00	
13.40	13.70	0.75		

GENERAL REMARKS

1) Description derived from driller's daily report.
2) Inspection pit dug prior to drilling (1.0 x 1.0 x 1.20m).

All dimensions in metres Scale 1:50	For Explanation of Symbols and Abbreviations see Key Sheets	Checked By: AC	Logged By: A. Latimer	Contract No. 1568

Date Printed:- 08/03/96

Form AEG21/2

British Geological Survey

ALLIED EXPLORATION & GEOTECHNICS LTD

BOREHOLE RECORD

Status:- **FINAL**
Date:- **07/03/96**

Project: NMCS2 Communications System in Cheshire - MS2 Cantilever Sites - M56			BOREHOLE No BH-14
Client: The Highways Agency	Location: 46/9 +05B SJ57NW/114		
Method & Equipment: Cable Percussion using a Pilcon Wayfarer 1500	Ground Level(m(AOD)): 6.32	Date: 20-12-95	Sheet: 2 of 2

SAMPLES & TESTS			Water	STRATA				Instrument/Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION	
8.05-8.50	SJ14	N31					(As sheet 1 of 2) below c.8.05m BGL ... becoming dense.	
				-2.48		8.80		
9.00	CB15	50 for 40mm*		-3.18		(0.70) 9.50	Very dense orange brown gravelly coarse SAND with some cobbles. Gravel is fine to coarse subangular to subrounded and consists of sandstone, quartzite and basalt. Cobbles consist of basalt and sandstone. (Fluvio-glacial)	
9.50	J16			-3.28		9.60		
9.60-9.80	B17 U*	(100)					Firm thinly laminated dark brown CLAY with occasional fine angular gravel. (Glacio-lacustrine)	
10.00-10.45	SJ18	N43					Stiff brown sandy CLAY with occasional gravel. Gravel is fine occasionally medium subangular to subrounded and consists of sandstone and basalt. (Glacial Till)	
10.80-11.20	B19							
11.50-11.95	U20	(70)				(4.20)		
12.00	J21							
12.40-12.80	B22							
12.80-13.25	U23	(65)						
13.30	J24							
13.40-13.70	B25							
				-7.48		13.80		
13.80-14.30	B26					(0.95)	Dense red brown fine to medium, occasionally coarse, SAND. (Fluvio-glacial)	
14.30-14.75	SJ27	N30		-8.43		14.75		
							Borehole complete at 14.75m BGL.	

Boring Progress and Water Observations

Date		Depth	Casing	Casing Dia	Water Depth
20.12.95		0.00	0.00		
20.12.95		14.75	13.70	200mm	9.40

Chiselling

From	To	Hours
9.00	9.20	0.50
13.40	13.70	0.75

Water Added

From	To
2.00	

GENERAL REMARKS

1) Description derived from driller's daily report.
2) Inspection pit dug prior to drilling (1.0 x 1.0 x 1.20m).

All dimensions in metres Scale 1:50	For Explanation of Symbols and Abbreviations see Key Sheets	Checked By: AR	Logged By: A. Latimer	Contract No. 1568

Date Printed:- 08/03/96

Form AEG21/2

British Geological Survey

ALLIED EXPLORATION & GEOTECHNICS LTD

BOREHOLE RECORD

Status:- **FINAL**
Date:- **07/03/96**

Project: **NMCS2 Communications System in Cheshire - MS2 Cantilever Sites - M56**

BOREHOLE No **BH-15**

Client: **The Highways Agency**

Location: SJ 51181 71941 SJ57NW/115
45/7 +30A

Method & Equipment: **Cable Percussion using a Pilcon Wayfarer 1500**

Ground Level(m(AOD)): **6.14**

Date: **17-12-95**

Sheet: **1 of 2**

SAMPLES & TESTS			Water	STRATA				Instrument Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION	
						(0.60)	(1) MADE GROUND (Soft brown sandy topsoil with fine gravel).	
				5.54		0.60		
						(0.40)	(1) MADE GROUND (Grey roadstone fill consisting of limestone).	
				5.14		1.00		
1.00-1.50	B1					(0.50)	Brown gravelly medium to coarse SAND. Gravel is fine to coarse subangular to rounded and consists of sandstone, mudstone and quartzite. (Fluvio-glacial)	
				4.64		1.50		
1.50	J2						Very dense slightly clayey slightly sandy fine to coarse subangular to rounded GRAVEL with occasional cobbles. Gravel and cobbles consist of sandstone, mercia siltstone, mudstone, quartzite and limestone. (Fluvio-glacial) between c.1.60 and 2.05m BGL ... clayey fine sand with occasional gravel.	
1.60-2.05	SJ3	N54				(1.00)		
2.10-2.50	B4							
				3.64		2.50		
2.50-2.95	SJ5	N35					Dense red brown gravelly fine to medium SAND with occasional cobbles. Gravel is fine to coarse subangular to rounded and consists of sandstone, mercia mudstone, siltstone and quartzite. Cobbles consist of sandstone. (Fluvio-glacial) between c.3.20 and 3.60m BGL ... sandy gravel.	
3.20-3.60	B6					(1.60)		
3.60-4.05	SJ7	N35						
				2.04		4.10		
4.10-4.50	B8						Medium dense red brown sandy fine to coarse subangular to rounded GRAVEL with occasional cobbles. Gravel consists of sandstone, basalt and quartzite. Cobbles consist of sandstone and quartzite. (Fluvio-glacial)	
4.50-4.95	SJ9	N27				(1.60)		
5.20-5.70	B10						below c.5.20m BGL ... some cobbles.	
				0.44		5.70		
5.70-6.15	SJ11	N24				(1.00)	Medium dense red brown slightly silty gravelly fine to medium SAND. Gravel is fine to medium subangular to subrounded and consists of sandstone and basalt. (Fluvio-glacial)	
				-0.56		6.70		
6.70-7.00	B12						Medium dense red brown silty fine to medium SAND. (Fluvio-glacial)	
7.00-7.45	SJ13	N15						
7.80-8.20	B14							

Boring Progress and Water Observations

Date	Depth	Casing	Casing Dia	Water Depth
17.12.95	0.00	0.00		
17.12.95	9.00	8.50	200mm	2.35
18.12.95	9.00	8.50	200mm	2.70
18.12.95	15.35	14.50	200mm	12.20

Chiselling

From	To	Hours
12.90	13.35	0.75

Water Added

From	To
1.50	
9.00	9.50
13.00	14.00

GENERAL REMARKS

1) Description derived from driller's daily report.
2) Inspection pit dug prior to drilling (1.0 x 1.0 x 1.20m).

All dimensions in metres
Scale 1:50

For Explanation of Symbols and Abbreviations see Key Sheets

Checked By: AK

Logged By: A. Latimer

Contract No. **1568**

Date Printed:- 08/03/96

Form AEG21/2

ALLIED EXPLORATION & GEOTECHNICS LTD

BOREHOLE RECORD

Status:- **FINAL**
Date:- **07/03/96**

Project: **NMCS2 Communications System in Cheshire - MS2 Cantilever Sites - M56**			BOREHOLE No **BH-15**
Client: The Highways Agency	Location: 45/7 +30A SJ57NW/115		
Method & Equipment: Cable Percussion using a Pilcon Wayfarer 1500	Ground Level(m(AOD)): 6.14	Date: 17-12-95	Sheet: 2 of 2

SAMPLES & TESTS			Water	STRATA				Instrument Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION	
						(2.65)	(As sheet 1 of 2) Medium dense red brown silty fine to medium SAND. (Fluvio-glacial)	
8.55-9.00	SJ15	N12						
				-3.21		9.35		
9.35	J16					(0.50)	Firm brown fine sandy CLAY with occasional lenses of orange brown sand and silt. (Glacial Till)	
9.50-9.95	U17	(55)		-3.71		9.85		
9.85	J18						Firm thinly to thickly laminated brown CLAY with occasional thin laminae of light brown silt. (Glacio-lacustrine)	
10.40-10.80	B19							
11.20-11.65	U20	(53)				(2.85)		
11.70	J21							
12.10-12.60	B22							
12.60-12.90	B23 U*	(100)		-6.56		12.70		
						(0.70)	Red brown slightly sandy fine to coarse subangular to subrounded GRAVEL with occasional cobbles. Gravel and cobbles consist of sandstone and basalt. (Fluvio-glacial)	
				-7.26		13.40		
13.50-13.95	SJ24	N52				(0.40)	Very dense orange brown slightly gravelly fine to coarse SAND. Gravel is fine to medium subangular and consists of sandstone. (Fluvio-glacial)	
				-7.66		13.80		
14.00-14.40	B25						Firm thinly laminated brown CLAY with occasional lenses of orange brown medium to coarse sand and occasional silt dusting on laminae surfaces. (Glacio-lacustrine)	
14.40-14.85	B26 U*	(70)				(1.55)		
14.90-15.35	SJ27	N37						
				-9.21		15.35		
							Borehole complete at 15.35m BGL.	

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date		Depth	Casing	Casing Dia	Water Depth	From	To	Hours	From	To	
17.12.95		0.00	0.00			12.90	13.35	0.75	1.50		1) Description derived from driller's daily report. 2) Inspection pit dug prior to drilling (1.0 x 1.0 x 1.20m).
17.12.95		9.00	8.50	200mm	2.35				9.00	9.50	
18.12.95		9.00	8.50	200mm	2.70				13.00	14.00	
18.12.95		15.35	14.50	200mm	12.20						

All dimensions in metres Scale 1:50	For Explanation of Symbols and Abbreviations see Key Sheets	Checked By: AR	Logged By: A. Latimer	Contract No. 1568

Date Printed:- 08/03/96

Form AEG21/2

(532) Wt.30370/0370 10,000 9/39 A.& E.W.Ltd. Gp.685

RECORD OF SHAFT OR BORE FOR MINERALS

NGR 5195 7857

SJ 57 NW/10 24

24SE. 9.

County CHESHIRE

6" Quarter Sheet 24SE

1" N.S. Geol. Map 97

1" O.S. Geol. Map —

Whether Confidential

Note attached.

Name and Number of Shaft or Bore given by Geological Survey: Circulating Water Well (No 2 WELL.)

Name and Number given by owner (if different from above) Imperial Chemical Industries.

Town or Village WESTON Date of sinking 1942

Exact site Rocksavage, A.P.13. 500 yds. S.E. of WESTON VILLA

Rocksavage, Weston Alkali Works near Runcorn. see attached sketch.

A sketch-map or tracing from a large-scale map is desirable.

Purpose for which made Water supply

Level at which bore commenced relative to O.D. If not down bore, state if horizontal or up

Made by Messrs. E. Timmins & Sons Ltd. for Messrs. I.C.I. Ltd., M.S. Factory, Rocksavage.

Information from E. Timmins & Sons, Ltd. Date received

Specimens Dip of strata

Geological Classification	Description	Thickness Metres			Depth Metres		
Glacial Gravel	Made up ground	2.13	7	-	2.13	7	-
	Sandy Clay	1.53	5	-	3.66	12	-
	Sandstone Boulder	0.61	2	-	4.27	14	-
	Sandy Clay and Gravel (Tubed)	2.44	8	-	6.71	22	-
Keuper Sandstone ?	Soft Red Sandstone with Marl Bands	10.05	33	-	16.76	55	-
	Soft Red Sandstone with Marl Bands	35.06	115	-	51.82	170	-
	Sandy Marl	1.52	5	-	53.34	175	-
	Soft Red Sandstone	3.05	10	-	56.39	185	-
	Gritty Sandstone with Clay nodules and a few pebbles	16.76	55	-	73.15	240	-
	Soft Sandstone	3.05	10	-	76.20	250	-
	Marl with Sandy beds	3.05	10	-	79.25	260	-
	Coarse Gritty Sandstone with Clay nodules and few pebbles	18.29	60	-	97.54	320	-
	Marl Bed	0.31	1	-	97.85	321	-
	Coarse Gritty Sandstone	10.96	36	-	108.81	357	-
	Marl	0.31	1	-	109.12	358	-
	Soft Fine Grained Sandstone	18.90	62	-	128.02	420	-
	Coarse Sandstone with Clay nodules	13.72	45	-	141.74	465	-
Upper Mottled Sandstone	Soft Red Sandstone	10.67	35	-	152.41	500	-
	Total depth of Borehole				152.41	500	-

			g.p.h.
Water Levels: R.W.D.	19' 1"	below surface level	
Pumping Water Level.	64' 7"	" when yielding	19,858
" " "	74' 5"	" " "	23,452
" " "	79' 0"	" " "	26,058
" " "	87' 7"	" " "	30,102
" " "	100' 5"	" " "	35,672
" " "	110' 0"	" " "	40,166

The above figures were obtained during a period of 14 days test pumping between May 27th 1942, and June 9th 1942, and the water levels quoted were recorded after constant results were established.

P.T.O...

Geological Survey and Museum, South Kensington, London, S.W.7.

G.S.M. Office File No.	Site marked on 6" Map by	Site marked on 1" Map by

Window Sampler Hole Log

Soil Mechanics

Drilled RT Logged DAS Checked NH	Start 23/03/2010 End 23/03/2010	Equipment, Methods and Remarks Competitor 130 Hand Dug Inspection Pit to 1.20m. Windowless Sampling to 4.70m	Depth from / to / Diameter / Casing Depth	Ground Level +5.12 mOD Coordinates E 351697.81 National Grid N 378684.98 Chainage

Samples and Tests

Depth	Type & No	Records	Date Casing	Time Water

Strata

Description	Depth, Level (Thickness)	Legend	Backfill/ Instruments
Grass onto dark brown slightly sandy CLAY. Sand is fine to coarse. (TOPSOIL)	0.20 +4.92		
Soft to firm orange brown mottled grey slightly sandy silty CLAY.	(2.10)		
Soft black slightly sandy clayey SILT. Sand is fine to medium.	2.30 +2.82		
4.50 m Brown lenses. Becoming sandy	(2.40)		
EXPLORATORY HOLE ENDS AT 4.70 m	4.70 +0.42		SP

Depth	Type & No	Records	Date Casing	Time Water

Groundwater Entries

No.	Struck (m)	Post strike behaviour	Depth sealed (m)
1	2.80		-

Depth Related Remarks *

From / to (m)

Chiselling

Depths (m) / Time / Tools used

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

(c) ESGL www.esgl.co.uk

Project: Ince Marshes

Project No.: F0604-10

Carried out for: Entec UK Ltd

Borehole

DP6

Sheet 1 of 1

British Geological Survey

FOUNDATION ENGINEERING Ltd.

BOREHOLE LOG

LOCATION : WEAVER VIADUCT BOREHOLE No. : 2 Sheet 1 of 2

BOREHOLE DIA. : 8" GROUND LEVEL : 16 · 34' O.D.

DATE (Start) : 20 · 4 · 66 WATER LEVEL : See note

Dates	Description	Thickness	Depth	Sample	Remarks
	Firm brown clayey TOPSOIL	0'-6"	0'-0" / 0'-6"		
	Soft to firm grey brown sandy silty CLAY laminated with green silty sand	5'-6"	6'-0"	1	
	Very soft to soft grey black sandy clayey SILT	10'-0"		2	
				3	35 blows/ft
			16'-0"		
	Loose brown sandy f.m.c. GRAVEL	4'-0"		4	46 blows/ft
			20'-0"		
	Loose brown sandy clayey silty SAND	3'-6"		5	12 blows/ft
	Stiff to very stiff brown laminated sandy CLAY with bands of reddish brown silty boulder clay	5'-6"	23'-6"	6	
	Loose brown SAND	2'-0"	29'-0"	7	32 blows/ft
			31'-0"	8	
Chiselling 2½ hrs	Very stiff to hard brown very sandy CLAY with boulders	16'-0"		9	
				10	U4 failed
7 hrs	Hard red fissured SANDSTONE	1'-0"	47'-0"		
	Very compact red marly cemented SAND with sandstone	4'-0"	48'-0" / 50'-0"	11	150 blows/6" (initial)

FOUNDATION ENGINEERING Ltd.

BOREHOLE LOG

LOCATION : WEAVER VIADUCT BOREHOLE No. : 2 Sheet 2 of 2

BOREHOLE DIA. : GROUND LEVEL :

DATE (Start) : WATER LEVEL :

Dates	Description	Thickness	Depth		Sample	Remarks
	Very compact red marly SAND with sand-stone	4'-0"	50'-0"		● 12A	Bulk Sample
			52'-0"		† ● 12	150 blows/4 3/4" (initial)
3 hrs (7 hrs)	Very compact green red decayed SANDSTONE & MARL	5'-0" +				
			57'-0"		† ● 13	150 blows/4 1/2" (initial)
Chiselling	Note: Borehole made water freely at 16'-0" depth with borehole drilled, cased to 23'-6" depth water rose from 10'-0" to 3'-0" B.G.L. overnight. Borehole made water freely between 29'-0" & 34'-0" depths, also between 48'-0" & 55'-0" depths. With borehole drilled to 55'-0", cased to 52'-0" depths, water rose from 30'-0" B.G.L to Ground Level overnight					BOREHOLE COMPLETE

British Geological Survey

FOUNDATION ENGINEERING Ltd.

BOREHOLE LOG

LOCATION : WEAVER VIADUCT BOREHOLE No. : 7 Sheet 1 of 2

BOREHOLE DIA. : 8" GROUND LEVEL : 10 · 00' O.D.

DATE (Start) : 16 · 4 · 66 WATER LEVEL : See note

Dates	Description	Thickness	Depth	Sample	Remarks
			0'-0"		
	Soft grey black sandy clayey SILT	8'-0"		1	
	Soft PEAT	1'-0"	8'-0"	2	
			9'-0"	3	
				4	
	Compact sandy GRAVEL	11'-0"		5	52 blows/ft
	(large cobbles at 19'-0")		19'-0"	6	
	Stiff red boulder CLAY	1'-0"	20'-0"	7	
	Firm red brown laminated silty CLAY	1'-0"	21'-0" 22'-0"	8	
	Firm red brown laminated sandy silty CLAY	6'-0"		9	
			28'-0"	10	U4 failed
	Firm red brown clayey SILT	7'-6"		11	
				12	
			35'-6"	13	
				14	
	Firm to stiff red brown laminated silty CLAY	8'-6"		15	
			44'-0"	16	
	Firm to stiff boulder CLAY	3'-6"			
			47'-6"	17	
	Soft clayey SILT	4'-6"			
			50'-0"		

BOREHOLE SCALE : 1" — 5' · DISTURBED SAMPLE · UNDISTURBED SAMPLE

British Geological Survey

FOUNDATION ENGINEERING Ltd.

BOREHOLE LOG

LOCATION : WEAVER VIADUCT BOREHOLE No. : 7 Sheet 2 of 2

BOREHOLE DIA. : GROUND LEVEL :

DATE (Start) : WATER LEVEL :

Dates	Description	Thickness	Depth	Sample	Remarks
	Soft clayey SILT	4'-6"	5 0'-0"		
	Firm sandy boulder CLAY	2'-0"	52'-0"	18	75 blows/ft
			54'-0"	19	
				20	
	Stiff CLAY with boulders	20'-0"		21	U4 failed
				22	U4 failed
				23	
				24	
	Firm brown silty CLAY	1'-0"	74'-0"		
	Hard red MARL with sandstone	2'-6"	75'-0"	25	
				26	
			77'-6"	27	200 blows/3" (initial)
19½ hrs chiselling	Hard SANDSTONE With MARL.	5'-0"+			
			82'-6"	28	200 blows/3" (initial)
	Note: Water tidal above ground level				BOREHOLE COMPLETE

BOREHOLE SCALE : 1" = 5' • : DISTURBED SAMPLE ▮ : UNDISTURBED SAMPLE + STANDARD PENETRATION

British Geological Survey

FOUNDATION ENGINEERING Ltd.

BOREHOLE LOG

LOCATION : WEAVER VIADUCT BOREHOLE No. : 8 Sheet 1 of 3

BOREHOLE DIA. : 8" GROUND LEVEL : 18 · 98' O.D.

DATE (Start) : 3 · 5 · 66 WATER LEVEL : See note

Dates	Description	Thickness	Depth	Sample	Remarks
	Loamy TOPSOIL	0'-9"	0'-0"		
			0'-9"		
	Loose brown sandy SILT	6'-3"		1	5 blows/ft
			7'-0"	2	5 blows/ft
	Firm brown laminated clayey SILT	4'-0"			
			11'-0"	3	
	Loose grey sandy SILT	11'-0"		4	3 blows/ft
				5	5 blows/ft
			22'-0"		
	Soft to firm grey peaty silty CLAY PEAT	0'-6"	23'-0"		
			23'-6"	6	
	Soft to firm peaty silty CLAY	2'-6"	26'-0"		
	Soft grey peaty CLAY	2'-0"	28'-0"		
	Loose grey sandy SILT	1'-6"	29'-6"		
	Soft grey silty peaty CLAY	3'-6"		7	11 blows/ft
	Loose grey sandy GRAVEL with sandstone boulder	2'-0"	33'-0"	8	
	Stiff grey CLAY	1'-0"	35'-0"	9	
			36'-0"	10	
				11	
	Stiff red CLAY with boulders	15'-0"			
				12	
				13	
			50'-0"		

British Geological Survey

FOUNDATION ENGINEERING Ltd.

BOREHOLE LOG

LOCATION : WEAVER VIADUCT BOREHOLE No. : 8 Sheet 2 of 3

BOREHOLE DIA. : GROUND LEVEL :

DATE (Start) : WATER LEVEL :

Dates	Description	Thickness	Depth	Sample	Remarks
	Stiff red CLAY with boulders	15'-0"	50'-0"		
			51'-0"	14	
	Firm to stiff laminated silty CLAY	5'-0"			
			56'-0"	15	
	Loose SAND with layers of boulder clay	6'-6"		16	14 blows/ft
			62'-6"		
21½ hrs chiselling				17	U4 failed
	Stiff brownish-red CLAY with boulders	28'-6"		18	U4 failed
				19	
				20	U4 failed
				21	
	Firm laminated silty CLAY	2'-0"	91'-0"	22	
			93'-0"	23	
	Hard marly cemented SAND with layers of boulder clay	4'-6"		24	165 blows/ft (initial)
	Hard red SANDSTONE	5'-0"+	97'-6"	25	180 blows/3" (initial)
			100'-0"		

BOREHOLE SCALE : 1" = 5' • : DISTURBED SAMPLE ▮ : UNDISTURBED SAMPLE + STANDARD PENETRATION TEST

FOUNDATION ENGINEERING Ltd.

BOREHOLE LOG

LOCATION : WEAVER VIADUCT BOREHOLE No. : 8 Sheet 3 of 3

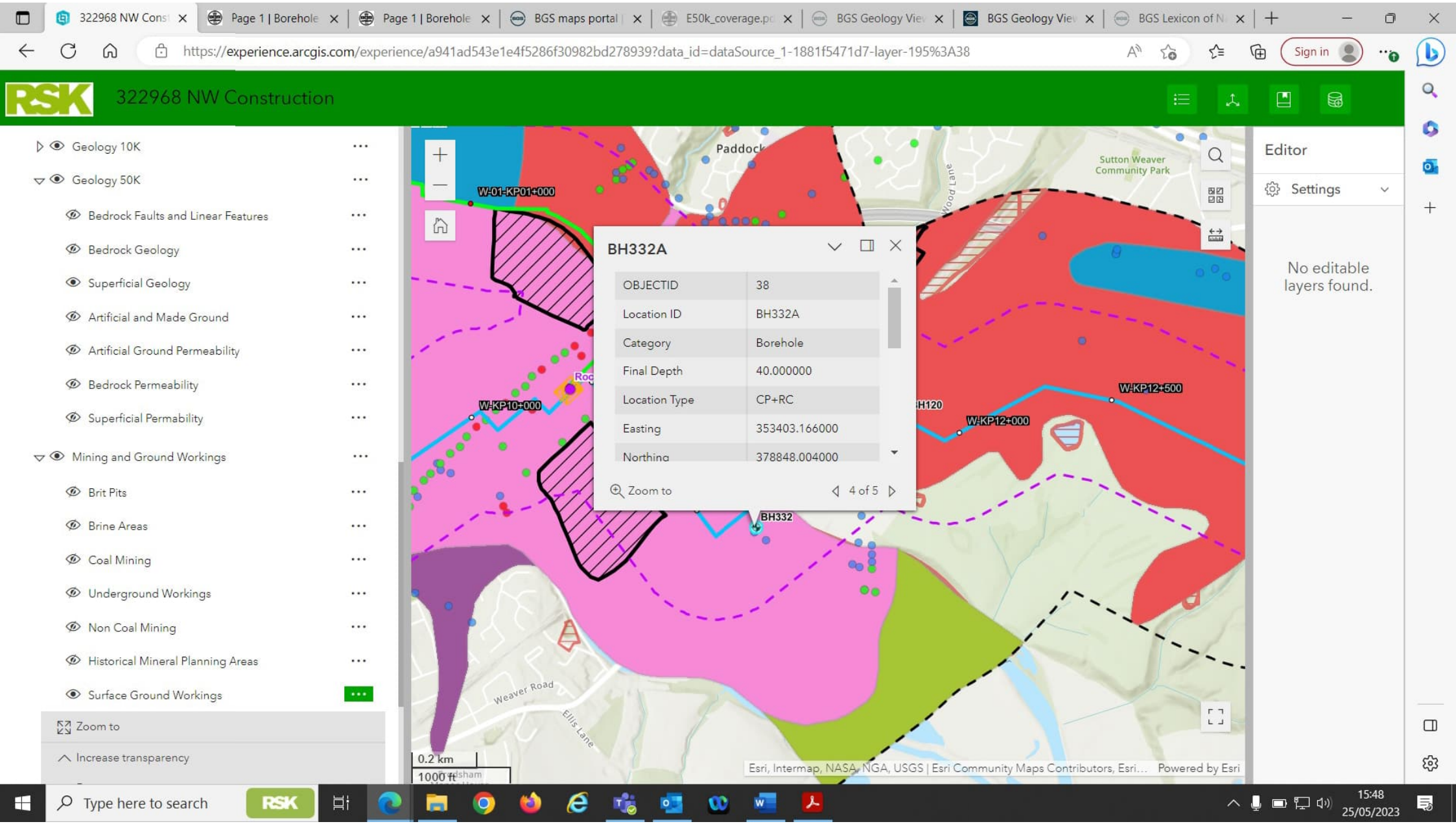
BOREHOLE DIA. : GROUND LEVEL :

DATE (Start) : WATER LEVEL :

Dates	Description	Thickness	Depth		Sample	Remarks
Chiselling (21½ hrs)	Hard red SANDSTONE	5'-0" +	10 0'-0"			
			102'-6"		+ ● 26	200 blows / 3" (initial)
	Note Water encountered first at 5'-0" B.G.L. With borehole drilled to 75'-0" & cased to 65'-0" depth, water rose from 30'-6" to 12'-6" B.G.L. overnight					BOREHOLE COMPLETE

BOREHOLE SCALE : 1" — 5' • : DISTURBED SAMPLE ▮ : UNDISTURBED SAMPLE + STANDARD PENETRATION TEST

British Geological Survey


322968 NW Construction
Geology 10K
Geology 50K
Bedrock Faults and Linear Features
Bedrock Geology
Superficial Geology
Artificial and Made Ground
Artificial Ground Permeability
Bedrock Permeability
Superficial Permability
Mining and Ground Workings
Brit Pits
Brine Areas
Coal Mining
Underground Workings
Non Coal Mining
Historical Mineral Planning Areas
Surface Ground Workings
Zoom to
Increase transparency
BH332A
OBJECTID 38
Location ID BH332A
Category Borehole
Final Depth 40.000000
Location Type CP+RC
Easting 353403.166000
Northing 378848.004000
Zoom to
4 of 5
W-01-KP01+000
W-KP10+000
W-KP12+000
W-KP12+500
BH332
Paddock
Sutton Weaver Community Park
Weaver Road
Ellis Lane
Editor
Settings
No editable layers found.
0.2 km
1000 ft
Esri, Intermap, NASA, NGA, USGS | Esri Community Maps Contributors, Esri... Powered by Esri
Type here to search
15:48
25/05/2023

FOUNDATION ENGINEERING Ltd.

BOREHOLE LOG

LOCATION : WEAVER VIADUCT BOREHOLE No. : 15 Sheet 1 of 3

BOREHOLE DIA. : 8" GROUND LEVEL : 17 · 09' O.D.

DATE (Start) : 2 · 6 · 66 WATER LEVEL : See note

Dates	Description	Thickness	Depth	Sample	Remarks
	Firm brown clayey TOPSOIL	0'-6"	0'-0"		
	Firm grey brown sandy SILT	1'-6"	0'-6"		
	Firm to soft grey brown sandy silty CLAY with thin layers of grey silty sand	3'-0"	2'-0"	1	
	Very loose grey brown silty SAND (pieces of decayed wood from 14'-0")	11'-0"	5'-0"	2	5 blows/ft
	Very loose grey brown gravelly SAND with thin bands of black clayey silt	2'-0"	14'-0"	3	7 blows/ft
	Loose brown sandy f. m. GRAVEL with thin bands of grey black peaty clay	4'-0"	16'-0"		
	Med. dens. grey sandy f. m. c. GRAVEL	8'-0"	18'-0"	4	11 blows/ft
	Loose grey sandy SILT	1'-6"	22'-0"	5	18 blows/ft
	Soft to firm grey brown silty CLAY	5'-6"	30'-0"	6	6 blows/ft
	Loose brown silty clayey SAND with pieces of decayed wood	7'-0"	31'-6"	7	U4 failed
	Compact grey sandy f. m. c. GRAVEL with pieces of decayed wood	4'-0"	37'-0"	8	7 blows/ft
	Med. dens. grey brown SAND	2'-0"	44'-0"	9	32 blows/ft
			48'-0"		
			50'-0"		

BOREHOLE SCALE : 1" = 5' • : DISTURBED SAMPLE ▮ : UNDISTURBED SAMPLE ⊥ STANDARD PENETRATION TEST

FOUNDATION ENGINEERING Ltd.

BOREHOLE LOG

LOCATION :WEAVER VIADUCT BOREHOLE No. : 15 Sheet 2 of 3

BOREHOLE DIA. : GROUND LEVEL :

DATE (Start) : WATER LEVEL :

Dates	Description	Thickness	Depth	Sample	Remarks
	Compact brown SAND & f.m.c. gravel	2'-0"	50'-0"	10	28 blows/ft
	Firm brown sandy silty CLAY	0'-6"	52'-0"		
	Very compact grey brown sandy GRAVEL with pieces of sandstone	3'-6"	52'-6"	11	89 blows/ft
	Firm brown sandy CLAY with boulders	3'-0"	56'-0"		
	Compact brown clayey SAND	3'-0"	59'-0"	12	
	Stiff brown very sandy CLAY with boulders	2'-0"	62'-0"		
	Firm to stiff brown silty CLAY with boulders	5'-0"	64'-0"	13	U4 failed
3½ hrs chiselling			69'-0"	14	
	Stiff brown sandy CLAY with boulders & layers of brown clayey sand, pieces of red marl	16'-6"		15	
				16	
				17	U4 failed
				18	
	Firm brown laminated silty CLAY	2'-6"	85'-6"	19	
	Firm brown sandy CLAY with boulders & bands of brown silty laminated clay & brown sand	6'-0"	88'-0"	20	
	Soft brown clayey SILT	2'-0"	94'-0"		
	Compact brown SAND with layers of brown laminated silty clay	2'-0"	96'-0"	21	92 blows/9½"
	Compact brown laminated sandy silty CLAY	4'-6"	98'-0"		
			100'-0"		

British Geological Survey

FOUNDATION ENGINEERING Ltd.

BOREHOLE LOG

LOCATION : WEAVER VIADUCT BOREHOLE No. : 15 Sheet 3 of 3

BOREHOLE DIA. : GROUND LEVEL :

DATE (Start) : WATER LEVEL :

Dates	Description	Thickness	Depth	Sample	Remarks
	Compact brown laminated sandy silty CLAY	4'-6"	100'-0"		
			102'-6"	● 22	34 blows/ft
				● 23	69 blows/6"
	Very compact brown silty SAND	12'-0"			
	Hard brown silty CLAY	1'-0"	114'-6"	● 24	66 blows/6"
			115'-6"		
	Very compact brown silty SAND	9'-6"		● 25	69 blows/6"
			125'-0"	● 26	72 blows/6"
	Very compact brown clayey silty SAND with layers of clayey silt & boulder clay	5'-0"	130'-0"	● 27	50 blows/6"
	Very compact brown silty SAND with occ. fine gravel	4'-0"			
			134'-0"	● 28	50 blows/4"
	Very compact brown SAND & brown sandy boulder clay	3'-6"	137'-6"		
				● 29	50 blows/1"
	Very compact brown clayey cemented SAND	12'-6" +			
				● 30	100 blows/4" (initial)
4 hrs chiselling	Note: Water encountered 4'-0" B.G.L. With borehole drilled & cased to 110'-0" water rose from 10'-0" to 2'-3" B.G.L. overnight. Borehole made water freely 110'-0" to 150'-0" depth.		150'-0"	● 31	150 (initial) blows/2"

BOREHOLE COMPLETE

BOREHOLE SCALE : 1"=5' • : DISTURBED SAMPLE ▮ : UNDISTURBED SAMPLE + STANDARD PENETRATION TEST

FOUNDATION ENGINEERING Ltd.

BOREHOLE LOG

LOCATION :WEAVER VIADUCT BOREHOLE No. : 19 Sheet 1 of 3

BOREHOLE DIA. : 8 " GROUND LEVEL : 19 . 52 ' O.D.

DATE (Start) : 26 . 2 . 66 WATER LEVEL : See note

Dates	Description	Thickness	Depth	Sample	Remarks
	MADE GROUND topsoil brick + ash	0'-6"	0'-0" / 0'-6"		
	Soft to firm brown silty CLAY	5'-6"		1	U4 failed
			6'-0"	2	
	Soft grey clayey sandy SILT	4'-0"		3	
			10'-0"	4	
	Soft black clayey SILT	8'-0"		5	
			18'-0"		
	Loose gravelly SAND	5'-6"		6	12 blows/ft
			23'-6"	7	
	Firm grey peaty silty CLAY	6'-6"		8	
			30'-0"		
	Soft grey clayey SILT with vegetation	5'-0"		9	11 blows/ft
			35'-0"		
	Firm mottled grey silty CLAY	3'-0"		10	U4 failed
			38'-0"		
	Firm brown silty CLAY	4'-0"		11	11 blows/ft
			42'-0"	12	25 blows/ft
	Med. dens. sandy GRAVEL	7'-0"			
				13	23 blows/ft
	Stiff grey CLAY with boulders (became red at 49'-6")	4'-0"	49'-0"	14	
			49'-6"		
			50'-0"		

BOREHOLE SCALE : 1" — 5' • : DISTURBED SAMPLE ▮ : UNDISTURBED SAMPLE STANDARD PENETRATION

FOUNDATION ENGINEERING Ltd.

BOREHOLE LOG

LOCATION : WEAVER VIADUCT BOREHOLE No. : 19 Sheet 2 of 3

BOREHOLE DIA. : GROUND LEVEL :

DATE (Start) : WATER LEVEL :

Dates	Description	Thickness	Depth	Sample	Remarks
1 hr	Stiff grey CLAY with boulders (became red at 49'-6")	4'-0"	50'-0"	15, 16	
	Compact sandy fine GRAVEL	4'-6"	53'-0"	17	70 blows/ft
3 hrs	Hard red CLAY with boulders	10'-0"	57'-6"	18, 19	
	Hard grey clayey SILT	6'-6"	67'-6"	20, 21, 22	
	Med. dens. SAND	6'-0"	73'-0"	23	20 blows/ft
1 hr 3/4	Firm CLAY with boulders	2'-6"	79'-0"	24, 25	34 blows/ft
Chiselling	Compact gravelly SAND	10'-6"	81'-6"	26	38 blows/6"
				27	75 blows/6"
	Med. dens. SAND	13'-0"	92'-0"	28	14 blows/ft
			100'-0"		

BOREHOLE SCALE : 1" = 5' • : DISTURBED SAMPLE ▮ : UNDISTURBED SAMPLE + STANDARD PENETRATION TEST

FOUNDATION ENGINEERING Ltd.

BOREHOLE LOG

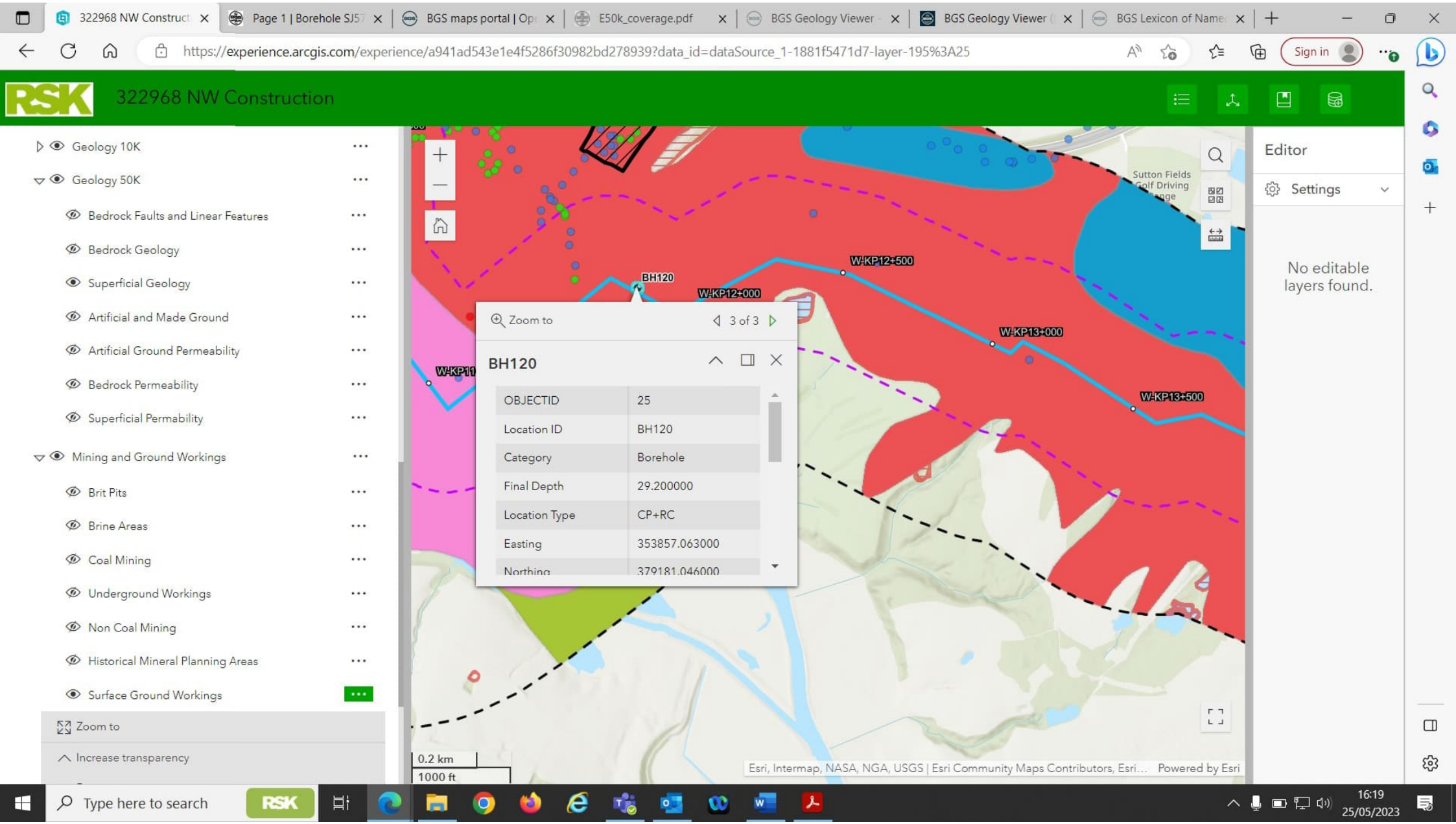
LOCATION : WEAVER VIADUCT BOREHOLE No. : 19 Sheet 3 of 3

BOREHOLE DIA. : GROUND LEVEL :

DATE (Start) : WATER LEVEL :

Dates	Description	Thickness	Depth	Sample	Remarks
	Med. dens. SAND	13'-0"	10 0'-0"	● 29	20 blows/ft
	Compact gravelly SAND	1'-0"	105'-0"		
5 hrs	Stiff red CLAY with boulders	4'-0"	106'-0"	● 30	50 blows/6" (initial)
	Very compact SAND	2'-6"	110'-0"	● 31	60 blows/6" (initial)
4 hrs	Very hard red CLAY with boulders	3'-6"	112'-6"	● 32	60 blows/6" (initial)
	Red-brown MARL & SANDSTONE	5'-0" +	116'-0"	● 33	90 blows/6" (initial)
7 hrs			121'-0"	● 34	110 blows/6" (initial)
Chiselling	Note: With borehole drilled & cased to 26'-6" depth, water stood at 4'-9" B.G.L. overnight. With borehole drilled & cased to 106'-6" depth water rose to ground level				

BOREHOLE SCALE 1" = 5'


322968 NW Construct
Page 1 | Borehole SJ5
BGS maps portal | Op
E50k_coverage.pdf
BGS Geology Viewer
BGS Geology Viewer
BGS Lexicon of Name
https://experience.arcgis.com/experience/a941ad543e1e4f5286f30982bd278939?data_id=dataSource_1-1881f5471d7-layer-195%3A25
Sign in
RSK
322968 NW Construction
Geology 10K
Geology 50K
Bedrock Faults and Linear Features
Bedrock Geology
Superficial Geology
Artificial and Made Ground
Artificial Ground Permeability
Bedrock Permeability
Superficial Permability
Mining and Ground Workings
Brit Pits
Brine Areas
Coal Mining
Underground Workings
Non Coal Mining
Historical Mineral Planning Areas
Surface Ground Workings
Zoom to
Increase transparency
BH120
W-KP12+000
W-KP12+500
W-KP13+000
W-KP13+500
Zoom to
3 of 3
BH120
OBJECTID 25
Location ID BH120
Category Borehole
Final Depth 29.200000
Location Type CP+RC
Easting 353857.063000
Northing 379181.046000
Sutton Fields Golf Driving Range
Editor
Settings
No editable layers found.
0.2 km
1000 ft
Esri, Intermap, NASA, NGA, USGS | Esri Community Maps Contributors, Esri... Powered by Esri
Type here to search
16:19
25/05/2023

SJ 57 NE 10

FUGRO - McCLELLAND LIMITED

BOREHOLE LOG

Borehole B194/01R

Sheet 1 of 2

Method	Date	Site
Shell & Auger.	18/06/90 - 19/06/90	NWEP
Dia mm 200	**Coord** 355037mE, 378953mN	**Ground Level m.OD** 46.25
		Client SCUK/BECHTEL

Soil Samples/Tests Type/Test	Depth m.	Water & Progress	OD Level m.	Depth m.	Description of Strata	Legend
B1	0.00 - 1.00	18/06/90	45.95	0.30	Brown sandy TOPSOIL (0.30)	
					Loose to medium dense light grey-brown silty fine to coarse SAND with fine to medium gravel (0.70)	
B2	1.00		45.25	1.00		
C3 (12)	1.00 - 1.45				Medium dense grey-brown silty fine to coarse SAND and fine to medium GRAVEL (2.60)	
C4 (19)	2.00 - 2.45					
C5 (19)	3.00 - 3.45					
D6	3.60		42.65	3.60		
C7 (21)	4.00 - 4.45		42.25	4.00	Medium dense brown to light brown fine to coarse SAND (0.40)	
		18/06/90			Medium dense grey-brown clayey silty fine to coarse SAND with fine to coarse gravel (0.60)	
B8	4.50 - 4.60	19/06/90				
S9 (31)	4.60 - 5.05		41.65	4.60	Medium dense grey-brown fine to coarse SAND and fine to coarse GRAVEL with some cobbles (2.40)	
C10 (21)	5.50 - 5.95					
C11 (21)	6.50 - 6.95					
		19/06/90	39.25	7.00		

Remarks

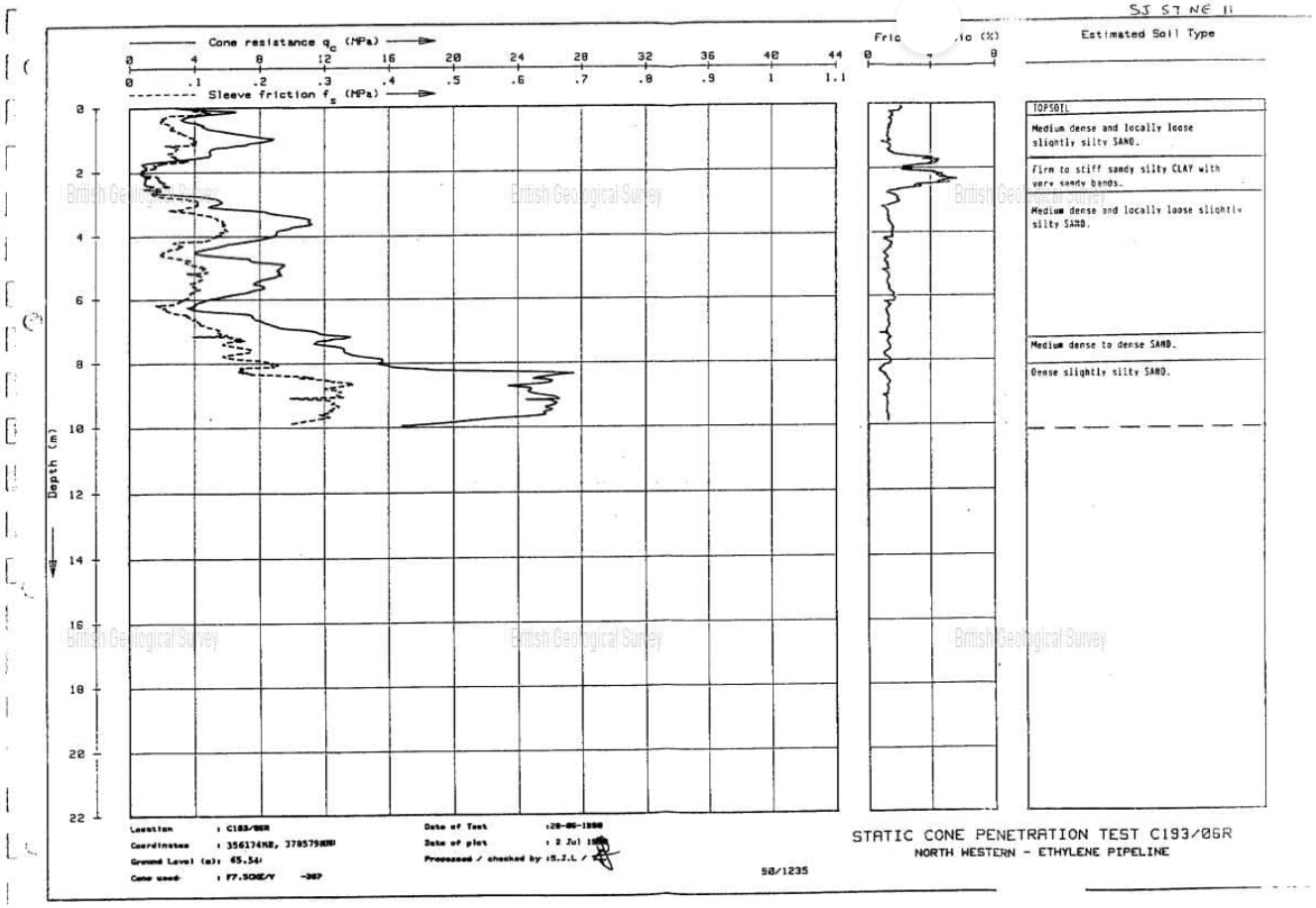
Ground-water was not encountered

Logged by	Scale	End Casing Depth	Job No.
SPM	1:50	m. 7.00	901235

Sample/Test key:
- U () UI00 sample (blows)
- D Disturbed sample
- B Bulk sample
- W Water sample
- - Progress & Day

Penetration Tests
- S () Standard (N value)
- C () Cone (N value)
- * Blows and penetration when 300mm not achieved

British Geological Survey


SJ 57 NE 11
Cone resistance q_c (MPa)
Sleeve friction f_s (MPa)
Friction ratio (%)
Estimated Soil Type
Depth (m)
TOPSOIL
Medium dense and locally loose slightly silty SAND.
Firm to stiff sandy silty CLAY with very sandy bands.
Medium dense and locally loose slightly silty SAND.
Medium dense to dense SAND.
Dense slightly silty SAND.
STATIC CONE PENETRATION TEST C193/06R
NORTH WESTERN - ETHYLENE PIPELINE
98/1235

PROJECT: LINCOLN NEW TOWN
LOCATION: Flood Brook Sewer
GROUND LEVEL: 49.8
DIA. OF CASING: 6 INS. TO FT.
INCLINATION: Vertical
INS. TO FT.
SCALE OF LOG: 1" = 4 ft.
SHEET 1 OF 2

TYPE OF BORING: Shell & Auger

Daily Progress	Reduced Level	Depth	Legend	Sampling Type	Sampling Depth	Nat. m %	Description and Remarks, Including Water Observations.	Key to Laboratory Tests
	48.8	1.0					TOPSOIL - Organic	
				D	2.0	19	CLAY - Sandy, soft, brown	
	47.3	2.5		U4	2.5			
							SAND - Red, coarse	
				D	4.0	16		
				S(16)	5.0			
26/3/68	43.3	6.5					Clayey, wet with pebbles	
	41.8	8.0		D	8.0	18		
							CLAY - Sandy, soft, brown	
				D	10.0	18		
	37.8	12.0		D	12.0	29		
							SAND - Fine, saturated, red	
				D	14.0	28		
				D	16.0	29		
				D	18.0	18		
				D	20.0	34		
27/3/68				D	22.0	23		
	27.3	22.5		U4	22.5			
							CLAY - Soft, light brown, silty	
				D	24.0	17		
	24.8	25.0						
							SAND - Fine grained saturated	
				D	26.0	21		
				D	28.0	21		
				D	30.0	1		

CONTINUED

U(4) = 4" Dia. Undisturbed Sample
D = Disturbed Sample
Δ = Water Sample
S( ) = Standard Penetration Test
C( ) = Cone Penetration Test
Figures in Brackets Indicate No. of Blows
* Indicates Penetration in Ins. for 50 Blows
V = Vane Test

TX = Triaxial Test
CV = Consolidation Test
I = Index Test
O = Compaction Test
Ch = Chemical Test

Borehole No. 17

PROJECT: RONCORN NEW TOWN

LOCATION: Flood Brook Sewer.

GROUND LEVEL: 49.8 DIA. OF CASING: 6 INS. TO FT.

INCLINATION: Vertical INS. TO FT.

SCALE OF LOG: 1" = 4 ft. SHEET 2 OF 2

TYPE OF BORING: Shell & Auger

Daily Progress	Reduced Level	Depth	Legend	Sampling Type	Sampling Depth	Nat. m %	Description and Remarks, Including Water Observations.	Key to Laboratory Tests
	19.8	30.0					GRAVEL - Coarse	
27/3/68				D	32.0	3		
	15.8	34.0		D	34.0	16	MARL - Weathered, with clay laminations	
				D	36.0	17		
28/3/68	11.8	38.0		D	38.0			
				C($\frac{1}{2}$")	38.5		Hard	
	9.8	40.0		D	40.0	12	Bottom of Borehole	

CONTINUED

U(4) = 4" Dia. Undisturbed Sample
D = Disturbed Sample
Δ = Water Sample
S( ) = Standard Penetration Test
C( ) = Cone Penetration Test
Figures in Brackets Indicate No. of Blows
✱ Indicates Penetration in Ins. for 50 Blows
V = Vane Test

TX = Triaxial Test
CV = Consolidation Test
I = Index Test
O = Compaction Test
Ch = Chemical Test

Borehole No. 17

SJ 57 NE 10

FUGRO - McCLELLAND LIMITED

BOREHOLE LOG

Borehole B194/01R

Sheet 1 of 2

Method	Date	Site
Shell & Auger.	18/06/90 - 19/06/90	NWEP
Dia mm 200	**Coord** 355037mE, 378953mN	**Ground Level m.OD** 46.25
		Client SCUK/BECHTEL

Soil Samples/Tests Type/Test	Depth m.	Water & Progress	OD Level m.	Depth m.	Description of Strata	Legend
B1	0.00 - 1.00	18/06/90	45.95	0.30	Brown sandy TOPSOIL (0.30)	
					Loose to medium dense light grey-brown silty fine to coarse SAND with fine to medium gravel (0.70)	
B2	1.00		45.25	1.00		
C3 (12)	1.00 - 1.45				Medium dense grey-brown silty fine to coarse SAND and fine to medium GRAVEL (2.60)	
C4 (19)	2.00 - 2.45					
C5 (19)	3.00 - 3.45					
D6	3.60		42.65	3.60		
C7 (21)	4.00 - 4.45		42.25	4.00	Medium dense brown to light brown fine to coarse SAND (0.40)	
		18/06/90			Medium dense grey-brown clayey silty fine to coarse SAND with fine to coarse gravel (0.60)	
B8	4.50 - 4.60	19/06/90				
S9 (31)	4.60 - 5.05		41.65	4.60	Medium dense grey-brown fine to coarse SAND and fine to coarse GRAVEL with some cobbles (2.40)	
C10 (21)	5.50 - 5.95					
C11 (21)	6.50 - 6.95					
		19/06/90	39.25	7.00		

Remarks

Ground-water was not encountered

Logged by	Scale	End Casing Depth	Job No.
SPM	1:50	m. 7.00	901235

Sample/Test key:
- U () U100 sample (blows)
- D Disturbed sample
- B Bulk sample
- W Water sample
- - Progress & Day

Penetration Tests
- S () Standard (N value)
- C () Cone (N value)
- * Blows and penetration when 300mm not achieved

British Geological Survey

SJ 57 NE 10

FUGRO - McCLELLAND LIMITED

BOREHOLE LOG

Borehole B194/01R

Sheet 2 of 2

Method	Date	Site
Shell & Auger.	18/06/90 - 19/06/90	NWEP
Dia mm 200	**Coord** 355037mE, 378953mN	**Ground Level m.OD** 46.25
		Client SCUK/RECHTEL

Soil Samples/Tests		Water & Progress	OD Level m.	Depth m.	Description of Strata	Legend
Type/Test	Depth m.					
					i. Install standpipe to 3.00. ii. Water added from 0.00 to 7.00.	

GROUNDWATER OBSERVATIONS

Date	Time	Borehole Depth	Casing Depth	Water Level
18/06/90	1800	4.50	4.50	DRY
19/06/90	0800	4.50	4.50	DRY
19/06/90	1200	7.00	7.00	DRY

Remarks

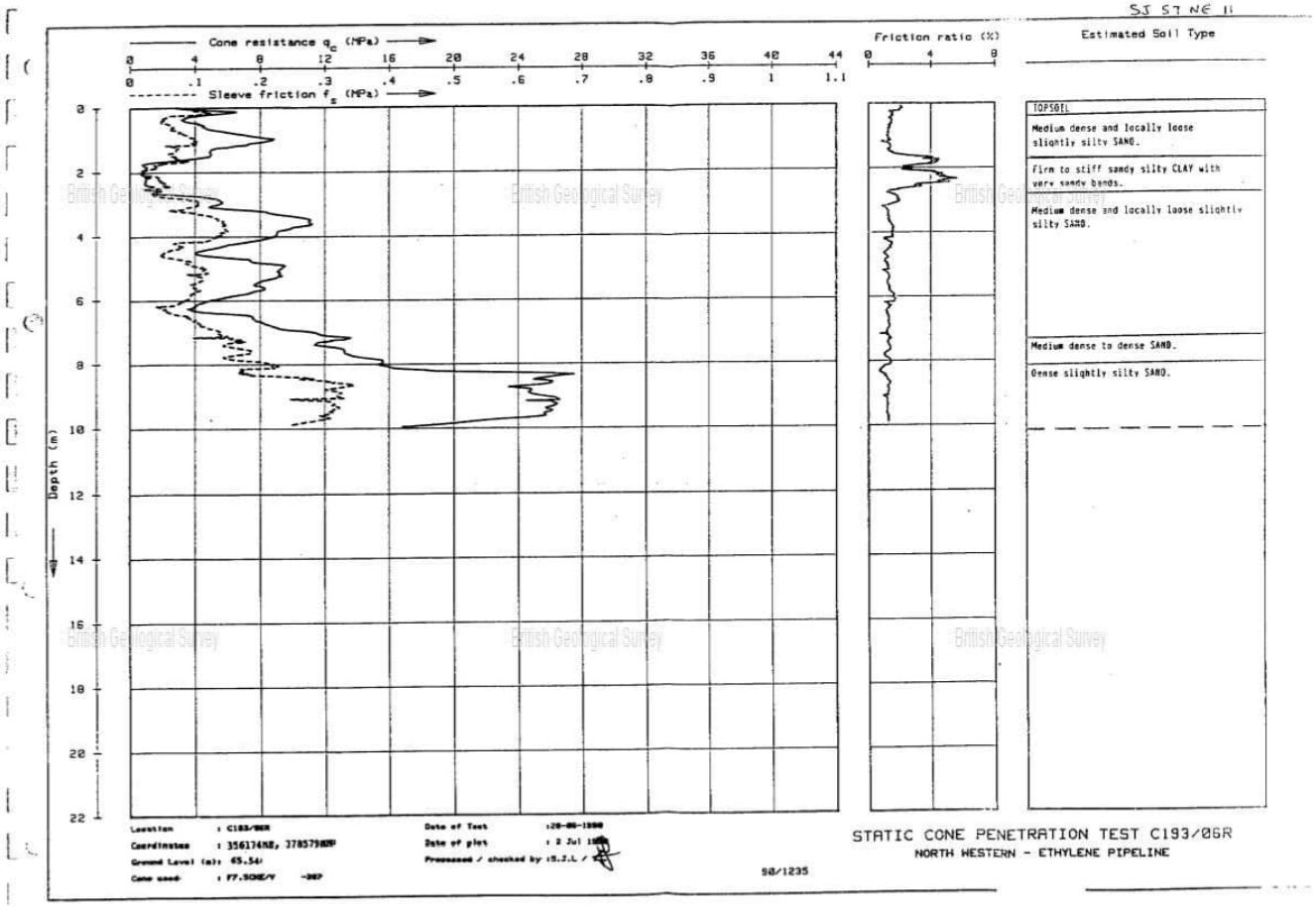
Ground-water was not encountered

Logged by	Scale	End Casing Depth	Job No.
SPM	1:50	m. 7.00	901235

Sample/Test key:
- U () U100 sample (blows)
- D Disturbed sample
- B Bulk sample
- W Water sample
- - Progress & Day

Penetration Tests
- S () Standard (N value)
- C () Cone (N value)
- * Blows and penetration when 300mm not achieved

British Geological Survey


SJ 57 NE 11
Cone resistance q_c (MPa)
Sleeve friction f_s (MPa)
Friction ratio (%)
Estimated Soil Type
Depth (m)
TOPSOIL
Medium dense and locally loose slightly silty SAND.
Firm to stiff sandy silty CLAY with very sandy bands.
Medium dense and locally loose slightly silty SAND.
Medium dense to dense SAND.
Dense slightly silty SAND.
STATIC CONE PENETRATION TEST C193/06R
NORTH WESTERN - ETHYLENE PIPELINE
98/1235

British Geological Survey

BGS ID: 16115755 : BGS Reference: SJ57NW188
British National Grid (27700) : 353625,379426

Report an issue with this borehole

PROJECT: RUNCORN NEW TOWN
LOCATION: Flood Brook II

GROUND LEVEL: 72.8 ft. DIA. OF CASING: 154 mm. to metres
INCLINATION: Vertical mm. to metres
SCALE OF LOG: 1" = 4' DATE DRILLED: 8/9.10.70.

TYPE OF BORING: Shell and auger

Reduced Level	Depth ft.	Legend	Sampling Type	Sampling Depth	Soil Description	Key to Laboratory Tests
					SAND - dark brown, medium grained	
			D	2.0		
68.8	4.0		D	4.0		
			S(37)	5.0	▼GWL 5' lighter brown, medium grained, medium dense	
			D	8.0		
			S(37)	10.0		
			D	13.0		
			S(34)	15.0		
			D	18.0		
52.8	20.0		S(33)	20.0	lighter brown, medium grained, medium dense, with stones to 1½"	
			D	22.0		
48.8	24.0		D	24.0	saturated	
47.8	25.0		S(5)*	25.0	CLAY - hard, brown, sandy, stoney	
47.3	25.5		S(4)*	26.0	hard, brown, sandy, stoney with enclosures of brown coarse grained stoney sand	
			D	28.0		
42.8	30.0		D	30.0		
			S(2)*		MARL - red/brown, hard, unweathered	

Moisture Content and plot of Atterberg Limits
Percent
10 20 30 40

Ground water encountered at 5.0'
Quantity

SHEET 1 OF 2

Borehole No.9B

British Geological Survey

BGS ID: 16115755 : BGS Reference: SJ57NW188
British National Grid (27700) : 353625,379426

Report an issue with this borehole

PROJECT: RUNCORN NEW TOWN
LOCATION: Flood Brook II

GROUND LEVEL: 72.8 ft. DIA. OF CASING: 154 mm. to metres
INCLINATION: Vertical mm. to metres
SCALE OF LOG: 1" = 4' DATE DRILLED: 8/9/10.7.70.

TYPE OF BORING: Shell and auger

Reduced Level	Depth ft.	Legend	Sampling Type	Sampling Depth	Soil Description	Key to Laboratory Tests	Moisture Content and plot of Atterberg Limits (Percent: 10, 20, 30, 40)
39.8	33.0	C C			MARL - red/brown, hard, unweathered Bottom of borehole		

Ground water encountered at 5.0'
Quantity

SHEET 2 OF 2

Borehole No.9B

FOUNDATION ENGINEERING Ltd.

BOREHOLE LOG

LOCATION : WEAVER VIADUCT BOREHOLE No. : 8 Sheet 1 of 3

BOREHOLE DIA. : 8" GROUND LEVEL : 18 · 98' O.D.

DATE (Start) : 3 · 5 · 66 WATER LEVEL : See note

Dates	Description	Thickness	Depth	Sample	Remarks
	Loamy TOPSOIL	0'-9"	0'-0" / 0'-9"		
	Loose brown sandy SILT	6'-3"		1	5 blows/ft
			7'-0"	2	5 blows/ft
	Firm brown laminated clayey SILT	4'-0"			
			11'-0"	3	
	Loose grey sandy SILT	11'-0"		4	3 blows/ft
				5	5 blows/ft
			22'-0"		
	Soft to firm grey peaty silty CLAY PEAT	0'-6"	23'-0"		
	Soft to firm peaty silty CLAY	2'-6"	23'-6"	6	
	Soft grey peaty CLAY	2'-0"	26'-0"		
	Loose grey sandy SILT	1'-6"	28'-0"		
	Soft grey silty peaty CLAY	3'-6"	29'-6"	7	11 blows/ft
	Loose grey sandy GRAVEL with sandstone boulder	2'-0"	33'-0"	8	
	Stiff grey CLAY	1'-0"	35'-0"	9	
			36'-0"	10	
				11	
	Stiff red CLAY with boulders	15'-0"			
				12	
				13	
			50'-0"		

British Geological Survey

BOREHOLE SCALE - 1" — 5' • - DISTURBED SAMPLE ▮ - UNDISTURBED SAMPLE ⊥ STANDARD PENETRATION TEST

British Geological Survey

BGS ID: 16247906 : BGS Reference: SJ57NW240
British National Grid (27700) : 352560,379160

Report an issue with this borehole

FOUNDATION ENGINEERING Ltd.

BOREHOLE LOG

LOCATION : WEAVER VIADUCT BOREHOLE No. : 8 Sheet 2 of 3

BOREHOLE DIA. : GROUND LEVEL :

DATE (Start) : WATER LEVEL :

Dates	Description	Thickness	Depth	Sample	Remarks
	Stiff red CLAY with boulders	15'-0"	50'-0"		
			51'-0"	14	
	Firm to stiff laminated silty CLAY	5'-0"			
			56'-0"	15	
	Loose SAND with layers of boulder clay	6'-6"		16	14 blows/ft
			62'-6"		
21½ hrs chiselling				17	U4 failed
	Stiff brownish-red CLAY with boulders	28'-6"		18	U4 failed
				19	
				20	U4 failed
				21	
	Firm laminated silty CLAY	2'-0"	91'-0"	22	
			93'-0"	23	
	Hard marly cemented SAND with layers of boulder clay	4'-6"		24	165 blows/ft (initial)
			97'-6"	25	180 blows/3" (initial)
	Hard red SANDSTONE	5'-0"+	100'-0"		

BOREHOLE SCALE : 1"=5' •: DISTURBED SAMPLE ▮: UNDISTURBED SAMPLE + STANDARD PENETRATION TEST

UNDISTURBED SAMPLE + STANDARD PENETRATION TEST

FOUNDATION ENGINEERING Ltd.

BOREHOLE LOG

LOCATION : WEAVER VIADUCT BOREHOLE No. : 8 Sheet 3 of 3

BOREHOLE DIA. : GROUND LEVEL :

DATE (Start) : WATER LEVEL :

Dates	Description	Thickness	Depth		Sample	Remarks
(21½ hrs) Chiselling	Hard red SANDSTONE	5'-0" +	10 0'-0"			
			102'-6"		+ ● 26	200 blows / 3" (initial)
	Note Water encountered first at 5'-0" B.G.L. With borehole drilled to 75'-0" & cased to 65'-0" depth, water rose from 30'-6" to 12'-6" B.G.L. overnight					BOREHOLE COMPLETE

BOREHOLE SCALE : 1" — 5' • : DISTURBED SAMPLE ▮ : UNDISTURBED SAMPLE + STANDARD PENETRATION TEST

British Geological Survey

BOREHOLE SCALE 1" = 5' ▽ DISTURBED SAMPLE ▼ UNDISTURBED SAMPLE + STANDARD PENETRATION TEST

British Geological Survey

BGS ID: 17100380 : BGS Reference: SJ57NW296
British National Grid (27700) : 353668,379209

Report an issue with this borehole

PROJECT: KINGSTON NEW TOWN

LOCATION: Flood Brook Sewer

GROUND LEVEL: 49.8 DIA. OF CASING: 6 INS. TO FT.

INCLINATION: Vertical INS. TO FT.

SCALE OF LOG: 1" = 4 ft. SHEET 1 OF 2

TYPE OF BORING: Shell & Auger

Daily Progress	Reduced Level	Depth	Legend	Sampling Type	Sampling Depth	Nat. m %	Description and Remarks, Including Water Observations.	Key to Laboratory Tests
	48.8	1.0					TOPSOIL - Organic	
				D	2.0	19	CLAY - Sandy, soft, brown	
	47.3	2.5		U4	2.5			
							SAND - Red, coarse	
				D	4.0	16		
				S(16)	5.0			
26/3/68	43.3	6.5					Clayey, wet with pebbles	
	41.8	8.0		D	8.0	18		
							CLAY - Sandy, soft, brown	
				D	10.0	18		
	37.8	12.0		D	12.0	29		
							SAND - Fine, saturated, red	
				D	14.0	28		
				D	16.0	29		
				D	18.0	18		
				D	20.0	34		
27/3/68				D	22.0	23		
	27.3	22.5		U4	22.5			
							CLAY - Soft, light brown, silty	
				D	24.0	17		
	24.8	25.0						
							SAND - Fine grained saturated	
				D	26.0	21		
				D	28.0	21		
				D	30.0	1		

CONTINUED

U(4) = 4" Dia. Undisturbed Sample
D = Disturbed Sample
Δ = Water Sample
S( ) = Standard Penetration Test
C( ) = Cone Penetration Test
Figures in Brackets Indicate No. of Blows
* Indicates Penetration in Ins. for 50 Blows
V = Vane Test

TX = Triaxial Test
CV = Consolidation Test
I = Index Test
O = Compaction Test
Ch = Chemical Test

Borehole No. 17

PROJECT: RONCORN NEW TOWN

LOCATION: Flood Brook Sewer.

GROUND LEVEL: 49.8 DIA. OF CASING: 6 INS. TO FT.

INCLINATION: Vertical INS. TO FT.

SCALE OF LOG: 1" = 4 ft. SHEET 2 OF 2

TYPE OF BORING: Shell & Auger

Daily Progress	Reduced Level	Depth	Legend	Sampling Type	Sampling Depth	Nat. m %	Description and Remarks, Including Water Observations.	Key to Laboratory Tests
	19.8	30.0					GRAVEL - Coarse	
27/3/68				D	32.0	3		
	15.8	34.0		D	34.0	16	MARL - Weathered, with clay laminations	
				D	36.0	17		
28/3/68	11.8	38.0		D	38.0			
				C($\frac{1}{2}$")	38.5		Hard	
	9.8	40.0		D	40.0	12	Bottom of Borehole	
							CONTINUED	

U(4) = 4" Dia. Undisturbed Sample
D = Disturbed Sample
Δ = Water Sample
S( ) = Standard Penetration Test
C( ) = Cone Penetration Test
Figures in Brackets Indicate No. of Blows
* Indicates Penetration in Ins. for 50 Blows
V = Vane Test

TX = Triaxial Test
CV = Consolidation Test
I = Index Test
O = Compaction Test
Ch = Chemical Test

Borehole No. 17

LOCATION : CLIFTON - SUTTON TRUNK FOUL SEWER

GROUND LEVEL 63.4 DIA. OF CASING : 6 INS. TO FT.

INCLINATION : VERTICAL INS. TO FT.

SCALE OF LOG : 1" = 4 ft SHEET 1 OF 1

TYPE OF BORING : SHELL AND AUGER

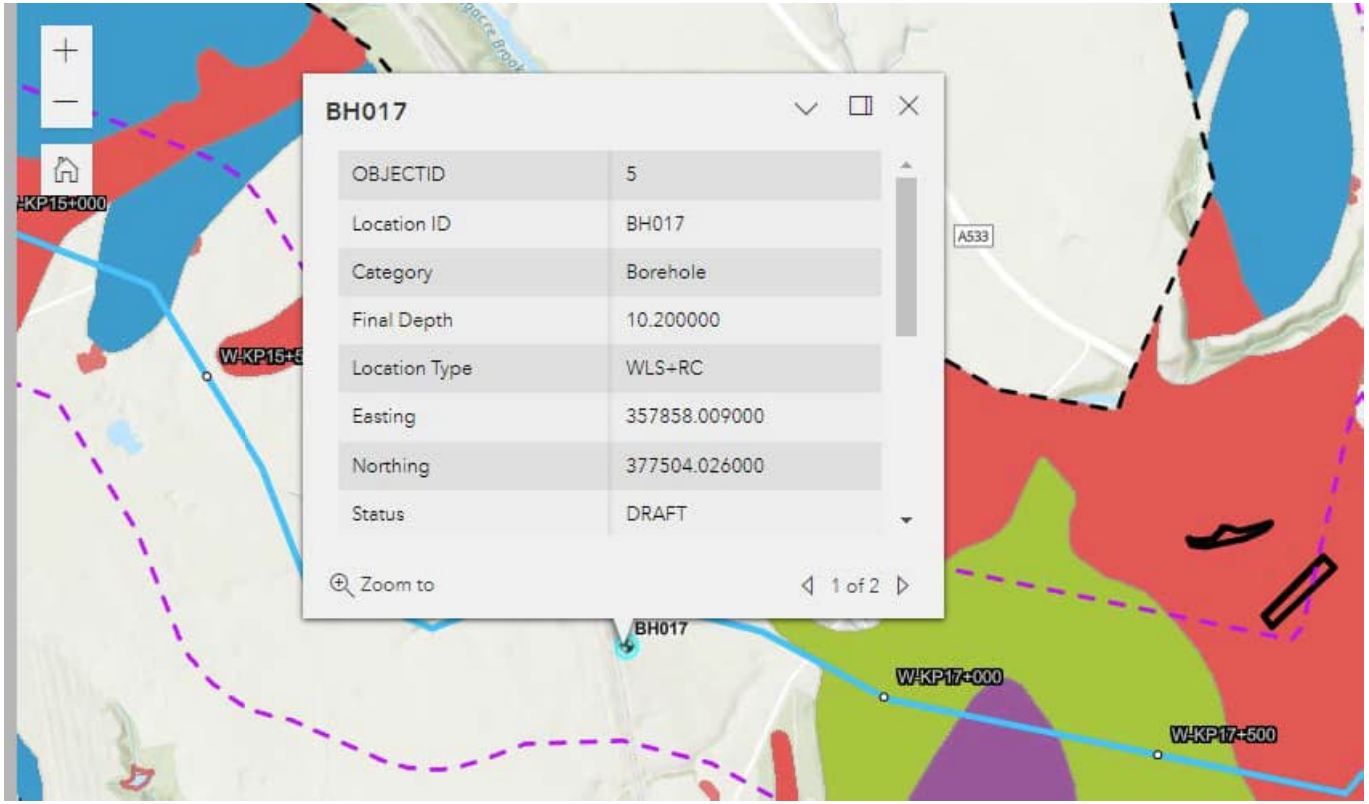
Daily Progress	Reduced Level	Depth	Legend	Sampling Type	Sampling Depth	Nat. m %	Description and Remarks, including Water Observations.	Key to Laboratory Tests
	62.4	1.0					TOPSOIL - organic	
				D U4	2.0	11	SAND - red-brown, coarse grained	
21.10. 1968	59.9	3.5		D	3.5	14	CLAY - red-brown, sandy, boulder	
				D U4	5.0	16		
	56.9	6.5		D	6.5	17	▼ G.W.L. 6.5'	
				D	8.0	18	SAND - red, medium grained, saturated	
				D	10.0	22		
	51.4	12.0		D	12.0	18		
				D	14.0	12	CLAY - brown, boulder, sandy with cobbles to 4"	
				D	16.0	10		
22.10. 1968				D	18.0	10		
	43.4	20.0		D	20.0	14	with silt laminations	
	42.4	21.0					MARL - grey-green, weathered	
				D	22.0	18		
	40.4	23.0		D	23.0	5	unweathered	
	38.4	25.0					BOTTOM OF BOREHOLE	

~~CONTINUED~~

U(4) = 4" Dia. Undisturbed Sample
D = Disturbed Sample
△ = Water Sample
S( ) = Standard Penetration Test
C( ) = Cone Penetration Test
( ) Figures in Brackets Indicate No. of Blows
* Indicates Penetration in Ins. for 50 Blows
V = Vane Test

TX = Triaxial Test
CV = Consolidation Test
I = Index Test
O = Compaction Test
Ch = Chemical Test

Borehole No. 1


BH017
OBJECTID
5
Location ID
BH017
Category
Borehole
Final Depth
10.200000
Location Type
WLS+RC
Easting
357858.009000
Northing
377504.026000
Status
DRAFT
Zoom to
1 of 2
A533
W-KP15+000
W-KP17+000
W-KP17+500
BH017

For Institute use only

SO 57 NE/2

Geological Classification	Nature of Strata *If measurements start below ground surface, state how far.*	Thickness Feet	Inches	Metres	Depth Feet	Inches	Metres
Alluvial Deposits.	SANDY CLAY	24			24		
	GRAVEL	12	6		36	6	
Permo-Triassic — Keuper Marl	KEUPER MARL	564	6		601		
	KEUPER MARL	1499			2100		
Keuper Sandstone	RED SANDSTONE	200			2300		

British Geological Survey

Soil Mechanics

BOREHOLE No. 1

Sheet 1 of 4

Equipment & Methods
Cable tool boring, 200mm diameter to 8.50m, then 150mm to 9.00m. Rotary core drilling, 74mm diameter, with water flush and mylar lining.

Location No. 7703
Location SJ57NE16
A49 WEAVERHAM TO LOWER WHITLEY IMPROVEMENT

Carried out for
Department of Transport

Ground Level
8.97 m A.O.D.

Coordinates
359903.00mE
376178.00mN

Date
09.07.91 to 11.07.91

Description	Reduced Level	Legend	Depth (Thick)	Samples/Tests: Depth	Sample Type	Sample No.	Test	Field Records
TOPSOIL	8.97		(0.30)					
	8.67		0.30	0.50	D	1		Inspection pit to 1.30m
Soft to firm orange brown sandy becoming very sandy CLAY with occasional dark grey organic pockets. (Alluvial Deposits)			(1.40)	0.80 - 1.25	U	2		22 blows
				1.30	D	3		
	7.27		1.70	1.70 - 2.15	U	4		22 blows
Loose orange brown locally slightly clayey fine to coarse SAND. Below about 2.50m, with some subrounded quartzite gravel. (Alluvial Deposits)				2.20	D	5		
				2.50	W	8		Water entry at 2.50m
			(1.80)	2.70 - 3.45	D	6	S N-7	1,0/1,1,2,2,2 /2,3,3,3
				2.70 - 3.50	B	7		
Loose to medium dense subrounded to rounded fine to coarse quartzite GRAVEL. with much sand and rare cobbles (Alluvial Deposits)	5.47		3.50	3.70 - 4.15	D	8	S N-10	1,2/2,2,3,3
				3.70 - 4.20	B	9		
			(1.40)					
Stiff extremely closely fissured CLAY with occasional silt pockets. Fissures; planar to curved and smooth. (Glacial Deposits)				4.70 - 5.15			S N-13	2,2/3,3,3,4
soft sandy clay with a little gravel	4.07		4.90	4.70 - 5.20	B	10		
				5.30	D	11		
				5.30 - 5.75	U	12		70 blows
			(1.40)	5.80	D	13		
Very stiff red brown slightly sandy CLAY with some fine to coarse subangular to subrounded gravel occasional cobbles. (Glacial Deposits)	2.67		6.30	6.30 - 6.75	D	14	S N-45	2,3/6,12,18,9
				6.30 - 6.80	B	15		
			(0.60)					
Very stiff red brown slightly sandy CLAY with some fine to coarse subrounded mudstone and quartzite gravel. (Glacial Deposits)	2.07		6.90	7.00	D	16		
			(0.60)	7.20 - 7.65	D	17	S N-24	3,8/7,7,5,5
	1.47		7.50	7.20 - 7.70	B	18		
Stiff red brown mottled grey green locally very silty CLAY with some angular mudstone lithorelicts, very weak to weak. (Keuper Marl: Zone 3/4a)			(1.40)	8.30	D	19		9.00m: Sample 22 Type D.
				8.70 - 9.00	U			U100 attempted no recovery after 80 blows
	0.07		8.90	8.80	D	20		
				8.90	D	21		
MUDSTONE (As sheet 2.) (Keuper Marl: Zone 2.) Muddy sandstone, Mod.strong.			(3.68)	9.00 - 10.50	W 100	TCR 100	SCR 39	RQD 0	If NI NI 25	9.00m, D22 PLT at 9.77m (D). PLT at 9.90m (A).

Remarks
1. Hand excavated inspection pit (1.00*0.80*1.30m dimensions)
2. Water entry at 2.50m, no rise after 20mins.
3. Chiselling from 6.40m to 6.90m for one hour.

Logged by JAS

Scale 1:50

Notes:
Materials are described in accordance with Appendices. For explanation of symbols and abbreviations see Fig. 1. (c) Soil Mechanics
All depths and reduced levels in metres. Thicknesses given in brackets in depth column. 24.09.91/10.08 (Ver 4.1.27)

Fig. 2

Soil Mechanics

BOREHOLE No. 1

Sheet 2 of 4

Equipment & Methods

As sheet 1

Location No. 7703

Location SJ 57 NE 16

A49 WEAVERHAM TO LOWER WHITLEY IMPROVEMENT

Carried out for

Department of Transport

Ground Level | **Coordinates** | **Date**

As sheet 1

Description	Reduced Level	Legend	Depth (Thick)	Drilling Records: Depth	W	Mechanical core log: TCR	SCR	RQD	If	Field Records and Test Results
(A) Completely weathered to stiff red brown clay. Muddy sandstone, mod.strong. Siltstone, mod.weak to mod.strong. Completely weathered to a stiff red brown clay. Completely weathered to a stiff red brown clay. Red brown extremely closely fractured to 9.80m MUDSTONE, weak with occasional gypsum pockets, partings and lenses. Below 9.80m, mod.weak and very closely fractured. Below 11.50m, grey green mottling and thinly to thickly interlaminated with SILTSTONE, Mod.strong. Fractures; Subh.Pl.Ro. (Keuper Marl: Zone 2)				9.00 - 10.50	100	100	39	0		9.00m, D22 PLT at 9.77m (D). PLT at 9.90m (A).
				10.50 - 11.50	100	100	55	10		
			(3.68)						NI 40 100	
				11.50 - 12.00	100	100	98	40		PLT at 11.65m (A,D)
	-3.61		12.58							
Muddy sandstone, mod.strong. Muddy sandstone, mod.strong. Light grey green with much gypsum veining. Some gravel size gypsum pockets. Muddy sandstone, mod.strong. Red brown becoming by 12.74m grey green very closely to closely fractured thinly to thickly interlaminated MUDSTONE and SILTSTONE, mod. strong with occasional extremely to very closely spaced gypsum partings and lenses. Fractures; Subh.Pl Ro. Below 14.15m, red brown and grey green. (Keuper Marl: Zone 1)				12.00 - 13.50	100	95	92	15		PLT at 12.99m (A,D)
			(3.17)	13.50 - 15.00	100	96	93	13	NI 40 200	PLT at 13.75m (A,D). PLT at 14.32 (A)
	-6.78		15.75	15.00 - 16.50	100	99	93	23		PLT at 15.68m (A,D)
Red brown closely fractured laminated MUDSTONE, Moderately weak with occasional gypsum partings and lenses. Fractures; Subh.Pl.Ro (Keuper Marl: Zone 1)			(0.75)						NI 80 250	
	-7.53		16.50							
Sandstone, strong. Sandstone, strong. Sandstone, strong. Sandstone, strong. Grey green and red brown very closely to closely fractured, thinly to thickly interlaminated MUDSTONE and SILTSTONE, mod.strong with occasional closely spaced gypsum laminae and lenses. Fractures; Subh.Pl.Ro. (Keuper Marl: Zone 1) Weak.			(2.80 pen)	16.50 - 18.00	100	90	87	7	NI 55 110	PLT at 16.55m (A) PLT at 17.58m (A)
				18.00 - 19.30	100	98	98	32		PLT at 18.35m (A,D) PLT at 19.16m (A,D)
BOREHOLE ENDS AT 19.30 m.	-10.33		19.30							

Remarks

4. For overdriven SPT's N value given for first 300mm test drive. Blows given for all 75mm increments.

Logged by JAS

Scale 1:50

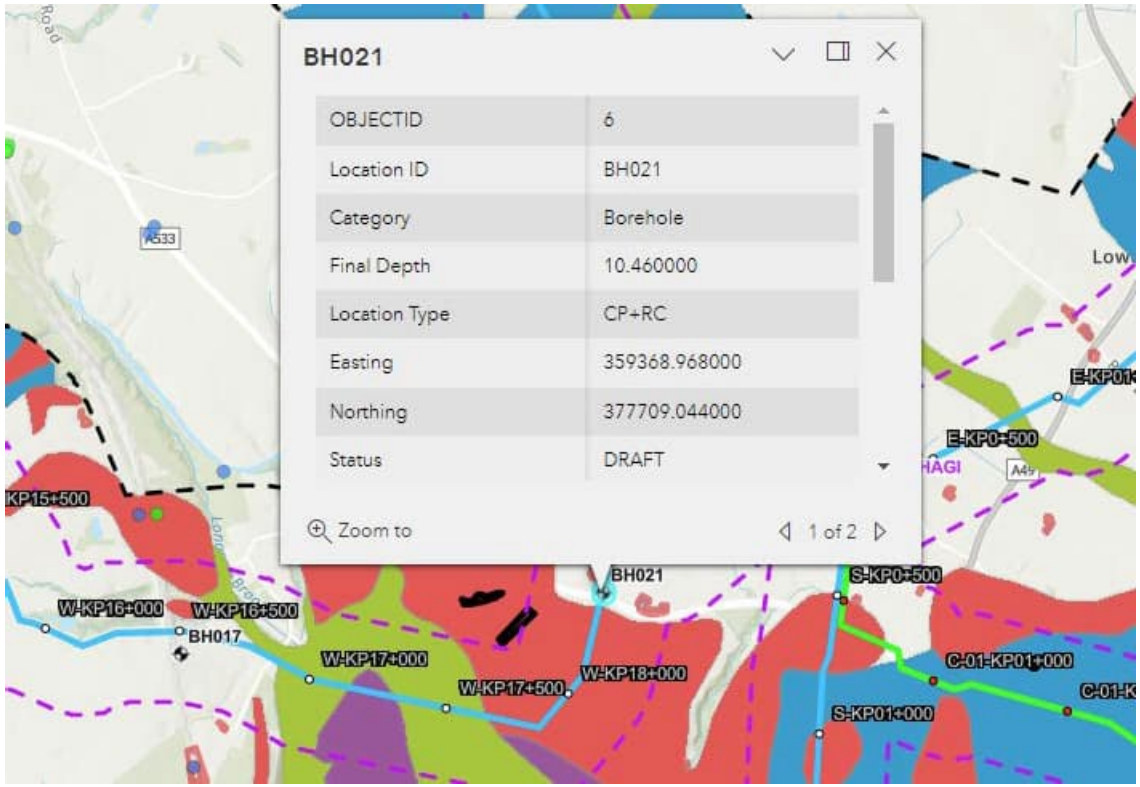
Fig. 2

Notes:

Materials are described in accordance with Appendices. For explanation of symbols and abbreviations see Fig. 1. (c) Soil Mechanics

All depths and reduced levels in metres. Thicknesses given in brackets in depth column. 04.10.91/09.54 (Ver 4.1.27)

British Geological Survey


BH021
OBJECTID 6
Location ID BH021
Category Borehole
Final Depth 10.460000
Location Type CP+RC
Easting 359368.968000
Northing 377709.044000
Status DRAFT
Zoom to
1 of 2
A533
A49
BH021
BH017
W-KP15+500
W-KP16+000
W-KP16+500
W-KP17+000
W-KP17+500
W-KP18+000
E-KP0+500
S-KP0+500
C-01-KP01+000
S-KP01+000

SJ 57 NE 8

FUGRO - McCLELLAND LIMITED

BOREHOLE LOG

Borehole B192/10

Sheet 1 of 3

Method	Date	Site
Shell & Auger.	12/07/90 - 12/07/90	NWEP
Dia mm 200	**Coord** 357778mE, 378004mN	**Ground Level m.OD** 22.13
		Client SCUK/BECHTEL

Soil Samples/Tests		Water & Progress	OD Level m.	Depth m.	Description of Strata	Legend
Type/Test	Depth m.					
B1	0.00 - 0.30	12/07/90			Brown silty TOPSOIL (0.30)	
B2	0.30		21.83	0.30		
U3	0.30 - 0.75				Soft becoming firm reddish-brown slightly sandy silty CLAY (9.90)	
D4	0.75 - 0.90					
S5 (5)	0.90 - 1.35					
U6	2.00 - 2.45					
D7	2.45 - 2.60					
S8 (8)	2.60 - 3.05					
U9	3.50 - 3.95					
D10	3.95 - 4.10					
S 11(6)	4.10 - 4.55					
U12	5.00 - 5.45					
D13	5.45 - 5.60					
S14 (14)	5.60 - 6.05					
U15	6.50 - 6.95					
D16	6.95 - 7.10 *					
S17 (17)	7.10 - 7.55					
		STRIKE at 7.40m Seepage rose to 7.00m				
U18	9.00 - 9.45					
D19	9.45 - 9.60					
S20 (16)	9.60 - 10.05					

Remarks

Ground-water was encountered at 7.40m depth

Logged by	Scale	End Casing Depth m.	Job No.
SW	1:50	9.60	901235

Sample/Test key:
- U () UI00 sample (blows)
- D Disturbed sample
- B Bulk sample
- W Water sample
- – Progress & Day

Penetration Tests
- S () Standard (N value)
- C () Cone (N value)
- * Blows and penetration when 300mm not achieved

British Geological Survey

SJ 57 NE 8

FUGRO - McCLELLAND LIMITED

BOREHOLE LOG

Borehole 8192/10

Sheet 2 of 3

Method	Date	Site
Shell & Auger.	12/07/90 - 12/07/90	NWEP
Dia mm 200	**Coord** 357778mE 378004mN	**Ground Level m.OD** 22.13
		Client SCUK/BECHTEL

Soil Samples/Tests		Water & Progress	OD Level m.	Depth m.	Description of Strata	Legend
Type/Test	Depth m.					
D21	10.20	12/07/90	11.93	10.20	SEE LAST SHEET	

Remarks

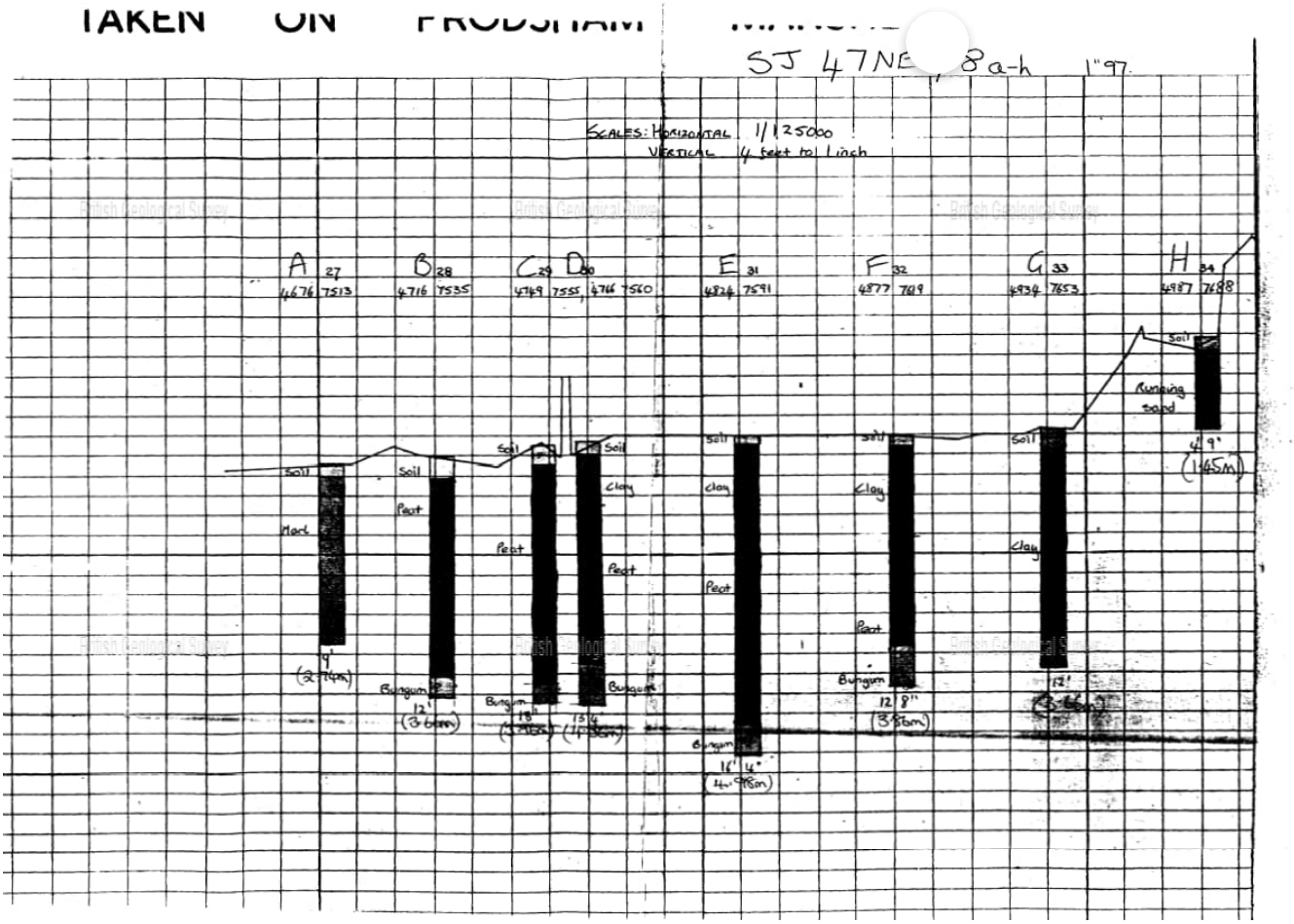
Ground-water was encountered at 7.40m depth

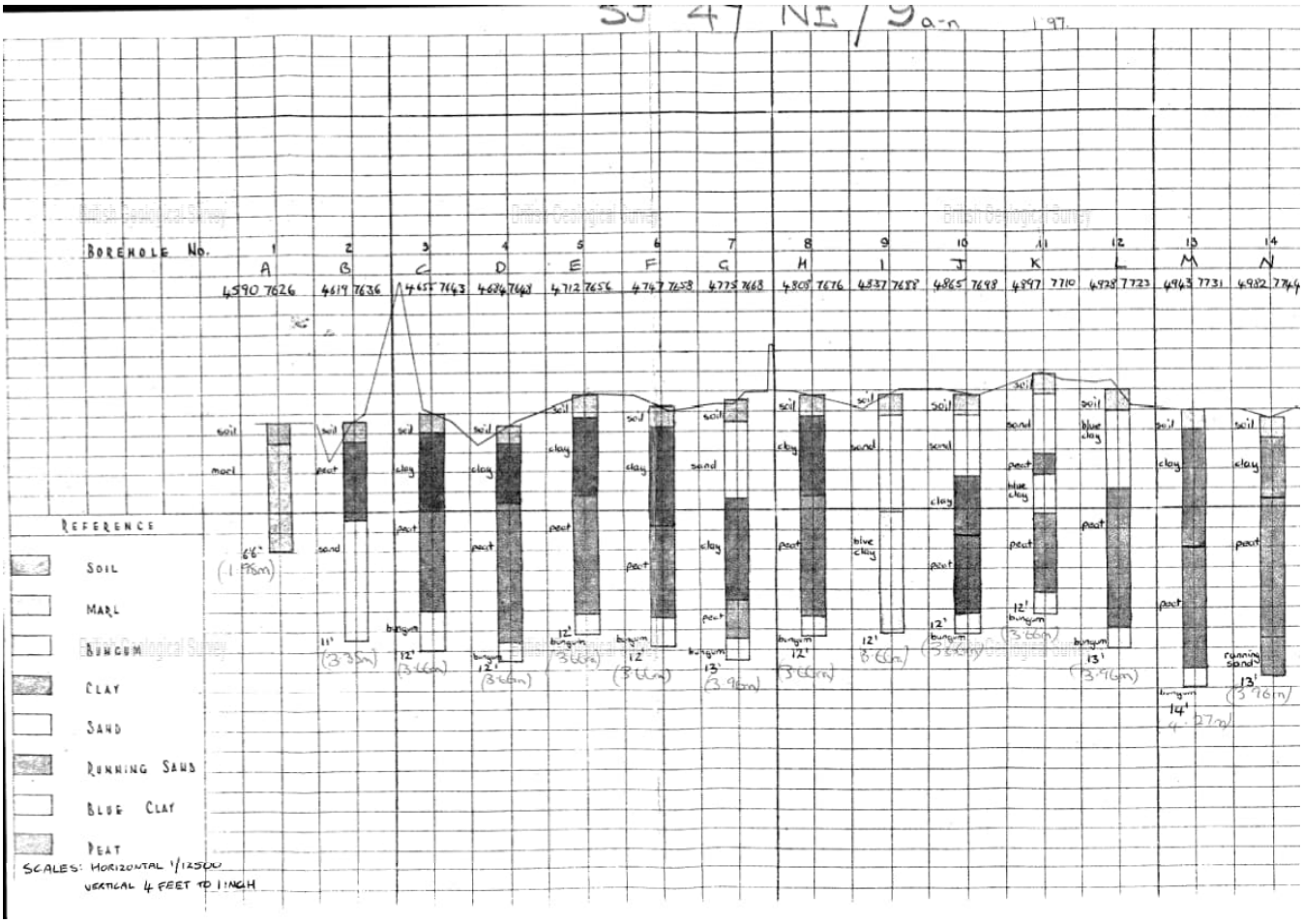
Logged by	Scale	End Casing Depth m.	Job No.
SW	1:50	9.60	901235

Sample/Test key:
- U () U100 sample (blows)
- D Disturbed sample
- B Bulk sample
- W Water sample
- - Progress & Day

Penetration Tests
- S () Standard (N value)
- C () Cone (N value)
- * Blows and penetration when 300mm not achieved

British Geological Survey


SJ 47NE 8a-h
SCALES: HORIZONTAL 1/1250
VERTICAL 4 feet to 1 inch
A 27
B 28
C 29
D 30
E 31
F 32
G 33
H 34
Soil
Peat
Marl
Clay
Burgum
Running sand


SJ 47 NE / 9
BOREHOLE No.
1 A 4590 7626
2 B 4619 7636
3 C 4655 7643
4 D 4686 7648
5 E 4712 7656
6 F 4747 7658
7 G 4775 7668
8 H 4805 7676
9 I 4837 7688
10 J 4865 7698
11 K 4897 7710
12 L 4928 7723
13 M 4963 7731
14 N 4982 7744
REFERENCE
SOIL
MARL
BUNGUM
CLAY
SAND
RUNNING SAND
BLUE CLAY
PEAT
SCALES: HORIZONTAL 1/12500
VERTICAL 4 FEET TO 1 INCH

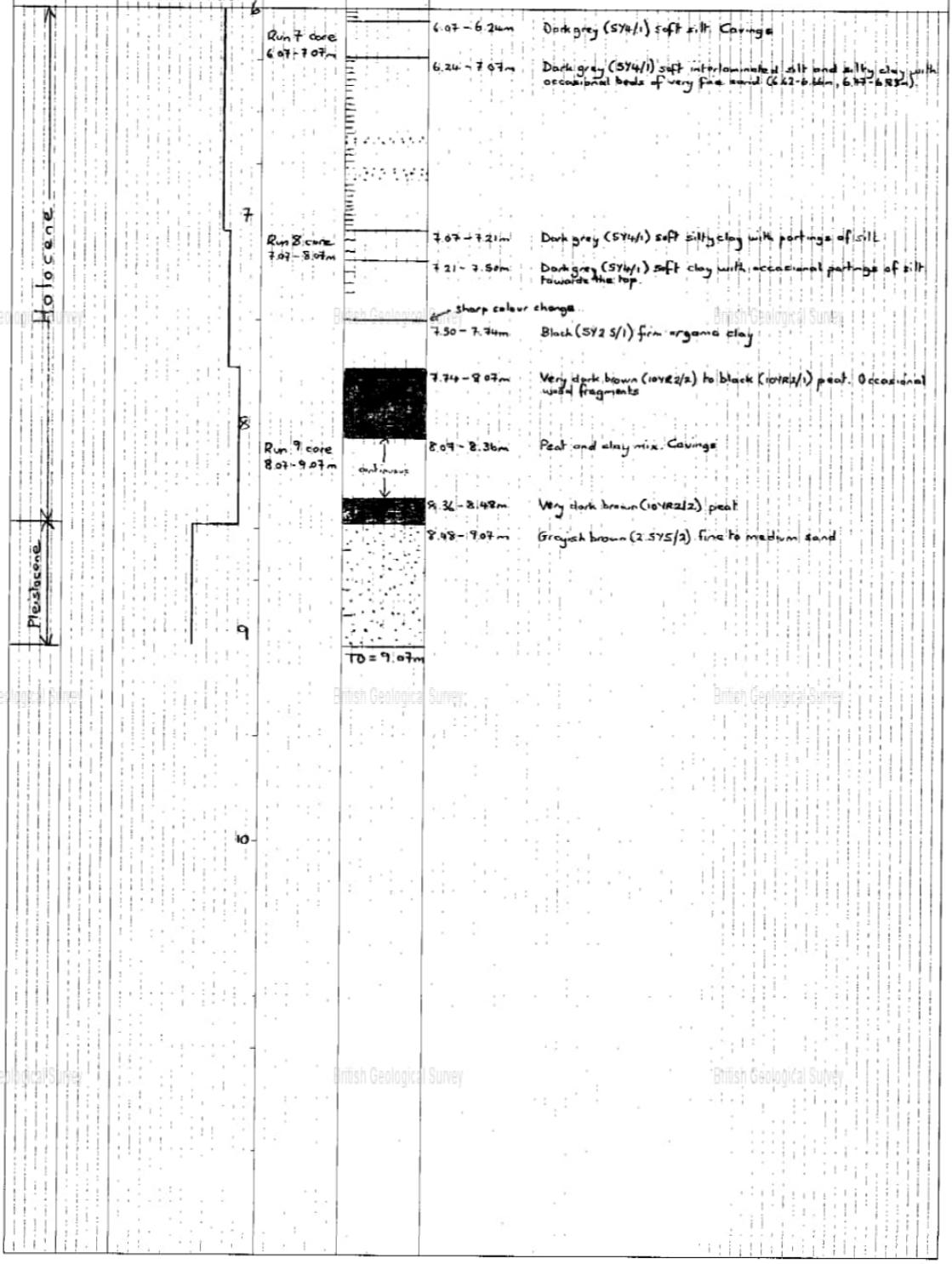
BRITISH GEOLOGICAL SURVEY

Borehole/Well No.	Location	NGR/~~Lat. & Long~~
SJ47NE 80 (INCE 4)	Helsby March, Mersey	SJ4792 7641
	~~KB~~/Ground level + 5.42m OD	Logged by David Brew 30.6.00

Stratigraphy	Carbonates (Calc. R / Calc. A / Calc. L) Average grain size: C P G V C C M F V F S I C	Sedimentary structures	Graphic lithology	Lithological description
Holocene		Run 1 core 0.04 - 1.04m		0 - 0.04m Core missing
				0.04 - 0.59m Dark brown (10YR3/3) to dark brown (10YR4/3) firm clayey silt. Occasional rootlets
				0.59 - 0.94m Yellowish brown (10YR5/4) soft slightly very fine sandy silt with partings of silty clay.
				0.94 - 1.04m Yellowish brown (10YR5/6) soft very fine sand
		Run 2 core 1.07 - 2.07m		1.04 - 1.07m Core missing
				1.07 - 1.25m Yellowish brown (10YR5/4) loose very fine sand. Cavings
				1.25 - 1.71m Yellowish brown (10YR5/4) to brown (10YR5/3) very fine sand
				sharp colour change
				1.71 - 1.92m Dark grey (10YR4/1) soft interlaminated very fine sandy silt and silty clay.
				1.92 - 1.97m Dark grey (10YR4/1) soft clay
				1.97 - 2.01m Very dark brown (10YR2/2) peat
				2.01 - 2.07m Dark grey (5Y4/1) clay
		Run 3 core 2.07 - 3.07m		2.07 - 2.36m Sand, silt, clay, peat mix Cavings
				2.36 - 2.90m Grey (N6/0) mottled brown (10YR5/3) soft clay
				2.90 - 2.98m Dark brown (10YR3/2) and dark grey (10YR4/1) interlaminated peat and clay
				2.98 - 3.07m Very dark brown (10YR2/2) peat
		Run 4 core 3.07 - 4.07m		3.07 - 3.59m Clay and peat mix. Cavings
				continuous
				3.59 - 4.07m Very dark brown (10YR2/2) and black (10YR2/1) peat. Wood fragments throughout.
		Run 5 core 4.07 - 5.07m		4.07 - 4.40m Peat and clay mix. Cavings.
				continuous
				4.40 - 4.56m Very dark brown (10YR2/2) peat. Occasional wood fragments
				4.56 - 5.07m Grey (5Y5/1) soft clay. Occasional Phragmites
		Run 6 core 5.07 - 6.07		5.07 - 5.29m Clay and sand mix. Cavings
				5.29 - 6.07m Dark grey (5Y4/1) soft interlaminated silt and silty clay

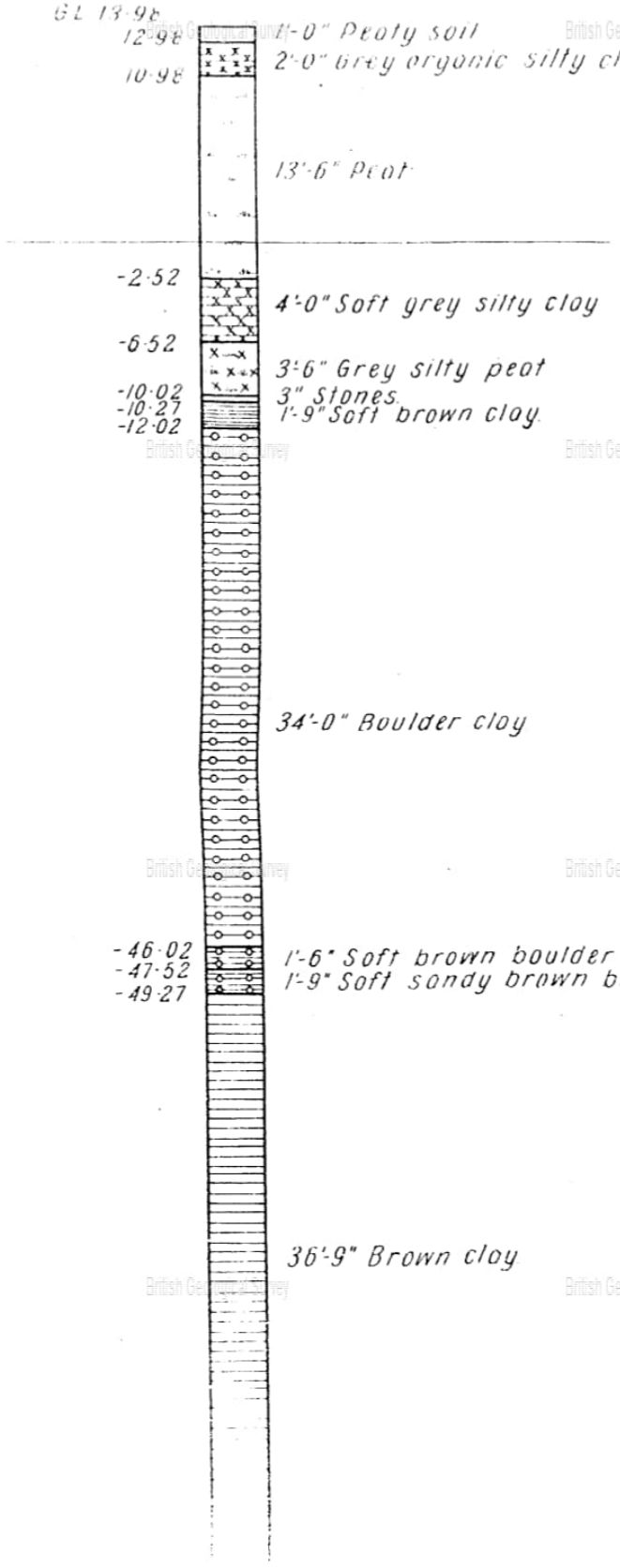
BRITISH GEOLOGICAL SURVEY

Borehole/Well No.	Location	NGR/~~Lat. & Long.~~
SJ47NE80 (INCE4)	Helsby Marsh, Mersey	SJ 4792 7641
	~~KB~~/Ground level + 5.42m OD	Logged by David Brew 30.6.00



~~SJ47NE/7~~

E



British Geological Survey

Borehole Log

SOCOTEC

Drilled	KP	**Start**	17/11/2020
Logged	RTM		
Checked	MS	**End**	30/11/2020
Approved	TC		

Equipment, Methods and Remarks

Dando 3000.
Cable percussion boring.
SPT Hammer ID: TH65, Rod type: 54mm Whitworth.

Depth from (m)	to (m)	Diameter (mm)	Casing Depth (m)
1.20	13.50	200	13.50
13.50	40.00	150	40.00

Ground Level	4.22 mOD
Coordinates (m)	E 346944.26
National Grid	N 375977.78

Samples and Tests

Depth	Type & No.	Records	Date / Casing	Time / Water
0.01 - 0.20	B 5			
0.20	PID	0.0 ppmv		
0.20	D 1			
0.20 - 0.50	B 6			
0.20	ES 2			
0.50	PID	0.0 ppmv		
0.50	D 3			
0.50 - 1.00	B 9			
0.50	ES 4			
1.00	PID	0.0 ppmv		
1.00	D 7			
1.00 - 1.50	B 11			
1.00	ES 8			
1.30	ES 10		1.50	Dry
1.50 - 1.95	UT 12	5 blows 100% rec		
1.50 - 2.00	B 15			
2.00 - 2.45	UT 16	5 blows 100% rec	2.00	Damp
2.00	D 13			
2.00 - 2.50	B 18			
2.00	ES 14			
2.50 - 2.95	UT 19	10 blows 100% rec	2.50	Damp
2.50	D 17			
2.70	D 21			
2.70 - 3.00	B 22			
3.00 - 3.45	UT 23	8 blows 100% rec	3.00	1.50
3.00	D 20			
3.50	HV	12 blows 100% rec	3.50	2.50
3.50 - 3.95	UT 25			
3.50	D 24			
4.00 - 4.45	UT 27	15 blows 100% rec	4.00	2.50
4.00	D 26			
4.50 - 4.95	UT 29	11 blows 100% rec	4.50	3.00
4.50	D 28			
5.00 - 5.45	UT 31	12 blows 100% rec	5.00	3.50
5.00	D 30			
5.50	HV	13 blows 100% rec	5.50	3.60
5.50 - 5.95	UT 33			
5.50	D 32			
6.00 - 6.45	UT 35	12 blows 100% rec	6.00	4.00
6.00	D 34			
			17/11/20 6.50	1700 4.00
6.50 - 6.95	UT 37	15 blows 100% rec		
6.50	D 36		18/11/20 6.50	0800 4.00
7.00 - 7.45	UT 39	18 blows 100% rec	7.00	3.50
7.00	D 38			
7.50 - 7.95	UT 41	25 blows 100% rec	7.50	Damp
7.50	D 40			
7.80	D 44			
7.80 - 8.00	B 43			
8.00 - 8.45	UT 45	34 blows 78% rec	8.00	Damp
8.00	D 42			
8.50 - 8.95	UT 47	75 blows 100% rec	8.50	Damp
8.50	D 46			
9.00 - 9.45	UT 49	57 blows 100% rec	9.00	Damp
9.00	D 48			

Strata Description

Main	Detail	Depth, Level (Thickness)
Soft, locally firm, brown, mottled orangish brown and grey, CLAY with frequent rootlets.		(0.60)
		0.60 +3.62
Soft brown, mottled reddish brown and grey, slightly sandy CLAY with occasional silt pockets (approximately 10 to 20mm).		(0.70)
		1.30 +2.92
Firm black fibrous, locally pseudo-fibrous, PEAT.		(0.30)
		1.60 +2.62
Plastic dark brown slightly sandy amorphous PEAT with occasional small pockets (up to 5mm) of silty clay.		(1.00)
		2.60 +1.62
Very soft bluish grey silty CLAY.	3.90-7.70 locally mottled light grey	(5.10)
	7.50-7.70 pockets (up to 12mm) of peat	7.70 -3.48
Firm black fibrous PEAT with strong organic odour.		(0.40)
		8.10 -3.88
Spongy brown pseudo-fibrous PEAT with occasional small pockets (up to 4mm) of dark grey clay. Strong organic odour.		(2.40)

Legend / Backfill: Topsoil; Concrete; Bentonite; Arisings; Gravel; Pea Gravel; Slotted Pipe; Plain Pipe; Gas Tap; Water Strike; Response Zone; Seal; Filter; Installation Ref.

Groundwater Entries

No.	Depth Strike (m)	Remarks	Depth Sealed (m)
1	2.50	Rose to 1.50 m after 20 minutes. Slow inflow	2.70

Depth Related Remarks

Depths (m)	Remarks
0.00 - 1.20	Hand excavated inspection pit.

Hard Boring

Depths (m)	Duration (mins)	Tools used

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

© Copyright SOCOTEC UK Limited

Scale 1:50

39/03/2021 11:57:56

Project GEOTECHNICAL AND CONTAMINATED LAND GROUND INVESTIGATION AT THE PROPOSED UK GEOS DEVELOPMENT AT ELTON, CHESHIRE

Project No. A0038-20

Carried out for British Geological Survey

Borehole BHA-102

Borehole Log

SOCOTEC

Drilled	KP	**Start**	**Equipment, Methods and Remarks**	**Depth from (m)**	**to (m)**	**Diameter (mm)**	**Casing Depth (m)**	**Ground Level**	4.22 mOD
Logged	RTM	17/11/2020	Dando 3000. Cable percussion boring. SPT Hammer ID: TH65, Rod type: 54mm Whitworth.	1.20 13.50	13.50 40.00	200 150	13.50 40.00	**Coordinates (m)**	E 346944.26
Checked	MS	**End**						**National Grid**	N 375977.78
Approved	TC	30/11/2020							

Samples and Tests

Depth	Type & No.	Records	Date Casing	Time Water
10.00 - 10.45 10.00	UT 51 D 50	30 blows 67% rec	10.00	Dry
10.50 - 10.95 10.50 10.50 10.50 - 10.95	SPT S D 0 D 52 B 53	N=15 (2,3/4,4,3,4) no recovery	10.50	4.00
11.00 - 11.45 11.00 11.00 - 11.45	SPT S D 54 B 55	N=17 (2,2/2,2,5,8)	11.00	1.80
11.50 - 11.95 11.50 11.50 - 11.95	SPT S D 56 B 57	N=14 (2,2/3,3,4,4)	11.50	2.50
12.00 - 12.45 12.00 12.00 - 12.45	SPT S D 58 B 59	N=14 (3,3/3,4,3,4)	12.00	3.50
12.50 - 12.95	UT 60	82 blows 100% rec	12.50	6.00
13.00 - 13.45 13.00	UT 62 D 61	75 blows 100% rec	13.00	8.00
			18/11/20 13.50	1700 8.00
13.50 - 13.95 13.50	UT 64 D 63	90 blows 100% rec	19/11/20 13.50	0800 8.00
14.00 - 14.45 14.00	UT 66 D 65	83 blows 100% rec	14.00	1.00
14.50 - 14.95 14.50	UT 68 D 67	88 blows 100% rec	14.50	4.50
15.00 - 15.45 15.00 15.00	UT 70 D 69 EW	89 blows 100% rec	15.00	5.00
			19/11/20 15.50	1700 6.00
15.50 - 15.95 15.50	UT 72 D 71	84 blows 100% rec	20/11/20 15.50	0800 6.00
16.00 - 16.45 16.00	UT 74 D 73	88 blows 100% rec	16.00	4.50
16.50 - 16.95 16.50	UT 76 D 75	86 blows 100% rec	16.50	6.00
17.00 - 17.45 17.00	UT 78 D 77	89 blows 100% rec	17.00	6.50
			20/11/20 17.50	1700 6.50
17.50 - 17.95 17.50	UT 80 D 79	78 blows 100% rec	23/11/20 17.50	0800 6.50
18.00 - 18.45 18.00	UT 82 D 81	84 blows 100% rec	18.00	15.50
18.50 - 18.95 18.50	UT 84 D 83	86 blows 100% rec	18.50	16.00
19.00 - 19.45 19.00	UT 86 D 85	96 blows 100% rec	19.00	16.50
19.50 - 19.95 19.50	UT 88 D 87	84 blows 100% rec	19.50	16.50

Strata Description

Main	Detail	Depth, Level (Thickness)	Legend	Backfill
Spongy brown pseudo-fibrous PEAT with occasional small pockets (up to 4mm) of dark grey clay. Strong organic odour.				
Medium dense grey silty fine to medium SAND.		10.50 -6.28 (0.60)		
Medium dense bluish grey fine to medium SAND.		11.10 -6.88 (0.80)		
Medium dense grey gravelly fine to medium SAND. Gravel is subangular to subrounded fine to coarse of various lithologies including sandstone and siltstone.		11.90 -7.68 (0.40)		
Very stiff reddish brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to medium of various lithologies including sandstone, mudstone and quartzite.	15.00-17.50 gravel is subrounded to rounded fine to coarse	12.30 -8.08 (7.20)		
	18.90-19.50 occasional small pockets (up to 10mm) of silty fine to medium sand			
Soft brown sandy SILT. Sand is fine to medium.		19.50 -15.28		

Groundwater Entries

No.	Depth Strike (m)	Remarks	Depth Sealed (m)
2	10.50	Rose to 7.60 m after 30 minutes. Medium inflow	10.70

Depth Related Remarks

Depths (m)	Remarks

Hard Boring

Depths (m)	Duration (mins)	Tools used

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

© Copyright SOCOTEC UK Limited

Scale 1:50

30/03/2021 11:57:56

Project	GEOTECHNICAL AND CONTAMINATED LAND GROUND INVESTIGATION AT THE PROPOSED UK GEOS DEVELOPMENT AT ELTON, CHESHIRE
Project No.	A0038-20
Carried out for	British Geological Survey

Borehole

BHA-102

Borehole Log

SOCOTEC

Drilled	KP	Start	17/11/2020	Equipment, Methods and Remarks	Depth from (m)	to (m)	Diameter (mm)	Casing Depth (m)	Ground Level 4.22 mOD
Logged	RTM			Dando 3000. Cable percussion boring. SPT Hammer ID: TH65, Rod type: 54mm Whitworth.	1.20	13.50	200	13.50	Coordinates (m) E 346944.26
Checked	MS	End			13.50	40.00	150	40.00	National Grid N 375977.78
Approved	TC		30/11/2020						

Samples and Tests

Depth	Type & No.	Records	Date Casing	Time Water
20.00 - 20.45 20.00	UT 90 D 89	59 blows 100% rec	20.00	18.00
20.50 - 20.95 20.50	UT 92 D 91	60 blows 100% rec	20.50	17.00
21.00 - 21.45 21.00	UT 94 D 93	59 blows 100% rec	21.00	18.00
21.50 - 21.95 21.50	UT 96 D 95	60 blows 78% rec	21.50	18.00
22.00 - 22.45 22.00	UT 98 D 97	75 blows 78% rec	22.00	19.00
22.50 - 22.95 22.50	UT 100 D 99	74 blows 78% rec	22.50	19.50
23.00 - 23.45 23.00	UT 102 D 101	75 blows 100% rec	23.00	19.00
23.50 - 23.95 23.50	UT 104 D 103	83 blows 100% rec	23.50	19.80
			23/11/20 24.00	1700 19.80
24.00 - 24.45 24.00	UT 106 D 105	78 blows 100% rec		
			24/11/20 24.00	0800 19.80
24.50 - 24.95 24.50	UT 108 D 107	83 blows 100% rec	24.50	9.50
25.00 - 25.45 25.00	UT 110 D 109	78 blows 100% rec	25.00	20.00
25.50 - 25.95 25.50	UT 112 D 111	86 blows 100% rec	25.50	20.50
26.00 - 26.45 26.00	UT 114 D 113	79 blows 100% rec	26.00	21.00
26.50 - 26.95 26.50	UT 116 D 115	80 blows 100% rec	26.50	21.00
27.00 - 27.45 27.00	UT 118 D 117	89 blows 100% rec	27.00	21.50
27.50 - 27.95 27.50	UT 120 D 119	89 blows 100% rec	27.50	22.00
28.00 - 28.45 28.00	UT 122 D 121	89 blows 100% rec	28.00	22.00
28.50 - 28.95 28.50	UT 124 D 123	96 blows 100% rec	28.50	23.00
29.00 - 29.45 29.00	UT 126 D 125	98 blows 100% rec	29.00	8.00
29.50 - 29.95 29.50	UT 128 D 127	86 blows 100% rec	29.50	9.00

Strata Description

Main	Detail	Depth, Level (Thickness)
Soft brown sandy SILT. Sand is fine to medium.		(2.60)
	21.45-22.10 becoming slightly sandy silt	
Firm thinly laminated reddish brown silty CLAY.		22.10 -17.88 (3.90)
	25.00-26.00 becoming thinly to thickly laminated silty clay	
Firm to stiff reddish brown slightly gravelly sandy CLAY. Gravel is subangular to subrounded fine to coarse of various lithologies including sandstone and mudstone.		26.00 -21.78
	27.00-29.45 slightly sandy slightly gravelly, locally gravelly, clay	

Legend

Backfill

3

Groundwater Entries

No.	Depth Strike (m)	Remarks	Depth Sealed (m)
3	29.00	Rose to 8.00 m after 30 minutes. Medium inflow	29.50

Depth Related Remarks

Depths (m)	Remarks

Hard Boring

Depths (m)	Duration (mins)	Tools used

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

© Copyright SOCOTEC UK Limited

Scale 1:50

30/03/2021 11:57:56

Project	GEOTECHNICAL AND CONTAMINATED LAND GROUND INVESTIGATION AT THE PROPOSED UK GEOS DEVELOPMENT AT ELTON, CHESHIRE
Project No.	A0038-20
Carried out for	British Geological Survey

Borehole

BHA-102

Borehole Log

SOCOTEC

Drilled	KP	Start	17/11/2020
Logged	RTM		
Checked	MS	End	30/11/2020
Approved	TC		

Equipment, Methods and Remarks

Dando 3000.
Cable percussion boring.
SPT Hammer ID: TH65, Rod type: 54mm Whitworth.

Depth from (m)	to (m)	Diameter (mm)	Casing Depth (m)
1.20	13.50	200	13.50
13.50	40.00	150	40.00

Ground Level	4.22 mOD
Coordinates (m)	E 346944.26
National Grid	N 375977.78

Samples and Tests

Depth	Type & No.	Records	Date Casing	Time Water
30.00 - 30.45	UT 130	85 blows 100% rec	30.00	11.00
30.00	D 129		24/11/20	1700
			30.00	11.00
30.50 - 30.95	UT 132	86 blows 100% rec		
30.50	D 131		25/11/20	0800
			30.00	11.00
			25/11/20	1700
			31.00	2.00
31.00 - 31.45	UT 134	89 blows 100% rec		
31.00	D 133		26/11/20	0800
			31.00	2.00
31.50 - 31.95	UT 136	86 blows 100% rec	31.50	4.00
31.50	D 135			
			26/11/20	1700
			32.00	4.00
32.00 - 32.45	UT 138	98 blows 100% rec		
32.00	D 137		27/11/20	0800
			32.00	4.00
32.50 - 32.95	UT 140	89 blows 100% rec	32.50	2.50
32.50	D 139			
33.00 - 33.45	UT 142	89 blows 100% rec	33.50	2.50
33.00	D 141			
33.50 - 33.95	UT 144	90 blows 100% rec	33.50	3.00
33.50	D 143			
34.00 - 34.45	UT 146	88 blows 100% rec	34.00	3.00
34.00	D 145			
34.50 - 34.95	UT 148	85 blows 100% rec	34.50	3.00
34.50	D 147			
35.00 - 35.45	UT 150	88 blows 100% rec	35.00	3.50
35.00	D 149			
35.50 - 35.95	UT 152	88 blows 100% rec	35.50	3.50
35.50	D 151			
			27/11/20	1700
			36.00	3.50
36.00 - 36.45	UT 154	96 blows 100% rec		
36.00	D 153		30/11/20	0800
			36.00	3.50
36.50 - 36.95	UT 156	98 blows 100% rec	36.50	2.50
36.50	D 155			
37.00 - 37.45	UT 158	89 blows 100% rec	37.50	2.50
37.00	D 157			
37.50 - 37.95	UT 160	88 blows 100% rec	37.50	2.60
37.50	D 159			
38.00 - 38.45	UT 162	90 blows 100% rec	38.00	2.80
38.00	D 161			
38.50 - 38.95	UT 164	93 blows 100% rec	38.50	2.90
38.50	D 163			
39.00 - 39.45	UT 166	88 blows 100% rec	39.00	2.50
39.00	D 165			
39.50 - 39.95	UT 168	84 blows 100% rec	39.95	2.50
39.50	D 167			
			30/11/20	1700
			40.00	2.00
40.00	D 169			

Strata Description

Main	Detail	Depth, Level (Thickness)	Legend	Backfill
Firm to stiff reddish brown slightly gravelly sandy CLAY. Gravel is subangular to subrounded fine to coarse of various lithologies including sandstone and mudstone.		(8.50)		
Firm, locally soft to firm, brown slightly sandy CLAY with occasional pockets (5 to 30mm varying with depth) of light brown and grey fine to coarse sand Occasional subrounded to rounded fine to medium, rarely fine to coarse, gravel of various lithologies including flint, mudstone and sandstone. (GLACIAL TILL)		34.50 -30.28		
		(4.50)		
Soft to firm thickly laminated brown slightly sandy CLAY. Laminae are light brown of silty fine sand and sandy silt.	38.50 occasional partings (1mm thick) of light brown fine sand, rare veins (<5x40mm) of light brown fine sand	39.00 -34.78		
		(1.00)		
END OF EXPLORATORY HOLE		40.00 -35.78		

Groundwater Entries

No.	Depth Strike (m)	Remarks	Depth Sealed (m)

Depth Related Remarks

Depths (m)	Remarks

Hard Boring

Depths (m)	Duration (mins)	Tools used

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

© Copyright SOCOTEC UK Limited

Scale 1:50

30/03/2021 11:57:56

Project	GEOTECHNICAL AND CONTAMINATED LAND GROUND INVESTIGATION AT THE PROPOSED UK GEOS DEVELOPMENT AT ELTON, CHESHIRE
Project No.	A0038-20
Carried out for	British Geological Survey

Borehole

BHA-102

Borehole Log

SOCOTEC

Drilled	DD	Start	27/11/2020
Logged	LG		
Checked	MS	End	
Approved	TC		03/12/2020

Equipment, Methods and Remarks

Dando 3000.
Cable percussion boring.
SPT Hammer ID: TH54, Rod type: 54mm Whitworth.

Depth from (m)	to (m)	Diameter (mm)	Casing Depth (m)
1.20	15.95	200	15.95
15.95	30.00	150	30.00

Ground Level	6.76 mOD
Coordinates (m)	E 347592.86
National Grid	N 376019.63

Samples and Tests

Depth	Type & No.	Records	Date / Casing	Time / Water
0.05	D 1	0.00-1.20 Hand excavated inspection pit.		
0.25	D 2			
0.25	ES 3			
0.30 - 0.50	B 4			
0.50	ES 5			
1.00	ES 6			
1.20	D 7			
1.50 - 2.40	SPT S	N=0 (0,0/0,0,0,0) SW=450	1.50	Dry
1.50	D 8			
1.80	D 9			
1.80 - 2.20	B 10			
2.00	D 11			
2.50 - 2.95	UT 12	6 blows 100% rec	2.50	Dry
2.50 - 3.00	B 14			
3.00	D 13			
3.50 - 3.95	SPT S	N=4 (1,1/1,1,1,1)	3.50	Damp
3.50	D 15			
4.00	D 16			
4.50 - 4.95	UT 18	9 blows 100% rec	4.50	Dry
4.50	D 17			
5.00	D 19			
5.00 - 5.50	B 20			
5.50 - 5.95	SPT S	N=0 (0,0/0,0,0,0)	5.50	Damp
5.50	D 0			
5.50 - 6.00	B 21			
6.00	D 22			
6.50 - 6.95	UT 23	7 blows 100% rec	6.50	Damp
7.00	D 24			
7.50 - 7.95	SPT S	N=4 (1,0/1,1,1,1)	7.50	Dry
7.50	D 25			
7.90	D 26			
8.50 - 8.95	UT 27	36 blows 100% rec	8.50	Dry
			30/11/20	1800
			9.00	Dry
9.00	D 28			
			01/12/20	0730
			9.00	Dry
9.50 - 9.95	SPT S	N=5 (1,1/1,1,2,1)	9.50	Dry
9.50	D 29			
9.90	D 30			
9.90	W 31			

Strata Description

Main	Detail	Depth, Level (Thickness)
Soft brown sandy slightly gravelly CLAY with occasional rootlets. Gravel is angular fine to coarse of various lithologies. (TOPSOIL)		(0.20) 0.20 +6.56
Brown very silty fine to medium SAND.		(0.90) 1.10 +5.66
Very soft brown sandy CLAY with occasional partings of greyish brown silty sand.		(0.60) 1.70 +5.06
Very soft dark grey CLAY.		(0.90) 2.60 +4.16
Plastic dark brown pseudo-fibrous PEAT with numerous fragments (up to 50x20mm) of wood. Strong organic odour.		(1.80) 4.40 +2.36
Very soft to soft bluish grey SILT with numerous pockets (up to 50x20mm) of plastic black fibrous peat. Numerous fragments (up to 20mm) of wood.	4.40-4.70 very soft, high clay content	(3.40) 7.80 -1.04
Firm dark brown pseudo-fibrous PEAT with occasional fragments (up to 20x10mm) of brown plant matter.	7.80-8.00 mottled bluish grey, silty	(2.00) 9.80 -3.04
Soft brownish grey slightly sandy CLAY with	9.60-9.70 band of grey fine to medium sand	

Backfill: 1 (0.90), 2 (1.90)

Groundwater Entries

No.	Depth Strike (m)	Remarks	Depth Sealed (m)
1	9.90	Rose to 5.10 m after 20 minutes. Medium inflow	9.90

Depth Related Remarks

Depths (m)	Remarks

Hard Boring

Depths (m)	Duration (mins)	Tools used

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

© Copyright SOCOTEC UK Limited

Scale 1:50

30/03/2021 11:59:04

Project	GEOTECHNICAL AND CONTAMINATED LAND GROUND INVESTIGATION AT THE PROPOSED UK GEOS DEVELOPMENT AT ELTON, CHESHIRE
Project No.	A0038-20
Carried out for	British Geological Survey

Borehole

BHF-101

Borehole Log

SOCOTEC

Drilled	DD	Start	Equipment, Methods and Remarks	Depth from (m)	to (m)	Diameter (mm)	Casing Depth (m)	Ground Level	6.76 mOD
Logged	LG	27/11/2020	Dando 3000. Cable percussion boring. SPT Hammer ID: TH54, Rod type: 54mm Whitworth.	1.20	15.95	200	15.95	Coordinates (m)	E 347592.86
Checked	MS	End		15.95	30.00	150	30.00	National Grid	N 376019.63
Approved	TC	03/12/2020							

Samples and Tests

Depth	Type & No.	Records	Date Casing	Time Water
10.00 - 10.20	B 32			
10.50 - 10.95	UT 33	18 blows 89% rec	10.50	5.30
10.80	D 34			
11.50 - 11.95	SPT S	N=16 (2,2/3,4,4,5)	11.50	5.70
11.50	D 35			
11.50 - 12.00	B 36			
12.50 - 12.95	UT 38	61 blows 100% rec	12.50	6.60
12.50	D 37			
13.00	D 39			
13.00 - 13.20	B 40			
13.40	D 41			
13.50 - 13.95	SPT S	N=13 (2,2/3,3,4,3)	13.50	6.40
13.50	D 42			
13.50 - 14.00	B 43			
14.00	D 44			
14.50 - 14.95	SPT S	N=11 (1,2/2,2,3,4)	14.50	6.80
14.50	D 0			
14.50 - 15.00	B 45			
15.00	D 46			
15.00	EW			
15.30	D 47			
15.50 - 15.95	UT 48	59 blows 58% rec	15.50	3.30
			01/12/20 15.50	1800 3.40
16.00	D 49		02/12/20 15.50	0730 2.80
16.50 - 16.95	SPT S	N=20 (2,3/3,5,6,6)	16.50	3.60
16.50	D 50			
16.50 - 17.00	B 51			
17.00	D 52			
17.50 - 17.95	UT 53	76 blows 100% rec	17.50	16.80
18.00	D 54			
18.50 - 18.95	SPT S	N=22 (3,3/4,6,6,6)	18.50	Damp
18.50	D 55			
19.40	D 56			
19.50 - 19.95	UT 57	81 blows 100% rec	19.50	19.10

Strata Description

Main	Detail	Depth, Level (Thickness)
Soft brownish grey slightly sandy CLAY with abundant pockets (up to 10x3mm) of brown fibrous organic matter. Occasional fragments (up to 45x30mm) of wood.	10.50-10.70 very sandy	(0.90) 10.70 -3.94
Medium dense greyish brown slightly gravelly clayey fine to coarse SAND. Gravel is angular to rounded fine to medium of various lithologies including sandstone, limestone and mudstone.	11.70-12.40 numerous pockets (up to 100x30mm) of sandy slightly gravelly clay	(1.70) 12.40 -5.64
Stiff brown, mottled black CLAY with frequent pockets (up to 70x30mm) of light brown sand and gravel. Gravel is subangular to rounded fine to medium of various lithologies including mudstone, sandstone and chert.		(0.20) 12.60 -5.84
Stiff reddish brown CLAY.		(0.70) 13.30 -6.54
Medium dense reddish brown slightly gravelly clayey fine to coarse SAND with frequent pockets (up to 200x100mm) of firm clay. Gravel is angular to subrounded fine to coarse of various lithologies including sandstone, chert and mudstone.		(1.90) 15.20 -8.44
Firm to stiff reddish brown slightly sandy slightly gravelly CLAY. Gravel is angular to rounded fine to coarse of various lithologies including mudstone, sandstone, limestone and chert.		(4.10) 19.30 -12.54
Firm brown very sandy SILT with occasional pockets (up to 20x30mm) of sandy clay.	20.00 1 No. thick lamination of firm slightly sandy clay	

Legend

Backfill

Groundwater Entries

No.	Depth Strike (m)	Remarks	Depth Sealed (m)

Depth Related Remarks

Depths (m)	Remarks

Hard Boring

Depths (m)	Duration (mins)	Tools used

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

© Copyright SOCOTEC UK Limited

AGS

Scale 1:50

30/03/2021 11:59:04

Project	GEOTECHNICAL AND CONTAMINATED LAND GROUND INVESTIGATION AT THE PROPOSED UK GEOS DEVELOPMENT AT ELTON, CHESHIRE
Project No.	A0038-20
Carried out for	British Geological Survey

Borehole

BHF-101

4520 7458 SJ47SE 18

BeWT

MACHINE EXCAVATED TRIAL PIT

Location Runcorn Industrial Supply | Job No. 8156/81 | Project Ref 9-00-05-949 | Ground Level (m AOD) | Co-ordinates E N | Trial Pit No. TP5

Field Records Samples Cohesion(kN/m2)	Depth (m)	Type & No.	DESCRIPTION OF STRATA	Reduced Level m AOD	Strata Legend	Depth (Thickness) m
			Grass over TOPSOIL			(0.40) 0.40
140+	0.50 - 0.60	B 1	Very stiff dark brown/grey slightly sandy CLAY with a little fine to coarse gravel and occasional sand bands			
	1.40	D 1				(1.80)
	2.10	D 2				2.20
			Trial Pit Complete			

Scale 1:50

Trial Pit excavated using a mechanical excavator.

Remarks
1) No groundwater encountered during excavation.
2) Sides of pit stable.

Plan

Logged By G.L.	DATE 14-11
Checked By:	
Approved By:	
FIG No.	

British Geological Survey

ALLIED EXPLORATION & GEOTECHNICS LTD

BOREHOLE RECORD

Status:- FINAL
Date:- 07/03/96

Project: NMCS2 Communications System in Cheshire - MS2 Cantilever Sites - M56

BOREHOLE No: BH-06

Client: The Highways Agency

Location: 52/3 +70A SJ 45654 74258

Method & Equipment: Cable Percussion using a Pilcon Wayfarer 1500

Ground Level(m(AOD)): 9.48

Date: 13-12-95

Sheet: 1 of 2

SAMPLES & TESTS			Water	STRATA				Instrument backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION	
				9.38		(0.10)0.10	(1) TOPSOIL.	
0.80-1.20	B1					(2.20)	MADE GROUND (Medium dense dark brown sandy fine to medium occasionally coarse angular to subangular gravel. Gravel consists of limestone. Some rootlets).	
1.50-1.95	CB2	N22					below c.1.50m BGL ... becoming grey clayey gravel.	
				7.18		2.30		
2.30-2.50	B3						Firm to stiff red brown sandy CLAY with occasional gravel. Gravel is fine subangular and consists of sandstone, basalt and quartzite. (Glacial Till) between c.2.30 and 5.00m BGL ... extremely closely fissured.	
2.50-2.95	U4	(55)						
3.00	J5							
3.01-3.40	B6							
3.50-3.95	U7	(65)						
4.00	J8							
4.50-4.95	U9	(75)						
5.00	J10					(5.50)		
5.10-5.50	B11							
5.50-5.95	U12	(35)						
6.00	J13							
6.40-6.80	B14							
7.00-7.45	U15	(120)					below c.7.00m BGL ... becoming very stiff.	
7.50	J16							
				1.68		7.80		
							(As sheet 2 of 2)	

Boring Progress and Water Observations

Date		Depth	Casing	Casing Dia	Water Depth
13/12/95		0.00	0.00		
13/12/95		9.70	9.70	150mm	4.85

Chiselling

From	To	Hours
9.60	9.70	1.00

Water Added

From	To
5.50	9.70

GENERAL REMARKS

1) Description derived from driller's daily report. 2) Inspection pit dug prior to drilling (1.0 x 1.0 x 1.2m). 3) Slight seepage at 5.50m BGL.

All dimensions in metres Scale 1:50	For Explanation of Symbols and Abbreviations see Key Sheets	Checked By: AR	Logged By: A. Latimer	Contract No. 1568

Date Printed:- 08/03/96

Form AEG21/2

British Geological Survey

ALLIED EXPLORATION & GEOTECHNICS LTD

BOREHOLE RECORD

Status:- **FINAL**
Date:- 07/03/96

Project: NMCS2 Communications System in Cheshire - MS2 Cantilever Sites - M56			BOREHOLE No BH-06 22
Client: The Highways Agency	Location: 52/3 +70A SJ47SE		
Method & Equipment: Cable Percussion using a Pilcon Wayfarer 1500	Ground Level(m(AOD)): 9.48	Date: 13-12-95	Sheet: 2 of 2

SAMPLES & TESTS			Water	STRATA				Instrument backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION	
8.00-8.45	CB17	N38		0.58		(1.10) 8.90	Dense brown clayey fine to coarse subangular to subrounded GRAVEL. Gravel consists of sandstone and basalt. (Fluvio-glacial)	
9.00-9.45 9.01-9.40	SJ18 B19	50 for 115mm		-0.02		(0.60) 9.50	Very dense red brown slightly gravelly medium to coarse SAND. Gravel is fine to medium subangular and consists of sandstone. (Highly Weathered Bunter Sandstone)	
9.50-9.60 9.70	SJ20 C21	50 for 30mm 50 for 22mm		-0.22		(0.20) 9.70	Red brown medium to coarse grained poorly cemented moderately weathered SANDSTONE weak with some red brown medium to coarse sand. (Bunter Sandstone)	
							Borehole complete at 9.70m BGL	

Boring Progress and Water Observations					
Date		Depth	Casing	Casing Dia	Water Depth
13/12/95		0.00	0.00		
13/12/95		9.70	9.70	150mm	4.85

Chiselling			Water Added	
From	To	Hours	From	To
9.60	9.70	1.00	5.50	9.70

GENERAL REMARKS

1) Description derived from driller's daily report. 2) Inspection pit dug prior to drilling (1.0 x 1.0 x 1.2m). 3) Slight seepage at 5.50m BGL.

All dimensions in metres Scale 1:50	For Explanation of Symbols and Abbreviations see Key Sheets	Checked By: AR	Logged By: A. Latimer	Contract No. 1568

Date Printed:- 08/03/96

Form AEG21/2

British Geological Survey

BOREHOLE RECORD - Cable Percussion

Project M56 Junction 14 Drainage Remedial Work | Engineer Atkins | **Borehole BH104**

Coordinates E346528.29 N374720. National Grid

Client Highways Agency | Project No PN030329

British Geological Survey

Sampling / Properties / Strata

Depth	Sample Type	Depth Cased	Depth to Water	Strength kN/m²	W %	SPT N	Description	Depth	Legend	Level OD
								G.L.		7.59
0.20	J						MADE GROUND: Topsoil. (**)	0.20		7.39
0.50 - 1.00	B						Firm brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to medium. Occasional shell fragments.			
1.20 - 1.65	SJB					10				
2.00 - 2.45	U(40)	1.50								
2.50	J									
3.00 - 3.45	SJB	3.00				22	From 3.00m becoming stiff.			
4.00 - 4.45	U(50)									
4.50	J									
5.00 - 5.45	SJB	4.50				16	From 5.00m occasional lenses of orange brown fine to medium sand.			
								6.00		1.59
6.00 - 6.45	SJB	6.00	5.70			14	Firm brown sandy CLAY with many lenses/bands of orange brown sand.			
7.00	J							7.00		0.59
							Very soft to soft grey locally black slightly sandy CLAY.			
7.50 - 7.95	U(100)	7.50	DRY					7.40		0.19
							Firm to stiff brown sandy CLAY.			
8.00	J							8.00		-.41

Boring

Depth	Dia	Technique	Crew
1.20	500x500	Inspection Pit	AW
11.00	150	Cable Percussion	AW

Progress

Depth of Hole	Depth Cased	Depth to Water	am (A) pm (P) Date
Start 0.00			19/02/04
11.00 End	10.50	3.00	A19/02/04
			P19/02/04
			19/02/04

Groundwater

Depth Struck	Depth Cased	Depth after 20 mins	Depth Sealed	Remarks on Groundwater
6.00	6.00	5.70	7.50	Slow inflow
8.50	7.50	7.50	7.50	Slow inflow

Remarks Inspection pit excavated to 1.20m. 19mm piezometer installed tip at 6.50m, seal 11.00-7.00m, filter 7.00-5.00m, seal 5.00-4.00m, backfill 4.00-0.50m, concrete 0.50m-GL, flush cover fitted. (**denotes drillers description).

geotechnics

Logged by: AG

Symbols and abbreviations are explained on the accompanying key. All linear dimensions are in metres.

Scale: 1:50

BOREHOLE RECORD - Cable Percussion

Project M56 Junction 14 Drainage Remedial Work | Engineer Atkins | **Borehole BH104**

Coordinates E346528.29 N374720. National Grid

Client Highways Agency | Project No PN030329

Sampling

Depth	Sample Type	Depth Cased	Depth to Water
9.00 - 9.45	SJB	9.00	1.50
10.50- 10.95	SJ	10.50	3.00

Properties

Strength kN/m 2	W %	SPT N
		11
		17

Strata

Description	Depth	Legend	Level OD
As on preceding sheet	8.00		-.41
Medium dense brown silty fine to medium SAND with some shell fragments.	8.50		-0.91
	11.00		-3.41

Boring

Depth	Dia	Technique	Crew
1.20	500x500	Inspection Pit	AW
11.00	150	Cable Percussion	AW

Progress

Depth of Hole	Depth Cased	Depth to Water	as (A) pm (P)	Date
Start 0.00				19/02/04
			A	19/02/04
11.00 End	10.50	3.00	P	19/02/04
				19/02/04

Groundwater

Depth Struck	Depth Cased	Depth after 20 mins	Depth Sealed	Remarks on Groundwater
6.00	6.00	5.70	7.50	Slow inflow
8.50	7.50	7.50	7.50	Slow inflow

Remarks Inspection pit excavated to 1.20m. 19mm piezometer installed tip at 6.50m, seal 11.00-7.00m, filter 7.00-5.00m, seal 5.00-4.00m, backfill 4.00-0.50m, concrete 0.50m-GL, flush cover fitted. (**denotes drillers description).

geotechnics

Logged by: AG

Symbols and abbreviations are explained on the accompanying key. All linear dimensions are in metres.

Scale: 1:50

British Geological Survey

SJ 57 NE 8

FUGRO - McCLELLAND LIMITED

BOREHOLE LOG

Borehole B192/10M

Sheet 3 of 3

Method: Shell & Auger.	Date: 12/07/90 - 12/07/90	Site: NWEP	
Dia mm: 200	Coord: 357778mE 378006mN	Ground Level m.OD: 22.13	Client: SCUK/BECHTEL

Soil Samples/Tests		Water & Progress	OD Level m.	Depth m.	Description of Strata	Legend
Type/Test	Depth m.					

GROUNDWATER OBSERVATIONS

Date	Time	Borehole Depth	Casing Depth	Water Level
12/07/90	1600	7.50	7.10	7.00
12/07/90	1800	10.20	0.00	6.40

Remarks

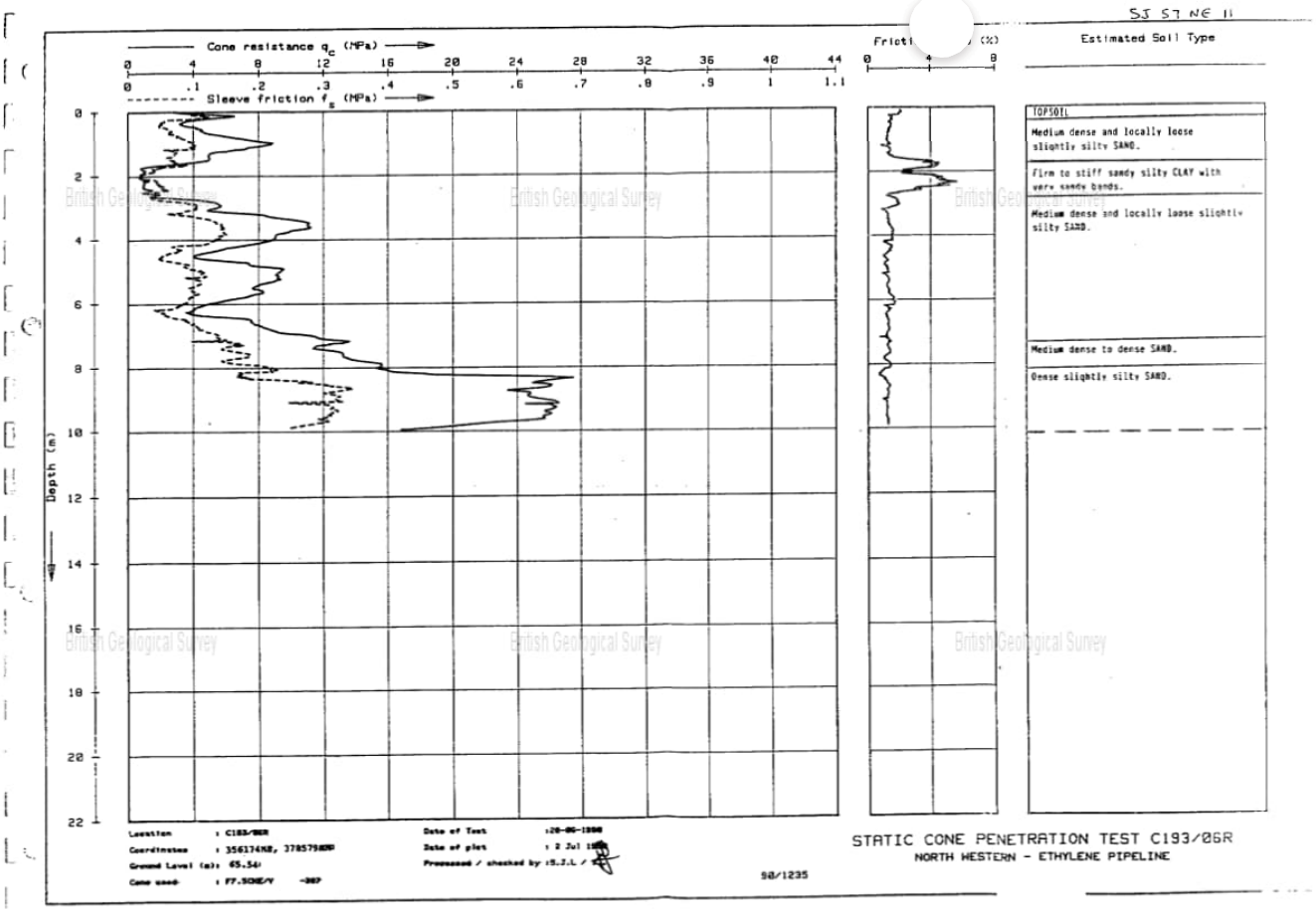
Ground-water was encountered at 7.40m depth

Logged by	Scale	End Casing Depth m.	Job No.
SW	1:50	9.60	901235

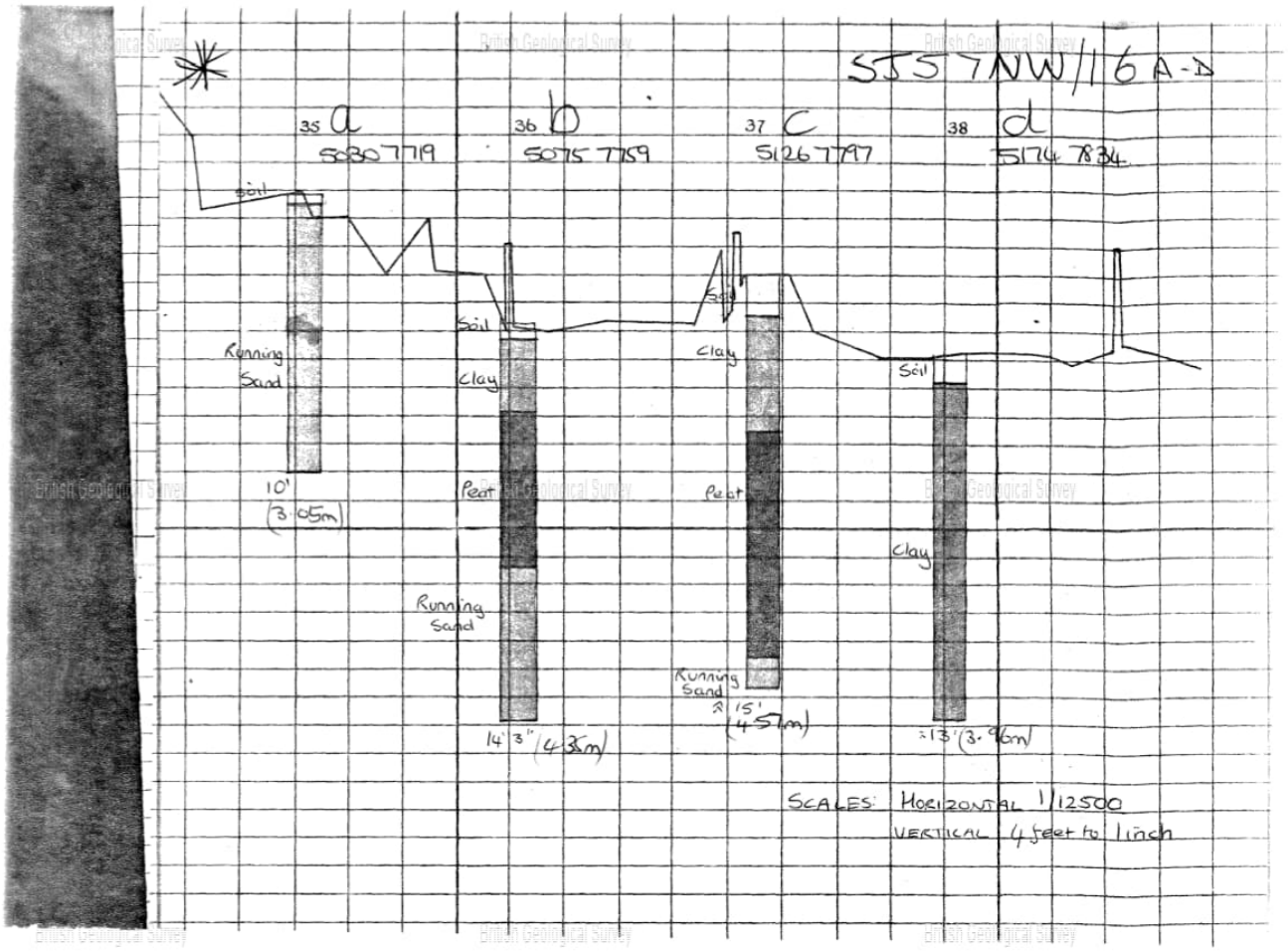
Sample/Test key:
- U () U100 sample (blows)
- D Disturbed sample
- B Bulk sample
- W Water sample
- - Progress & Day

Penetration Tests
- S () Standard (N value)
- C () Cone (N value)
- * Blows and penetration when 300mm not achieved

British Geological Survey


SJ 57 NE 11
Cone resistance q_c (MPa)
Sleeve friction f_s (MPa)
Friction (%)
Estimated Soil Type
Depth (m)
TOPSOIL
Medium dense and locally loose slightly silty SAND.
Firm to stiff sandy silty CLAY with very sandy bands.
Medium dense and locally loose slightly silty SAND.
Medium dense to dense SAND.
Dense slightly silty SAND.
STATIC CONE PENETRATION TEST C193/06R
NORTH WESTERN - ETHYLENE PIPELINE
98/1235

BGS ID: 166894 : BGS Reference: SJ57NW16/D
British National Grid (27700) : 351740,378340
Report an issue with this borehole



SJ57NW 94

CABLE PERCUSSION RECORD SHEET

BeWT

STRATA SURVEYS LIMITED

Location Runcorn Industrial Supply

Job No. 8156/81 Project Ref: 9-00-05-949

Borehole No. BH106

Sheet 1 of 2.

Equipment and methods Light Cable Percussion

Casing Diameter (mm) 150

Casing Depth (m) 15.90

S271 7902

Drilled by T.D'H

Ground level 6.70 m AOD

Co-ordinates E N

Date 29-08-96

CASING DEPTH (m)	WATER DEPTH (m)	Field Records	SAMPLES / TESTS Depth (m) from	to	SAMPLE Type & No	SPT N Value	Description	Depth & Thickness (m)	Reduced Level (m AOD)	Strata Legend
	PM	0.00 02/09	0.20	0.20	D 1		TOPSOIL over brown slightly clayey fine to medium grained SAND with occasional fine to medium gravel and roots	(0.60)		
								0.60	6.100	
		-(29-08)-	0.70	0.70	D 2		Firm brown/grey slightly sandy CLAY	(0.40)		
0.90	NIL	4S	1.00	1.45	U 1			1.00	5.700	
							Soft dark brown/grey laminated CLAY with occasional silt bands			
			1.50	1.50	D 3					
	AM	1.85 03/09								
1.70	NIL	3O	2.00	2.45	U 2		Stiff at 2.00m	()		
	T2	20 mins 2.45 02/09	2.45	2.45	W 2			(2.90)		
	T1	20 mins 2.65 02/09	2.60	2.60	D 4					
			2.65	2.65	W 1					
2.90	NIL	6	3.05	3.50	U 3		Soft to very soft at 3.05m	()		
			3.50	3.50	D 5					
	M1	3.60 02/09								
	T4	20 mins 3.90 03/09	3.90	3.90	W 4			3.90	2.800	
4.00	3.80		4.00	4.45	B 1	4.0	Loose grey slightly clayey very silty fine grained SAND with occasional silt lenses			
		1,0-1,0,1,2	4.00	4.45	S 1					
								(1.60)		
5.00	M2	5.00 02/09	5.00	5.45	S 2	5.0				
		1,0-1,1,1,2								
	AM	5.45 04/09								
								5.50	1.200	
5.80	0.00	1,0-1,2,3,2	5.80	6.25	B 2	8.0	Loose brown slightly clayey fine to coarse SAND & GRAVEL			
			5.80	6.25	S 3					
	PM	6.80 03/09								
6.90	0.00		6.90	7.35	B 3	6.0		(2.80)		
	PM	7.00 04/09	6.90	7.35	S 4					
		1,1-1,1,1,3								
	T3	20 mins 7.75 03/09	7.75	7.75	W 3					
8.00	0.00	-(02-09)-	8.00	8.45	B 4	5.0				
		1,0-1,1,1,2	8.00	8.45	S 5					
								8.30	-1.600	
							Loose grey clayey SILT ...peaty in places			
9.00	3.15	1,1-1,1,0,1	9.00	9.45	B 5	3.0				
			9.00	9.45	S 6			(1.60)		
10.00	9.70	1,0-1,0,1,1	10.00	10.45	B 6	3.0	(Continued.....)	9.90	-3.200	
			10.00	10.45	S 7					

Remarks

1) Service pit dug 0.60m x 0.40m x 1.00m.
2) Groundwater struck at 3.60m rising to 2.90m after 20 mins.
3) Water balance used below 3.60m.
4) Groundwater struck at 5.00m rising to 2.45m after 20 mins.
5) Water level 0.00m pm 02-09.
6) Water level 1.85m am 03-09.
7) Groundwater struck at 10.50m rising to 7.75m after 20 mins.

Scale 1:50

Logged by G.L	Date 09/09
Checked by	
Approved by	
FIG No.	

British Geological Survey

SJ57NW 94

BeWT

STRATA SURVEYS LIMITED

CABLE PERCUSSION RECORD SHEET

Location Runcorn Industrial Supply

Job No. 8156/81 Project Ref: 9-00-05-949

Borehole No. BH106

Sheet 2 of 2.

Equipment and methods Light Cable Percussion

Casing Diameter (mm) 150

Casing Depth (m) 15.90

Drilled by T.D'H

Ground level 6.70 m AOD

Co-ordinates E N

Date 29-08-96

Casing Depth (m)	Water Depth (m)	Field Records	Samples / Tests: Depth (m) from	to	Sample Type & No	SPT N Value	Description	Depth & Thickness (m)	Reduced Level (m AOD)	Strata Legend
10.00	9.70	1,0-1,0,1,1	10.00 10.00	10.45 10.45	B 6 S 7	3.0	(....cont.) Saturated brown wood	(0.90)		
	M3	10.50 03/09						10.80	-4.100	
							Loose grey slightly clayey SILT ..peaty in places			
11.50	0.00	1,1-1,1,2,2	11.50 11.50	11.95 11.95	B 7 S 8	6.0		(1.40)		
							Soft mottled dark brown/black peaty CLAY	12.20	-5.500	
12.40	NIL	16	12.50	12.95	U 4					
			13.00	13.00	D 6			(1.50)		
13.40	12.00	2,8-16,17,17,22	13.50 13.50	13.95 13.95	B 8 S 9	72		13.70	-7.000	
							Brown fine to coarse SAND & GRAVEL	(0.10) 13.80	-7.100	
	M4	14.00 03/09					Very stiff reddish brown sandy CLAY with occasional fine gravel and sand bands			
14.20	0.00	8,9-12,12,12,22	14.50 14.50	14.95 14.95	B 9 S 10	58		(1.80)		
15.30	5.40	6,54-40/20mm	15.50 15.50	15.80 15.67	B 10 S 11	600		15.60	-8.900	
		-(03-09)-					Reddish brown highly weathered MARL	(0.40)		
15.90	7.00	25/40mm,75/30mm	16.00	16.07	S 12	429		16.00	-9.300	
		-(04-09)-					Borehole Complete			

Remarks

8) Groundwater struck at 14.00m rising to 3.90m after 20 mins.
9) Water level 6.80m pm 03-09.
10) Water level 5.45m am 04-09.
11) Chiselling from 15.80m to 16.00m for 30 mins.
12) Water level 7.00m pm 04-09.

Scale 1:50

Logged by GL Date 09/09

Checked by

Approved by

FIG No.

British Geological Survey

SJ57NW 95

BeWT

STRATA SURVEYS LIMITED

CABLE PERCUSSION RECORD SHEET

Location Runcorn Industrial Supply
Job No. 8156/81 Project Ref: 9-00-05-949

Borehole No. BH107
Sheet 1 of 2.

Equipment and methods Light Cable Percussion
Casing Diameter (mm) 150
Casing Depth (m) 19.30

SJ 582 7911

Drilled by T.O'H
Ground level 5.50 m AOD
Co-ordinates E N
Date 10-09-96

CASING DEPTH (m)	WATER DEPTH (m)	Field Records	SAMPLES / TESTS Depth (m) from	to	SAMPLE Type & No	SPT N Value	Description	Depth & Thickness (m)	Reduced Level (m AOD)	Strata Legend
							TOPSOIL	(0.30) 0.30	5.200	
			0.50	0.50	D 1		Soft to firm brown slightly sandy CLAY	(0.70)		
	AM	0.80 11/09								
	AM	0.85 12/09								
NIL	NIL	16	1.00	1.45	U 1			1.00	4.500	
							Soft to firm grey/brown laminated CLAY with occasional sand partings			
	T1	20 mins 1.50 10/09	1.45	1.45	D 2			(1.00)		
			1.50	1.50	C 1					
1.70	M1	2.00 10/09	2.00	2.45	U 2			2.00	3.500	
		10	2.10				Loose brown slightly clayey very silty fine grained SAND			
			2.45	2.45	D 3			(1.00)		
2.90	0.00	1,1-1,2,2,1	2.90	3.35	SPT 1	6.0		3.00	2.500	
	T2	20 mins 3.00 11/09	2.90	3.55	C 1					
			3.00	3.00	W 2		Very loose to loose grey slightly clayey very silty fine grained SAND			
	PM	3.75 10/09								
4.00	0.00	1,0-0,0,0,2	4.00	4.45	SPT 2	2.0		(2.15)		
			4.00	4.45	S 2					
5.00	0.00	1,0-2,2,2,2	5.00	5.45	SPT 3	8.0		5.15	0.350	
			5.00	5.45	S 3		Loose to medium dense brown slightly clayey medium to coarse grained SAND with much fine to coarse gravel			
	PM	5.90 12/09								
6.00	0.00	1,1-1,1,2,2	6.00	6.45	SPT 4	6.0				
			6.00	6.45	S 4					
	PM	6.90 11/09						(3.55)		
7.10	0.00	1,2-2,2,2,3	7.10	7.55	SPT 5	9.0				
			7.10	7.55	S 5					
8.10	0.00	1,3-3,4,2,2	8.10	8.55	SPT 6	11				
			8.10	8.55	S 6					
			8.70	8.70	D 4			8.70	-3.200	
							Soft grey CLAY with some organic matter			
9.00	1.50	1,1-2,2,3,3	9.00	9.45	S 7	10	(Continued.....)			
			9.70	9.70	D 5					

-(10-09)-

Remarks
1) Service pit dug 0.60m x 0.60m x 1.00m.
2) Groundwater struck at 2.00m rising to 1.50m after 20 mins.
3) Water balance used from 2.00m to 8.70m
4) SPT at 2.90m - rods sank 200mm under own weight.
5) Water level 3.75m pm 10-09.
6) Water level 0.80m am 11-09.
7) Groundwater struck at 11.50m rising to 3.00m after 20 mins.

Scale 1:50

Logged by	Date
GL	22/09
Checked by	
Approved by	

FIG No.

British Geological Survey

SJ57NW 95

BeWT

STRATA SURVEYS LIMITED

CABLE PERCUSSION RECORD SHEET

Location Runcorn Industrial Supply

Job No. 8156/81 Project Ref: 9-00-05-949

Borehole No. BH107

Sheet 2 of 2.

Equipment and methods Light Cable Percussion

Casing Diameter (mm) 150

Casing Depth (m) 19.30

Drilled by T.O'H

Ground level 5.50 m AOD

Co-ordinates E N

Date 10-09-96

CASING DEPTH (m)	WATER DEPTH (m)	Field Records	SAMPLES / TESTS Depth (m) from	to	SAMPLE Type & No	SPT N Value	Description	Depth & Thickness (m)	Reduced Level (m AOD)	Strata Legend
		-(10-09)-					(....cont.)	(2.80)		
10.30	2.30	1,1-1,1,2,2	10.50	10.95	S 8	6.0				
			11.00	11.00	D 6					
11.20	M2	11.50 11/09 5	11.50 11.60	11.95	U 3		Medium dense grey slightly clayey medium to coarse SAND & fine to coarse GRAVEL	11.50	-6.000	
12.20	0.00	Rods sank 300mm 4,5-5,5,7,11	12.20 12.20	12.65 12.95	B 7 S 9	28		(1.00)		
							Dense grey slightly silty fine to coarse grained SAND with some fine to coarse gravel	12.50	-7.000	
13.20	0.00	4,8-9,9,9,15	13.20 13.20	13.65 13.65	B 8 S 10	42		(1.30)		
13.90	3.75	6,6-9,7,8,9	13.90	14.35	S 11	33	Firm to stiff dark brown CLAY with a little fine gravel	13.80	-8.300	
			14.50	14.60	D 7					
14.70	3.20	80	15.00	15.45	U 4					
			15.50	15.60	D 8			(3.70)		
15.90	5.90	70	15.00	16.45	U 5					
			16.45	16.45	D 9					
17.00	7.70	80	17.20	17.65	U 6		sandy below 17.20m	0		
			17.65	17.65	D 10			17.50	-12.000	
		-(11-09)-					Stiff dark brown sandy CLAY with a little fine to coarse gravel and occasional sand bands			
18.40	3.20	4,5-7,7,9,15	18.50	18.95	S 12	38		(2.50)		
			19.10	19.00	D 11					
19.30	5.90	120	19.50	19.95	U 7					
		-(12-09)-	19.95	19.95	D 12			20.00	-14.500	
							Borehole Complete			

Remarks

8) Water balance used from 11.50m to 13.80m.
9) Water level 6.90m pm 11-09.
10) Water level 0.85m am & 5.90m pm 12-09

Scale 1:50

Logged by	Date
G.L.	22/09
Checked by	
Approved by	
FIG No.	

SJ57NW 10C

BeWT

MACHINE EXCAVATED TRIAL PIT 5041 7724

Location Runcorn Industrial Supply Job No. 8156/81 Project Ref

Ground Level (m AOD) Co-ordinates E N

Trial Pit No. TP18

Field Records Samples Cohesion(kN/m2) Depth (m) Type & No.	DESCRIPTION OF STRATA	Reduced Level m AOD	Strata Legend	Depth (Thickness) m
0.50 B 1	Nettles over TOPSOIL with some roots			(0.40) 0.40
0.90 D 1	Dark brown slightly clayey fine to medium grained SAND			(0.40) 0.80
1.90 D 2	Light brown silty fine to medium grained SAND			(1.70) 2.50
	Trial Pit Complete			

Scale 1:50

Trial Pit excavated using a mechanical excavator.

Remarks

1) Land drain hit at 0.75m
2) No progress below 2.50m due to sides of pit collapsing.
3) No groundwater encountered during excavation.

Plan

		DATE
Logged By	G.L	13-11
Checked By:		
Approved By:		
FIG No.		

British Geological Survey

SJ57NW 101

BeWT

MACHINE EXCAVATED TRIAL PIT 5099 7775

Location Runcorn Industrial Supply Job No. 8156/81 Project Ref

Ground Level (m AOD) Trial Pit No. TP19

Co-ordinates E N

Field Records Samples Cohesion(kN/m2) Depth (m) Type & No.	DESCRIPTION OF STRATA	Reduced Level m AOD	Strata Legend	Depth (Thickness) m
	Grass over TOPSOIL			(0.50)
55 0.60 0.70 D 1	Firm grey slightly sandy CLAY			0.50 (0.40)
1.00 D 2	Light brown fine to medium grained SAND			0.90 (0.25) 1.15
1.50 B 1	Black fibrous PEAT			(1.70)
2.40 D 3				
2.80 W 1				2.60
3.00 D 4	Grey silty fine to coarse grained SAND			(0.70)
	Trial Pit Complete			3.30

Scale 1:50

Trial Pit excavated using a mechanical excavator.

Remarks:
1) Land drain hit at 0.50m.
2) Sides of pit collapsing below 2.80m.
3) Moderate groundwater entries at 2.80m.
4) No progress below 3.30m due to sides of pit collapsing.

Plan

Logged By	G.L	DATE 13-11
Checked By:		
Approved By:		
FIG No.		

British Geological Survey

LOCATION : Flood Brook Sewer Phase II

GROUND LEVEL: 44.6 DIA. OF CASING: 6 INS. TO FT.

INCLINATION : Vertical INS. TO FT.

SCALE OF LOG: 1" = 4' SHEET 1 OF 1

TYPE OF BORING: Shell and auger

Daily Progress	Reduced Level	Depth ft.	Legend	Sampling Type	Sampling Depth	Nat. m %	Description and Remarks, including Water Observations.	Key to Laboratory Tests
	43.6	1.0					TOPSOIL - brown/black	
				D	2.0	18	CLAY - brown, soft, sandy	
				S(6)				
	41.1	3.5					grey, soft, sandy	
19.2.70.				D	5.0	20		
				D	8.0	21		
	35.6	9.0						
				D	10.0	20	brown, soft, silty	
				U4				
	33.1	11.5		D	11.5	20		
							brown, firm, silty	
				D	13.0	16		
				D	15.0	16		
	29.6	15.0		U4				
20.2.70.							brown, firm, sandy, stoney	
				D	16.5	16		
				D	18.0	15		
	24.6	20.0		D	20.0	16		
							Bottom of borehole	

CONTINUED

U(4) = 4" Dia. Undisturbed Sample
D = Disturbed Sample
△ = Water Sample
S( ) = Standard Penetration Test
C( ) = Cone Penetration Test
Figures in Brackets Indicate No. of Blows
✱ Indicates Penetration in ins. for 50 Blows
V = Vane Test

TX = Triaxial Test
CV = Consolidation Test
I = Index Test
O = Compaction Test
Ch = Chemical Test

Borehole No. 6

SJ 57 NW / 48

HOLST & CO. LTD.

SITE INVESTIGATION DEPT.
5-7, NEW YORK ROAD
LEEDS, 2

52203 79848

Contract No. M2666/F1321 Borehole No. 732
Location Runcorn Ground Level
Client I.C.I. Limited Date

BOREHOLE LOG

STRATA	Legend	Depth below Ground Level	Thickness of Strata	Type of Sample	c lb/sq. ft.	ø deg.	m.c %	y lb/cu. ft.	N
Made ground: Ash, brick, concrete				2'0"					29
				7'0"					20
			14'6"						
				12'0"					22
		14'6"		15'0"					
Made ground: Ash, cinder									9
			8'6"	20'0"					
									7
		23'0"		23'6"					5
Loose grey silty sand and sandy silt									
				28'6"					7
			19'0"	33'6"					10
				38'6"					10
		42'0"		42'6"					
Firm red sandy stony clay			3'6"		1320	0	11.8	146	
		45'6"		46'0"					
Red weathered sandstone			3'0"						85
		48'6"							
Red sandstone		50'6"	2'0"						

Water Struck at 21'0" Maximum Observed Water Level 21'0"

Undisturbed Sample []
Disturbed Sample o
Water Sample Δ
Penetration Test I

c = Cohesion
ø = Angle of Internal Friction
m.c = Moisture Content
y = Bulk Density
N = Standard Penetration Value

Water levels are subject to seasonal or tidal variation and should not be taken as constant

British Geological Survey

FOUNDATION ENGINEERING Ltd.

BOREHOLE LOG

LOCATION : WEAVER VIADUCT BOREHOLE No. : 18 Sheet 1 of 3

BOREHOLE DIA. : 8" GROUND LEVEL : 20 · 77' O.D.

DATE (Start) : 7 · 3 · 66 WATER LEVEL : See note

Dates	Description	Thickness	Depth	Sample	Remarks
	TOPSOIL	0'-9"	0'-0"		
			0'-9"		
	Firm brown sandy silty CLAY	7'-3"		1	U4 failed
			8'-0"	2	U4 failed
	Soft to firm black silty CLAY	5'-0"			
			13'-0"	3	
	Very loose grey silty SAND	5'-0"		4	6 blows/ft
			18'-0"	5	
	Firm black clayey SILT	2'-6"	20'-6"		
	Loose sandy GRAVEL	6'-6"		6	11 blows/ft
				7	11 blows/ft
	Firm grey peaty CLAY	1'-0"	27'-0"	8	
			28'-0"		
	Very loose grey SILT	7'-0"		9	8 blows/ft
			35'-0"		
	Loose sandy GRAVEL	7'-0"		10	14 blows/ft
				11	11 blows/ft
	Firm brown silty CLAY	1'-0"	42'-0"	12	
			43'-0"	13	18 blows/ft
	Loose sandy coarse GRAVEL	4'-0"			
	Firm peaty CLAY	0'-6"	47'-0"	14	
			47'-6"		
	Med. dens. sandy coarse GRAVEL	9'-0"			
			50'-0"		

BOREHOLE SCALE : 1″=5′ • : DISTURBED SAMPLE ▮ : UNDISTURBED SAMPLE ⊢ STANDARD PENETRATION TEST

FOUNDATION ENGINEERING Ltd.

BOREHOLE LOG

LOCATION : WEAVER VIADUCT BOREHOLE No. : 16 Sheet 2 of 3

BOREHOLE DIA. : GROUND LEVEL :

DATE (Start) : WATER LEVEL :

Dates	Description	Thickness	Depth	Sample	Remarks
			5 0'-0"	15	34 blows/ft
	Med. dens. sandy coarse GRAVEL	9'-0"		16	
1 hr			56'-6"	17	40 blows/3" (initial)
				18	50 blows/6"
	Stiff red CLAY with boulders	22'-6"		19	
			67'-0"	20	
3 hrs	(became very sandy between 67'-0" & 68'-0")		68'-0"	21	55 blows/6"
				22	
2½ hrs				23	
					U4 failed
				24	
			79'-0"		U4 failed
	Very stiff laminated silty CLAY	6'-0"		25	60 blows/6"
	(claystone at 84'-0")		84'-0"	26	92 blows/ft
			85'-0"		
	Very compact f.m. SAND	12'-6"		27	150 blows/3" (initial)
				28	73 blows/ft
			97'-6"	29	
	Very compact sandy GRAVEL	0'-6"	98'-0"	30	
	Stiff clayey SILT	1'-0"	99'-0"		
	Very compact SAND	12'-0"	100'-0"		

BOREHOLE SCALE : 1"=5' • : DISTURBED SAMPLE ▮ : UNDISTURBED SAMPLE + STANDARD PENETRATION TEST

FOUNDATION ENGINEERING Ltd.

BOREHOLE LOG

LOCATION : WEAVER VIADUCT BOREHOLE No. : 18 Sheet 3 of 3

BOREHOLE DIA. : GROUND LEVEL :

DATE (Start) : WATER LEVEL :

Dates	Description	Thickness	Depth		Sample	Remarks
			10 0'-0"			
					31	100 blows/6"
	Very compact SAND with occ. thin bands of clay & silt	12'-0"				
					32	96 blows/ft
			111'-0"		33	
	Very stiff grey CLAY	2'-0"	113'-0"		34	
	Very compact sandy GRAVEL	8'-0"			35	75 blows/6" (initial)
	Very stiff CLAY with boulders	1'-0"	121'-0"		36	125 blows/6"
			122'-0"			
	Very compact sandy GRAVEL with some sandstone fragments	6'-0" +			37	100 blows/6" (initial)
			128'-0"		38	
						BOREHOLE COMPLETE
	Note: With borehole drilled & cased to 15'-0" depth, water stood at 3'-3" B.G.L. overnight.					

British Geological Survey

BOREHOLE SCALE : 1″ = 5′ • : DISTURBED SAMPLE ▮ : UNDISTURBED SAMPLE ⊥ STANDARD PENETRATION TEST

FOUNDATION ENGINEERING Ltd.

BOREHOLE LOG

LOCATION : WEAVER VIADUCT
BOREHOLE No. : 22 Sheet 1 of 2
BOREHOLE DIA. : 8"
GROUND LEVEL : 24.76' O.D.
DATE (Start) : 2 . 2 . 66
WATER LEVEL : See note

Dates	Description	Thickness	Depth	Sample	Remarks
1 hr chiselling	MADE GROUND glass, old tins etc	15'-0"	0'-0"	1	
				2	15 blows/ft
				3	11 blows/ft
			15'-0"	4	
				5	
	Soft PEAT	12'-0"		6	
				7	
	Soft grey peaty CLAY	6'-0"	27'-0"	8	
				9	
			33'-0"	10	
				11	
	Soft grey silty CLAY	14'-0"		12	8 blows/ft
	Soft clayey PEAT	1'-0"	47'-0"	13	11 blows/ft
	Soft PEAT	3'-0"	48'-0"	14	
			50'-0"		

BOREHOLE SCALE : 1"=5' •: DISTURBED SAMPLE ▮: UNDISTURBED SAMPLE + STANDARD PENETRATION TEST

FOUNDATION ENGINEERING Ltd.

BOREHOLE LOG

LOCATION : WEAVER VIADUCT BOREHOLE No. : 22 Sheet 2 of 2

BOREHOLE DIA. : GROUND LEVEL :

DATE (Start) : WATER LEVEL :

Dates	Description	Thickness	Depth	Sample	Remarks
	Soft PEAT	3'-0"	50'-0"	15	
	Compact sandy GRAVEL	6'-0"	51'-0"	16	46 blows/
	Compact brown SAND	1'-6"	57'-0"	17	77 blows/ft
	Compact red sandy SILT	1'-6"	58'-6"	18	
	Compact brown gravelly SAND	4'-0"	60'-0"	19	
3hrs chiselling				20	39 blows/ft
	Stiff red CLAY with boulders	6'-0"	64'-0"	21	
7hrs chiselling	Compact SAND	0'-3"	70'-0"		
	Hard red-brown silty CLAY	3'-9"+	70'-3"	22	
				23	
			74'-0"	24	
	Note: Water encountered 5'-0" B.G.L.				BOREHOLE COMPLE

BOREHOLE SCALE 1" = 5' DISTURBED SAMPLE ▲ UNDISTURBED SAMPLE

BOREHOLE SCALE : 1" = 5' • : DISTURBED SAMPLE ▮ : UNDISTURBED SAMPLE + STANDARD PENETRATION TEST

FOUNDATION ENGINEERING Ltd.

BOREHOLE LOG

British Geological Survey

LOCATION : WEAVER VIADUCT BOREHOLE No. : 25 Sheet 1 of 2

BOREHOLE DIA. : 8 " GROUND LEVEL : 46 · 24 ' O.D.

DATE (Start) : 22 · 3 · 66 WATER LEVEL : See note.

Dates	Description	Thickness	Depth	Sample	Remarks
	TOPSOIL	0' - 8"	0' - 0"		
	Firm to stiff red CLAY with boulders, vegetation	2' - 9"	0' - 9"	1	
	Loose to med. dens. f.m.c. SAND	7' - 6"	3' - 6"	2	12 blows/ft
				3	13 blows/ft
	Firm brown silty CLAY with boulders	4' - 0"	11' - 0"	4	31 blows/ft
	Firm red clayey SILT	3' - 0"	15' - 0"	5	11 blows/ft
	Loose red sandy SILT	5' - 0"	18' - 0"	6	12 blows/ft
	Compact gravelly SAND	8' - 6"	24' - 0"	7	47 blows/ft
				8	17 blows/ft
	Compact sandy f.m.c. GRAVEL	6' - 6"	32' - 6"	9	42 blows/ft
	Firm very sandy silty CLAY with boulders	1' - 0"	39' - 0"	10	
	Very compact sandy f.m.c. GRAVEL with cobbles	4' - 6"	40' - 0"	11	76 blows/ft
8 hrs	Stiff red CLAY with boulders	1' - 0"	44' - 6"		
	Very stiff red very sandy CLAY with boulders & pieces of marl	4' - 6"	45' - 6"	12	80 blows/ft
			50' - 0"		

BOREHOLE SCALE : 1″=5′ • : DISTURBED SAMPLE ▮ : UNDISTURBED SAMPLE ⊢ STANDARD PENETRATION TEST

BGS ID: 16247923 : BGS Reference: SJ57NW257
British National Grid (27700) : 353100,379570
Report an issue with this borehole

FOUNDATION ENGINEERING
Ltd.

BOREHOLE LOG

LOCATION : WEAVER VIADUCT BOREHOLE No. : 25 Sheet 2 of 2

BOREHOLE DIA. : GROUND LEVEL :

DATE (Start) : WATER LEVEL :

Dates	Description	Thickness	Depth	Sample	Remarks
5 hrs	Very hard red CLAY with boulders	5'-0"	5 0'-0"	13 14	
	Very hard red-brown silty CLAY.	6'-0"	55'-0"	15 16	
5 hrs	Hard red sandy CLAY with boulders	2'-0"	61'-0"	17	
	Band of green silty SANDSTONE	0'-6"	63'-0"	18	
	Very hard red CLAY with boulders	5'-6"	63'-6"	19	150 blows/5" (initial)
6½ hrs	Hard red-brown & green marly CLAY.	5'-6" +	69'-0"	20	132 blows/6" (initial)
Chiselling	Note: With borehole drilled & cased to 35'-0" depth, water stood at 18'-0" B.G.L.		74'-6"	21	U4 failed
				22	200 blows/3" (initial) BOREHOLE COMPLETE

BOREHOLE SCALE : 1" = 5' • : DISTURBED SAMPLE ▮ : UNDISTURBED SAMPLE + STANDARD PENETRATION TEST

SJ 57 NW / 53

HOLST & CO. LTD.

SITE INVESTIGATION DEPT.

PARKSIDE LANE

LEEDS LS11 5SX.

52039 79968

Contract No. M2666/F1321 Borehole No. 765

Location Rocksavage Works Ground Level

Client I.C.I. Ltd. Date

BOREHOLE LOG

STRATA	Legend	Depth below Ground Level	Thickness of Strata	Type of Sample	c lb/sq. ft.	ø deg.	m.c %	y lb/cu. ft.	N
Made ground: Stone and rubble		2'0"	2'0"						
Weathered red brown sandstone		4'9"	2'9"						
Hard red sandstone		5'0"	3"						

Water Struck at 6" Maximum Observed Water Level Ground level

Undisturbed Sample []
Disturbed Sample o
Water Sample Δ
Penetration Test I

c = Cohesion
ø = Angle of Internal Friction
m.c = Moisture Content
y = Bulk Density
N = Standard Penetration Value

Water levels are subject to seasonal or tidal variation and should not be taken as constant

British Geological Survey

SS 57 NW/57

HOLST & CO. LTD.

SITE INVESTIGATION DEPT.

PARKSIDE LANE

LEEDS LS11 5SX.

52043 79946

Contract No. M2666/F1321 Borehole No. 769

Location Rocksavage Works Ground Level

Client I.C.I. Limited Date

BOREHOLE LOG

STRATA	Legend	Depth below Ground Level	Thickness of Strata	Type of Sample	c lb/sq. ft.	ø deg.	m.c %	y lb/cu. ft.	N
Made ground; stone		9"	9"						
Made ground: ash and black silt			4'9"						
		5'6"							
Soft brown sandy clay with sandstone fragements		6'6"	1'0"						
Brown sandstone		6'9"	3"						

Water Struck at 3" Maximum Observed Water Level Ground level

Undisturbed Sample []
Disturbed Sample o
Water Sample Δ
Penetration Test I

c = Cohesion
ø = Angle of Internal Friction
m.c = Moisture Content
y = Bulk Density
N = Standard Penetration Value

Water levels are subject to seasonal or tidal variation and should not be taken as constant

British Geological Survey

SJ57NW/124

STRATA SURVEYS LIMITED

Client: InterGen
Location Rocksavage Works

MACHINE EXCAVATED TRIAL PIT SJ57NW

Project Ref: 9207 7220 Job No. 8612 Ground Level 32.5 (m AOD) Co-ordinates E N

Trial Pit No. 124 . TP12

Field Records Samples Cohesion(kN/m2)	Depth (m)	Type & No.	DESCRIPTION OF STRATA	Reduced Level m AOD	Strata Legend	Depth (Thickness) m
	0.10	D 1	Hard grey/reddish brown highly weathered MARL			
	0.50	D 2				
	1.00	D 3				(2.10)
	2.10	D 4				
			Trial Pit Complete	30.400		2.10

Scale 1:50

Trial Pit excavated using a mechanical excavator.

Remarks
1) No progress below 2.10m due to rockhead.
2) No groundwater encountered during excavation.
3) Sides of pit stable.

Plan

		DATE
Logged By	G.L.	
Checked By:	31-01-96	
Approved By:		
FIG No.		

British Geological Survey

SJ 58 SW 53
512 817

GROUND TESTS LTD.

RECORD OF ~~BOREHOLE~~/TRIAL HOLE NO....4....

SITE ...RUNCORN A.T.E.....

JOB REF. NO. SE5/5662

GROUND LEVEL 37.82m...O.D./~~A.O.D.~~

METHOD/SIZE ...hand ... 1m square

DATE .....8.1.73.....

Scale 1 : 50 metric

DESCRIPTION OF STRATA	Depth m	SAMPLES UA/1%	SPT	DIST.	BULK	Water	SYMBOL	INTERFACE LEVEL m	N
0 to 0.13m Turf and organic soil.								37.69	
0.13 to 0.49m Compact soil, cinder, brick, stone, and clay FILL.								37.33	
0.49 to 0.75m Stiff lightbrown/red streaked moist SILTY semi plastic slightly sandy CLAY.								37.07	
0.75 to 0.79m Stiff reddish brown with grey specks, semi plastic CLAY, with pieces of sandstone.								37.03	
0.79 to 0.83m Hard reddish brown and grey SANDSTONE with clay in fissures and joints. Platy pieces approx. 8mm thick.								36.99	
Trial hole terminated at 0.83m, unable to penetrate with hand auger.									

WATER STRUCK AT DEPTHS	DEPTH OF CASING WHEN SEALED N.S.–NOT SEALED	ESTIMATED FLOW	WATER ADDED AT DEPTHS TO ASSIST BORING	WATER LEVEL IN CASED/UNCASED BOREHOLE ON COMPLETION		
				DATE	WATER LEVEL	DEPTH OF CASING
1. none	–	–	–	8.1.73	none	–
2.						
3.						

British Geological Survey

BGS ID: 16116743 : BGS Reference: SJ58SW1227
British National Grid (27700) : 351969,380348

Report an issue with this borehole

LOCATION : Rapid Transit

GROUND LEVEL: 219.3 DIA. OF CASING : 6 INS. TO FT.

INCLINATION : Vertical INS. TO FT.

SCALE OF LOG : 1" = 4' SHEET 1 OF 1

TYPE OF BORING: Shell and auger

Daily Progress	Reduced Level	Depth ft.	Legend	Sampling Type	Sampling Depth	Nat. m %	Description and Remarks, including Water Observations.	Key to Laboratory Tests
	218.3	1.0					TOPSOIL - black, sandy, fibrous	
				D U4	2.0	14	MARL - red/grey, weathered	
				D	4.0	17		
				U4	5.0			
				D	6.0	15		
4.3.70.				D	8.0	18		
				D S(0)*	10.0	12		
				D	12.0	20		
				S(6)*	13.0	12		
				D	14.0	11		
	202.8	16.5		S(5)*	16.0	7		
							Bottom of borehole	

~~CONTINUED~~

U(4) = 4" Dia. Undisturbed Sample
D = Disturbed Sample
△ = Water Sample
S( ) = Standard Penetration Test
C( ) = Cone Penetration Test
Figures in Brackets Indicate No. of Blows
* Indicates Penetration in ins. for 50 Blows
V = Vane Test

TX = Triaxial Test
CV = Consolidation Test
I = Index Test
O = Compaction Test
Ch = Chemical Test

Borehole No.4

PROJECT: RUNCORN NEW TOWN
LOCATION: Expressway CE56
GROUND LEVEL: 193.6 DIA. OF CASING: 6 INS. TO FT.
INCLINATION: Vertical INS. TO FT.
SCALE OF LOG: 1" = 4' SHEET 1 OF 1

TYPE OF BORING: Shell and auger

Daily Progress	Reduced Level	Depth ft.	Legend	Sampling Type	Sampling Depth	Nat. m %	Description and Remarks, Including Water Observations.	Key to Laboratory Tests
7.2.1969	192.6	1.0		D	1.0	21	TOPSOIL - Black, sandy, fibrous	
				U4	2.0		CLAY - Firm, brown, sandy, stoney	
	190.6	3.0					MARL - Brown, weathered	
				D	4.0	22		
				U4	5.0			
				D	7.0	22		
				D	8.0	19		
				D	9.0	20		
				U4	10.0			
8.2.1969				D	12.0	20		
	179.6	14.0		D	14.0	22		
				U4	15.0		Hard, brown	
	177.1	16.5					Bottom of borehole	

CONTINUED

U(4) = 4" Dia. Undisturbed Sample
D = Disturbed Sample
Δ = Water Sample
S( ) = Standard Penetration Test
C( ) = Cone Penetration Test

TX = Triaxial Test
CV = Consolidation Test
I = Index Test
O = Compaction Test

Version 2.0.6.7

BGS ID: 17095661 : BGS Reference: SJ58SW2220

British National Grid (27700) : 351410,380320

Report an issue with this borehole

<< < Prev Page 1 of 5 Next > >>

PROJECT : RUNCORN NEW TOWN
LOCATION : Expressway CE56
GROUND LEVEL: 171.6 DIA. OF CASING : 6 INS. TO FT
INCLINATION : Vertical INS. TO FT
SCALE OF LOG: 1" = 4' SHEET 1 OF 1

TYPE OF BORING: Shell and auger

Daily Progress	Reduced Level	Depth ft.	Legend	Sampling Type	Sampling Depth	Nat. m %	Description and Remarks, including Water Observations.	Key to Laboratory Tests
28.2.1969	170.6	1.0		D U4	2.0	25	TOPSOIL - Black, sandy, fibrous CLAY - Soft, brown, sandy	
	168.1	3.5		D D U4	3.5 5.0	20 21 18	MARL - Grey brown, weathered	
	165.1 164.6	6.5 7.0		D	6.5	21	Brown, hard Bottom of borehole	

CONTINUED

U(4) = 4" Dia. Undisturbed Sample
D = Disturbed Sample
△ = Water Sample
S( ) = Standard Penetration Test
C( ) = Cone Penetration Test

TX = Triaxial Test
CV = Consolidation Test
I = Index Test
O = Compaction Test
Ch = Chemical Test

Version 2.0.6.7

BGS ID: 17095667 : BGS Reference: SJ58SW2226

British National Grid (27700) : 351490,380350

Report an issue with this borehole

<< < Prev Page 1 of 5 Next > >>

PROJECT: RUNCORN NEW TOWN

LOCATION: Expressway CE56.

GROUND LEVEL: 189.5

INCLINATION: Vertical

SCALE OF LOG: 1" = 4'

DIA. OF CASING: 6 INS. TO FT

INS. TO FT

SHEET 1 OF 1

TYPE OF BORING: Shell and auger

Daily Progress	Reduced Level	Depth ft.	Legend	Sampling Type	Sampling Depth	Nat. m %	Description and Remarks, including Water Observations.	Key to Laboratory Tests
	189.0	0.5					TOPSOIL- Black, sandy, fibrous	
				D			MARL - Brown, weathered	
				U4	2.0	23	LL PL PI 39 20 19.	
				D	4.0	19		
				D	5.0			
5.6.1969				D	6.5	18		
				D	8.0	14		
	180.5	9.0					Brown unweathered	
				C(0.25)	10.0	1		
	178.5	11.0					Bottom of borehole	

CONTINUED

U(4) = 4" Dia. Undisturbed Sample
D = Disturbed Sample
Δ = Water Sample
S( ) = Standard Penetration Test
C( ) = Cone Penetration Test

TX = Triaxial Test
CV = Consolidation Test
I = Index Test
O = Compaction Test
Ch = Chemical Test

BGS ID: 17101882 : BGS Reference: SJ58SW2538

British National Grid (27700) : 352313,380047

Report an issue with this borehole

PROJECT: RUNCORN NEW TOWN

LOCATION: Expressway 8 Borrow Pit

GROUND LEVEL: 33.16

INCLINATION: Vertical

SCALE OF LOG: 1:50

DIA. OF CASING: 154 mm. to 3.5 metres

mm. to metres

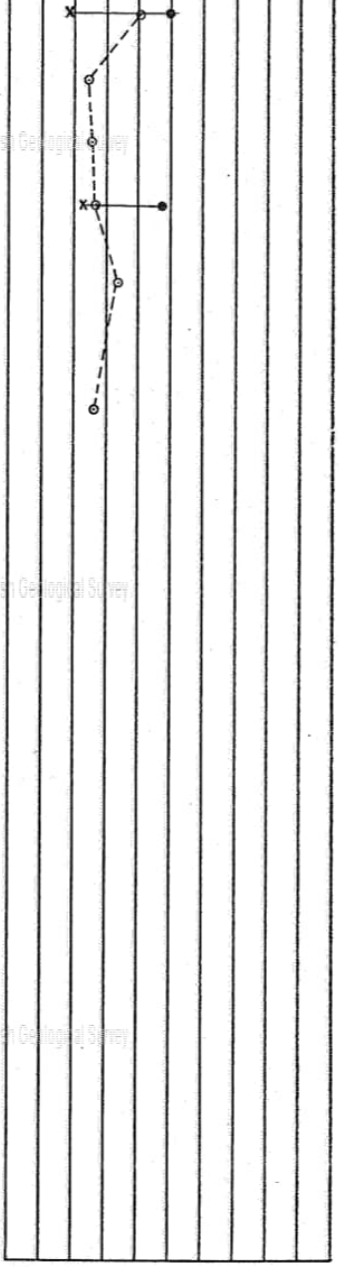
DATE DRILLED: 25.2.71

TYPE OF BORING: Shell and Auger

Reduced Level	Depth m	Legend	Sampling Type	Sampling Depth m	Soil Description	Key to Laboratory Tests
32.86	0.3		D B	0.5	TOPSOIL	
			D U4	1.0	CLAY - firm, brown, very sandy.	
31.66	1.5		D B	1.5		
			D B	2.0	MARL - red and grey, weathered.	
			D S(24)	2.5		
29.66	3.5		S(4.25)	*3.5		
					BOTTOM OF BOREHOLE	

Moisture Content and plot of Atterberg Limits

Percent 10 20 30 40



Ground water encountered at

Quantity

SHEET 1 OF 1

APPENDIX B
BOREHOLE RECORDS FOR SOUTH PIPELINE

For Institute use only

SO 57 NE/2

Geological Classification	Nature of Strata *If measurements start below ground surface, state how far.*	Thickness Feet	Thickness Inches	Thickness Metres	Depth Feet	Depth Inches	Depth Metres
Alluvial Deposits	SANDY CLAY	24			24		
Alluvial Deposits	GRAVEL	12	6		36	6	
Permo-Triassic / Keuper Marl	KEUPER MARL	564	6		601		
Permo-Triassic / Keuper Marl	KEUPER MARL	1499			2100		
Permo-Triassic / Keuper Sandstone	RED SANDSTONE	200			2300		

British Geological Survey

Soil Mechanics

BOREHOLE No.2

Sheet 1 of 4

Equipment & Methods
Cable tool boring, 200mm diameter to 8.20m, 150mm diameter to 12.00m. Rotary core drilling, 74mm diameter with water flush and mylar lining.

Location No. 7703
Location SJ57NE17
A49 WEAVERHAM TO LOWER WHITLEY IMPROVEMENT

Carried out for
Department of Transport

Ground Level
9.02 m A.O.D.

Coordinates
359937.00mE
376085.00mN

Date
12.07.91 to 15.07.91

Description	Reduced Level	Legend	Depth (Thick)	Samples/Tests: Depth	Sample Type	Sample No.	Test	Field Records
TOPSOIL	9.02		(0.30)					
	8.72		0.30					
				0.60	D	1		Inspection pit to 1.30m. (Damp).
Soft to firm orange brown slightly sandy CLAY with occasional dark grey carbonaceous pockets. Below 2.00m, locally sandy. (Alluvial Deposits)				1.00 - 1.45	U	2		35 blows.
				1.50	D	3		
			(2.60)					
				2.00 - 2.45	U	4		25 blows.
Soft brown sandy CLAY with occasional orange brown and dark grey clayey sand pockets and dark grey carbonaceous sandstone gravel, very weak. Organic odour. (Alluvial Deposits).				2.50	D	5		
	6.12		2.90	2.90	D	6		
			(0.40)					
	5.72		3.30	3.00 - 3.45	U	7		15 blows. (wet)
Loose orange brown fine to coarse SAND with occasional clayey pockets, rare fine gravel (Alluvial Deposits).			(0.50)	3.50	D	8		
	5.22		3.80	3.80	W	14		Water entry at 4.00m.
				4.00 - 4.50	B	10		
				4.00 - 4.75	D	9	S N-1	0,0/0,0,1,0 /0,0,0,0
Very loose clayey fine to coarse SAND. (Alluvial Deposits)			(1.90)	4.50 - 5.00	B	11		
				5.00 - 5.75	D	12	S N-3	0,1/0,1,1,1
Some soft to firm grey organic sandy clay pockets.				5.00 - 6.00	B	13		/1,3,2,2
				5.10	W	24		
	3.32		5.70					Water entry at 5.70m.
Very loose becoming loose brown silty fine to coarse SAND, with occasional fibrous timber fragments. (Alluvial Deposits)			(1.60)	6.00 - 6.75			S N-1	0,0/0,1,0,0 /1,0,1,1 no recovery
				6.00 - 7.00	B	15		
				7.00 - 7.50	B	16		
Loose brown clayey subrounded to rounded fine to coarse quartzite GRAVEL, with some sand Below 7.50m, and COBBLES. (Fluvio-glacial Deposits)	1.72		7.30	7.00 - 7.75			S N-5	0,1/0,1,2,2 /2,2/3,3
			(0.70)	7.50 - 8.00	B	17		
Extremely closely fissured.	1.02		8.00	8.10	D	18		
				8.20 - 8.65	U	19		27 blows
Stiff to very stiff red brown slightly sandy CLAY with some fine to coarse mudstone and quartzite gravel. (Glacial Deposits)				8.70	D	20		
			(2.10)					
Very closely fissured.				9.00 - 9.45	U	21		65 blows
				9.50	D	22		

Remarks
1. Hand excavated inspection pit, (1.00*0.80*1.30m dimensions).
2. Falling head permeability test carried out at 7.50m.
3. Water entry at 4.00m. No rise after 20mins.

Cont...

Logged by JAS
Scale 1:50

Notes:
Materials are described in accordance with Appendices. For explanation of symbols and abbreviations see Fig. 1. (c) Soil Mechanics 24.09.91/10.13 (Ver 4.1.27)
All depths and reduced levels in metres. Thicknesses given in brackets in depth column.

Fig. 3

Soil Mechanics

BOREHOLE No. 2

Sheet 2 of 4

Equipment & Methods

As sheet 1

Location No. 7703

Location SJ 57 NE 17

A49 WEAVERHAM TO LOWER WHITLEY IMPROVEMENT

Carried out for

Department of Transport

Ground Level | **Coordinates** | **Date**

As sheet 1

Description	Reduced Level	Legend	Depth (Thick)	Samples/Tests: Depth	Sample Type	Sample No.	Test	Field Records
Stiff CLAY (As sheet 1.)	-1.08	Sand and gravel.	(2.10) 10.10	10.00 - 10.35	U	23		100 blows, Water entry.
				10.40	D	25		
Very dense very sandy subangular to subrounded mudstone and fine to coarse quartzite GRAVEL with some brown clay and occasional cobbles (Fluvio-glacial Deposits)		Some firm clay matrix.	(1.70)	11.00 - 11.45	D	26	S N=74	15,15/16,13,22,23
				11.00 - 11.50	B	27		
				11.50 - 11.80	B	28		12.00m: Sample 29 Type D.
Stiff red brown CLAY with some angular mudstone lithorelicts, very weak to weak and MUDSTONE, weak. (Keuper Marl: Zone 3 and 4a)	-2.78		11.80 (0.30)					
	-3.08		12.10 (0.40)	12.00 - 12.50	W 100	TCR 80	SCR 14	RQD 0	Lf NI 40
Red brown extremely to very closely fractured MUDSTONE, weak to mod.weak. Fractures; Subh.Pl.Ro. (Keuper Marl: Zone 2.)	-3.48		12.50 (1.60)	12.50 - 14.00	100	80	80	7	10 55 110 PLT at 12.71m, (A,D)
Red brown very closely to closely fractured MUDSTONE mod.weak to mod.strong with occ.very closely spaced gypsum laminae and lenses. Fractures; Subh.Pl.Ro. (Keuper Marl: Zone 1.)	-5.08	Sandstone, mod.strong. Sandstone, mod.strong. Sandstone, Mod.strong.	14.10						
			(1.60)	14.00 - 15.50	100	93	93	0	5 30 70 PLT at 14.24m, (A,D). PLT at 15.20m,(A).
Red brown and grey green extremely to very closely fractured thinly to thickly interlaminated MUDSTONE and SILTSTONE, mod. weak to mod.strong with occ. very closely spaced gypsum lenses and laminae. Fractures;Subh.Pl.R. (Keuper Marl: Zone 1.)	-6.68		15.70 (0.85)	15.50 - 16.50	100	98	86	10	NI 35 100 PLT at 16.25m, (A,D).
Grey green extremely to very closely fractured thinly to thinly laminated MUDSTONE, mod weak with occ.very closely spaced siltstone laminae, mod.strong and gypsum lenses and laminae. Fractures; Subh,Pl,Ro (Keuper Marl: Zone 1.)	-7.53		16.55 (0.45p)	16.50 - 17.00	100	92	80	0	NI 10 30
	-7.98		17.00						
Red brown and grey green extremely to very closely fractured thinly to thickly interlaminated MUDSTONE and SILTSTONE, mod.weak to mod.strong. Fractures; Subh.Pl.Ro. (Keuper Marl: Zone 1)									
BOREHOLE ENDS AT 17.00 m.									

Remarks

3. Water entry at 5.70m, rose to 3.80m after 15mins, no further rise.
   Water entry at 10.10m, rose to 8.50m after 5mins and 5.10m after 20mins.
4. Chiselling from 11.30 to 12.00m for 1.50 hours.

Notes:

Materials are described in accordance with Appendices. For explanation of symbols and abbreviations see Fig. 1. (c) Soil Mechanics
All depths and reduced levels in metres. Thicknesses given in brackets in depth column. 24.09.91/10.13 (Ver 4.1.27)

Logged by JAS

Scale 1:50

Fig. 3

Soil Mechanics

BOREHOLE No.8

Sheet 1 of 2

Equipment & Methods
Cable tool boring, 200mm diameter.

Location No. 7703
Location SJ57NE 18
A49 WEAVERHAM TO LOWER WHITLEY IMPROVEMENT

Carried out for
Department of Transport

Ground Level
8.77 m A.O.D.

Coordinates
359991.00mE
376021.50mN

Date
10.07.91 to 10.07.91

Description	Reduced Level	Legend	Depth (Thick)	Samples/Tests: Depth	Sample Type	Sample No.	Test	Field Records
TOPSOIL	8.77		(0.20)					
Firm orange brown sandy CLAY with occasional rootlets. (Alluvial Deposits)	8.57		0.20	0.30	D	1		Inspection pit to 0.50m
			(1.30)					
Firm orange brown slightly sandy CLAY with some dark grey organic pockets. (Alluvial Deposits)	7.27		1.50	1.00 - 1.45	U	2		20 blows.
				1.50	D	3		
Dark grey carbonaceous sandstone gravel, very weak.			(0.50)	1.80	D	4		
	6.77		2.00	2.00 - 2.45	D	5	S N=4	Water entry at 2.00m. 1,-/1,1,1,1
Soft brown slightly sandy CLAY with occ.orange brown clayey sand pockets and dark grey carbonaceous sandstone gravel, very weak and organic odour. (Alluvial Deposits)				2.50	W	6		
			(1.30)	2.80	D	7		
	5.47		3.30	3.00 - 3.45	D	8	S N=2	2,1/-,1,1,- No recovery
Soft grey sandy organic CLAY. (Alluvial Deposits)				3.70	D	9		
			(1.20)					
				4.00 - 4.45			S N=2	1,-/2,-,-,- Damp. No recovery.
	4.27		4.50					
Soft orange brown with occasional grey mottling locally sandy CLAY with occasional green silt pockets. (Alluvial Deposits)			(1.20)	5.00 - 5.45	D	11	S N=7	1,1/2,2,1,2
	3.07		5.70					
Brown clayey subrounded fine to coarse quartzite GRAVEL and COBBLES, strong (Fluvio-glacial Deposits)			(0.70)	5.70 - 6.20	B	12		Water entry at 5.70m
				6.20	W	13	K	
	2.37		6.40	6.40	D	14		
				6.50 - 6.90	U			U100 attempted no recovery after 100 blows.
				6.80	D	15		
				7.00	D	16		
Stiff red brown slightly sandy locally sandy CLAY with a little fine to coarse mudstone and quartzite gravel.				7.10 - 7.55	U	17		69 blows
Extremely closely fissured, Planar to curved and smooth.								
			(3.50)	8.10	D	18		
Below 8.50m, Sandy. (Glacial Deposits)				8.50 - 8.95	D	19	S N=10	1,1/1,1,4,4
Coarse clayey sand.								
				9.40	D	20		
Clayey GRAVEL (As sheet 2.)	-1.13		9.90	10.00	D	21		

Remarks
1. Hand excavated inspection pit (1.00*0.80*0.50m dimensions).
2. Water entry at 2.00m, rose to 1.40m after 20mins.
   Water entry at 5.70m, rose to 3.80m after 20mins.

Logged by JAS

Scale 1:50

Fig. 9

Notes:
Materials are described in accordance with Appendices. For explanation of symbols and abbreviations see Fig. 1. (c) Soil Mechanics
All depths and reduced levels in metres. Thicknesses given in brackets in depth column. 24.09.91/09.31 (Ver 4.1.27)

British Geological Survey

Soil Mechanics

BOREHOLE No.8

Sheet 2 of 2

Equipment & Methods

As sheet 1

Location No. 7703

Location SJ 57 NE 18

A49 WEAVERHAM TO LOWER WHITLEY IMPROVEMENT

Carried out for

Department of Transport

Ground Level | **Coordinates** | **Date**

As sheet 1

Description	Reduced Level	Legend	Depth (Thick)	Samples/Tests: Depth	Sample Type	Sample No.	Test	Field Records
Red brown clayey subrounded fine to coarse quartzite GRAVEL, strong (Fluvio-glacial Deposits)	-1.43		(0.30) 10.20	10.20 - 10.65	D	22	S N=79	4,5/8,8,13,50 for 70mm
			(0.80)					
Stiff red brown mottled grey green locally very silty CLAY with some angular mudstone lithorelicts, v.weak to weak. (Keuper Marl: Zone 3 and 4a)	-2.23		11.00	10.90	D	23		
	-2.43		(0.20p) 11.20	11.00 - 11.20	D	24	S 50	8,22/50 for 70mm
Red brown mottled grey green laminated locally very silty MUDSTONE, weak (Keuper Marl: Zone 2.)								
BOREHOLE ENDS AT 11.20 m.								

Water Level Observations During Boring

Date	Time	Depth of Hole (m)	Depth of Casing (m)	Depth to Water (m)	Remarks
1991					
10.07	-	1.50	1.50	DRY	
10.07	-	2.00	2.00	2.00	Water entry after 20mins.
10.07	-	2.00	2.00	1.40	
10.07	-	4.00	4.00	DAMP	
10.07	-	5.70	5.70	5.70	Water entry after 20mins.
10.07	-	5.70	5.70	3.80	Topped up.
10.07	1800	6.20	5.70	0.30	
11.07	0800	6.20	5.70	0.60	
11.07	-	11.20	10.00	6.90	

Remarks

3. Falling head test at 6.20m.
4. Chiselling from 10.70 to 11.00m for one hour.
5. Backfilled with spoil on completion.

Notes:

Materials are described in accordance with Appendices. For explanation of symbols and abbreviations see Fig. 1. (c) Soil Mechanics
All depths and reduced levels in metres. Thicknesses given in brackets in depth column. 24.09.91/10.18 (Ver 4.1.27)

Logged by JAS

Scale 1:50

Fig. 9

British Geological Survey

SJ66NE130

BeWT

STRATA SURVEYS LIMITED

CABLE PERCUSSION RECORD SHEET

Location Moulton Playing Fields
Job No. 8156-33 Project Ref: 9-00-03-419

Borehole No. BH1
Sheet 1 of 1.

Equipment and methods Light Cable Percussion
Casing Diameter (mm) 150
Casing Depth (m) 3.50

Drilled by T.O'H
Ground level m AOD
Co-ordinates E 6564 N 6968
Date 09-12-95

CASING DEPTH (m)	WATER DEPTH (m)	Field Records	SAMPLES / TESTS Depth (m) from	to	SAMPLE Type & No	SPT N Value	Description	Depth & Thickness (m)	Reduced Level (m AOD)	Strata Legend
							Sandy TOPSOIL	(0.40) 0.40		
			0.60	1.00	B 1		Dark brown fine grained SAND	(0.20) 0.60		
NIL		4,4-6,7,8,8	1.00 1.00	1.45 1.45	SPT 2 S 1	29	Medium dense light brown slightly clayey silty fine to medium grained SAND	(1.50)		
	T1	20 mins 1.50 09-12								
	M1	1.70 09-12								
2.00		1,1-2,3,4,4	2.00	2.45	S 2	13		2.10		
2.40		35	2.50	2.95	U 1		Soft dark brown slightly sandy CLAY	(0.90)		
	T2	20 mins 2.90 09-12						3.00		
	M2	3.00 09-12					Dense brown slightly clayey fine grained SAND	(0.70)		
3.50		2,2-11,13,13,12	3.50	3.95	S 3	49		3.70		
		-(09-12)-					Very stiff dark brown slightly sandy CLAY with occasional fine gravel (Boulder Clay)	(0.30) 4.00		
							Borehole Complete			

Remarks
1) Service pit dug 0.60m x 0.60m x 1.00m.
2) Groundwater struck at 1.70m rising to 1.50m after 20 mins.
3) Groundwater struck at 3.00m rising to 2.90m after 20 mins.
4) Piezometer installed with tip at 3.50m and seal from 1.70m to 2.50m.
5) Water level 2.20m before and 3.08m after installation.
6) Reading 1.91m 20/12

Logged by GL Date 13-12
Checked by
Approved by

Scale 1:50 Field Records Column RHS Blows to drive U100s

FIG No.

British Geological Survey

TM 66 NE 131

BeWT

STRATA SURVEYS LIMITED

CABLE PERCUSSION RECORD SHEET

Location Moulton Playing Fields
Job No. 8156-33 Project Ref: 9-00-03-419

Borehole No. BH2
Sheet 1 of 1.

Equipment and methods Light Cable Percussion
Casing Diameter (mm) 150
Casing Depth (m) 3.60

Drilled by T.O'H
Ground level m AOD
Co-ordinates E 6558 N 6975
Date 11-12-95

CASING DEPTH (m)	WATER DEPTH (m)	Field Records	SAMPLES / TESTS Depth (m) from	to	SAMPLE Type & No	SPT N Value	Description	Depth & Thickness (m)	Reduced Level (m AOD)	Strata Legend
							TOPSOIL	(0.15) 0.15		
			0.50	1.00	B 1		Loose brown slightly clayey fine to medium grained SAND			
NIL		1,2-2,2,2,2	1.00	1.45	S 1	8		(1.75)		
	T1	20 mins 1.30 11-12	1.30	1.30	W 1					
	M1	1.50 11-12								
2.00		50	2.00	2.45	U 1			1.90		
			2.45	2.45	D 1		Firm dark brown sandy CLAY with a little fine gravel and occasional sand bands (Boulder Clay)			
2.90	T2	20 mins 2.95 11-12	2.95	2.95	W 2			(2.15)		
		80	3.00	3.45	U 2					
			3.50	3.50	D 2					
3.60	M2	10,11-12,13,10,11 3.60 11-12	3.60	4.05	S 2	46				
		-(11-12)-					Borehole Complete	4.05		

Remarks
1) Service pit dug 0.50m x 0.50m x 1.00m.
2) Groundwater struck at 1.50m rising to 1.30m.
3) Groundwater struck at 3.60m rising to 2.95m after 20 mins.
4) Piezometer installed with tip at 1.80m and seal from 0.50m to 1.00m.
5) Dry before and water level 1.52m after installation.
6) Reading 0.97m 20/12

Scale 1:50 Field Records Column RHS Blows to drive U100s

Logged by GL Date 13-12
Checked by
Approved by
FIG No.

British Geological Survey

SJ66NE 132

BeWT

STRATA SURVEYS LIMITED

CABLE PERCUSSION RECORD SHEET

Location Moulton Playing Fields
Job No. 8156-33 Project Ref: 9-00-03-419

Borehole No. BH3
Sheet 1 of 1.

Equipment and methods Light Cable Percussion
Casing Diameter (mm) 150
Casing Depth (m) 3.30

Drilled by T.O'H
Ground level m AOD
Co-ordinates E 6555 N 6985
Date 11-12-95

CASING DEPTH (m)	WATER DEPTH (m)	Field Records	SAMPLES / TESTS Depth (m) from	to	SAMPLE Type & No	SPT N Value	Description	Depth & Thickness (m)	Reduced Level (m AOD)	Strata Legend
							Sandy TOPSOIL	(0.35)		
			0.50	0.80	B 1		Light brown clayey fine to medium grained SAND	0.35 (0.40) 0.75		
NIL		30	1.00	1.45	U 1		Firm dark brown CLAY with occasional grey fissures and roots (Boulder Clay)			
			1.50	1.50	D 1					
1.70		70	2.00	2.45	U 2		becoming stiff below 2.00m	(2.15) 2.90		
	T1	20 mins 2.50 11-12	2.50	2.50	D 2					
			2.50	2.50	W 1					
3.20		2,4-6,8,11,10	3.30	3.75	S 1	35	Dense brown clayey fine to coarse grained SAND with occasional fine to medium gravel			
	M1	3.30 11-12	3.50	3.95	B 2			(1.10)		
		-(11-12)-						4.00		
							Borehole Complete			

Remarks
1) Service pit dug 0.50m x 0.50m x 1.00m.
2) Groundwater struck at 3.30m rising to 2.50m after 20 mins.
3) Piezometer installed with tip at 3.50m and seal from 1.50m to 2.50m.
4) Water level 2.50m before and 3.14m after installation.
5) Reading 1.98m 20/12

Scale 1:50 Field Records Column RHS Blows to drive U100s

Logged by	Date
GL	13-12
Checked by	
Approved by	
FIG No.	

British Geological Survey

Soil Mechanics

BOREHOLE No. 4

Sheet 1 of 2

Equipment & Methods Cable tool boring, 200mm diameter.	**Location No.** 7703 **Location** SJ67NW 11 A49 WEAVERHAM TO LOWER WHITLEY IMPROVEMENT	
Carried out for Department of Transport	**Ground Level** 13.57 m A.O.D.	**Coordinates** 360485.00mE 375191.50mN **Date** 11.07.91 to 12.07.91

Description	Reduced Level	Legend	Depth (Thick)	Samples/Tests: Depth	Sample Type	Sample No.	Test	Field Records
TOPSOIL	13.57		(0.20)					
	13.37		0.20	0.20	D	1		Inspection pit to 1.30m
Made ground: Stiff brown sandy CLAY with occasional fine to coarse gravel.	13.17		(0.20)					
	13.02		0.40					
			(0.15)	0.60	D	2		
			0.55					
				1.10	D	3		
Made ground: TARMAC and aggregate GRAVEL (Old Road Base)			(1.55)					
Made ground: Medium dense orange brown silty fine to coarse SAND and fine to coarse GRAVEL.				1.50 - 1.95	D	4	S N=20	2,1/3,3,5,9
	11.47		2.10					
				2.10 - 3.00	B	5		
				3.00 - 3.45	D	6	S N=30	2,4/5,7,8,10
				3.50 - 4.50	B	7		
				4.50 - 4.95	D	8	S N=21	2,2/3,6,6,6
				5.00 - 6.00	B	9		
								Water entry at 6.00m
Medium dense red brown silty, becoming slightly silty by 7.50m, coarse SAND with a trace of gravel. (Fluvio-glacial Deposits)			(8.30)	6.00 - 6.45	D	10	S N=29	2,1/3,7,9,10
				6.50 - 7.50	B	11		
				7.50 - 7.95	D	12	S N=23	2,2/2,3,5,13
				8.00 - 9.00	B	13		
				9.00 - 9.45	D	14	S N=16	3,2/2,4,3,7
				9.60	W	15		
				10.00	D	16		

Remarks

1. Hand excavated inspection pit (1.00*0.80*1.30m dimensions).
2. Water entry at 6.00m, Rose to 5.70m after 20mins.
3. Chiselling from 12.00 to 12.40 for 1 hour and 12.70 to 13.00 for 1 hour

Notes:

Materials are described in accordance with Appendices. For explanation of symbols and abbreviations see Fig. 1. (c) Soil Mechanics
All depths and reduced levels in metres. Thicknesses given in brackets in depth column. 23.09.91/15.37 (Ver 4.1.27)

Logged by: JAS

Scale: 1:50

Fig. 5

British Geological Survey

Soil Mechanics

BOREHOLE No. 4

Sheet 2 of 2

Equipment & Methods

As sheet 1

Location No. 7703

SJ67NW11

Location

A49 WEAVERHAM TO LOWER WHITLEY IMPROVEMENT

Carried out for

Department of Transport

Ground Level | **Coordinates** | **Date**

As sheet 1

Description	Reduced Level	Legend	Depth (Thick)	Samples/Tests: Depth	Sample Type	Sample No.	Test	Field Records
Medium dense SAND (As sheet 1.)			(8.30)					
	3.17		10.40	10.40	D	17		
				10.50 - 10.90	U	18		100 blows
Firm to stiff red brown slightly sandy locally sandy CLAY with some fine to coarse mudstone and quartzite gravel. (Glacial Deposits)			(1.40)					
				11.50	D	19		
	1.77		11.80	11.80 - 12.00	D	20		U100 attempted, 100 blows.
Stiff red brown mottled grey green CLAY with some angular mudstone lithorelicts and mudstone GRAVEL, weak recovered. Probably very thinly interbedded. (Keuper Marl: Zone 3 and 4a)			(1.32 pen)	12.40 - 12.77	D	21	S 87	6,11/13,24,50 for 70mm
				13.00 - 13.12	D	22	S (86)	36,50 for 40mm
BOREHOLE ENDS AT 13.12 m.	0.45		13.12					

Water Level Observations During Boring

Date	Time	Depth of Hole (m)	Depth of Casing (m)	Depth to Water (m)	Remarks
1991					
11.07	1800	3.50	3.00	DRY	
12.07	0800	3.50	3.00	DRY	
12.07	-	5.00	5.00	DRY	
12.07	-	6.00	6.00	6.00	Water entry
12.07	-	6.00	6.00	5.70	
12.07	-	13.12	12.00	8.50	

Remarks

4. Backfilled on completion.

Logged by: JAS

Scale: 1:50

Fig. 5

Notes:

Materials are described in accordance with Appendices. For explanation of symbols and abbreviations see Fig. 1. (c) Soil Mechanics 23.09.91/15.37 (Ver 4.1.27)

All depths and reduced levels in metres. Thicknesses given in brackets in depth column.

British Geological Survey

Soil Mechanics

BOREHOLE No. 5

Sheet 1 of 3

Equipment & Methods
Cable tool boring, 200mm diameter to 14.00m, then rotary core drilling 74mm diameter with water flush and mylar lining.

Location No. 7703
Location SJ67NW12
A49 WEAVERHAM TO LOWER WHITLEY IMPROVEMENT

Carried out for
Department of Transport

Ground Level
9.49 m A.O.D.

Coordinates
360565.50mE
375201.00mN

Date
22.07.91 to 22.07.91

Description	Reduced Level	Legend	Depth (Thick)	Samples/Tests: Depth	Sample Type	Sample No.	Test	Field Records
TOPSOIL	9.49		(0.30)					
	9.19		0.30					
Loose orange brown clayey SAND. (Alluvial Deposits)			(0.70)	0.70	D	1		Inspection pit to 1.00m
	8.49		1.00	1.00 - 1.45	D	2	S N=11	1,2/3,2,3,3
Medium dense				1.00 - 1.50	B	3		
Soft to firm brown very sandy clay.				2.50 - 2.95	U	4		Water entry
				3.00	D	5		15 blows
			(5.00)					
Very loose orange brown locally clayey fine to coarse SAND.				4.00 - 4.75			S N=1	0,0/1,0,0,0 /1,0,1,1 no recovery
(Alluvial Deposits)				4.00 - 5.00	B	6		
				5.00	W	8		
				5.50 - 6.25	D	7	S N=1	0,1/0,0,0,1 /1,3,5,5
	3.49		6.00					Water entry at 6.00m
Medium dense orange brown very sandy subrounded to rounded quartzite GRAVEL with some cobbles (Fluvio-glacial Deposits)				6.30 - 6.75			C N=18	3,4/4,5,4,5
				6.30 - 6.80	B	9		
			(1.80)					
Stiff brown slightly sandy CLAY with some fine to coarse subrounded quartzite and mudstone gravel. (Glacial Deposits)				7.30 - 7.75			C N=42	3,7/8,9,11,14 K: Permeability test.
				7.30 - 7.80	B	10		
	1.69		7.80					
			(0.20)					
	1.49		8.00	8.00	D	11		
				8.20 - 8.65			C N=16	2,2/3,4,4,5
With some gravel.				8.20 - 8.70	B	12		
								K test at 9.00m.
Medium dense silty SAND. (As sheet 2.) (Fluvio-glacial Deposits)			(5.50)					
				9.50 - 9.95	D	13	C N=14	1,2/3,3,4,4
				9.50 - 10.00	B	14		

Remarks
1. Inspection pit (1.00*0.80*1.00m dimensions).
2. Water entry at 2.50m, no rise after 20mins. Water entry at 6.00m, rose to 5.00m after 20mins.

Notes:
Materials are described in accordance with Appendices. For explanation of symbols and abbreviations see Fig. 1. (c) Soil Mechanics
All depths and reduced levels in metres. Thicknesses given in brackets in depth column. 23.09.91/15.53 (Ver 4.1.27)

Logged by JAS
Scale 1:50
Fig. 6

British Geological Survey

Soil Mechanics

BOREHOLE No. 5

Sheet 2 of 3

Equipment & Methods	**Location No.** 7703
As sheet 1	**Location** A49 WEAVERHAM TO LOWER WHITLEY IMPROVEMENT
Carried out for Department of Transport	**Ground Level** — **Coordinates** As sheet 1 — **Date**

SJ67NW12

Description	Reduced Level	Legend	Depth (Thick)	Samples/Tests: Depth	Sample Type	Sample No.	Test	Field Records
				11.00 - 11.45	D	15	S N=17	2,2/3,4,5,5
				11.00 - 11.50	B	16		
Medium dense red brown silty fine to coarse SAND with a trace of fine gravel.			(5.50)					
(Fluvio-glacial Deposits)				12.30 - 12.75	D	17	S N=12	1,2/3,3,3,3
				12.30 - 12.80	B	18		
Stiff red brown slightly sandy clay with some gravel.				12.90	D	19		
Stiff red brown mottled grey green CLAY with some angular mudstone lithorelicts, weak. (Keuper Marl: Zone 4a and 3.)	-4.01		13.50	13.50 - 13.95	D	20	S N=45	2,3/6,8,15,16
			(0.30)	13.60	D	21		
	-4.31		13.80	13.90	D	22		

Description	W	TCR	SCR	RQD	If
Zone of core loss, possibly zone 4/3.					
Grey green laminated extremely to very closely fractured slightly weathered MUDSTONE, moderately weak locally weak with occ. gypsum laminae and lenses. Fractures; Subh.Pl.Sm. (Keuper Marl: Zone 2.)	100	71	51	0	NI 20 50
Mod.strong.					
SubV.IRR.SM.fracture.					
Very closely spaced very thin beds of muddy fine sandstone, mod.strong to strong.	100	100	91	0	
Extremely closely fractured and weak.					
Red brown and green grey very closely fractured thinly to thickly interlaminated MUDSTONE and SILTSTONE, moderately strong with occasional gypsum laminae and lenses. Fractures; Subh.Pl to IRR and Ro.	100	93	93	0	NI 35 70
SubV.IRR.Ro.fracture					
(Keuper Marl: Zone 1.) Very closely spaced thin beds of fine grey sandstone, strong.	100	93	91	0	

	-6.75		16.24	15.50 - 17.00				
			(3.76 pen)	17.00 - 18.50				
				18.50 - 20.00				
BOREHOLE ENDS AT 20.00 m.	-10.51		20.00					

Remarks

3. Falling head permeability tests at 6.90m and 9.00m
4. Chiselling from 6.80 to 7.80m for 2 hours.
5. Backfilled with spoil on completion.

Logged by JAS

Scale 1:50

Notes:
Materials are described in accordance with Appendices. For explanation of symbols and abbreviations see Fig. 1. (c) Soil Mechanics
All depths and reduced levels in metres. Thicknesses given in brackets in depth column. 24.09.91/10.16 (Ver 4.1.27)

Fig. 6

British Geological Survey

Soil Mechanics

BOREHOLE No. 5

Sheet 3 of 3

Equipment & Methods

As sheet 1

Location No. 7703

SJ67NW12

Location

A49 WEAVERHAM TO LOWER WHITLEY IMPROVEMENT

Carried out for

Department of Transport

Ground Level | Coordinates | Date

As sheet 1

Description	Reduced Level	Legend	Depth (Thick)	Drilling Records: Depth	Drilling Records: W	Mechanical core log: TCR	Mechanical core log: SCR	Mechanical core log: RQD	Mechanical core log: If	Field Records and Test Results

Water Level Observations During Boring

Date	Time	Depth of Hole (m)	Depth of Casing (m)	Depth to Water (m)	Remarks
1991					
22.07	-	2.00	2.00	DRY	
22.07	-	2.50	2.50	2.50	Water seepage
22.07	-	2.50	2.50	2.50	No rise after 20mins.
22.07	-	5.00	5.00	DRY	
22.07	-	6.00	6.00	6.00	Water entry
22.07	-	6.00	6.00	5.00	After 20mins topped up below 6.30m
22.07	1800	13.00	13.00	5.00	
23.07	0800	13.00	13.00	2.00	
23.07	-	13.50	13.50	3.00	

Remarks

6. For overdriven SPT's N value given for first 300mm test drive.
   Blows given for all 75mm increments

Logged by

JAS

Scale

1:50

Notes:
Materials are described in accordance with Appendices. For explanation of symbols and abbreviations see Fig. 1. (c) Soil Mechanics
All depths and reduced levels in metres. Thicknesses given in brackets in depth column. 04.10.91/09.57 (Ver 4.1.27)

Fig. 6

British Geological Survey

Soil Mechanics

BOREHOLE No. 6

Sheet 1 of 4

Equipment & Methods
Cable tool boring, 150mm diameter to 14.00m. Then rotary core drilling, 74mm diameter with water flush and mylar linings.

Location No. 7703
SJ67NW 13

Location
A49 WEAVERHAM TO LOWER WHITLEY IMPROVEMENT

Carried out for
Department of Transport

Ground Level
13.99 m A.O.D.

Coordinates
360556.50mE
375135.50mN

Date
17.07.91 to 17.07.91

Description	Reduced Level	Legend	Depth (Thick)	Samples/Tests: Depth	Sample Type	Sample No.	Test	Field Records
TOPSOIL	13.99		(0.10)					
	13.89		0.10					
			(0.30)					
	13.59		0.40					
Made Ground: Tarmac/Hardcore. (Foremans Description)			(0.30)					
	13.29		0.70	0.80	D	1		Inspection pit to 1.50m.
			(0.30)	1.00 - 1.45	D	2	S N=30	3,5/5,8,8,9
	12.99		1.00					
Made Ground: Compacted Limestone Hardcore. (Foremans Description)				1.00 - 1.50	B	3		
Made Ground: Orange brown fine to coarse SAND with occasional quartzite gravel.								
				2.50 - 2.95			C N=20	2,3/4,5,5,6
				2.50 - 3.00	B	4		
Medium dense very sandy subangular to subrounded fine to coarse quartzite and granite GRAVEL with some cobbles			(3.90)					
(Fluvio-glacial Deposits)				4.00 - 4.45			C N=21	3,5/4,6,5,6
				4.00 - 4.50	B	5		
Stiff red brown extremely closely fissured CLAY with a trace of rounded fine quartzite gravel. Fissures; Curved and smooth. (Glacial Deposits)	9.09		4.90					
			(0.40)	5.10	D	6		
	8.69		5.30	5.10 - 5.55	U	7		70 blows
				5.60	D	8		
				6.50 - 6.95	D	9	S N=17	2,2/3,4,5,5
				6.50 - 7.00	B	10		
				7.10	W	15		Water entry.
			(6.60)					
Medium dense red brown fine to coarse SAND with a trace of gravel.				8.00 - 8.45	D	11	S N=13	1,2/2,3,4,4 water entry at 8.00m
				8.00 - 8.50	B	12		
(Fluvio-glacial Deposits)								
				9.50 - 9.95	D	13	S N=16	1,2/3,3,4,6
				9.50 - 10.00	B	14		

Remarks
1. Hand excavated inspection pit (1.00*0.80*1.50m dimensions).
2. Water entry at 8.00m, rose to 7.10m after 20mins.
3. Chiselling from 13.00 to 14.00m for 1.5 hours.

Notes:
Materials are described in accordance with Appendices. For explanation of symbols and abbreviations see Fig. 1. (c) Soil Mechanics 24.09.91/10.17 (Ver 4.1.27)
All depths and reduced levels in metres. Thicknesses given in brackets in depth column.

Logged by JAS
Scale 1:50
Fig. 7

British Geological Survey

Soil Mechanics

BOREHOLE No. 6

Sheet 2 of 4

Equipment & Methods: As sheet 1	Location No. 7703
	Location: A49 WEAVERHAM TO LOWER WHITLEY IMPROVEMENT SJ67NW 13
Carried out for: Department of Transport	Ground Level: As sheet 1 — Coordinates: As sheet 1 — Date:

Description	Reduced Level	Legend	Depth (Thick)	Samples/Tests: Depth	Sample Type	Sample No.	Test	Field Records
Medium dense SAND.(As sheet 1.) (Fluvio-glacial Deposits)			(6.60)	11.00 - 11.45	D	16	S N=17	
				11.00 - 11.50	B	17		2,2/3,4,5,5
Very stiff red brown slightly sandy CLAY with some fine to coarse subrounded quartzite and mudstone gravel and occ. grey green silt. (Glacial Deposits)	2.09		11.90	12.00	D	18		
				12.00 - 12.45	U	19		45 blows
Grey green mudstone gravel, weak to mod.weak			(1.10)	12.50	D	20		
NI and in parts completely weathered to a clay.	0.99		13.00	13.20	D	21		
Stiff grey green mottled red brown CLAY with some angular mudstone lithorelicts, weak and occasional gypsum pockets. (Keuper Marl: Zone 4a/3)			(0.80)	13.50 - 13.94	D	22	S 106	
NI and in parts completely weathered to a clay.	0.19		13.80	14.00	D	23	S (106)	3,8/17,18,21,50 for 70mm
Muddy Sandstone, mod.strong.			(0.70)	W	TCR	SCR	RQD	Is NI 35 70
NI and in parts completely weathered to a clay.	-0.51		14.50					
Green grey laminated extremely closely fractured slightly weathered MUDSTONE, mod. weak locally weak with occ.gypsum lenses. Fractures; Subh.Pl.Ro. (Keuper Marl: Zone 2)			(1.45)	14.00 - 15.50	100	79	63	0 PLT at 14.40 (A and D). NI 20 50
Muddy Sandstone, mod.strong	-1.96		15.95					
Green grey laminated extremely to very closely fractured MUDSTONE, mod.weak with occ.gypsum laminae and lenses. Fractures; Subh.Pl.Ro. (Keuper Marl: Zone 1.)				15.50 - 17.00	100	100	90	9 PLT at 16.11 (A and D).
Highly weathered, very weak.								
Extremely closely spaced Subh.Pl.Ro.Fractures and locally weak to mod.weak				17.00 - 18.50	100	100	98	7 20 40 130 PLT at 18.25m (A and D).
Red brown with occasional green grey mottling very closely fractured thinly to thickly interlaminated MUDSTONE and SILTSTONE, mod.strong with occasional gypsum laminae and lenses. Below 19.10m, with some grey green mottling. Fractures; Subh.Pl.Ro. (Keuper Marl: zone 1.)			(4.05)					
Highly weathered, very weak.				18.50 - 20.00	100	100	100	15 PLT at 18.67m (A and D).
	-6.01		20.00					

Remarks

Logged by: JAS

Scale: 1:50

Notes:
Materials are described in accordance with Appendices. For explanation of symbols and abbreviations see Fig. 1. (c) Soil Mechanics 24.09.91/10.17 (Ver 4.1.27)

Fig. 7

Soil Mechanics

BOREHOLE No. 6

Sheet 3 of 4

Equipment & Methods	**Location No.** 7703
As sheet 1	**Location** A49 WEAVERHAM TO LOWER WHITLEY IMPROVEMENT
Carried out for Department of Transport	**Ground Level** — **Coordinates** As sheet 1 — **Date**

SJ67NW13

Description	Reduced Level	Legend	Depth (Thick)	Drilling Records: Depth	Drilling Records: W	Mechanical core log: TCR	SCR	RQD	If	Field Records and Test Results
Grey green extremely to very closely fractured thinly to thickly interlaminated MUDSTONE and SILTSTONE, moderately strong with occasional gypsum laminae and lenses. Fractures; Subh.Pl.Ro. (Keuper Marl: Zone 1.)		x x x	(2.16)	20.00 - 21.50	100	93	87	0	NI 20 60	PLT at 20.87m (A).
Muddy Sandstone, mod.strong to strong.	-8.17		22.16	21.50 - 23.00	100	100	81	0		PLT at 22.22m (A).
Red brown very closely fractured thinly to thickly interlaminated MUDSTONE and SILTSTONE, moderately strong. Fractures; Subh.Pl.Ro. (Keuper Marl: Zone 1.)		x x x	(1.84 pen)	23.00 - 24.00	100	100	100	20	NI 50 110	PLT at 23.80m (A and D).
Muddy Sandstone, mod.strong to strong.										
Grey Sandstone, strong.										
Grey Sandstone, strong.										
BOREHOLE ENDS AT 24.00 m.	-10.01		24.00							

Water Level Observations During Boring

Date	Time	Depth of Hole (m)	Depth of Casing (m)	Depth to Water (m)	Remarks
1991					
17.07	-	7.00	6.50	DRY	
17.07	-	8.00	8.00	8.00	Water entry.
17.07	-	8.00	8.00	7.10	After 20mins topped up below 9.00m
17.07	1800	12.70	12.00	DRY	
18.07	0800	12.70	12.00	5.60	
18.07	-	13.50	13.50	9.00	
19.07	0800	17.00	14.00	7.50	Rotary core drilling.
19.07	1800	24.00	14.00	7.00	
20.07	0800	24.00	14.00	7.50	

Remarks

Logged by JAS

Scale 1:50

Notes:
Materials are described in accordance with Appendices. For explanation of symbols and abbreviations see Fig. 1. (c) Soil Mechanics
All depths and reduced levels in metres. Thicknesses given in brackets in depth column. 24.09.91/10.17 (Ver 4.1.27)

Fig. 7

British Geological Survey

SJ6019 7510 SJ67/25

(C11982) WL30870/8570 10,000 9/30 A.&E.W.Ltd. Gp.686

Name and Number of Shaft or Bore given by Geological Survey:

Bore or 'Artesian well' at LITTLE LEIGH on the River Weaver

County CHESHIRE

6" Quarter Sheet 33 NE

33 NE 2.

Geological Classification	Description	Thickness			Depth		
	1" map. 97 (Warrington & Runcorn).						
	* Site not given [see next sheet] overleaf.						
	Quoted in Calvert. A.F. Salt in Cheshire' 1915. p. 721. Graphic section.						
Drift	Sand and clay	-	14	0	-	14	0
	Sand, waterworn pebbles and blue clay	-	5	0	-	19	0
?	Indurated red clay	-	20	0		39	0
	Indurated blue clay	-	15	0	-	54	0
Keuper Marl	Red and blue clayey marl	-	20	0	-	74	0
	Red marl	-	8	0	-	82	0
	Blue marl	-	8	0		90	0
	Red marl with gypsum	-	10	0	-	100	0
	Blue clay and red marl with bands of gypsum upto ½" thick and very numerous	-	50	0	-	150	0
	At 150ft. weak brine broke in and ran in the borehole above the shaft water 3ft.	-	-	-	-	150	0
	Red and blue marl with a slaty formation, and in the latter fibrous gypsum interbedded	-	38	0	-	188	0
	Red marl	-	3	0	-	191	0
	Slaty marl with fibrous gypsum	-	18	0	-	209	0
	Red marl with fibrous gypsum	-	21	0	-	230	0
	Slaty marl with gypsum	-	9	0	-	239	0
	marl with gypsum	-	6	0	-	245	0
	Slaty marl with gypsum	-	12	0	-	257	0
	marl with gypsum	-	12	0	-	269	0
	Slaty marl with gypsum	-	6	0	-	275	0
	Red and blue marl with gypsum	-	6	0	-	281	0
	Two cavities were met with here one above the other about 6" diameter. Brine was in the well to overflowing and the last strength because [illegible] remove	-			-	281	0
	marl with gypsum	-	9	0	-	290	0
	Slaty marl: very much gypsum	-	3	0	-	293	0
	marl with gypsum	-	12	0	-	305	0
	Salty marl with gypsum	-	9	0	-	314	0
	Salty blue indurated clay and gypsum	-	6	0	-	320	0
	marl and gypsum	-	12	0	-	332	0
	Slaty formation with gypsum	-	6	0	-	338	0
	Very salty blue indurated clay	-	6	0	-	344	0
	Very firm marl	-	9	0	-	353	0
	Slaty marl, very little gypsum	-	6	0	-	359	0
	Salty slaty marl	-	9	0	-	368	0
	marl with gypsum	-	24	0	-	392	0
	marl with copious gypsum	-	12	0	-	404	0
	Slaty formation	-	6	0	-	410	0
	Salty slaty marl and gypsum	-	9	0		419	0
	Here met a hard vein which took 24 hours to break through						
	Trace of marl, much gypsum fall back line	-	12	0		431	0

British Geological Survey

[redacted]

SJ67/25

(1)1928 Wt.30070/8070 10,000 9/33 A.& E.W.Ltd. Gp.665

Name and Number of Shaft or Bore given by Geological Survey: 33 NE/2

County

6" Quarter Sheet

Geological Classification	Description	Thickness			Depth		
	Slaty, with traces of marl, flaky & gypsum	-	6	0	-	437	0
	Slaty, copious gypsum	-	11	0	-	448	0
	Marl, gypsum	-	2	0	-	450	0

According to Messrs Jones mins the site of this bore is alongside the Inn on the north eastern side of Acton Bridge and in Little Leigh Parish

"Leigh Arms" Acton Bridge

1" map. 97 (Runcorn)
6" map Cheshire 33NE.
Surface about 50ft. O. D.

British Geological Survey

[redacted]

Norwest Holst Soil Engineering Ltd.

Borehole No. **55**

BOREHOLE LOG

Contract No. F9349
Location Warburton to Audley Pipeline
Client British Gas plc
Method of Boring Cable Percussion
Diameter of Borehole 150mm

SJ67SE/188

Sheet 1 of 1
Co-ords 69833E 70667N
Ground Level 36.00 m.A.O.D.
Date 13/11/91

Description of Strata	Legend	Depth Below G.L.(m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	"N"/ R.Q.D.%	Daily Progress
TOPSOIL.		0.30	35.70				
MADE GROUND:		0.70	35.30				
Soft to firm reddish brown very silty very sandy CLAY with occasional fine to medium rounded gravel. ...1.30m: with grey rootlet traces. ...below 2.30m: Interlaminated with silty fine sand. ...below 2.50m: becoming firm to stiff		3.50	32.50		0.80-1.25 (28) 1.30 1.80-2.25 (34) 2.30 2.80-3.25 (50) 3.30 3.50		
Medium dense reddish brown very silty medium SAND with some bands of reddish brown slightly gravelly clay.		4.50	31.50		3.80-4.30 3.80-4.25 s	"30"	
Very stiff brown very silty very sandy CLAY with some to much rounded gravel.					4.80-5.25 (80) 5.30 6.00-6.25 (100) NR 6.30-6.80 6.30-6.75 s 7.00 7.50-7.86 s	"150" 114 for 210mm	
Borehole complete at 8.00m.		8.00	28.00				

Type of Sample

Is	S.P.T.	■	Undisturbed
Ic	C.P.T.	x	Vane
0	Jar	△	Water
●	Bulk		Piezometer

Remarks (Observations of Ground Water etc.) ( ) U100 blows

Slight seepage below 2.70m.
Water struck at 3.50m, casing to 3.00m, rising to 2.70m after 20 minutes standing.
Water sealed 4.80m.
Final standing water level 2.70m.

British Geological Survey

SJ67SW 45

BB DRILLING LTD.

BORING METHOD(S): CABLE PERCUSSION
MACHINE(S): PILCON 1500
BORE HOLE NO.: VR1
SHEET NO.: 2 of 2
CASING: 200mm

CONTRACT: WEAVER NAVIGATION (VALEROYAL WEIR)

DAILY PROGRESS			SAMPLES AND INSITU TESTS		GROUND LEVEL A.O.D.			DESCRIPTION OF STRATA
Date	Casing Depth	Ground Water	Levels	Type	Legend	Depth	OD Level	
27/3/87	Cont.		8.00-8.45	B		8.00		Firm, reddish brown, silty CLAY with abundant fine angular friable mudstone gravel.
				N(11)				
			8.50-8.95	U(95)				
						8.70		(Probably completely weathered Marl, Residual Soil)?
			9.05	J				
			9.10-9.50	B				Stiff to very stiff reddish brown silty CLAY with abundant fine to coarse angular friable mudstone gravel. (Probably completely weathered Marl, Residual Soil)?
						9.50		
			9.65-10.10	U(170)				
			10.20	J				
10.50	10.50	DRY	10.35-10.42	N(50)*		10.50		Reddish brown, highly weathered, MUDSTONE. Very weak. (Probably Marl)?
								End of Borehole.
								(Piezometer installed, tip at 6.70mBGL).

REMARKS

Instructed by client to pull off at 10.50mBGL.
* Blows for 70mm penetration.

Key: U = Undisturbed Sample. B = Bulk (disturbed) sample. W = Ground Water Sample. J = Small (disturbed) Sample. ▽ = Water first met. N = S/CPT 'N' values.

REPORT NO. 52236J

British Geological Survey

British Geological Survey

BGS ID: 717044 : BGS Reference: SJ67SW46
British National Grid (27700) : 364100,370100
Report an issue with this borehole

SJ67SW46

BB DRILLING LTD.

BORING METHOD(S): CABLE PERCUSSION
MACHINE(S): PILCON 1500
BORE HOLE NO.: VR2
SHEET NO.: 1 of 2
CONTRACT: WEAVER NAVIGATION (VALEROYAL WEIR)
CASING: 200mm

DAILY PROGRESS			SAMPLES AND INSITU TESTS		GROUND LEVEL A.O.D.			DESCRIPTION OF STRATA
Date	Casing Depth	Ground Water	Levels	Type	Legend	Depth	OD Level	
26/3/87						0.30		Topsoil (Drillers description).
			0.40–0.85	J				Very soft to soft, dark brown, very fine to medium sandy, silty, CLAY.
				N(3)				
			0.85–1.30	J				
				N(4)				
			1.35–1.80	B		1.35		
			1.90–2.35	U(20)				Soft reddish brown silty CLAY with some fine sub angular gravel.
			2.45	J				
			2.85	J				Sandy at 2.85mBGL.
			3.00–3.45	U(15)				
			3.55	J		3.55		
			3.60–4.00	B				Soft, mottled grey to brown, slightly sandy, silty CLAY. Rare fine angular gravel. Some organic content.
			4.10–4.55	U(15)				
			4.65	J				
			4.75–5.05	B		4.75		
			5.05–5.50	U(18)				Soft, red-brown, slightly fine sandy, silty CLAY occasional fine angular gravel.
						5.40		
	5.40	▽	5.60	J				Very loose light reddish brown silty clayey fine to medium SAND.
			5.90–6.50	J				
				N(12)*				
			6.50–6.95	B		6.50		
				N(4)				Soft dark brown sandy silty CLAY.
			7.60–8.00	B,Ø		7.60		Soft dark, greyish brown, silty very fine sandy CLAY, with some fine to coarse angular gravel.
						7.90		As sheet 2 of 2

REMARKS

* Blows for 600mm penetration
Groundwater struck at 5.40mBGL and rose to 3.70m in 10 minutes.
Chiselling from 10.10m to 11.00mBGL took 2¾ hours.

Key: U = Undisturbed Sample. B = Bulk (disturbed) sample. W = Ground Water Sample. J = Small (disturbed) Sample. ▽ = Water first met. N = S/CPT 'N' values.

REPORT NO. 52236J

British Geological Survey

British Geological Survey

BGS ID: 717044 : BGS Reference: SJ67SW46
British National Grid (27700) : 364100,370100

Report an issue with this borehole

SJ67SW 546

BB DRILLING LTD.

BORING METHOD(S): CABLE PERCUSSION
MACHINE(S): PILCON 1500
BORE HOLE NO.: VR2
SHEET NO.: 2 of 2
CONTRACT: WEAVER NAVIGATION (VALEROYAL WEIR)
CASING: 200mm

DAILY PROGRESS			SAMPLES AND INSITU TESTS		GROUND LEVEL A.O.D.			DESCRIPTION OF STRATA
Date	Casing Depth	Ground Water	Levels	Type	Legend	Depth	OD Level	
6/3/87	cont.		8.25	J				Loose dark greyish brown, clayey medium to coarse SAND with abundant fine to medium sub angular to subrounded gravel.
			8.30-8.75	U(50)		8.30		
			8.85	J				Stiff, red, silty, CLAY with abundant fine angular mudstone gravel. (Probably completely weathered Marl, Residual Soil)?
			8.90-9.20	B				
			9.30-9.75	U(100)				
			9.85	J				
						10.10		
			10.40-10.50	J				Red, highly weathered, MUDSTONE. Very weak.
				N(50)*				
			10.50-11.00	B				(Probably Marl)?
11.00						11.00		
								End of Borehole. (Piezometer installed with tip at 6.00mBGL).

REMARKS
* Blows for 100mm penetration.

Key: U = Undisturbed Sample. B = Bulk (disturbed) sample. W = Ground Water Sample. J = Small (disturbed) Sample. ▽ = Water first met. N = S/CPT 'N' values.

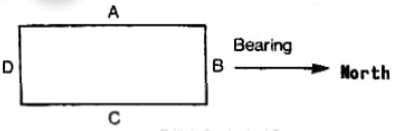
REPORT NO. 52236J

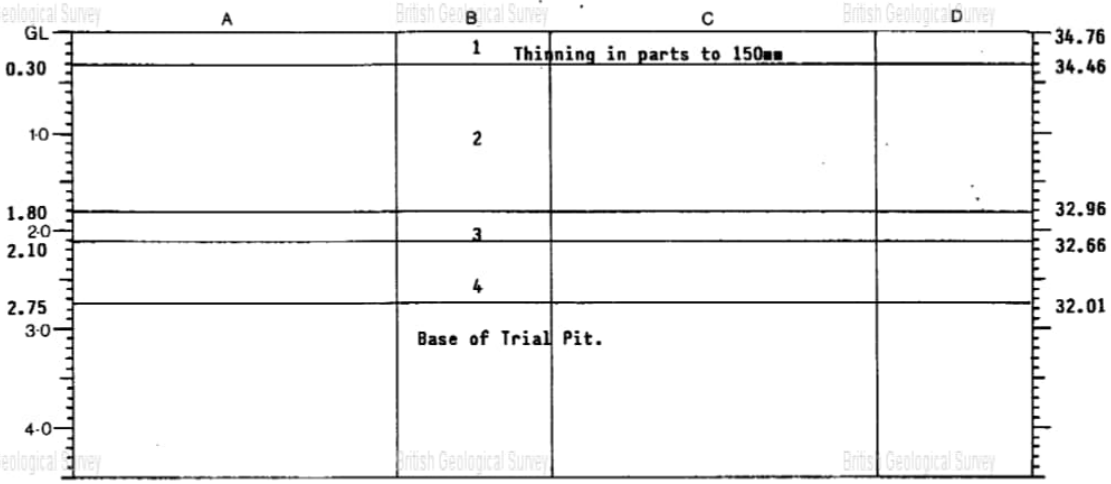
British Geological Survey

SJ67SW 67 6063 1480

Date 18.10.88 Pit 4.70 x 1.00 x 2.75m deep

Level 34.76 m AOD





Samples Depth	Type	Strata No.	Description	Test Depth m.	Cu kN/m²	Remarks
		1	Brown and dark brown silty sandy CLAY - TOPSOIL with some pockets of buff brown fine to coarse sand at base.			
0.50 1.50	B	2	Firm to stiff red brown and grey mottled silty very sandy fissured CLAY with some fine to coarse gravel. Occasional yellow fine to coarse sand pockets. Several red brown fine to coarse sand pockets from 1.00m up to 250mm.	0.80 0.90 1.40 1.60	52 65 27 81	
1.50 2.00	B	3	Red orange brown fine to coarse SAND with some red brown and grey clay lenses. Some grey staining.			
2.00 2.50	B	4	Very stiff red brown and brown silty sandy fine to coarse gravelly CLAY. Occasional cobbles and boulders up to 250mm and dark grey green fine to coarse sand pockets. (Weathered cobbles).	2.00		Not possible to push vane in.

Plant	JCB 3CX	Water	Slight seepage in sand from 1.80-2.10m.
Shored to	Nil	Stability	Slight sand run in with water. Sides stable.

Cu - Approximate value of undrained shear strength from hand vane

Trial Pit Record

Exploration associates

Project Department of Transport
A49 Weaverham Diversion

Contract E8343

Trial Pit 61 (1 of 1)

EX 19

SJ67SW / 118

STRATA SURVEYS LTD.,
Telephone: 0606 834637 Fax: 0606 836657

Borehole Number : 12
Sheet 1 of 1.

Job Number : 6999 Location : Ashbank Farm, Sandiway
Client : Gandy and Son

Dia. & Drilling Methods
light cable percussion
150mm diameter

Description of Strata	Red. Level	Legend	Thick -ness	Depth m	Sample Depths	Sample Types	N Value	Cu	ø	Water Level	Piezo -meter	Daily Prog.
Grass over TOPSOIL.	481.55		(0.50)	0.00								
Soft brown PEAT.	481.05		(2.00)	0.50						Isl 20 mins		
Dark brown/grey wet silty fine to medium SAND.	479.05		(2.50)	2.50	2.50 - 3.70	B 1				▼ Med		AWS
					4.00 - 4.70	B 2						
Borehole Completed	476.55			5.00								11/5

General Remarks :
Water strike @ 2.9m rising to 1.6m in 20 minutes.
Temporary standing level at end of shift at 1.6m.

Dates : 11th May 93
Driller : LB
Engineer: MJR

Coordinates :

British Geological Survey

SJ67SW/128

STRATA SURVEYS LTD.,
Telephone: 0606 834637 Fax: 0606 836657

Borehole Number : 22
Sheet 1 of 1.

Job Number : 6999 Location : Ashbank Farm, Sandiway
Client : Gandy and Son

Dia. & Drilling Methods
light cable percussion
150mm diameter

Description of Strata	Red. Level	Legend	Thick -ness	Depth m	Sample Depths	Sample Types	N Value	Cu	ø	Water Level	Piezo -meter	Daily Prog.
	480.50			0.00								
TOPSOIL.			(0.30)									
	480.20			0.30								
Soft black/brown sandy PEAT.			(1.50)		0.50 - 1.00	B 1						
	478.70			1.80						▼ No rise (1s) pm 7/5		AMS
Brown wet silty fine to coarse SAND with some fine to medium gravel.			(2.20)		2.00 - 2.50	B 2						
					3.50 - 4.00	B 3						
	476.50			4.00								7/5
Borehole Completed												

General Remarks :
Water strike 1.8m with no rise after 20 minutes.
Temporary standing level at 1.8m (pm 7/5).

Dates : 7th may 93
Driller : MC
Engineer: MJR

Coordinates :

British Geological Survey

SJ67SW/134

STRATA SURVEYS LTD.,
Telephone: 0606 834637 Fax: 0606 836657

Borehole Number : 28
Sheet 1 of 3.

Job Number : 6999 Location : Moss Farm, Sandiway
Client : Gandy and Son

Dia. & Drilling Methods
light cable percussion
150mm diameter

Description of Strata	Red. Level	Legend	Thick -ness	Depth m	Sample Depths	Sample Types	N Value	Cu	ø	Water Level	Piezo -meter	Daily Prog.
TOPSOIL.			(0.60)	0.00								
Brown dry slightly silty fine SAND.			(3.90)	0.60	0.50 - 1.00	B 1						
					2.00 - 2.50	B 2						
					3.50 - 4.00	B 3						
Brown dry slightly silty fine to coarse SAND.			(1.50)	4.50	5.00 - 5.50	B 4						
Brown dry slightly silty fine to medium SAND.			(0.50)	6.00	6.00 - 6.50	B 5						
Brown dry silty fine to medium with a little coarse SAND.			(8.50)	6.50	7.50 - 8.00	B 6						11/5
					9.00 - 9.50	B 7						
Borehole Continued				10.00								

General Remarks :
Water strike @ 22.7m rising to 22.0m in 20 minutes.
Temporary standing level at 22.0m (pm 12/5).

Dates : 11 and 12th May 93
Driller : MC
Engineer: MJR

Coordinates :

British Geological Survey

SJ67SW/134

STRATA SURVEYS LTD.,
Telephone: 0606 834637 Fax: 0606 836657

Borehole Number : 28
Sheet 2 of 3.

Job Number : 6999 Location : Moss Farm, Sandiway
Client : Gandy and Son

Dia. & Drilling Methods
light cable percussion
150mm diameter

Description of Strata	Red. Level	Legend	Thick -ness	Depth m	Sample Depths	Sample Types	N Value	Cu	ø	Water Level	Piezo -meter	Daily Prog.
Brown dry silty fine to medium with a little coarse SAND.			(8.50)	10.00	10.50 - 11.00	B 8						
					12.00 - 12.50	B 9						
					13.50 - 14.00	B 10						
Reddish brown slightly silty fine to coarse SAND.			(7.30)	15.00	15.00 - 15.50	B 11						
					16.50 - 17.00	B 12						
					18.00 - 18.50	B 13						
					19.50 - 20.00	B 14						
Borehole Continued				20.00								

General Remarks :
Water strike @ 22.7m rising to 22.0m in 20 minutes.
Temporary standing level at 22.0m (pm 12/5).

Dates : 11 and 12th May 93
Driller : MC
Engineer: MJR

Coordinates :

British Geological Survey

SJ67SW/134

STRATA SURVEYS LTD.,
Telephone: 0606 834637 Fax: 0606 836657

Borehole Number : 28
Sheet 3 of 3.

Job Number : 6999 Location : Moss Farm, Sandiway
Client : Gandy and Son

Dia. & Drilling Methods
light cable percussion
150mm diameter

Description of Strata	Red. Level	Legend	Thick -ness	Depth m	Sample Depths	Sample Types	N Value	Cu	ø	Water Level	Piezo -meter	Daily Prog.
Reddish brown slightly silty fine to coarse SAND.			(7.30)	20.00	19.50 - 20.00	B 14						
					21.00 - 21.50	B 15				Tsl pm 12/5		
Brown silty predominantly fine and medium SAND.			(2.70)	22.30	22.50 - 23.00	B 16				▼ Slow		AWS
					24.00 - 24.50	B 17						
Borehole Completed				25.00								12/5

General Remarks :
Water strike @ 22.7m rising to 22.0m in 20 minutes.
Temporary standing level at 22.0m (pm 12/5).

Dates : 11 and 12th May 93
Driller : MC
Engineer: MJR

Coordinates :

British Geological Survey

SJ67SW/ 135

STRATA SURVEYS LTD.,
Telephone: 0606 834637 Fax: 0606 836657

Borehole Number : 29
Sheet 1 of 2.

Job Number : 6999 Location : Moss Farm, Sandiway
Client : Gandy and Son

Dia. & Drilling Methods
light cable percussion
150mm diameter

Description of Strata	Red. Level	Legend	Thick -ness	Depth m	Sample Depths	Sample Types	N Value	Cu	ø	Water Level	Piezo -meter	Daily Prog.
TOPSOIL.			(0.20)	0.00								
Dark brown sandy TOPSOIL with rootlets.			(0.90)	0.20								
Brown dry slightly silty fine to medium SAND.				1.10	1.00 - 1.50	B 1						
					2.50 - 3.00	B 2						
					4.00 - 4.50	B 3						
			(8.90)		5.50 - 6.00	B 4						
					7.00 - 7.50	B 5						11/5
					8.50 - 9.00	B 6						
Borehole Continued				10.00								

General Remarks :
Water strike @ 17.2m rising to 17.1m in 20 minutes.
Temporary standing level at 17.40m (pm 12/5)

Dates : 11 and 12 May 93
Driller : T OH
Engineer: MJR

Coordinates :

British Geological Survey

SJ67SW 135

STRATA SURVEYS LTD.,
Telephone: 0606 834637 Fax: 0606 836657

Borehole Number : 29
Sheet 2 of 2.

Job Number : 6999 Location : Moss Farm, Sandiway
Client : Gandy and Son

Dia. & Drilling Methods
light cable percussion
150mm diameter

Description of Strata	Red. Level	Legend	Thick -ness	Depth m	Sample Depths	Sample Types	N Value	Cu	ø	Water Level	Piezo -meter	Daily Prog.
Reddish brown slightly silty fine to medium SAND.			(7.20)	10.00	10.00 - 10.50	B 7						
					11.50 - 12.00	B 8						
					13.00 - 13.50	B 9						
					14.50 - 15.00	B 10						
					16.00 - 16.50	B 11						
Reddish brown wet slightly silty fine to medium SAND.			(2.30)	17.20	17.50 - 18.00	B 12				▽ Tal 20 mins ▼ Slow Tal pm 12/5		ANS
					19.00 - 19.50	B 13						
Borehole Completed				19.50								12/5

General Remarks :
Water strike @ 17.2m rising to 17.1m in 20 minutes.
Temporary standing level at 17.40m(pm 12/5)

Dates : 11 and 12 May 93
Driller : T OH
Engineer: MJR

Coordinates :

British Geological Survey

SJ67/108

Borehole Log

ESG

Drilled	DM	Start	22/03/2017
Logged	IJ		
Checked	APB	End	23/03/2017
Approved	APB		

Equipment, Methods and Remarks
Dando 175
Hand dug inspection pit to 1.20m. Cable percussion boring to 13.00m. Terminated upon encountering Lower Boulder Clay. No insitu testing required.
Lockable top cap and standpipe installed (50mm diameter). Cover level = 38.131mAOD.

Depth from (m)	to (m)	Diameter (mm)	Casing Depth (m)
0.00	13.00	200	13.00

Ground Level	37.99 mOD
Coordinates (m)	E 361725.12
National Grid	N 370002.98

Samples and Tests

Depth	Type & No.	Records	Data	Time	Water
1.00	D 1				
2.00	D 2				
3.00	D 3				
4.00	D 4				
5.00	D 5				
6.00	D 6				

Strata Description

Main	Detail	Depth, Level (Thickness)
MADE GROUND: Dark brown slightly gravelly clayey fine to coarse SAND. Gravel is angular to subangular fine to coarse including limestone.		0.10 (0.10) +37.89
Firm brown mottled light brown sandy CLAY. (CHESHIRE BASIN - UPPER BOULDER CLAY)		(1.40)
Brown slightly gravelly slightly silty fine to coarse SAND. Gravel is rounded to subangular fine and medium of mudstone and sandstone. (CHESHIRE BASIN - MIDDLE SANDS)		1.50 +36.49 (6.80)

Legend: Backfill

Groundwater Entries

No.	Depth Strike (m)	Remarks	Depth Sealed (m)

Depth Related Remarks

Depths (m)	Remarks
2.00 - 13.00	Water added to assist borehole stability.

Hard Boring

Depths (m)	Duration (mins)	Tools used

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

(c) ESG www.esg.co.uk 26/04/2017 14:25:17

Project	PETTY POOL (MERES & MOSSES), CHESHIRE
Project No.	F7010-17
Carried out for	Amec Foster Wheeler E&I

Borehole

PP OBH 2017-E

Sheet 1 of 2

Borehole Log

ESG

Drilled	DM	Start	22/03/2017
Logged	IJ		
Checked	APB	End	
Approved	APB		23/03/2017

Equipment, Methods and Remarks

Dando 175
Hand dug inspection pit to 1.20m. Cable percussion boring to 13.00m. Terminated upon encountering Lower Boulder Clay. No insitu testing required.
Lockable top cap and standpipe installed (50mm diameter). Cover level = 38.151mAOD.

Depth from (m)	to (m)	Diameter (mm)	Casing Depth (m)
0.00	13.00	200	13.00

Ground Level	37.99 mOD
Coordinates (m)	E 361725.12
National Grid	N 376002.98

Samples and Tests

Depth	Type & No.	Records	Date Casing	Time Water
11.00	D 7			
			22/03/17 13.00	1600 3.80
			23/03/17 13.00	0830 2.40

Strata Description

Main	Detail	Depth, Level (Thickness)	Legend	Backfill
Brown slightly gravelly slightly silty fine to coarse SAND. Gravel is rounded to subangular fine and medium of mudstone and sandstone. (CHESHIRE BASIN - MIDDLE SANDS)				
Firm brown slightly gravelly sandy CLAY rare with sand lenses. Gravel is angular to subangular fine and medium of mudstone. (CHESHIRE BASIN - LOWER BOULDER CLAY)		10.80 +27.19		
		(2.20)		
END OF EXPLORATORY HOLE		13.00 +24.99		

Groundwater Entries

No.	Depth Strike (m)	Remarks	Depth Sealed (m)

Depth Related Remarks

Depths (m)	Remarks

Hard Boring

Depths (m)	Duration (mins)	Tools used

Notes: For explanation of symbols and abbreviations see Key to Exploratory Hole Records. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

(c) ESG www.esg.co.uk 26/04/2017 14:25:17

AGS

Project	PETTY POOL (MERES & MOSSES), CHESHIRE
Project No.	F7016-17
Carried out for	Amec Foster Wheeler E&I

Borehole

PP OBH 2017-E

Sheet 2 of 2

British Geological Survey

Norwest Holst Soil Engineering Ltd.

Borehole No. **46**

BOREHOLE LOG

Contract No. F9349
Location Warburton to Audley Pipeline
Client British Gas plc
Method of Boring Cable Percussion
Diameter of Borehole 150mm

SJ76NW/127

Sheet 1 of 1
Co-ords 70384E 68679N
Ground Level 35.60 m.A.O.D.
Date 18/11/91

Description of Strata	Legend	Depth Below G.L.(m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	"N"/ R.Q.D.%	Daily Progress
TOPSOIL		0.30	35.30				
Loose brown clayey medium SAND		0.80	34.80		0.50-0.95 s	"8"	
Soft to firm brown slightly silty CLAY with occasional rounded gravel		1.20	34.40		1.20		
					1.50-1.95 (39)		
Stiff brown with blue grey fissures slightly silty CLAY with occasional gravel and some rootlet traces		2.50	33.10		2.20		
					2.50-2.95 (47)		
					3.20		
Firm to stiff reddish brown mottled green silty CLAY with some gravel and occasional thin bands of silt and sand					3.50-3.95 (46)		
					4.20		
					4.50-4.95 (44)		
					5.50		
					6.00-6.45 (38)		
					7.00		
					7.50-7.95 (36)		
Borehole complete at 8.00m		8.00	27.60				

Type of Sample

Is	S.P.T.	■	Undisturbed
Ic	C.P.T.	x	Vane
0	Jar	△	Water
●	Bulk	▮	Piezometer

Remarks (Observations of Ground Water etc.) () U100 blows
Water seepage at Ground level

British Geological Survey

For Institute use only

SO 57 NE/2

Geological Classification	Nature of Strata *If measurements start below ground surface, state how far.*	Thickness Feet	Inches	Metres	Depth Feet	Inches	Metres
Alluvial Deposits.	SANDY CLAY	24			24		
	GRAVEL	12	6		36	6	
Permo-Triassic — Keuper Marl	KEUPER MARL	564	6		601		
	KEUPER MARL	1499			2100		
Keuper Sandstone	RED SANDSTONE	200			2300		

British Geological Survey

Soil Mechanics

BOREHOLE No. 1

Sheet 1 of 4

Equipment & Methods
Cable tool boring, 200mm diameter to 8.50m, then 150mm to 9.00m. Rotary core drilling, 74mm diameter, with water flush and mylar lining.

Location No. 7703
Location SJ57NE16
A49 WEAVERHAM TO LOWER WHITLEY IMPROVEMENT

Carried out for
Department of Transport

Ground Level
8.97 m A.O.D.

Coordinates
359903.00mE
376178.00mN

Date
09.07.91 to 11.07.91

Description	Reduced Level	Legend	Depth (Thick)	Samples/Tests: Depth	Sample Type	Sample No.	Test	Field Records
TOPSOIL	8.97		(0.30)					
	8.67		0.30	0.50	D	1		Inspection pit to 1.30m
Soft to firm orange brown sandy becoming very sandy CLAY with occasional dark grey organic pockets. (Alluvial Deposits)			(1.40)	0.80 - 1.25	U	2		22 blows
				1.30	D	3		
	7.27		1.70	1.70 - 2.15	U	4		22 blows
Loose orange brown locally slightly clayey fine to coarse SAND. Below about 2.50m, with some subrounded quartzite gravel. (Alluvial Deposits)				2.20	D	5		
				2.50	W	8		Water entry at 2.50m
			(1.80)	2.70 - 3.45	D	6	S N-7	1,0/1,1,2,2,2 /2,3,3,3
				2.70 - 3.50	B	7		
Loose to medium dense subrounded to rounded fine to coarse quartzite GRAVEL. with much sand and rare cobbles (Alluvial Deposits)	5.47		3.50	3.70 - 4.15	D	8	S N-10	1,2/2,2,3,3
				3.70 - 4.20	B	9		
			(1.40)					
Stiff extremely closely fissured CLAY with occasional silt pockets. Fissures; planar to curved and smooth. (Glacial Deposits)				4.70 - 5.15			S N-13	2,2/3,3,3,4
soft sandy clay with a little gravel	4.07		4.90	4.70 - 5.20	B	10		
				5.30	D	11		
				5.30 - 5.75	U	12		70 blows
			(1.40)	5.80	D	13		
Very stiff red brown slightly sandy CLAY with some fine to coarse subangular to subrounded gravel occasional cobbles. (Glacial Deposits)	2.67		6.30	6.30 - 6.75	D	14	S N-45	2,3/6,12,18,9
				6.30 - 6.80	B	15		
			(0.60)					
Very stiff red brown slightly sandy CLAY with some fine to coarse subrounded mudstone and quartzite gravel. (Glacial Deposits)	2.07		6.90	7.00	D	16		
			(0.60)	7.20 - 7.65	D	17	S N-24	3,8/7,7,5,5
	1.47		7.50	7.20 - 7.70	B	18		
Stiff red brown mottled grey green locally very silty CLAY with some angular mudstone lithorelicts, very weak to weak. (Keuper Marl: Zone 3/4a)			(1.40)	8.30	D	19		9.00m: Sample 22 Type D.
				8.70 - 9.00	U			U100 attempted no recovery after 80 blows
	0.07		8.90	8.80	D	20		
				8.90	D	21		
MUDSTONE (As sheet 2.) (Keuper Marl: Zone 2.) Muddy sandstone, Mod.strong.			(3.68)	9.00 - 10.50	W 100	TCR 100	SCR 39	RQD 0	If NI NI 25	9.00m, D22 PLT at 9.77m (D). PLT at 9.90m (A).

Remarks
1. Hand excavated inspection pit (1.00*0.80*1.30m dimensions)
2. Water entry at 2.50m, no rise after 20mins.
3. Chiselling from 6.40m to 6.90m for one hour.

Logged by JAS

Scale 1:50

Notes:
Materials are described in accordance with Appendices. For explanation of symbols and abbreviations see Fig. 1. (c) Soil Mechanics
All depths and reduced levels in metres. Thicknesses given in brackets in depth column. 24.09.91/10.08 (Ver 4.1.27)

Fig. 2

Soil Mechanics

BOREHOLE No. 1

Sheet 2 of 4

Equipment & Methods

As sheet 1

Location No. 7703

Location SJ 57 NE 16

A49 WEAVERHAM TO LOWER WHITLEY IMPROVEMENT

Carried out for

Department of Transport

Ground Level | **Coordinates** | **Date**

As sheet 1

Description	Reduced Level	Legend	Depth (Thick)	Drilling Records: Depth	W	Mechanical core log: TCR	SCR	RQD	If	Field Records and Test Results
(A) Completely weathered to stiff red brown clay. Muddy sandstone, mod.strong. Siltstone, mod.weak to mod.strong. Completely weathered to a stiff red brown clay. Completely weathered to a stiff red brown clay. Red brown extremely closely fractured to 9.80m MUDSTONE, weak with occasional gypsum pockets, partings and lenses. Below 9.80m, mod.weak and very closely fractured. Below 11.50m, grey green mottling and thinly to thickly interlaminated with SILTSTONE, Mod.strong. Fractures; Subh.Pl.Ro. (Keuper Marl: Zone 2)				9.00 - 10.50	100	100	39	0		9.00m, D22 PLT at 9.77m (D). PLT at 9.90m (A).
				10.50 - 11.50	100	100	55	10		
			(3.68)						NI 40 100	
				11.50 - 12.00	100	100	98	40		PLT at 11.65m (A,D)
	-3.61		12.58							
Muddy sandstone, mod.strong. Muddy sandstone, mod.strong. Light grey green with much gypsum veining. Some gravel size gypsum pockets. Muddy sandstone, mod.strong. Red brown becoming by 12.74m grey green very closely to closely fractured thinly to thickly interlaminated MUDSTONE and SILTSTONE, mod. strong with occasional extremely to very closely spaced gypsum partings and lenses. Fractures; Subh.Pl Ro. Below 14.15m, red brown and grey green. (Keuper Marl: Zone 1)				12.00 - 13.50	100	95	92	15		PLT at 12.99m (A,D)
			(3.17)	13.50 - 15.00	100	96	93	13	NI 40 200	PLT at 13.75m (A,D). PLT at 14.32 (A)
	-6.78		15.75	15.00 - 16.50	100	99	93	23		PLT at 15.68m (A,D)
Red brown closely fractured laminated MUDSTONE, Moderately weak with occasional gypsum partings and lenses. Fractures; Subh.Pl.Ro (Keuper Marl: Zone 1)			(0.75)						NI 80 250	
	-7.53		16.50							
Sandstone, strong. Sandstone, strong. Sandstone, strong. Sandstone, strong. Grey green and red brown very closely to closely fractured, thinly to thickly interlaminated MUDSTONE and SILTSTONE, mod.strong with occasional closely spaced gypsum laminae and lenses. Fractures; Subh.Pl.Ro. (Keuper Marl: Zone 1) Weak.			(2.80 pen)	16.50 - 18.00	100	90	87	7	NI 55 110	PLT at 16.55m (A) PLT at 17.58m (A)
				18.00 - 19.30	100	98	98	32		PLT at 18.35m (A,D) PLT at 19.16m (A,D)
BOREHOLE ENDS AT 19.30 m.	-10.33		19.30							

Remarks

4. For overdriven SPT's N value given for first 300mm test drive. Blows given for all 75mm increments.

Logged by JAS

Scale 1:50

Fig. 2

Notes:

Materials are described in accordance with Appendices. For explanation of symbols and abbreviations see Fig. 1. (c) Soil Mechanics

All depths and reduced levels in metres. Thicknesses given in brackets in depth column. 04.10.91/09.54 (Ver 4.1.27)

British Geological Survey

Sampling		Properties			Strata SJ67SW 58 60589 74462			
Depth	Type	Cu kPa	w%	SPT N	Description	Depth	Level	Legend
						GL	31.37	
					TOPSOIL**			
0.50-0.95	U(20)					0.50	30.87	
					Soft to firm, red brown, light grey silty CLAY with occasional orange fine to medium sand lenses.			
1.20	D							
1.50-1.95	U(20)		27		Some grey lenses in parts.			
2.20	D							
2.50-2.95	U(40)							
3.20	D							
3.50-3.95	U(40)		23					
4.20	D					4.20	27.17	
4.50-4.95	U(40)				Red brown, poorly laminated, completely weathered grade A silty MUDSTONE. Very weak Becoming highly weathered grade B, and very weak with depth.			
5.20	D							
5.50-5.95	U(120)		17		Locally moderately to highly weathered.			
6.20	D							
6.50-6.95	SDB			73				
7.20	D							
7.50-7.95	SDB			46/25				
8.20	D							
8.50-8.95	SDB			67				
9.20	D							
9.50-9.95	SDB			68				
10.00	D					10.00	21.37	

Drilling

Type	From	To	Size	Fluid
Cable Percussion	GL	11.00	0.15	-

Groundwater

Struck	Behaviour	Sealed	Date	Hole	Cased	Water
5.80	Very slight seepage.		19.10.88	7.00	6.00	Dry
			20.10.88	7.00	6.00	5.00
			20.10.88	11.00	7.50	8.70

Remarks Obstruction 7.00-8.00m, 1.5 hours chiselling. ** Drillers description.
Piezometer installed at 10.40m, filter from 11.00-8.00m.

Borehole Record

Exploration associates

Project Department of Transport
A49 Weaverham Diversion

Contract E8343

Borehole 71 (1 of 2)

British Geological Survey

Sampling		Properties			Strata SJ67SW 58				
Depth	Type	Cu kPa	w%	SPT N	Description	Depth	Level	Legend	
10.20	D				Red brown, poorly laminated, highly weathered grade B, MUDSTONE, very weak to weak, some light grey clay lenses.	10.00	21.37		
10.50-10.95	SD			90					
11.00	D				End of Borehole.	11.00	20.37		

...ling ...	Groundwater										
...e	From	To	Size	Fluid	Struck	Behaviour	Sealed	Date	Hole	Cased	Water

...marks

...hole Record

...oration associates

Project: Department of Transport
A49 Weaverham Diversion

Contract: E8343

Borehole: 71 (2 of 2)

British Geological Survey

SJ67SW 60 60578 74347

Sampling Depth	Type	Properties Cu kPa	w%	SPT N	Strata Description	Depth	Level	Legend
						GL	33.42	
					TOPSOIL**	0.30	33.12	
					Firm to stiff, reddish brown silty sandy CLAY**			
1.50–1.95	U(30)		18					
2.00–2.50	B					1.90	31.52	
					Red brown gravelly silty fine to coarse SAND with occasional cobbles.			
3.00–3.45	SD			5				
						3.20	30.22	
					Red brown with blue grey silty layers, highly weathered grade B, silty MUDSTONE. Very weak to weak.			
4.50–4.95	U(65)	154	35					
5.00	D							
6.00–6.45	U(70)							
6.50	D							
7.50–7.95	U(70)		20					
8.00	D							
8.50–8.95	U(50)	36	22					
9.00	D							
9.50–9.95	U(70)							
10.00	D					10.00	23.42	

Drilling

Type	From	To	Size	Fluid
Cable Percussion	GL	14.00	0.15	–
Rotary Core	14.00	18.50	0.76	Water

Groundwater

Struck	Behaviour	Sealed	Date	Hole	Cased	Water
–	–	–	13.10.88	10.00	10.00	Dry
			14.10.88	10.00	10.00	Dry
			14.10.88	14.00	14.00	Dry

Remarks ** Drillers description.

Borehole Record

Exploration associates

Project
Department of Transport
A49 Weaverham Diversion

Contract
E8343

Borehole 73 (1 of 2)

Sampling		Properties			Strata TQ67SW 60			
Depth	Type	Cu kPa	w%	SPT N	Description	Depth	Level	Legend
10.50-10.95	SD			45	Red brown, highly weathered grade B, silty MUDSTONE, very weak, to weak. Some grey silty layers.	10.00	23.42	
11.50-11.95	U(50)							
12.00	D							
12.50-12.95	SD			96/50				
14.00	D					14.00	19.42	

Drill Run	Fr	Cr	FI	RQD (SCR)	Description	Depth	Level	Legend
	100%	73%	9	29% (53%)	Red brown, fine grained thinly laminated, slightly to moderately weathered grade D to E, silty MUDSTONE, moderately weak to moderately strong. Joints with a little clay, generally sub-horizontal.			
15.50			8					
	100%	90%	13	50% (79%)	Becoming locally grade E from 17.40m.			
			3					
18.50					End of Borehole.	18.50	14.92	

Groundwater

Type	From	To	Size	Fluid	Struck	Behaviour	Sealed	Date	Hole	Cased	Water
								14.10.88	18.50	14.00	Dry

Remarks

Borehole Record

Exploration associates

Project
Department of Transport
A49 Weaverham Diversion

Contract
E8343

Borehole
73 (2 of 2)

SJ67SW/ 131

STRATA SURVEYS LTD.,
Telephone: 0606 834637 Fax: 0606 836657

Borehole Number : 25
Sheet 1 of 2.

Job Number : 6999 Location : Ashbank Farm, Sandiway
Client : Gandy and Son

Dia. & Drilling Methods
light cable percussion
150mm diameter

Description of Strata	Red. Level	Legend	Thick -ness	Depth m	Sample Depths	Sample Types	N Value	Cu	ø	Water Level	Piezo -meter	Daily Prog.
	492.20			0.00								
TOPSOIL.			(0.30)									
	491.90			0.30								
Brown dry slightly silty fine to medium SAND. .. with some fine gravel below 5.0m					0.50 - 1.00	B 1						
					2.00 - 2.50	B 2						
					3.50 - 4.00	B 3						
			(7.70)		5.00 - 5.50	B 4						
					6.50 - 7.00	B 5						
	484.20			8.00	8.00 - 8.50	B 6						7/5
Brown dry slightly silty fine to coarse SAND with some fine to coarse gravel.			(3.50)		9.50 - 10.00	B 7						
Borehole Continued				10.00								

General Remarks :
Water strike @ 11.5m with no rise after 20 minutes.
Temporary standing level at11.50m (pm 10/5).

Dates : 7 and 10th May 93
Driller :
Engineer: MJR

Coordinates :

British Geological Survey

SS67SW/131

STRATA SURVEYS LTD.,
Telephone: 0606 834637 Fax: 0606 836657

Borehole Number : 25
Sheet 2 of 2.

Job Number : 6999 Location : Ashbank Farm, Sandiway
Client : Gandy and Son

Dia. & Drilling Methods
light cable percussion
150mm diameter

Description of Strata	Red. Level	Legend	Thick -ness	Depth m	Sample Depths	Sample Types	N Value	Cu	g	Water Level	Piezo -meter	Daily Prog.
Brown dry slightly silty fine to coarse SAND with some fine to coarse gravel.			(3.50)	10.00	9.50 - 10.00	B 7						
Brown wet slightly silty fine to medium SAND with a little fine gravel.	480.70		(2.00)	11.50	11.50 - 12.00	B 8				▼ Seepage (s) pm 10/5		ANS
					13.00 - 13.50	B 9						
Borehole Completed	478.70			13.50								10/5

General Remarks :
Water strike @ 11.5m with no rise after 20 minutes.
Temporary standing level at11.50m (pm 10/5).

Dates : 7 and 10th May 93
Driller :
Engineer: MJR

Coordinates :

British Geological Survey

SJ67SW 4 US

BB DRILLING LTD.

BORING METHOD(S): CABLE PERCUSSION	BORE HOLE NO.: VR1
MACHINE(S): PILCON 1500	SHEET NO.: 1 of 2
CONTRACT: WEAVER NAVIGATION (VALEROYAL WEIR)	CASING: 200mm

DAILY PROGRESS			SAMPLES AND INSITU TESTS		GROUND LEVEL A.O.D.			DESCRIPTION OF STRATA
Date	Casing Depth	Ground Water	Levels	Type	Legend	Depth	OD Level	
26/3/87						0.10		Topsoil (Drillers description).
			0.35–0.80	J				Coarse to medium dense reddish brown, silty, very fine sandy CLAY.
				N(10)				
			0.80–1.10	B		1.10		
			1.20–1.50	B				Reddish brown, slightly fine sandy, very silty CLAY with abundant fine angular gravel. Some light grey silty clay lenses.
			1.55–2.00	U(20)				
			2.10	J				
			2.50–2.95	U(15)				
			3.05	J				From 3.05mBGL to 3.40mBGL no sand present.
3.40	2.70	DRY				3.40		
27/3/87	2.70	DRY	3.54–3.90	U(15)				
			4.00	J				
			4.10–4.50	B				Very soft, dark brown to black slightly sandy silty, very peaty CLAY. Occasional fine angular gravel with bands of very soft brown and grey mottled slightly sandy silty clay.
			4.55–5.00	U(74)				
			5.10	J				
			5.50–5.90	B,Ø				
	5.70	▽				6.20		
			6.30–6.75	B				Very loose, dark brown, very clayey, medium grained SAND.
			7.00–7.45	B				
			7.60–8.00			7.60		Dark brown, very sandy, very peaty CLAY with abundance of organic debris (roots, twigs etc).
						8.00		

REMARKS Groundwater strke at 6.20mBGL. Rose to 3.50mBGL, in 5 minutes, remaining at 3.50mBGL after another 15 minutes.
Chiselling from 9.50mBGL to 10.50mBGL took 2 hours.
Drillers reports SPT test at 6.20mBGL not possible, as rods were sinking into stratum. They came to rest at 7.20mBGL.

Key: U = Undisturbed Sample. B = Bulk (disturbed) sample. W = Ground Water Sample. J = Small (disturbed) Sample. ▽ = Water first met. N = S/CPT 'N' values.

REPORT NO. 52236J

British Geological Survey

1063 Wt. 22438/0384 10M 7/45 (51) F.&S.

Record of Shaft or Bore for Minerals

(For Survey use only)
1-inch Map Registered No.
5566 NE/8

Name and Number of Shaft or Bore: Newbridge No. 4 (Shaft) Horizontally bore. Moulton Hall.

For Messrs.

Town or Village

County

Six-inch quarter sheet [6577 6881]

6-inch Map Registered No.

Exact site "250 yds SSE of Hillside Fm"

Attach a tracing from a map, or a sketch-map, if possible.

Purpose for which made Salt. (none found)

Level at which shaft bore commenced relative to O.D. 127·32 (38.81) State if shaft bore is up, down, horizontal or inclined; in latter cases give angle of inclination and direction

Made by

Information from

Date of Sinking 1881

Specimens —

Additional Notes in Space Overleaf

(For Survey use only) Geological Classification	Nature of Strata	Thickness			Depth		
Glacial 303	Wet sand and gravel	20			20	6·10	
	Clay + loam	4			24	7·32	
	Dry red clay	30			54	16·46	
	Running sand	7			61	18·59	
	Dry sand loam + clay	21			82	24·99	
	Dry compound metal (? bol)	68			150	45·72	
	Sand + grav.	6			156	47·55	
	Bol + grav. ["collapsed mush"] * ← →	147	44	80	303	92·35	
		175.68 ft (53.55 m) below O.D.					
	On Oct. 17/1881 Struck hard substance. Rods dropped 18" and before they could be raised hole was filled w. gravel to a height of 18 yds from bottom.	Salt rock head henceforth reckoned to be a little more than 60 m below O.D., based on nearby RM boreholes (i.e. some 10 m below the base of this bore.)					
	Drift base as proved in bores in this area, and in the Weaver valley to the west, is much closer to the 47·55 m depth (base of sand + gravel bed) than the total depth of 303 ft. (92.35 m). Sherlock quotes this bore as evidence of a deep pre-glacial channel, but it is much more likely that the sequence from 47·55 m to 92·35 m is all collapsed mudstone						

0·4

Continued Overleaf

Geological Survey and Museum, South Kensington, London, S.W.7.	received	Correspondence File No.	1" N.S. Map No.	1" O.S. Map No.	Site marked (use symbol) on 1" Map	on 6" Map

Norwest Holst Soil Engineering Ltd.

Borehole No. **47**

BOREHOLE LOG

Contract No. F9349
Location Warburton to Audley Pipeline
Client British Gas plc
Method of Boring Cable Percussion
Diameter of Borehole 150mm

SJ67SE/180
69398 - 70370

Sheet 1 of 1
Co-ords 69398E 70370N
Ground Level 30.80 m.A.O.D.
Date 18/11/91

Description of Strata	Legend	Depth Below G.L.(m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	"N"/ R.Q.D.%	Daily Progress
TOPSOIL		0.30	30.50				
Firm orangish brown and reddish brown mottled silty CLAY		0.70	30.10		0.50 0.50-0.95 (38) 1.00		
Firm to stiff reddish brown slightly silty CLAY with occasional to some fine to medium rounded gravel and many grey rootlet traces. ...2.50m: with some thin bands of sand.					1.50-1.95 (52) 2.00 2.50-2.95 (58)		
Borehole complete at 3.00m		3.00	27.80		3.00		

Type of Sample

Is S.P.T. ■ Undisturbed
Ic C.P.T. x Vane
0 Jar △ Water
● Bulk ▮ Piezometer

Remarks (Observations of Ground Water etc.) () U100 blows
Groundwater not encountered during drilling

Norwest Holst Soil Engineering Ltd.

Borehole No. **54**

BOREHOLE LOG

Contract No. F9349
Location Warburton to Audley Pipeline
Client British Gas plc
Method of Boring Cable Percussion
Diameter of Borehole 150mm

SJ67SE/187

Sheet 1 of 1
Co-ords 69834E 70658N
Ground Level 35.90 m.A.O.D.
Date 14/11/91

Description of Strata	Legend	Depth Below G.L.(m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	"N"/ R.Q.D.%	Daily Progress
TOPSOIL		0.30	35.60				
MADE GROUND		0.80	35.10				
Firm to stiff yellow becoming reddish brown below 1.20m mottled occasionally green silty sandy CLAY with some rounded gravel ...1.50m with grey mottled traces		3.30	32.60		1.00-1.45 (30) 1.50 2.00-2.45 (47) 2.50 3.00-3.45 (80) 3.50		
Medium dense reddish brown very silty fine to medium SAND with occasional bands of slightly gravelly clay		4.20	31.70		3.50-3.95 s	"30"	
Stiff to very stiff reddish brown mottled occasionally green very silty very sandy CLAY with some rounded gravel					4.50-4.95 (100) 5.00 6.00-6.50 6.00-6.45 s 7.00 7.50-7.95 s	"120" "132"	
Borehole complete at 8.00m		8.00	27.90				

Type of Sample

Is	S.P.T.	■	Undisturbed
Ic	C.P.T.	x	Vane
0	Jar	△	Water
●	Bulk	▮	Piezometer

Remarks (Observations of Ground Water etc.) () U100 blows
Water struck at 3.30m, casing to 1.00m, rising to 2.90m after 20 minutes standing
Final standing water level 2.90m

Water levels are subject to seasonal or tidal variations and should not be taken as constant

British Geological Survey

APPENDIX B
BOREHOLE RECORDS FOR SPUR PIPELINE

Wt.30370/0370 10,000 9/[illegible] & E.V.Ltd. [illegible]

Name and Number of Shaft or Bore given by Geological Survey SJ 67 NW 9 3 County CHESHIRE

Bore at Gumers Lough ANDERTON near Northwich Quarter Sheet ~~34 NW~~

6.

Geological Classification	Description	Thickness			Depth		
	NGR 6423 7535						
	700 yards W.S.W. of Bridge Farm.						
	1" map: 97.						
	6" map: Cheshire 34 NW.						
	Surface about 100ft. O.D.						
	Surface soil	-	1	3	-	1	3
Drift.	Boulder clays, sands and gravels with ½ inch of drift coal at 17ft. 6ins.	-	56	3	-	57	6
Kemper Marl.	Kemper Red and Blue Marls with gypsum. At 304ft 11ins. a strong blue flag such as usually found above top Rock Salt bed when latter met with	-	274	3	-	331	9
	A.F. Calvert 'Salt in Cheshire' 1915. p. 720.						
	Surface 95.5 O.D. (R.L. Sherlock. Salt Mem. p. 30)						
	Depth given as 364⅔ft.						
	Not given by R.L. Sherlock on his map or field slip.						
	Indicated on P.F. Kendall's and also on						
	Brunner Mond's Plans.						
	Top and bottom beds absent according to Sherlock						
	(Salt Memoir) p. 30.						
	Sinking stated to 364⅔ft. deep.						

Norwest Holst Soil Engineering Ltd.

Borehole No. **5**

BOREHOLE LOG

Contract No. F6277
Location Lostock to Winnington Pipeline
Client British Gas
Method of Boring Percussion
Diameter of Borehole 150mm

Sheet 1 of 1
Chainage
Ground Level m.A.O.D.
Date 14/12/84

5567 NW 67

Description of Strata	Legend	Depth Below G.L.(m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	"N"/ R.Q.D.%	Daily Progress
TOPSOIL		0.70					
Brown clayey silty medium SAND		1.30					
Firm and stiff brown silty sandy CLAY with gravel		5.00					

Type of Sample

Is S.P.T. ■ Undisturbed
Ic. C.P.T. × Vane
O Jar △ Water
● Bulk Piezometer

Remarks (Observations of Ground Water etc.)

Groundwater not encountered

British Geological Survey

British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

Site	Borehole Number
Anderton Marina, Northwich, Cheshire	BH1

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion		29.81	Alvechurch Boat Centres Ltd	P3929
Location		**Dates**	**Engineer**	**Sheet**
365005 E 375755 N		18/08/2006		1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(0.50)	MADE GROUND : Clay and brick fill. (Drillers description)		
0.50-1.00	B01				29.31	0.50	MADE GROUND : Firm to stiff red-brown mottled black slightly sandy slightly gravelly CLAY. Gravel is subrounded to angular fine to coarse quartz, sandstone, brick with rare coal and slate. With frequent pockets, (<80mm) of black sandy silt and with rare rootlets.		
						(0.70)			
1.20-1.65	U01				28.61	1.20	Soft to firm red-brown slightly sandy slightly gravelly CLAY. Gravel is subrounded to subangular fine to coarse quartz, sandstone, siltstone with rare coal and rare cobbles of quartz. (GLACIAL TILL)		
1.65-2.00	B02								
2.00-2.45	SPT N=8			2,2/2,2,2,2					
2.50-3.00	B03								
3.00-3.45	U02								
						(4.30)			
3.50-4.00	B04								
4.00-4.45	SPT N=12			2,3/2,3,3,4					
4.50-5.00	B05								
5.00-5.45	U03								
5.50-6.00	B06				24.31	5.50	Stiff red-brown slightly sandy slightly gravelly CLAY. Gravel is subrounded to subangular fine to coarse quartz, sandstone, siltstone with occasional pockets, (<30mm) of medium to coarse red-brown sand. (GLACIAL TILL)		
						(0.50)			
6.00-6.45	SPT N=39			5,7/7,10,11,11	23.81	6.00	Dense red-brown slightly gravelly medium to coarse SAND. Gravel is subrounded to subangular fine to coarse quartz, siltstone and mudstone with rare pockets, (<40mm) of firm red-brown clay. (GLACIAL TILL)		
6.50-7.00	B07								
7.00-7.45	SPT(C) N=35			4,4/7,9,9,10		(2.00)			
7.50-8.00	B08								
				18/08/2006:	21.81	8.00	Complete at 8.00m		

British Geological Survey

Remarks
1. Hand dug service pit to 1.20m bgl. 2. 50mm diameter standpipe installed to 8.00m bgl. Plain pipe with bentonite seal from ground level to 5.00m bgl. Slotted pipe with gravel from 5.00m to 8.00m bgl. Bung gas valve and stopcock cover fitted. 3. Borehole remained dry on completion. 4. Geological classifications were provided by Waterman Civils Ltd.

Scale (approx)	Logged By
1:50	TJ

Figure No.

British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

Site	Trial Pit Number
Anderton Marina, Northwich, Cheshire	TP5

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit		30.50	Alvechurch Boat Centres Ltd	P3929
	Location	**Dates**	**Engineer**	**Sheet**
	365115 E 375770 N	17/08/2006		1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.35)	MADE GROUND : Stiff brown-red slightly sandy slightly gravelly CLAY. Gravel is subrounded to angular fine to coarse quartz, sandstone, brick with rare plastic. Occasional roots and rootlets.		
0.20-0.20	D01			30.15	0.35			
0.20-0.20	D01							
					(0.85)	MADE GROUND : Very stiff red-brown blocky slightly sandy slightly gravelly CLAY. Gravel is subrounded to angular fine to coarse quartz, sandstone, brick, siltstone with rare igneous and occasional cobble and rare boulder of quartz.		
0.80-0.80	I01							
1.00-1.00	D02							
1.00-1.00	D02			29.30	1.20			
1.30-1.30	D03				(0.20)	MADE GROUND : Soft black-grey slightly gravelly SILT. Gravel is subrounded to angular fine to coarse quartz, sandstone, siltstone and rare fine brick. With strong organic odour.		
1.30-1.30	D03			29.10	1.40			
1.30-1.30	D01			28.90	(0.20)			
1.50-1.50	D04				1.60			
1.50-1.50	D04					Soft grey sandy slightly gravelly SILT. Gravel is subrounded to subangular fine to coarse sandstone, quartz, siltstone with occasional rootlets.		
1.50-1.50	D02							
					(2.00)	Stiff red-brown mottled grey friable slightly sandy slightly gravelly CLAY. Gravel is subrounded to angular fine to coarse quartz, sandstone, siltstone and igneous with occasional pockets, (<40mm) of medium to coarse red-brown sand and occasional cobbles of quartz. (GLACIAL TILL)		
2.60-2.60	D05							
2.60-2.60	D05							
3.50-3.50	I02		Strike at 3.50m bgl.(1) at 3.50m, no rise after 20 mins.	26.90	3.60			1
3.80-3.80	D06				(0.40)	Stiff red-brown mottled grey slightly sandy slightly gravelly CLAY. Gravel is subrounded to angular fine to coarse quartz, sandstone and siltstone with rare pockets, (<40mm) of medium to coarse red-brown sand. (GLACIAL TILL)		
3.80-3.80	D06			26.50	4.00			
						Complete at 4.00m		

Plan

Remarks

1. Trial pit remained stable during excavation. 2. Water strike at 3.50m bgl, slow seepage. 3. Trial pit excavated to maximum extent of machine reach. 4. Geological classifications were provided by Waterman Civils Ltd.

Scale (approx)	Logged By	Figure No.
1:50	TJ	

SJ67NW 112

STRATA SURVEYS LIMITED

Location **Nether Tabley to Winnington Pipeline**

Client: **Kvaerner John Brown Ltd** Project Ref.: **6709**

Borehole No. **9**

Job No.: **9062/A**

Equipment and methods **Light Cable Percussion**

Start Date:	End Date:	Final Depth:	Diameter	Casing Depth
22/05/97	22/05/97	14.95m		

FIELD RECORDS	Samples / Tests				Description	Strata		
	Casing (Water) Depth (m)	Depth (m) from	to	SAMPLE Type & No	SPT (N) (Cu)		Depth & Thickness m	Reduced Level (m)	Legend
		10.5	10.9	U 22					
		11.0		D 23					
		12.0	12.2	U 24	(148)		(5.45)		
		12.9		D 27					
		13.6	14.0	S 28	(139)				
		14.5	14.9	S 29	(134)				
						Borehole Completed	14.95		

Remarks

Logged by **GHarwood** Drilled by **SSS**

Ground level

Co-ordinates:

SSL--cable per -08/96 Rev 4

SJ67NW 112

STRATA SURVEYS LIMITED

Location **Nether Tabley to Winnington Pipeline**

Client: **Kvaerner John Brown Ltd** Project Ref.: 6709

Borehole No. **9**

Job No.: **9062/A**

Equipment and methods **Light Cable Percussion**

Start Date:	End Date:	Final Depth:	Casing Diameter	Casing Depth
22/05/97	22/05/97	14.95m		

FIELD RECORDS	Samples / Tests: Casing (Water) Depth (m)	Depth (m) from	to	SAMPLE Type & No	SPT (N) (Cu)	Description	Strata: Depth & Thickness (m)	Reduced Level (m)	Legend
		0.20		D 1		Dark brown clayey TOPSOIL	(0.40)	0.40	
		0.50		D 2		MADE GROUND (firm brown sandy clay fill with occasional fine to medium gravel)	(1.00)		
		1.10		W 5					
		1.20	1.50	U 3					
		1.50	1.95	S 4	(8)			1.40	
						Loose brown clayey fine to medium SAND	(0.20)	1.60	
						Firm to stiff brown sandy CLAY with occasional fine to coarse gravel and occasional cobbles.			
		2.40		D 6					
		2.50	2.95	U 7	{69}				
		3.00		D 8					
		3.50	3.95	S 10	(16)				
		3.50		U 9					
		4.20		D 11			(5.00)		
		4.20		U 12					
		5.00		D 13					
		5.30		U 14					
		5.50	5.95	S 15	(21)				
		6.00	6.50	U 16	{76}				
		6.60	7.00	B 17					
						Stiff grey sandy CLAY with occasional fine to coarse gravel.		6.60	
							(0.50)		
						Firm to stiff brown slightly sandy CLAY with occasional silt laminae and fine to medium gravel		7.10	
		7.50	7.95	U 18					
		7.80		D 19					
							(2.40)		
		9.00	9.45	U 20					
		9.50		D 21				9.50	
						Very stiff brown sandy CLAY with occasional fine to medium gravel.			

Remarks 1) Water struck at 1.50m rising to 1.10m after 10 minutes, water level at 1.10m after 20 minutes.; 2) Borehole dry at completion of the borehole and with casing at 9.00m.; 3) Piezometer installed to 2.80m, with responce zone between 2.00m and 2.80m.

Logged by **GHarwood** Drilled by **SSS**

Ground level

Co-ordinates:

British Geological Survey

SJ67NW 112

STRATA SURVEYS LIMITED

Job No.: **9062/A**

Location **Nether Tabley to Winnington Pipeline**

Client: **Kvaerner John Brown Ltd** Project Ref.: 6709

Borehole No. **9**

Equipment and methods **Light Cable Percussion**

Start Date:	End Date:	Final Depth:	Diameter Casing	Depth
22/05/97	22/05/97	14.95m		

FIELD RECORDS	Samples / Tests				Description	Strata		
	Casing (Water) Depth (m)	Depth (m) from	to	SAMPLE Type & No	SPT (N) (Cu)		Depth & Thickness (m)	Reduced Level (m)	Legend
		0.20		D 1		Dark brown clayey TOPSOIL	(0.40)		
		0.50		D 2		MADE GROUND (firm brown sandy clay fill with occasional fine to medium gravel)	0.40 (1.00)		
		1.10		W 5					
		1.20	1.50	U 3					
		1.50	1.95	S 4	(8)	Loose brown clayey fine to medium SAND	1.40 (0.20)		
						Firm to stiff brown sandy CLAY with occasional fine to coarse gravel and occasional cobbles.	1.60		
		2.40		D 6					
		2.50	2.95	U 7	(69)				
		3.00		D 8					
		3.50	3.95	S 10	(16)				
		3.50		U 9					
		4.20		D 11			(5.00)		
		4.20		U 12					
		5.00		D 13					
		5.30		U 14					
		5.50	5.95	S 15	(21)				
		6.00	6.50	U 16	(76)				
		6.60	7.00	B 17					
						Stiff grey sandy CLAY with occasional fine to coarse gravel.	6.60 (0.50)		
						Firm to stiff brown slightly sandy CLAY with occasional silt laminae and fine to medium gravel	7.10		
		7.50	7.95	U 18					
		7.80		D 19			(2.40)		
		9.00	9.45	U 20					
		9.50		D 21			9.50		
						Very stiff brown sandy CLAY with occsaional fine to medium gravel.			

Remarks 1) Water struck at 1.50m rising to 1.10m after 10 minutes, water level at 1.10m after 20 minutes.; 2) Borehole dry at completion of the borehole and with casing at 9.00m.; 3) Piezometer installed to 2.80m, with responce zone between 2.00m and 2.80m.

Logged by **GHarwood** Drilled by **SSS**

Ground level

Co-ordinates:

SSL—cable per -08/95 Rev a1

British Geological Survey

SJ67NW 112

STRATA SURVEYS LIMITED

Location **Nether Tabley to Winnington Pipeline** | Borehole No. **9**

Client: **Kvaerner John Brown Ltd** | Project Ref.: **6709**

Job No.: **9062/A**

Equipment and methods **Light Cable Percussion**

Start Date:	End Date:	Final Depth:	Diameter	Casing Depth
22/05/97	22/05/97	14.95m		

FIELD RECORDS	Samples / Tests: Casing (Water) Depth (m)	Depth (m) from	to	SAMPLE Type & No	SPT (N) (Cu)	Description	Strata: Depth & Thickness m	Reduced Level (m)	Legend
		10.5	10.9	U 22					
		11.0		D 23					
		12.0	12.2	U 24	(148)		(5.45)		
		12.9		D 27					
		13.6	14.0	S 28	(139)				
		14.5	14.9	S 29	(134)				
						Borehole Completed	14.95		

Remarks

Logged by **GHarwood** | Drilled by **SSS**

Ground level

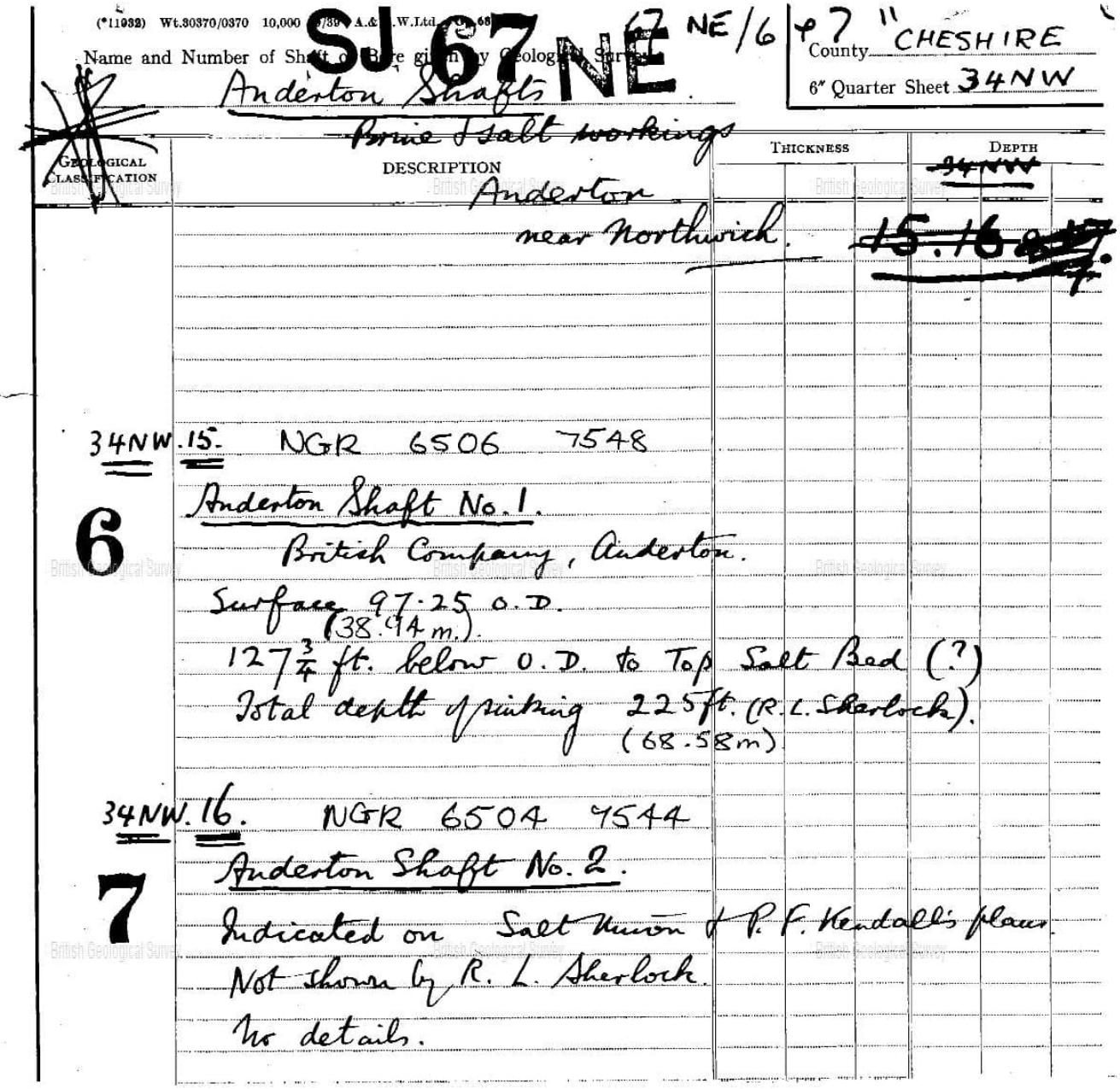
Co-ordinates:

British Geological Survey

Version 2.0.6.7

BGS ID: 763489 : BGS Reference: SJ67NE6
British National Grid (27700) : 365046,375473
Report an issue with this borehole

<< < Prev Page 1 of 3 Next > >>



(*11932) Wt.30370/0370 10,000 [illegible] A.& .W.Ltd. [illegible]

SJ 67 NE/6

Name and Number of Shaft or Bore given by Geological Survey

Anderton Shafts

Brine Salt workings

County CHESHIRE

6" Quarter Sheet 34NW

Geological Classification	Description	Thickness	Depth
	Anderton near Northwich.		~~15.16 & 17.~~
6	34NW.15. NGR 6506 7548 Anderton Shaft No. 1. British Company, Anderton. Surface 97·25 O.D. (38.94 m.). 127¾ ft. below O.D. to Top Salt Bed (?) Total depth of sinking 225 ft. (R.L. Sherlock). (68.58 m).		
7	34NW.16. NGR 6504 7544 Anderton Shaft No. 2. Indicated on Salt Union & P.F. Kendall's plans. Not shown by R.L. Sherlock. No details.		

SJ67NW 113

STRATA SURVEYS LIMITED

Job No.: 9062/A

Location **Nether Tabley to Winnington Pipeline**

Client: **Kvaerner John Brown Ltd** Project Ref.: 6709

Borehole No. **10**

Equipment and methods **Light Cable Percussion**

Start Date:	End Date:	Final Depth:	Casing Diameter	Casing Depth
20/05/97	20/05/97	14.95m		

FIELD RECORDS	Samples / Tests				Description	Strata		
	Casing (Water) Depth (m)	Depth (m) from	to	SAMPLE Type & No	SPT (N) (Cu)		Depth & Thickness m	Reduced Level (m)	Legend
		0.20		D 1		MADE GROUND (100mm topsoil over dark brown clay fill with ash and brick fragments)			
		0.50		D 2					
		1.20	1.65	U 3			(2.00)		
		1.70		D 4					
		1.90	2.35	S 5	(7)				
							2.00		
						Firm to stiff brown slightly sandy CLAY with occasional fine to medium gravel.			
		2.50	2.95	U 6	{85}				
		3.00		D 7					
		3.50	3.95	U 8					
		4.00		D 9			(4.00)		
		4.50	4.95	U 10					
		4.70		W 14					
		5.00		D 11					
		6.00	6.50	U 12					
							6.00		
						Dense brown fine to medium SAND			
		6.50	6.95	S 13	(46)				
		7.50	8.00	B 15			(2.70)		
		8.00	8.45	S 16	(14)				
		8.80		D 17			8.70		
		9.00	9.45	U 18	{196}	Stiff brown slightly sandy CLAY with occasional fine to medium gravel and occasional thin bands of fine to medium sand			
		9.50		D 19					

Remarks 1) Water struck at 6.50m rising to 4.70m after 20 minutes.; 2) Water level at end of the day at 4.70m with the borehole at 7.00m; 3) Borehole dry with casing at 10.30m and hole at 14.95m.; 4) piezometer installed to 8.50m with responce zone between 6.00m and 8.50m

Logged by **GHarwood** Drilled by **SSS**

Ground level

Co-ordinates:

British Geological Survey

SJ67NW 113

STRATA SURVEYS LIMITED

Job No.: **9062/A**

Location **Nether Tabley to Winnington Pipeline**

Client: **Kvaerner John Brown Ltd** Project Ref.: **6709**

Borehole No. **10**

Equipment and methods **Light Cable Percussion**

Start Date:	End Date:	Final Depth:	Diameter	Casing Depth
20/05/97	20/05/97	14.95m		

FIELD RECORDS	Samples / Tests					Description	Strata		
	Casing (Water) Depth (m)	Depth (m) from	to	SAMPLE Type & No	SPT (N) (Cu)		Depth & Thickness m	Reduced Level (m)	Legend
		10.7	11.1	S 20	(51)				
		11.2		D 21			(6.25)		
		12.3	12.7	S 22	(77)				
		12.9		D 23					
		13.7	14.1	S 24	(66)				
		14.2		D 25					
		14.5	14.9	S 26	(159)				
						Borehole Completed	14.95		

Remarks

Logged by **GHarwood** Drilled by **SSS**

Ground level

Co-ordinates:

SSL--cable per--08/96 Rev 4

British Geological Survey

Norwest Holst Soil Engineering Ltd.

Borehole No. **5**

BOREHOLE LOG

Contract No. F6277
Location Lostock to Winnington Pipeline
Client British Gas
Method of Boring Percussion
Diameter of Borehole 150mm

Sheet 1 of 1
Chainage
Ground Level m.A.O.D.
Date 14/12/84

5567 NW 67

Description of Strata	Legend	Depth Below G.L.(m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	"N"/ R.Q.D.%	Daily Progress
TOPSOIL		0.70					
Brown clayey silty medium SAND		1.30					
Firm and stiff brown silty sandy CLAY with gravel		5.00					

Type of Sample

Is S.P.T. ■ Undisturbed
Ic. C.P.T. × Vane
O Jar △ Water
● Bulk ⊥ Piezometer

Remarks (Observations of Ground Water etc.)

Groundwater not encountered

British Geological Survey

Norwest Holst Soil Engineering Ltd.

Borehole No. **4**

BOREHOLE LOG

Contract No. F6277
Location Lostock to Winnington Pipeline
Client British Gas
Method of Boring Percussion
Diameter of Borehole 150mm 5567wc 86

Sheet 1 of 2
Chainage
Ground Level m.A.O.D.
Date 10/12/84 - 11/12/84

Description of Strata	Legend	Depth Below G.L.(m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	"N"/ R.Q.D.%	Daily Progress
MADE GROUND:					1.00	3	
					2.00	3	
		2.70					
Very loose grey/brown clayey sandy SILT					3.00	1	
					4.50	5	
		4.80					
Soft brown silty CLAY					5.50 (16) NR		
		5.90					
Medium dense grey silty fine to medium SAND with bands of silty CLAY					6.00	11	
		7.40					
Dense brown fine to coarse GRAVEL					7.50	50NP	*
		8.60					
Highly weathered red/brown KEUPER MARL					9.00	21	

Type of Sample

Is	S.P.T.	■	Undisturbed
Ic.	C.P.T.	×	Vane
O	Jar	Δ	Water
●	Bulk		Piezometer

Remarks (Observations of Ground Water etc.)

(16) - U100 blows
NP - No penetration

Water seepage at 5.90 m
Overnight standing level 5.80 m (casing at 6.0 m)
Water struck at 7.40 m
Final standing level 2.00 m
* Timber obstruction at 7.2 m to 7.5 m.

British Geological Survey

SJ67NE 197

STRATA SURVEYS LIMITED

Location **Nether Tabley to Winnington Pipeline**

Client: **Kvaerner John Brown Ltd** Project Ref.: **6709**

Borehole No. **11**

Job No.: **9062/A**

Equipment and methods **Light Cable Percussion**

Start Date:	End Date:	Final Depth:	Diameter Casing Depth
19/05/97	19/05/97	12.05m	

FIELD RECORDS	Samples / Tests: Casing (Water) Depth (m)	Depth (m) from	to	SAMPLE Type & No	SPT (N) (Cu)	Description	Strata: Depth & Thickness m	Reduced Level (m)	Legend
		0.20		D 1		MADE GROUND (topsoil brick gravel in a brown clay matrix)			
		0.50		D 2					
		1.20	1.65	S 3	(26)				
		1.80		D 4			(3.80)		
		2.30	2.75	S 5	(9)				
		3.30	3.75	S 6	(4)				
		4.00		D 7			3.80		
		4.10	4.60	U 8	{85}	Firm brown sandy CLAY with occasional to some fine to coarse gravel.	(0.70)		
		4.60	5.05	S 9	(11)	Loose brown fine to medium SAND	4.50 (0.20)		
		5.10	5.55	U 10		Firm to stiff brown sandy CLAY with occasional fine to coarse gravel	4.70		
		5.60		D 11			(3.00)		
		6.60	7.05	U 12					
		7.10		D 13					
		7.80		D 14			7.70		
		8.00	8.50	U 15		Very stiff grey slightly sandy CLAY with occasional organic matter from 8.50m.			
		8.30		W 19			(1.30)		
		8.50	9.00	B 17					
		9.30	9.80	U 18		Firm black dark brown PEAT	9.00		
		10.0	10.4	S 20	(71)		(1.30)		

Remarks 1) No water struck during boring; 2) Water level on the following day at 8.30m with the borehole at 10.00m

Logged by **GHarwood** Drilled by **SSS**

Ground level

Co-ordinates:

British Geological Survey

STRATA SURVEYS LIMITED

Location **Winnington Expansion**

Client: **Brunner Mond** Project Ref.:

Borehole No. **9-1**

Sheet 1 of 1

Job No.: **8976-B**

Equipment and methods **Light cable percussion**

Drilled by GDB

Ground level m AOD

Start Date: 12/01/97 End Date: / / Final Depth: 6.00

Co-ordinates: E N

CASING DEPTH (m)	WATER DEPTH (m)	Field Records	SAMPLES / TESTS Depth (m) from	to	SAMPLE Type & No	SPT (N) {Cu}	Description	Depth & Thickness (m)	Reduced Level (m AOD)	Strata Legend
							MADE GROUND (100mm of tarmac over limestone hardcore.)	(0.40)		
			0.50	0.95	B 1	(5)		0.40		
			0.50	0.70	S 1		MADE GROUND (Loose and very loose grey/black clayey sandy fine to coarse gravel with some brick fragments)			
		⇦	1.00		W 1					
			1.50	1.95	B 2	(3)		(2.30)		
		△	1.50	1.65	S 2					
			2.50	2.95	B 3	(5)				
			2.50	2.95	S 3			2.70		
							Loose brown silty fine to medium SAND.			
			3.50	3.95	B 4	(7)		(1.40)		
			3.50	3.80	S 4					
								4.10		
							Soft to firm grey silty CLAY.			
			4.50	4.95	U 1	{46}		(1.30)		
			5.00		D 1					
		▽	5.40		W 2			5.40		
			5.50	5.95	B 5	(11)	Medium dense grey slightly clayey sandy fine to coarse GRAVEL.	(0.60)		
		{12/01/97}	5.50	5.95	S 5		**Borehole Completed**	6.00		

Remarks

Diameter (mm) Depth (m)

1) Sandbags placed around spoil
2) Water struck at 1.0m, rising to 0.9m after 20 mins
3) Water struck at 5.4m, rising to 1.9m after 20 mins
4) Monitoring well installed to 6.0m

Logged by

L. Wheeler

Date Borehole Backfilled :

12/01/97

FIG No.

British Geological Survey

SS 67 SW/53

HOLST & CO. LTD.

SITE INVESTIGATION DEPT.

PARKSIDE LANE

LEEDS LSII5SX.

64935 74864

Contract No. M4109/F1614 Borehole No. 1A

Location Winnington Ground Level

Client ICI Limited Date 6.9.70

BOREHOLE LOG

STRATA	Legend	Depth below Ground Level	Thickness of Strata	Type of Sample	c lb/sq. ft.	ø deg.	m.c %	y lb/cu. ft.	N
Railway Ballast		1'0	1'0						
Made ground: Tarmac		6"	6"	2'6					17
Made ground: Sand, stones ash		7'0	5'6	5'6					14
Light brown compact sand				8'6					21
			13'6	14'0	800	31	13.1	134	
				18'6					31
		20'6		21'0					
Hard brown boulder clay		23'0	2'6		6500	8	10.9	146	
Weathered brown and grey mudstone (Keuper Marl)			19'0	27'0	2150	0	19.7	131	
		34'0		32'0	3800	10	18.4	136	
Hard brown and grey mudstone (Keuper Marl)			5'6	35'0	3560	20	15.2	138	
		39'6		38'0	1850	25	16.9	135	

Water Struck at 9'6 Maximum Observed Water Level

Undisturbed Sample []
Disturbed Sample o
Water Sample Δ
Penetration Test I

c = Cohesion
ø = Angle of Internal Friction
m.c = Moisture Content
y = Bulk Density
N = Standard Penetration Value

Water levels are subject to seasonal or tidal variation and should not be taken as constant

British Geological Survey

SJ 67 SW / 49

HOLST & CO. LTD.
SITE INVESTIGATION DEPT.
PARKSIDE LANE
LEEDS LS11 5SX.

64953 74850

Contract No. M4109/F1614 Borehole No. 1
Location Winnington Ground Level
Client ICI Limited Date 7.9.70

BOREHOLE LOG

STRATA	Legend	Depth below Ground Level	Thickness of Strata	Type of Sample	c lb/sq. ft.	ø deg.	m.c %	y lb/cu. ft.	N
Railway Ballast		2'0	2'0	2'0					
Made ground: Sand, Ash, Stones		3'9	1'9	I					10
Brown and grey silty mudstone (Keuper Marl)				5'0					
				8'6	1400	0	19.5	137	
					3200	11	17.8	135	
				13'0					
					2450	0	14.6	140	
			26'9	18'0					
					2200	14	15.2	139	
				24'6					
					2900	26	17.6	139	
				28'6					
					4800	16	14.3	143	
		31'6		31'0					80 for 6"

Water Struck at 8'0 Maximum Observed Water Level

Undisturbed Sample []
Disturbed Sample o
Water Sample Δ
Penetration Test I

c = Cohesion
ø = Angle of Internal Friction
m.c = Moisture Content
y = Bulk Density
N = Standard Penetration Value

Water levels are subject to seasonal or tidal variation and should not be taken as constant

British Geological Survey

Contract Name	I.C.I. Topfields SJ 67SE/121 6503 7461	Borehole No. 7
		Sheet 1 of 1

Method of boring: Shell and Auger
Diameter: 200 mm
Ground level: 32.51m OD
Start: 4.7.79
Finish: 5.7.79

Daily progress	Water levels	In-situ tests	Samples	Depth (m)	Reduced level (m O.D.)	Thickness (m)	Description of Strata
			J			0.90	Made Ground: Ash and sand
				0.90	31.61		
		N = 20	B			1.00	Medium dense red-brown sand and gravel
				1.90	30.61		
		N=17	B J			2.40	Medium dense red-brown clayey sand
				4.30	28.21		
		N=26	B			2.50	Medium dense coarse to fine gravel with a little red-brown sand
		N=20	B				
	▼▽ 5/7		W	6.80	25.71		
			U*B			1.30	Very stiff red-brown very sandy silty clay with cobble to fine gravel size stones and layers of light brown sand (Boulder Clay)
			U*B				
	▽ 4/7		U	8.10	24.41		
4/7		N = 77	B			1.90	Very dense red-brown sand and coarse to fine gravel with a trace of clay
		N = 76	B	10.00	22.51		
5/7							

Notes Water added between 0 and 10 m. Bottom of Borehole

Co-ordinates E 365025.5 N 374608.2

Terresearch Limited	Report No. S.29/629	Appendix 1 Sheet 16

SJ675E 430

STRATA SURVEYS LIMITED

Location **Nether Tabley to Winnington Pipeline**

Client: **Kvaerner John Brown Ltd** Project Ref.: **6709**

Borehole No. **13**

Job No.: **9062/A**

Equipment and methods **Light Cable Percussion**

Start Date:	End Date:	Final Depth:	Diameter	Casing Depth
03/06/97	03/06/97	10.15m		

FIELD RECORDS	Samples / Tests: Casing (Water) Depth (m)	Depth (m) from	to	SAMPLE Type & No	SPT (N) (Cu)	Description	Strata: Depth & Thickness m	Reduced Level (m)	Legend
		0.20		D 1		MADE GROUND (black ash)	(0.90)		
		1.00		D 2			0.90		
		1.00	1.65	D 3	(213)	Stiff to very stiff brown sandy CLAY with occasional fineto medium gravel.			
		1.20		U 4					
		1.70		D 5					
		2.30	2.75	U 6	(120)		(2.60)		
		2.80		D 7					
		3.50		U 8			3.50		
						Very stiff brown slightly sandy CLAY with occasional fine to coarse gravel			
		4.40	4.85	U 9					
		4.90		D 10					
		5.70	6.15	U 11	(298)				
		6.20		D 12			(6.40)		
		7.20	7.65	U 13					
		7.70		D 14					
		8.70	8.95	U 15	(309)				
		9.00		D 16					
		9.70	10.0	U 17					
		10.0	10.1	S 18	(200)		9.90		

Remarks 1) Nowater encountered during boring.

Logged by **GHarwood** Drilled by **SSS**

Ground level

Co-ordinates:

British Geological Survey

SJ67SE 430

STRATA SURVEYS LIMITED

Location **Nether Tabley to Winnington Pipeline**

Client: **Kvaerner John Brown Ltd** Project Ref.: **6709**

Borehole No. **13**

Job No.: **9062/A**

Equipment and methods **Light Cable Percussion**

Start Date:	End Date:	Final Depth:	Diameter	Casing Depth
03/06/97	03/06/97	10.15m		

FIELD RECORDS	Samples / Tests				Description	Strata		
	Casing (Water) Depth (m)	Depth (m) from	to	SAMPLE Type & No	SPT (N) (Cu)		Depth & Thickness m	Reduced Level (m)	Legend
					Light grey highly weathered MUDSTONE **Borehole Completed**		(0.25) 10.15		

Remarks

Logged by **GHarwood** Drilled by **SSS**

Ground level

Co-ordinates:

British Geological Survey

TERRESEARCH LIMITED

TAYWOOD ROAD - NORTHOLT - MIDDLESEX UB5 6RL

SJ67SW/7
6485 7460

COMMERCIAL IN CONFIDENCE

BOREHOLE No. 5

Contract Name Topfields — Report No. S.29/629

Ground Level — Diameter of Boring 200 mm

Water Struck 4.90 and 13.70 — Method Shell and Auger

*Standing Water Level 2.40 7.6.79 — Start 4.6.79 — Finish 6.6.79

REMARKS : *Water level before pulling the casing 6.00; after pulling 2.50 m

Preliminary Sheet

Description of Strata	Thickness	Depth	Disturbed Samples	Undisturbed Samples and Insitu Tests
Made Ground Sand, bricks, clay and rubble	4.90	4.90	B1050 1.20 J1051 1.80 B1052 1.80 W1076 2.50 B1053 2.80 B1054 4.30	*U 1.80 2.80 N=9 4.30 N=2
Sand, gravel and peat and silt	1.90	6.80	B1055 5.80	5.80 N=2
Soft to firm brown sandy boulder clay	6.90	13.70	J1056 6.80 J1058 7.70 J1060 8.80 J1062 10.30 J1064 11.80 J1066 13.30	U1057 7.20 U1059 8.30 U1061 9.80 U1063 11.30 U1065 12.80
Sand, gravel, cobbles with traces of clay	4.60	18.30	W1067 13.70 B1068 14.00 B1069 15.00 B1070 16.50 B1071 18.00	14.00 N=32 15.00 N=31 16.50 N=35 18.00 N=23
Hard brown sandy boulder clay	1.70	20.00	J1073 18.80 J1075 20.00	U1072 18.30 U1074 19.50
TOTALS	20.00	20.00		

NOTES : 1. Descriptions are given in accordance with B.S. Civil Engineering Code of Practice C.P.2001 "Site Investigations".
2. J indicates Jar Sample
B " Bulk Sample
W " Water Sample
U " Undisturbed Core Samples, nominally 100mm dia. x 0.45m long. Depth shown to top of sample
U* " Sample not recovered
N " Number of blows for 300mm penetration in Standard Penetration Test
V " Shear strength in kN/m² given by Insitu Vane Test

SJ67/93 E

Contract Name	I.C.I. Topfields	Borehole No. 5
		Sheet 1 of 2

Method of boring: Shell and Auger
Diameter: 200 mm
Ground level: 28.36m OD
Start: 4.6.79
Finish: 6.6.79

Daily progress	Water levels	In-situ tests	Samples	Depth (m)	Reduced level (m O.D.)	Thickness (m)	Description of Strata
			B				Made
		N = 9	B J				
	▽ 6/6		W			4.90	Sand, bricks, clay and rubble
			B				
	▼ 6/6						
	▽	N = 2	B				
	▽ 4/6	5/6		4.90	23.40		Ground
5/6	▽▼ 4/6	N = 2	B			1.90	Very loose grey organic clayey silty sand
				6.80	21.50		
			J				Firm to stiff dark red-brown sandy silty clay with coarse to fine gravel size stones (Boulder Clay)
			U				
			J				
			U				
4/6			U				

Notes

E 364850.1 N 374597.8

Co-ordinates

Water level before pulling the casing 6.00, after pulling 2.50 m
Water added between depths of 0 and 19.0 m.

Cont'd.....

Contract Name	I.C.I. Topfields	Borehole No. 5
		Sheet 2 of 2

Method of boring: Shell and Auger
Diameter: 200 mm
Ground level: 28.38 m OD
Start: 4.6.79
Finish: 6.6.79

Daily progress	Water levels	In-situ tests	Samples	Depth (m)	Reduced level (m O.D.)	Thickness (m)	Description of Strata
			J			6.90	Firm to stiff dark red-brown sandy silty clay with coarse to fine gravel size stones (Boulder Clay)
			U				
			J				
			U				
			J				
	▽ 5/6		W	13.70	14.68		
		N = 32	B			4.60	Medium dense to dense red-brown sand with a little gravel, a trace of clay and with some cobbles
		N = 31	B				
		N = 35	B				
		N = 23	B	18.30	10.08		
5/6			U			1.70	Very stiff dark red-brown sandy silty clay with medium to fine gravel size stones and pockets of light brown sand and silt. (Boulder Clay)
5/6			J				
			U				
			J	20.00	8.38		
6/6							Bottom of Borehole

Notes

TERRESEARCH LIMITED

TAYWOOD ROAD - NORTHOLT - MIDDLESEX UB5 6RL

SJ67SW/8

6491 7464

BOREHOLE No. 6

COMMERCIAL IN CONFIDENCE

Contract Name Topfields Report No. S.29/629

Ground Level Diameter of Boring 200 and 150 mm

Water Struck 2.20 and 10.00 Method Shell and Auger

Standing Water Level 2.20 21.6.79 Start 6.6.79 Finish 20.6.79

REMARKS: Chiselling 0.40 to 1.00 m 1½ hours
6½ Days lost due to strike in Clients' works
Water level before pulling casing 3.40 afterwards 2.20 m
Sand blowing from 11.50 to 15.80 m

Preliminary Sheet

Description of Strata	Thickness	Depth	Disturbed Samples	Undisturbed Samples and Insitu Tests
Made Ground Cobbles timber, wire, bricks	1.20	1.20	B1101 0.50	
Clay cobbles bricks and sand	1.60	2.80	J1102 1.20 J1104 1.80 B1105 2.10	U1103 1.30
Gravel, bricks, glass, rubble and industrial waste	3.20	6.00	B1106 3.00 W1107 2.25 B1108 4.50	3.00 N=15 4.50 N=15
Silty sand with cobbles	1.00	7.00	B1109 6.00	*U 6.00
Soft to firm brown sandy boulder clay	3.00	10.00	J1110 7.00 J1112 8.00 J1114 9.50	U1111 7.50 U1113 9.00
Sand and gravel and bands of clay	1.50	11.50	B1115 10.50	10.50 N=56
Sand and gravel and cobbles	4.30	15.80	B1116 12.00 B1117 13.50 B1118 15.00	
Hard brown sandy boulder clay	0.70	16.50	J1120 16.50 W1121 3.50	U1119 16.00
Hard brown boulder clay with layers of sand and gravel	1.90	18.40	J1122 17.50 B1123 17.50 B1124 18.20	17.50 N=128 for 225 mm *U 18.20
Dense brown and grey sand	3.10	21.50	J1125 19.50 B1126 19.30 J1127 21.00 B1128 21.00	19.30 N=78 21.00 N=74
TOTALS	21.50	21.50		

NOTES: 1. Descriptions are given in accordance with B.S. Civil Engineering Code of Practice C.P.2001 "Site Investigations".
2. J indicates Jar Sample
B " Bulk Sample
W " Water Sample
U " Undisturbed Core Samples, nominally 100mm dia. x 0.45m long. Depth shown to top of sample
"U" " Sample not recovered
N " Number of blows for 300mm penetration in Standard Penetration Test
V " Shear strength in kN/m² given by Insitu Vane Test

TOFFIELDS, WINNINGTON NORTHWICH Bh No 6

SJ 67/93 F

Owner	ICI	Licence no. Appn no.	
Occupier	ICI	IGS ref. no.	
Ground level	27·18 m OD	ft. OD	
Level of well top	m OD	ft. OD	
Rest water level	m bwt	ft. bwt	
(Date)	m OD	ft. OD	

Nat. grid ref. SJ 6n9c9c 7n6n12

Status Exploratory

Aquifer Superficial Deposits

Code 111

Construction: Method Shell & Auger Date 6·6·79 – 20·6·79

BH LOG AVAILABLE

Depth bwt	Dia.	Linings (below well top) From	To	Dia.	Type
	200mm	0·0M	21·5CM		
21·50	150mm				

Summary of geological section	Thickness	Depth

Abstraction rates gph PWL gpd

Type of pump

Chem./bact. anal. YES/NO

Well driller

If insufficient space has been allowed, continue in 'Notes' overleaf.

I/5/79/207

SJ67SW/89 6475 7484

STRATA SURVEYS LIMITED

Location **Ash Debottlenecking**

Client: **Brunner Mond** Project Ref.:

Borehole No. **778**

Sheet 1 of 1

Job No.: **8976/A**

Equipment and methods **light cable percussion**

Drilled by

Ground level m AOD

Start Date: 23/08/69 End Date: / / Final Depth: 9.14

Co-ordinates: E N

CASING DEPTH (m)	WATER DEPTH (m)	Field Records	SAMPLES / TESTS: Depth (m) from	to	SAMPLE Type & No	SPT (N) (Cu)	Description	Depth & Thickness (m)	Reduced Level (m AOD)	Strata Legend
							FILL Brick and concrete fragments	(1.70)		
						(11)	MODERATELY COMPACT FILL Sand, gravel, with fine brick and slag traces.	1.70 (0.43)		
							Brown fine to medium SAND with some	2.13 (0.47)		
						(20)	MODERATELY COMPACT brown mixed SAND with mixed rounded GRAVEL	2.60 (1.60)		
						(6)	LOOSE brown mixed SAND with some rounded GRAVEL.	4.20 (1.50)		
						(15)	MODERATELY COMPACT mixed rounded GRAVEL with some mixed SAND and with COBBLES.	5.70 (3.44)		
						(26)				
						(22)				
							Borehole Completed	9.14		

Remarks

Casing Diameter (mm) Casing Depth (m)

Note; Water was added to assist boring from 2.13m to 4.15m below ground level. Ground water encountered at 4.15m below ground level rising to 3.9m in 15 minutes. After completion of the borehole and removal of the casing , the borehole caved in to 3.96m below ground level and the water level was 3.7m.

Date Borehole Backfilled :/ /

Logged by

FIG No.

British Geological Survey

SJ67SW/6470 7481 90

STRATA SURVEYS LIMITED

Location **Ash Debottlenecking**

Client: **Brunner Mond** Project Ref.:

Borehole No. **779**

Sheet 1 of 1

Job No.: **8976/A**

Equipment and methods **light cable percussion**

Drilled by

Start Date: 27/08/69 End Date: / / Final Depth: 9.14

Ground level m AOD

Co-ordinates: E N

CASING DEPTH (m)	WATER DEPTH (m)	Field Records	SAMPLES / TESTS Depth (m) from	to	SAMPLE Type & No.	SPT (N) (Cu)	Description	Depth & Thickness (m)	Reduced Level (m AOD)	Strata Legend
		//					FILL Tarmac	(0.61)		
								0.61		
							Mixed SAND with some GRAVEL.	(0.49)		
						(10)		1.10		
							MODERATELY COMPACT brown slightly silty mixed SAND with some mixed rounded GRAVEL.			
						(10)				
								(5.00)		
						(15)				
						(18)				
								6.10		
							LOOSE becoming MODERATELY COMPACT with depth, brown slightly silty mixed SAND, some mixed GRAVEL.			
						(6)				
								(3.04)		
						(19)				
								9.14		
							Borehole Completed			

Remarks

Casing Diameter (mm) Casing Depth (m)

Note: Water was added to assist boring from 1.1m to 4.2m below ground level.
Ground water was encountered at 4.2m below ground level and remained at that level throughout boring.

Date Borehole Backfilled :/ /

Logged by

FIG No.

SSL - cable perc. 08/96 Rev 4d

TERRESEARCH LIMITED

TAYWOOD ROAD - NORTHOLT - MIDDLESEX UB5 6RL

SJ 67 SW/6

6492 7456

BOREHOLE No. 4 Contd/..

COMMERCIAL IN CONFIDENCE

Contract Name .. Topfields ..... Report No. .....

Ground Level ..... Diameter of Boring .....

Water Struck ..... Method .....

Standing Water Level ..... Start ..... Finish .....

REMARKS :

Preliminary Sheet

Description of Strata	Thickness	Depth	Disturbed Samples		Undisturbed Samples and Insitu Tests
Hard brown sandy boulder clay with occasional boulders			J1156	19.00	19.00 N=67 for 150 mm
			B1157	19.00	
			J1158	20.00	20.00 N=113
			B1159	20.00	
			J1160	21.00	21.00 N=108
			B1161	21.00	
			B1162	21.90	
			J1163	22.50	22.50 N=98
			B1164	22.50	
	4.50	23.50			
Sand and gravel traces of marl and pieces of sandstone			J1165	23.50	23.50 N=120
			B1166	23.50	
			J1167	24.50	24.50 N=57 for 150m
			B1168	25.50	25.50 N=78
			B1169	26.50	26.50 N=93
	3.50	27.00			
Coarse sand and fine gravel			J1170	27.50	27.50 N=87
			B1171	27.50	28.50 N=90
			J1172	28.50	
			B1173	28.50	
			J1174	29.50	29.50 N=50
			B1175	29.50	
	3.00	30.00			
Hard brown boulder clay with layers of sand			J1176	30.50	30.50 N=57
			B1177	30.50	
	1.50	31.50			
Hard brown boulder clay with traces of marl			J1178	31.50	31.50 N=105
			B1179	31.50	
			J1180	32.50	32.50 N=109
			B1181	32.50	
	2.50	34.00	J1182	33.50	33.50 N=91 for 225m
TOTALS	34.00	34.00	B1183	33.50	

NOTES : 1. Descriptions are given in accordance with B.S. Civil Engineering Code of Practice C.P.2001 "Site Investigations".
2. J indicates Jar Sample
B " Bulk Sample
W " Water Sample
U " Undisturbed Core Samples, nominally 100mm dia. x 0.45m long. Depth shown to top of sample
U* " Sample not recovered
N " Number of blows for 300mm penetration in Standard Penetration Test
V " Shear strength in kN/m² given by Insitu Vane Test

TERRESEARCH LIMITED

TAYWOOD ROAD · NORTHOLT · MIDDLESEX UB5 6RL

SJ67SW/6

6492 7456

BOREHOLE No. 4

COMMERCIAL IN CONFIDENCE

Contract Name Topfields — Report No. S.29/629

Ground Level — Diameter of Boring 200 and 150 mm

Water Struck 10.30 — Method Shell and Auger

Standing Water Level 1.85 28.6.79 — Start 21.6.79 — Finish 27.6.79

REMARKS: Chiselling to 22.20 1½ hours

Preliminary Sheet

Description of Strata	Thickness	Depth	Disturbed Samples	Undisturbed Samples and Insitu Tests
Made Ground Ashes, sand, cobbles, rubble	1.20	1.20	B1129 0.60	
Clay, gravel, sand, slate, bricks	3.40	4.60	B1130 1.30 B1131 2.30 B1132 3.30 B1133 4.30	1.30 N=7 2.30 N=5 3.30 N=5 Further 300 mm N=5 4.30 N=13
Firm brown sandy boulder clay	4.90	9.50	J1134 5.00 B1135 5.00 W1136 4.00 J1137 6.00 B1138 6.00 J1139 7.00 B1140 7.00 J1141 8.00 B1142 8.00 J1143 9.00 B1144 9.00	5.00 N=15 6.00 N=17 7.00 N=18 8.00 N=14 9.00 N=22
Stiff to hard brown sandy boulder clay	0.90	10.40	J1145 10.00 B1146 10.00	10.00 N=46
Small to medium gravel with sand	3.50	13.90	B1147 11.00 B1148 12.00 B1149 13.00	11.00 N=59 12.00 N=58 13.00 N=50
Sand, gravel cobbles with bands of clay	5.10	19.00	B1151 14.00 B1152 15.00 B1153 16.00 B1154 17.00 ~~B1155 18.00~~	14.00 N=48 15.00 N=65 for 150mm 16.00 N=70 17.00 N=63 ~~18.00 N=55~~
TOTALS		Contd/..		

NOTES: 1. Descriptions are given in accordance with B.S. Civil Engineering Code of Practice C.P.2001 "Site Investigations".
2. J indicates Jar Sample
B " Bulk Sample
W " Water Sample
U " Undisturbed Core Samples, nominally 100mm dia. x 0.45m long. Depth shown to top of sample
U* " Sample not recovered
N " Number of blows for 300mm penetration in Standard Penetration Test
V " Shear strength in kN/m² given by Insitu Vane Test

TERRESEARCH LIMITED

TAYWOOD ROAD - NORTHOLT - MIDDLESEX UB5 6RL

SJ67SW/8

6491 7464

BOREHOLE No. 6

COMMERCIAL IN CONFIDENCE

Contract Name Topfields — Report No. S.29/629

Ground Level — Diameter of Boring 200 and 150 mm

Water Struck 2.20 and 10.00 — Method Shell and Auger

Standing Water Level 2.20 21.6.79 — Start 6.6.79 — Finish 20.6.79

REMARKS: Chiselling 0.40 to 1.00 m 1½ hours
6½ Days lost due to strike in Clients' works
Water level before pulling casing 3.40 afterwards 2.20 m
Sand blowing from 11.50 to 15.80 m

Preliminary Sheet

Description of Strata	Thickness	Depth	Disturbed Samples	Undisturbed Samples and Insitu Tests
Made Ground Cobbles timber, wire, bricks	1.20	1.20	B1101 0.50	
Clay cobbles bricks and sand	1.60	2.80	J1102 1.20 J1104 1.80 B1105 2.10	U1103 1.30
Gravel, bricks, glass, rubble and industrial waste	3.20	6.00	B1106 3.00 W1107 2.25 B1108 4.50	3.00 N=15 4.50 N=15
Silty sand with cobbles	1.00	7.00	B1109 6.00	*U 6.00
Soft to firm brown sandy boulder clay	3.00	10.00	J1110 7.00 J1112 8.00 J1114 9.50	U1111 7.50 U1113 9.00
Sand and gravel and bands of clay	1.50	11.50	B1115 10.50	10.50 N=56
Sand and gravel and cobbles	4.30	15.80	B1116 12.00 B1117 13.50 B1118 15.00	
Hard brown sandy boulder clay	0.70	16.50	J1120 16.50 W1121 3.50	U1119 16.00
Hard brown boulder clay with layers of sand and gravel	1.90	18.40	J1122 17.50 B1123 17.50 B1124 18.20	17.50 N=128 for 225 mm *U 18.20
Dense brown and grey sand	3.10	21.50	J1125 19.50 B1126 19.30 J1127 21.00 B1128 21.00	19.30 N=78 21.00 N=74
TOTALS	21.50	21.50		

NOTES: 1. Descriptions are given in accordance with B.S. Civil Engineering Code of Practice C.P.2001 "Site Investigations".
2. J indicates Jar Sample
B " Bulk Sample
W " Water Sample
U " Undisturbed Core Samples, nominally 100mm dia. x 0.45m long. Depth shown to top of sample
*U " Sample not recovered
N " Number of blows for 300mm penetration in Standard Penetration Test
V " Shear strength in kN/m² given by Insitu Vane Test

SJ 67 SW/53

HOLST & CO. LTD.

SITE INVESTIGATION DEPT.

PARKSIDE LANE

LEEDS LS11 5SX.

64935 74864

Contract No. M4109/F1614 Borehole No. 1A

Location Winnington Ground Level

Client ICI Limited Date 6.9.70

BOREHOLE LOG

STRATA	Legend	Depth below Ground Level	Thickness of Strata	Type of Sample	c lb/sq. ft.	ø deg.	m.c %	y lb/cu. ft.	N
Railway Ballast		1'0	1'0						
Made ground: Tarmac		6"	6"	2'6					17
Made ground: Sand, stones ash		7'0	5'6	5'6					14
Light brown compact sand				8'6					21
			13'6	14'0	800	31	13.1	134	
				18'6	[illegible]	[illegible]	[illegible]	[illegible]	31
		20'6		21'0					
Hard brown boulder clay		23'0	2'6		6500	8	10.9	146	
Weathered brown and grey mudstone (Keuper Marl)			19'0	27'0	2150	0	19.7	131	
		34'0		32'0	3800	10	18.4	136	
Hard brown and grey mudstone (Keuper Marl)			5'6	35'0	3560	20	15.2	138	
		39'6		38'0	1850	25	16.9	135	

Water Struck at 9'6 Maximum Observed Water Level

Undisturbed Sample []
Disturbed Sample o
Water Sample Δ
Penetration Test I

c = Cohesion
ø = Angle of Internal Friction
m.c = Moisture Content
y = Bulk Density
N = Standard Penetration Value

Water levels are subject to seasonal or tidal variation and should not be taken as constant

British Geological Survey

SJ675W, 26470 7481 90

STRATA SURVEYS LIMITED

Location **Ash Debottlenecking**

Client: **Brunner Mond** Project Ref.:

Borehole No. **779**

Sheet 1 of 1

Job No.: **8976/A**

Equipment and methods **light cable percussion**

Drilled by

Ground level m AOD

Start Date: 27/08/69 End Date: / / Final Depth: 9.14

Co-ordinates: E N

CASING DEPTH (m)	WATER DEPTH (m)	Field Records	SAMPLES / TESTS Depth (m) from to	SAMPLE Type & No	SPT (N) (Cu)	Description	Depth & Thickness (m)	Reduced Level (m AOD)	Strata Legend
		//				FILL Tarmac	(0.61)		
							0.61		
						Mixed SAND with some GRAVEL.	(0.49)		
					(10)		1.10		
						MODERATELY COMPACT brown slightly silty mixed SAND with some mixed rounded GRAVEL.			
					(10)				
							(5.00)		
					(15)				
					(18)				
							6.10		
						LOOSE becoming MODERATELY COMPACT with depth, brown slightly silty mixed SAND, some mixed GRAVEL.			
					(6)				
							(3.04)		
					(19)				
							9.14		
						Borehole Completed			

Remarks

Casing Diameter (mm) Casing Depth (m)

Note: Water was added to assist boring from 1.1m to 4.2m below ground level.
Ground water was encountered at 4.2m below ground level and remained at that level throughout boring.

Date Borehole Backfilled :/ /

Logged by

FIG No.

SSL - cable per 08/96 Rev a1

British Geological Survey

Version 2.0.6.7

BGS ID: 763488 : BGS Reference: SJ67NE5
British National Grid (27700) : 365636,375354
Report an issue with this borehole

<< < Prev Page 1 of 5 Next > >>

10 SJ 67 NE 5 67 NE/5

c Marbury Estate Boring

Marbury, Northwich. Cheshire

NGR 6564 7536

1" map. 97.

6" map. Cheshire 34 NW.W.

Marbury Estate. Trial boring for the Mersey Salt & Brine Co.

Metric.

			Thickness	Depth.
Sandy clay with a string bed of clay 3½ft. 3ft from surface.	11½		3·51	
Fine red sand	5	16½	1·52	5·03
V. fine red loam	1	17½	0·31	5·33
Red Keuper marls with a few inches of grey marls	86½	104	26·37	31·70
Gypsum vein in indurated marls	1½	105½	0·46	32·16
Red marl	15½	121	4·72	36·88
Gypsum vein as before	2	123	0·61	37·49
Red & Grey marl	21	144	6·40	43·89
Gypsum vein in dark indurated marl	26⅚	170⅚	8·18	52·07
Rock head & surface of Rock salt.	5⅙	176	1·58	53·65

Surface of boring 80ft above. O.D.
Brine stands at 120ft from surface.

Site is 800 yards west of Dairy House Farm, Marbury.

According to R.L. Sherlock surface level 79·95ft. O.D.
Depth of Bp Salt Bed 94ft. below O.D.
Depth of Sinking 174ft. (R.L.S.).

Contract Name	I.C.I. Topfields SJ 67SE/121 6503 7461	Borehole No. 7
		Sheet 1 of 1

Method of boring: Shell and Auger
Diameter: 200 mm
Ground level: 32.51m OD
Start: 4.7.79
Finish: 5.7.79

Daily progress	Water levels	In-situ tests	Samples	Depth (m)	Reduced level (m O.D.)	Thickness (m)	Description of Strata
			J	0.90	31.61	0.90	Made Ground: Ash and sand
		N = 20	B	1.90	30.61	1.00	Medium dense red-brown sand and gravel
		N=17	B J	4.30	28.21	2.40	Medium dense red-brown clayey sand
		N=26	B			2.50	Medium dense coarse to fine gravel with a little red-brown sand
		N=20	B				
	▼▽ 5/7		W	6.80	25.71		
			U*B			1.30	Very stiff red-brown very sandy silty clay with cobble to fine gravel size stones and layers of light brown sand (Boulder Clay)
			U*B				
	▽ 4/7		U	8.10	24.41		
4/7		N = 77	B			1.90	Very dense red-brown sand and coarse to fine gravel with a trace of clay
		N = 76	B	10.00	22.51		
5/7							Bottom of Borehole

Notes Water added between 0 and 10 m.

Co-ordinates E 365025.5 N 374608.2

Terresearch Limited	Report No. S.29/629	Appendix 1 Sheet 16

BGS ID: 828524 : BGS Reference: SJ67SE121
British National Grid (27700) : 365030,374610
Report an issue with this borehole

SJ 67/93G

Contract Name	I.C.I. Topfields	Borehole No. 7
		Sheet 1 of 1

Method of boring Shell and Auger
Diameter 200 mm
Ground level 32.51m OD
Start 4.7.79
Finish 5.7.79

Daily progress	Water levels	In-situ tests	Samples	Depth (m)	Reduced level (m O.D.)	Thickness (m)	Description of Strata
			J	0.90	31.61	0.90	Made Ground: Ash and sand
		N = 20	S	1.90	30.61	1.00	Medium dense red-brown sand and gravel
		N=17	B J	4.30	28.21	2.40	Medium dense red-brown clayey sand
		N=26	B			2.50	Medium dense coarse to fine gravel with a little red-brown sand
	▼▽ 5/7	N=20	B	6.80	25.71		
			W			1.30	Very stiff red-brown very sandy silty clay with cobble to fine gravel size stones and layers of light brown sand (Boulder Clay)
			U*B				
	▽ 4/7		U*B				
4/7			U	8.10	24.41		
		N = 77	B			1.90	Very dense red-brown sand and coarse to fine gravel with a trace of clay
		N = 76	B	10.00	22.51		
5/7							Bottom of Borehole

Notes: Water added between 0 and 10 m.

Co-ordinates E 365025.5 N 374608.2

SJ67/93A

Contract Name I.C.I. TOPFIELDS	Borehole No. 1
	Sheet 1 of 2

Method of boring Shell and Auger
Diameter 200mm
Ground level 30.58m. OD
Start 23.5.79
Finish 25.5.79

Daily progress	Water levels	In-situ tests	Samples	Depth (m)	Reduced level (m O.D.)	Thickness (m)	Description of Strata
Seepage	▽	23/5	B			0.90	Made Ground: Cobbles, rubble and soft brown clay
			3 U	0.90	29.68	0.35	Soft brown clay with stones
		N=9	B	1.25	29.33	1.65	Loose brown sand with a little gravel and with bands of clay
23/5	▽	25/5	U	2.90	27.68	11.50	Stiff to very stiff dark red-brown very sandy silty clay with medium to fine gravel size stones (Boulder Clay)
23/5			U				
			U				
			U				
			U				

Cont'd.....

Notes: 20 m of water level observation tubing installed
Water added between depths of 1.0m and 3.0m and also 15.0m-16.40m.

Co-ordinates E 364838.9 N 374476.6

Terresearch Limited	Report No. S29/629	Appendix 1 Sheet 1

SJ67SE 429

STRATA SURVEYS LIMITED

Location **Nether Tabley to Winnington Pipeline**

Client: **Kvaerner John Brown Ltd** Project Ref.: **6709**

Borehole No. **12**

Job No.: **9062/A**

Equipment and methods **Light Cable Percussion**

Start Date:	End Date:	Final Depth:	Diameter	Casing Depth
02/06/97	02/06/97	5.05m		

FIELD RECORDS	Samples / Tests				Description	Strata		
	Casing (Water) Depth (m)	Depth (m) from	to	SAMPLE Type & No / SPT (N) (Cu)		Depth & Thickness m	Reduced Level (m)	Legend
		0.20		D 1	MADE GROUND (200mm of topsoil and ash over black ash fill)			
		0.50		D 2		(1.00)		
		1.00		D 3		1.00		
		1.20	1.65	S 4 (24)	Firm grey mottled brown CLAY (completely weathered mudstone)			
						(1.40)		
		2.00		D 5				
		2.40	2.85	S 6 (11)		2.40		
					Grey with brown mottling highly weathered MUDSTONE			
		3.40	3.70	U 7				
		3.60		W 11				
		3.70	4.15	S 8 (62)		(2.65)		
		4.30		D 9				
		4.60	5.05	S 10 (122)				
					Borehole Completed	5.05		

Remarks 1) Water struck at 4.80m rising to 3.60m after 20 minutes.

Logged by **GHarwood** Drilled by **SSS**

Ground level

Co-ordinates:

British Geological Survey

SSL--rabi.pr .08/96 Rev a1

SJ 79 SW 44-53

BORINGS MADE BY THE MANCHESTER GAS CORPORATION ENGINEERING DEPARTMENT 1944

	Depth in Feet			Type of Strata	Date
	From	To			
				44 Bore Hole No.1	
	0'	2'	0·91	Surface Soil	
2-12	2	6'	1·83	Sand	
10-21	10	21'	6·40	Stiff Clay	
	21'			Red Sandstone	
				-	
				45 Bore Hole No.3	
	0	1'6"	0·46	Surface Soil	
	1'6"	9'6"	2·90	Sand	
	9'6"	23'6"	7·16	Stiff Clay	
	23'6"	24'6"	7·47	Clay	
	24'6"			Red Sandstone	
				-	
				46 Bore Hole No.2	
	0	1'6"	0·46	Surface soil	
	1'6"	9'6"	2·90	Sand & Gravel	
	9'6"	18'6"	5·64	Stiff Clay	
	18'6"			Red Sandstone	
				47 Bore Hole No.4	
	0'	1'6"	0·46	Surface Soil	
	1'6"	9'6"	2·90	Sand	
	9'6"	27'6"	8·38	Stiff Clay	
	27'6"			Red Sandstone	
				-	
				48 Bore Hole No.5	
	0'	1'6"	0·46	Surface soil	
	1'6"	6'	1·83	Sand & Gravel	
	6'	23'	7·01	Stiff Clay	
	23'			Red Sandstone	
				-	
				50 Bore Hole No.6	
	0'	2'6"	0·76	Surface soil	
	2'6"	6'6"	1·98	Sandy Clay	
	6'6"	12'6"	3·81	Stiff Clay	
	12'6"	17'6"	5·33	Sand	
	17'6"	33'	10·06	Red Sandstone	
				-	
				51 Bore Hole No.7	
	0	2'6"	0·76	Surface soil	
	2'6"	6'6"	1·98	Sand	
	6'6"	16'	4·38	Stiff Clay	
	16'	24'6"	7·47	Stoney Clay	
	24'6"			Red Sandstone	
				-	
				53 Bore Hole No.8	
	0	1'6"	0·46	Surface Soil	
	1'6"	9'6"	2·90	Sand	
	9'6"	24'6"	7·47	Clay & Gravel	
	24'6"			Red Sandstone	

Version 2.0.6.7
BGS ID: 887754 : BGS Reference: SJ68NW5
British National Grid (27700) : 363680,387410
Report an issue with this borehole

(No 2) 68 NW/5

RECORD OF WELL (SHAFT OR BORE)

O.S. 97
1" O.S.
Grid Ref. 2.

At Richmond's Gas Stove Co. Ltd Grappenhall Works
Town or Village Latchford Locks County CHESHIRE Six-inch quarter sheet 16NE
Exact site WARRINGTON (A rough sketch-map or a tracing from a map is very desirable)
in parish of No. 1 well
Level of ground surface above sea-level (O.D.) 32'6" ft. Depth of well/shaft/bore below ground surface, standing water far ft.
Shaft diameter ft. Bore 150¼ ft. Diameter of bore at top 8 ins.; at bottom ins.
Details of permanent lining tubes (internal diameters preferred) to 41 ft. 6 ins.

SJ 68 NW 5

Water struck at depths of (feet)
Rest-level of water below above top of well 12½ feet. Suction at 147 feet. Yield on hours' days' test
1,200 gallons per hour (with pump of capacity g.p.h.); depressing water level to feet below top. Time of recovery hrs. Amount normally pumped daily g.p.h. for hours.
Quality (attach copy of analysis if available) Hardness 61·0°
Sunk by Messrs Simmins for Messrs Richmond's Date of well 1906
Information from Messrs Simmins.

(For Survey use only). GEOLOGICAL CLASSIFICATION.	NATURE OF STRATA (and any additional remarks).	THICKNESS Feet.	THICKNESS Inches.	DEPTH Feet.	DEPTH Inches.
	Surface Soil	1	6	1	6
	Fine red sand	8	6	10	0
	Dirty sand with coal fragments	2	0	12	0
	Sand and gravel	5	6	17	6
	Soft red sandstone	6	8	85	6
	Hard light red sandstone	2	0	87	6
	Hard red sandstone	62	9	150	3
	See 6" Lancashire 116 NW (= Cheshire 16NE) for site location.				

THICKNESS (m)	DEPTH (m)
0.46	0.46
2.59	3.05
0.61	3.66
2.67	5.33
20.73	26.06
0.61	26.67
19.13	45.80

TOLOGICAL SURVEY AND MUSEUM, SOUTH KENSINGTON.

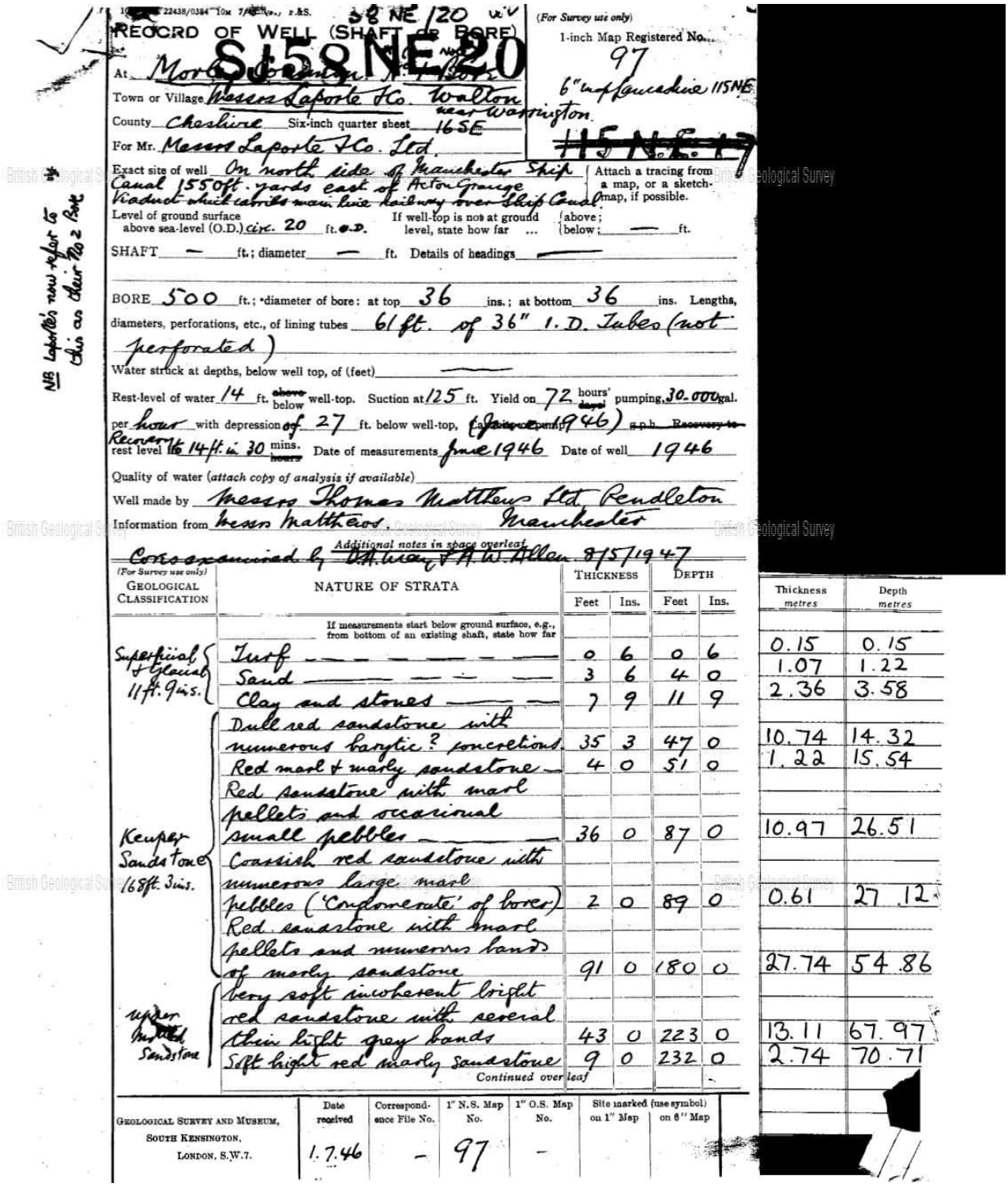
For Survey use only

Date received	O.S.M. Office File No.	Site marked on 1" map (use ...)

Version 2.0.6.7

BGS ID: 167127 : BGS Reference: SJ58NE20
British National Grid (27700) : 359420,385870
Report an issue with this borehole

<< < Prev Page 1 of 19 Next > >>



SJ58NE/20 W.V

RECORD OF WELL (SHAFT or BORE)

SJ58NE20

(For Survey use only)
1-inch Map Registered No. 97
6" map Lancashire 115NE
115NE 17

At Mort[illegible]
Town or Village Messrs Laporte & Co. Walton near Warrington.
County Cheshire Six-inch quarter sheet 16SE
For Mr. Messrs Laporte & Co. Ltd.
Exact site of well On north side of Manchester Ship Canal 1550ft. yards east of Acton Grange Viaduct which carries main line railway over Ship Canal.
Attach a tracing from a map, or a sketch-map, if possible.
Level of ground surface above sea-level (O.D.) circ. 20 ft. O.D. If well-top is not at ground level, state how far ... {above; below; — ft.
SHAFT — ft.; diameter — ft. Details of headings —

NB Laporte's now refer to this as their No 2 Bore

BORE 500 ft.; diameter of bore: at top 36 ins.; at bottom 36 ins. Lengths, diameters, perforations, etc., of lining tubes 61 ft. of 36" I.D. Tubes (not perforated)
Water struck at depths, below well top, of (feet) —
Rest-level of water 14 ft. above/below well-top. Suction at 125 ft. Yield on 72 hours' pumping, 30.000 gal. per hour with depression of 27 ft. below well-top, (January 1946) g.p.h. Recovery to Recovery to rest level in 14ft. in 30 mins. hours. Date of measurements June 1946 Date of well 1946
Quality of water (attach copy of analysis if available)
Well made by Messrs Thomas Matthews Ltd. Pendleton
Information from Messrs Matthews. Manchester
Additional notes in space overleaf
Core examined by D.A. Wray & A.W. Allen 8/5/1947

(For Survey use only) Geological Classification	Nature of Strata (If measurements start below ground surface, e.g., from bottom of an existing shaft, state how far)	Thickness Feet	Thickness Ins.	Depth Feet	Depth Ins.	Thickness metres	Depth metres
Superficial & Glacial 11ft. 9ins.	Turf	0	6	0	6	0.15	0.15
	Sand	3	6	4	0	1.07	1.22
	Clay and stones	7	9	11	9	2.36	3.58
Keuper Sandstone 168ft. 3ins.	Dull red sandstone with numerous barytic? concretions	35	3	47	0	10.74	14.32
	Red marl & marly sandstone	4	0	51	0	1.22	15.54
	Red sandstone with marl pellets and occasional small pebbles	36	0	87	0	10.97	26.51
	Coarsish red sandstone with numerous large marl pebbles ('Conglomerate' of borers)	2	0	89	0	0.61	27.12
	Red sandstone with marl pellets and numerous bands of marly sandstone	91	0	180	0	27.74	54.86
Upper Mottled Sandstone	Very soft incoherent bright red sandstone with several thin light grey bands	43	0	223	0	13.11	67.97
	Soft bright red marly sandstone	9	0	232	0	2.74	70.71

Continued over leaf

Geological Survey and Museum, South Kensington, London, S.W.7.	Date received	Correspondence File No.	1" N.S. Map No.	1" O.S. Map No.	Site marked (use symbol) on 1" Map	on 6" Map
	1.7.46	-	97	-		

(For Survey use only) Geological Classification	NATURE OF STRATA 55 If measurements start below ground surface, state how far ...	Thickness Feet ...	Thickness Inches ...	Depth Feet	Depth Inches	T. Metres.	D. Metres.
	Sand & gravel	12	0	12	0	3.66	3.66
	Boulders & gravel	1	6	13	6	0.46	4.12
	Gravel & sand	8	4	21	10	2.54	6.66
	Boulders	1	9	23	7	0.53	7.19
	Red sandy clay	10	5	34	0	3.17	10.36
	Soft Red Sandstone	472	11	506	11	144.14	154.50

British Geological Survey

SJ58/266

British Geological Survey

BOREHOLE RECORD

Contractor: **Blair Drilling Ltd, Unit 20 The Old Brickworks, Pott Shrigley, Macclesfield Cheshire SK10 5RX**
Tel: 01625 878411 Fax: 01625 878041. Email: info@blairdrilling.co.uk

Site: Perstorp 38m OBH (P5)
NGR: SJ 59597 86074
Ground Level:
Date Drilled: January 2009
Datum: Ground level

Depth/m	Thickness/m	Description of strata
0	0.7	hardcore
0.7	4.5	brown sand
5.2	3.8	black sand
9	28.5	hard sandstone
38.5		total depth drilling finished

CONSTRUCTION DETAILS

Drilled dia/mm	from /m depth	to /m depth
150	0	9
138	9	38.5

Casing dia/mm	from /m depth	to /m depth	Type
150	0	9	steel
50	0	35.5	PVC plain
50	35.5	38.5	PVC slotted

Water struck at 6 m BGL

Grouting details 50mm piezo with 3m response zone at 35.5 – 38.5m bgl gravel packed remainder of BH grouted 35.5 bgl to 1 m bgl with opc/bentonite mix

[redacted]

SJ68NW685

CABLE PERCUSSION RECORD SHEET

STRATA SURVEYS LIMITED

Location Lower Walton Pumping Station
Client: Warrington Borough Council Project Ref.:

Borehole No. BH2
Sheet 1 of 1.

Job No.: 8456/A

Equipment and methode Light Cable Percussion
Casing Diameter (mm) 150
Casing Depth (m) 6.90

6033
8653.

Drilled by T.O'H
Ground level m AOD
Co-ordinates E N
Date 13-03-96

CASING DEPTH (m)	WATER DEPTH (m)	Field Records	SAMPLES / TESTS Depth (m) from	to	Sample Type & No	SPT N Value Cu	Description	Depth & Thickness (m)	Reduced Level (m AOD)	Strata Legend
							MADE GROUND (150mm of topsoil over sandy topsoily brick rubble)	(0.30) 0.30		
			0.50	0.95	B 1		MADE GROUND (Very loose brown clayey silty fine to coarse grained sand with some fine to medium gravel)			
NIL	NIL		1.30 1.30	1.75 1.75	B 2 S 1	3.0		(2.00)		
2.20	NIL	20	2.30	2.75	U 1	35	Soft to firm mottled brown/grey very silty CLAY with a little organic matter and occasional silt partings	2.30		
			2.80	2.80	D 1					
3.20	NIL	20	3.50	3.95	U 2					
			3.95	3.95	D 2					
4.40	NIL	25	4.50	4.95	U 3	65				
			5.00	5.00	D 3			(5.00)		
5.40	NIL	25	5.50	5.95	U 4					
			5.95	5.95	D 4					
6.90	NIL	30	7.00	7.45	U 5	33				
		-(13-03)-	7.45	7.45	D 5		Grey slightly clayey very silty fine grained SAND	7.30 (0.25) 7.55		
							Borehole Complete			

Remarks
1) Service pit dug 0.60m x 0.60m x 1.30m.
2) No groundwater encountered during drilling.

Logged by G.L. Date 04/04
Checked by
Approved by

Scale 1:50

FIG No.

British Geological Survey

Norwest Holst Soil Engineering Ltd.

Borehole No. 9

BOREHOLE LOG

Contract No. F9056
Location Wilderspool Brewery, Warrington SJ68NW
Client Greenall Whitley
Method of Boring Cable Percussion
Diameter of Borehole 150mm 6106 8672
Sheet 1 of 2
Chainage
Ground Level 9.65 m.A.O.D.
Date 7/3/91

767

Description of Strata	Legend	Depth Below G.L. (m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	"N"/ R.Q.D.%	Daily Progress
MADE GROUND: Asphelt and hardcore sub base.		0.30	9.35				
		0.40	9.25		0.50-0.95 s	"8"	
MADE GROUND: Brick fill.		1.30					
Loose greyish brown silty fine SAND thinly interbedded with some grey silt and dark grey clay. Occasional black organic material and iron-staining.					1.50-1.95 s	"3"	
					2.50-2.95 s	"4"	
Loose dark grey silty fine SAND with patches of sandy silt and clayey patches.		3.40	6.25				
Soft grey fine sandy SILT with a little fine gravel. (Possible Made Ground)					3.50-3.95 s	"8"	
					4.50-4.95 s	"8"	
...At 6.00m black spongy twigs.					6.00-6.45 s	"7"	
		6.80	2.85				
Loose reddish brown fine medium and coarse SAND.					7.50-7.95 s	"8"	
...from 8.90m driller records "occasional gravel"					9.00-9.45 s	"10"	

Type of Sample

Is	S.P.T.	■	Undisturbed
Ic	C.P.T.	x	Vane
0	Jar	△	Water
●	Bulk	▮	Piezometer

Remarks (Observations of Ground Water etc.)

Groundwater struck 7/3/91 at 2.00m no rise.
Casing advanced to 15.00m not sealed.
Hard strata Chiselling 13.40-15.00m 2hrs

Water levels are subject to seasonal or tidal variations and should not be taken as constant

Version 2.0.6.7

BGS ID: 888532 : BGS Reference: SJ68NW767
British National Grid (27700) : 361060,386720
Report an issue with this borehole

<< < Prev Page 2 of 2 Next > >>

Norwest Holst Soil Engineering Ltd.

Borehole No. 9

BOREHOLE LOG

Contract No. F9096
Location Wilderspool Brewery, Warrington SJ68NW
Client Greenall Whitley
Method of Boring Cable Percussion
Diameter of Borehole 150mm
Sheet 2 of 2
Chainage
Ground Level 9.65 m.A.O.D.
Date 7/3/91

767

Description of Strata	Legend	Depth Below G.L.(m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	"N"/ R.Q.D.%	Daily Progress
Medium dense reddish brown fine medium and coarse sand					10.50-10.95 C	"14"	
		11.70	-2.05				
Very dense red silty fine sand with a little to some fine gravel size lithorelicts of sandstone (Completely Weathered Sandstone)					11.80-12.25 S	"93"	
...from 13.00m with fine medium and coarse gravel size lithorelicts.					13.00-13.45 S	"139"	
					14.50-14.70 S	50 for 50mm	
Borehole complete at 15.20m.		15.20	-5.55		15.00-15.20 S	50 for 40mm	7/3/91

Type of Sample

Is	S.P.T.	■	Undisturbed
Ic	C.P.T.	x	Vane
0	Jar	△	Water
●	Bulk	▮	Piezometer

Remarks (Observations of Ground Water etc.)

Methane gas detected see attached sheet.

50mm slotted standpipe piezometer installed to 12.00m.

Water levels are subject to seasonal or tidal variations and should not be taken as constant

Version 2.0.6.7

BGS ID: 887770 : BGS Reference: SJ68NW16
British National Grid (27700) : 362680,387230
Report an issue with this borehole

<< < Prev Page 1 of 2 Next > >>

WELL BORING at Latchford House County Lancashire

Geol. map in map New Series 97 6 in. map 116NW

Communicated by Nov. 1926 by Major E. Tuinins, Runcorn

Height above Ordnance Datum 45' Rest level of water

Yield

Quality (with copy of analysis on separate sheet)

SJ 68 NW 16. 10.

46 on free edge 68 NW

GEOLOGICAL FORMATION.	NATURE OF STRATA.	THICKNESS. Feet.	THICKNESS. Inches.	DEPTH. Feet.	DEPTH. Inches.
	Coarse dark brown sand of recent origin	20		20	
	Dark brown clay	10		30	
	Brown sand	1		31	
	Dark brown clay	13		44	
	Red Bunter Rock	58	6	102	6

6	10	6	10
3	05	9	15
0	31	9	46
3	96	13	42
17	82	31	24

GEOLOGICAL SURVEY AND MUSEUM, JERMYN STREET, LONDON. S.W. 1.

(B10619). Wt. 15824—S123. 2500. 11/25. Gp. 160. O.A.

M.S.C.

SJ68/62 H

Owner		Licence No.	
Occupier		IGS Ref. No.	
Ground Level	m OD		ft. OD
Level of Well Top	m OD		ft. OD
Rest Water Level	m bwt		ft. bwt
(Date)	m OD		ft. OD

Nat. Grid Ref. 6300 8703.

Status

Aquifer

Construction

Depth bwt	Dia.	Linings (below well top) From	To	Dia.	Type

Abstraction Rates	Type of Pump
gph	Chem./Bact. Anal. YES NO
gpd	Well Driller

If insufficient space has been allowed, continue in 'Notes' overleaf.

Summary of Geological Section	Thickness	Depth
Sand Y.		4'
Gravel Y.		6'
Stiff clay Y.		9'
Red silt Y.		15'

M.S.C.

SJ68/62 I

Owner		Licence No.	
Occupier		IGS Ref. No.	
Ground Level	m OD		ft. OD
Level of Well Top	m OD		ft. OD
Rest Water Level	m bwt		ft. bwt
(Date)	m OD		ft. OD

Nat. Grid Ref. 6329 8714

Status

Aquifer

Construction

Depth bwt	Dia.	Linings (below well top) From	To	Dia.	Type

Abstraction Rates	Type of Pump
gph	Chem./Bact. Anal. YES NO
gpd	Well Driller

If insufficient space has been allowed, continue in 'Notes' overleaf.

Summary of Geological Section	Thickness	Depth
Sand + gravel Y.		9'
Red silt Y.		24'

CLIENT	JOB NO	LOCATION	BOREHOLE NO
T.S.C. LTD.	C9398	CHS 0106, BLACK BEAR GARAGE	BH1
DATE: JANUARY 1998 / SCALE: 1 to 50	BORING METHOD: CABLE PERCUSSIVE		Sheet: 1

Drilling & Casing Progress	SAMPLE/TEST Type & No.	SAMPLE/TEST Depth(M)	SPT N – value or COHESION	DESCRIPTION	O D LEVEL	LEGEND	DEPTH
29TH							0.0
	B	0.25		MADE GROUND–Loose sand rubble soil & stone fill with some timber fragments present.			
	B	0.70					0.60
	S	1.00	6	Loose to medium dense slightly silty brown/yellow SAND.			
	B	2.10					
	S	2.50	13				
29TH							
	B	3.15					
	S	3.55	106				3.65
				Weathered very dense poorly cemented reddish brown SANDSTONE (Bunter). Rapidly becoming denser with depth.			
	S	4.60 – 4.80	> 50				
29TH							4.80

DUNELM DRILLING CO
0191 626 2634 FAX 0191 617 0086

BOREHOLE LOGSHEET

Water Observations, Remarks, Etc

Borehole dry.

Trial pit excavated to 1.00m BGL to check for services – 1hr
Chiselling obstructions/sandstone for 1hr.

British Geological Survey

Norwest Holst Soil Engineering Ltd.

L 5

BOREHOLE LOG

Contract No. F9056
Location Wilderspool Brewery, Warrington SJ68NW
Client Greenhall Whitley
Method of Boring Cable Percussion
Diameter of Borehole 150mm 6/10 8661

Sheet 1 of 2
Chainage
Ground Level 9.46 m.A.O.
Date 8/3/91

Description of Strata	Legend	Depth Below G.L.(m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	"N"/ R.Q.D.%	Daily Progress
MADE GROUND: Ashphelt and rubble sub base.		1.60	8.86		0.60-1.05 c	"11"	
MADE GROUND: Dark grey silty SAND with fine and medium gravel black organic material brick fragments and metal packing strip.					1.60-2.05 s	"18"	
					2.60-3.05 s	"7"	
					3.60-4.05 s	"6"	
		4.50	4.96		4.60-5.05 s	"8"	
Very soft to soft grey sandy SILT with a little fine gravel occasional clayey patches sand patches black spongy wood and coal fragments.					6.00-6.50 (28)		
...from 6.50m driller records sand lenses.							
(Possible Made Ground)		7.15	2.31		7.20-7.65 s	"9"	
Loose grey fine medium and coarse SAND with occasional fine to medium gravel of highly weathered red sandstone		7.80	1.66		8.00-8.30 s	50 for 75mm	
Very dense red silty fine SAND with some to much fine and medium gravel size sandstone lithorelicts (Completely Weathered Sandstone)					9.50-9.80 s	50 for 75mm	

Type of Sample

Is	S.P.T.	■	Undisturbed
Ic	C.P.T.	x	Vane
0	Jar	△	Water
●	Bulk	▦	Piezometer

Remarks (Observations of Ground Water etc.) (28) U100 Blows
Groundwater struck 8 3/91 at 6.40m rising to 4.20m in 20 minutes casing to 6.40m.
Casing to 9.00m not sealed
50mm slotted standpipe piezometer, installed to 7.50m.
Hard strata chiselling with bailer for 2hrs 8.00-14.00m

Water levels are subject to seasonal or tidal variations and should not be taken as constant

British Geological Survey

Norwest Holst Soil Engineering Ltd.

Borehole No. **5**

BOREHOLE LOG

Contract No. F9056
Location Wildershpool Brewery, Warrington SJ68NW
Client Greenhall Whitley
Method of Boring Cable Percussion
Diameter of Borehole 150mm

Sheet 2 of 2 763
Chainage
Ground Level 9.46 m.A.O.D.
Date 8/3/91

Description of Strata	Legend	Depth Below G.L.(m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	"N"/ R.Q.D.%	Daily Progress
Very dense red silty fine SAND with some to much fine and medium gravel size sandstone lithorelicts (Completely Weathered Sandstone)					11.00-11.15 S	70 * for 77mm	
					12.50-12.65 S	60 * for 80mm	
Borehole Complete at 13.00m.		13.00	-3.54				8/3/91

Type of Sample

Is S.P.T. ■ Undisturbed
Ic C.P.T. x Vane
0 Jar △ Water
● Bulk ▮ Piezometer

Remarks (Observations of Ground Water etc.) * Seating blows only

Water levels are subject to seasonal or tidal variations and should not be taken as constant

British Geological Survey

Version 2.0.6.7

BGS ID: 888533 : BGS Reference: SJ68NW768
British National Grid (27700) : 361160,386680
Report an issue with this borehole

<< < Prev Page 1 of 2 Next > >>

Norwest Holst Soil Engineering Ltd.

Borehole No. 10

BOREHOLE LOG

Contract No. F9056
Location Wilderspool Brewery, Warrington SJ68NW 768
Client Greenall Whitley
Method of Boring Cable Percussion
Diameter of Borehole 150mm 6116 8668
Sheet 1 of 2
Chainage
Ground Level 8.68 m.A.O.D.
Date 8/3/91

Description of Strata	Legend	Depth Below G.L.(m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	"N"/ R.Q.D.%	Daily Progress
MADE GROUND: Asphelt over hardcore.		0.20	8.48				
MADE GROUND: Black and reddish brown silty sand with brick rubble and ash...Odorous. Driller records contamination.					0.50-0.95 c	"11"	
					1.50-1.95 c	"14"	
					2.50-2.95 c	"27"	
					3.50-3.95 s	"7"	
					4.50-4.95 c	"19"	
Very soft to soft dark grey clayey silt with patches of silty sand and patches of black organic silt. Odorous - Driller records contamination.		5.80	2.88		6.00-6.45 s	"8"	
Medium dense gravel fill. (Drillers description)		6.60	2.08				
Very dense red silty fine to medium SAND with a little to some fine to medium gravel size sandstone lithorelicts very weak (Completely Weathered Sandstone)		7.40	1.28		7.50-7.95 s	"94"	
					9.00-9.95 s	"118"	

Type of Sample

Is	S.P.T.	■	Undisturbed
Ic	C.P.T.	x	Vane
0	Jar	△	Water
●	Bulk	▮	Piezometer

Remarks (Observations of Ground Water etc.)

Groundwater struck 8/3/91 at 4.30m no rise not sealed.
Standing water level 8/3/91 PM 5.10m casing to 12.00m.
Methane gas detected 8/3/91 see attached sheet.
50mm slotted standpipe piezometer installed to 8.00m.

Water levels are subject to seasonal or tidal variations and should not be taken as constant

British Geological Survey

Version 2.0.6.7

BGS ID: 888533 : BGS Reference: SJ68NW768
British National Grid (27700) : 361160,386680
Report an issue with this borehole

<< < Prev Page 2 of 2 Next > >>

Norwest Holst Soil Engineering Ltd.

Borehole No. 10

BOREHOLE LOG

Contract No. F9056
Location Wilderspool Brewery, Warrington SJ68NW 768
Client Greenall Whitley
Method of Boring Cable Percussion
Diameter of Borehole 150mm
Sheet 2 of 2
Chainage
Ground Level 8.68 m.A.O.D.
Date 8/3/91

Description of Strata	Legend	Depth Below G.L.(m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	"N"/ R.Q.D.%	Daily Progress
Very dense red silty fine to medium SAND with a little to some fine to medium gravel size sandstone lithorelicts very weak (Completely Weathered Sandstone)					C 10.50-10.70	50 for 75mm	
					C 11.50-11.65	81* for 150mm	
		12.10	-3.42		C 12.00-12.15	68* for 150mm	8/3

Type of Sample

Is S.P.T. ■ Undisturbed
Ic C.P.T. X Vane
0 Jar △ Water
● Bulk ▦ Piezometer

Remarks (Observations of Ground Water etc.) * Seating blows only

Chiselling hard strata 10.20m - 12.00m.

Water levels are subject to seasonal or tidal variations and should not be taken as constant

British Geological Survey

Version 2.0.6.7

BGS ID: 888561 : BGS Reference: SJ68NW796
British National Grid (27700) : 360950,386470
Report an issue with this borehole

<< < Prev Page 1 of 2 Next > >>

Norwest Holst Soil Engineering Ltd.

Borehole No. B

BOREHOLE LOG

Contract No. F9056
Location Wilderspool Brewery, Warrington SJ68NW
Client Greenall Whitley
Method of Boring Percussion & Rotary
Diameter of Borehole 150mm & 76mm 6095 3647
Sheet 1 of 2
Chainage
Ground Level 7.07 m.A.O.D.
Date 13/3/91 - 15/3/91

796

Description of Strata	Legend	Depth Below G.L.(m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	"N"/ R.Q.D.%	Daily Progress
Sandy Fill. (Drillers description)		0.50	6.57		0.50-0.95 c	"8"	13/3
MADE GROUND: Soft black silty very sandy clay with much fine to coarse angular to subrounded gravel, (brick and concrete fragments).		1.60	6.47		1.50-1.95 c	"3"	
MADE GROUND: Medium dense grey fine to coarse sand with much fine to coarse angular to subrounded gravel and occasional cobbles, (brick concrete, sandstone, glass fragments and pieces of cloth).		4.70	2.37		2.50-2.95 c 3.50-3.95 c 4.50-4.95 c	"14" "11" "3"	
MADE GROUND: Very soft black clayey sandy organic silt with some fine to coarse subangular to subrounded gravel contaminated with oil.		5.80	1.27				
MADE GROUND: Loose grey sandy fine to coarse angular to subrounded gravel (Brick, sandstone and ash).		6.70	0.37		6.00-6.45 c	"8"	
Medium dense grey and brown fine to coarse slightly organic SAND with occasional fine subangular gravel.		7.80	-0.73		7.00-7.45 s	"10"	
Very dense reddish brown fine SAND. (Completely Weathered Sandstone)					8.00-8.45 s 9.50-9.95 s	"75" "142"	

Type of Sample

Is	S.P.T.	■	Undisturbed
Ic	C.P.T.	x	Vane
0	Jar	△	Water
●	Bulk	▮	Piezometer

Remarks (Observations of Ground Water etc.)

Water struck at 1.60m, did not rise.
Water struck at 5.20m, did not rise.
Casing installed from ground level to 12.50m.
50mm slotted standpipe piezometer installed at 12.50m

Water levels are subject to seasonal or tidal variations and should not be taken as constant

British Geological Survey

Version 2.0.6.7

BGS ID: 888561 : BGS Reference: SJ68NW796
British National Grid (27700) : 360950,386470
Report an issue with this borehole

<< < Prev Page 2 of 2 Next > >>

Norwest Holst Soil Engineering Ltd.

Borehole No. B

BOREHOLE LOG

Contract No. F9056
Location Wilderspool Brewery, Warrington SJ68NW
Client Greenhall Whitley
Method of Boring Percussion & Rotary
Diameter of Borehole 150mm & 76mm

Sheet 2 of 2 796
Chainage
Ground Level 7.07 m.A.O.D.
Date 13/3/91 - 15/3/91

Description of Strata	Legend	Depth Below G.L.(m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	TCR %	SCR %	"N"/ R.Q.D.%	Daily Progress
Very dense reddish brown fine SAND with some fine to medium subangular gravel. (Completely Weathered Sandstone)				FF/m	11.00 S			84 * for 135mm	
					12.00 S			88 * for 138mm	
					12.50				15/3
Reddish brown medium grained completely weathered SANDSTONE very weak with some thin beds of slightly to moderately weathered sandstone.				NI	96	96		0	
Discontinuities: (i) Subvertical fractures smooth irregular. - 12.56-13.61m...Moderately weathered.					15.00				
-15.77-16.12m...70° dip fractures smooth planar healed (2, Sets intersecting)									
-16.12-17.00m...Completely weathered with some to much fine to coarse gravel sized rounded sandstone lithorelicts				NI	94	94		0	
Borehole Complete at 17.70m.		17.70	-10.63		17.70				15/3

Type of Sample

Is	S.P.T.	■	Undisturbed
Ic	C.P.T.	x	Vane
0	Jar	△	Water
●	Bulk	▮	Piezometer

Remarks (Observations of Ground Water etc.) * Seating Blows only
NI Non Intact

Water levels are subject to seasonal or tidal variations and should not be taken as constant

British Geological Survey

Version 2.0.6.7

BGS ID: 888532 : BGS Reference: SJ68NW767
British National Grid (27700) : 361060,386720
Report an issue with this borehole

<< < Prev Page 1 of 2 Next > >>

Norwest Holst Soil Engineering Ltd.

Borehole No. 9

BOREHOLE LOG

Contract No. F9056
Location Wilderspool Brewery, Warrington SJ68NW
Client Greenall Whitley
Method of Boring Cable Percussion
Diameter of Borehole 150mm
6106 8672
Sheet 1 of 2
Chainage
Ground Level 9.65 m.A.O.D.
Date 7/3/91
767

Description of Strata	Legend	Depth Below G.L. (m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	"N"/ R.Q.D.%	Daily Progress
MADE GROUND: Asphelt and hardcore sub base.		0.30	9.35		0.50-0.95 s	"8"	
		0.40	9.25				
MADE GROUND: Brick fill.		1.30			1.50-1.95 s	"3"	
Loose greyish brown silty fine SAND thinly interbedded with some grey silt and dark grey clay. Occasional black organic material and iron-staining.							
Loose dark grey silty fine SAND with patches of sandy silt and clayey patches.		3.40	6.25		2.50-2.95 s	"4"	
Soft grey fine sandy SILT with a little fine gravel. (Possible Made Ground)					3.50-3.95 s	"8"	
					4.50-4.95 s	"8"	
...At 6.00m black spongy twigs.					6.00-6.45 s	"7"	
		6.80	2.85				
Loose reddish brown fine medium and coarse SAND.					7.50-7.95 s	"8"	
...from 8.90m driller records "occasional gravel"					9.00-9.45 s	"10"	

Type of Sample

Is	S.P.T.	■	Undisturbed
Ic	C.P.T.	x	Vane
0	Jar	△	Water
●	Bulk	▮	Piezometer

Remarks (Observations of Ground Water etc.)

Groundwater struck 7/3/91 at 2.00m no rise.
Casing advanced to 15.00m not sealed.
Hard strata Chiselling 13.40-15.00m 2hrs

Water levels are subject to seasonal or tidal variations and should not be taken as constant

Norwest Holst Soil Engineering Ltd.

Trial Pit No. **1**

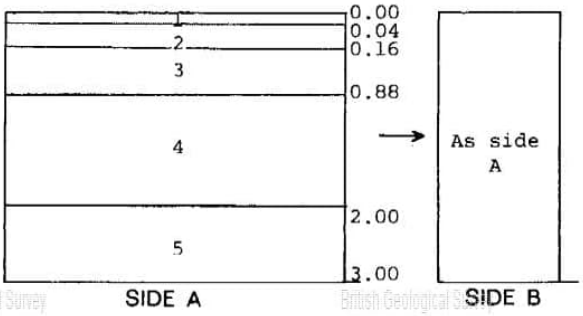
SJ68NW 773

TRIAL PIT LOG

Contract No. F9056
Location Wilderspool Brewery, Warrington
Client Greenhall Whitley
Excavation Plant JCB 3CX Hammer master
Dimensions (l x b x h) 2.00 x 1.00 x 3.00m 6112 8677

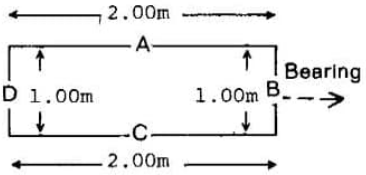
Chainage
Ground Level 9.30 m.A.O.D.
Date 18/3/91

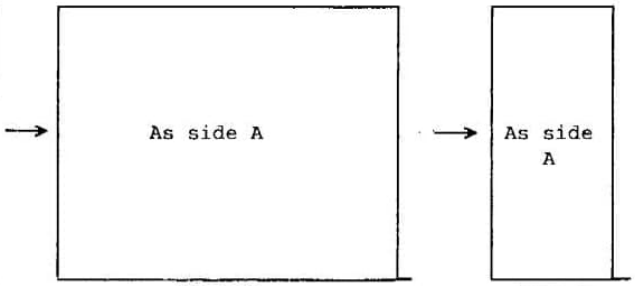
ELEVATIONS:—



SIDE A SIDE B

PLAN (Not to scale)





SIDE C SIDE D

SAMPLES

No. & Type	Depth m.
B1	0.50
B2	1.00
B3	2.20
B4	3.00

No.	Depth m.	STRATA DESCRIPTION	Cv/Cp kN/m2
1	0.00-0.04	MADE GROUND: Grey fine to coarse gravel sized limestone aggregate.	
2	0.04-0.16	MADE GROUND: Firm black silty sandy clay with occasional medium gravel sized brick fragments.	
3	0.16-0.88	MADE GROUND: Compact light brown occasionally grey streaked silty fine sand.	
4	0.88-2.00	Compact dark grey very silty fine SAND. Organic odour from 1.00m ... becoming thinly interbedded with dark grey slightly sandy CLAY with fine sand partings.	
5	2.00-3.00	Very soft dark grey slightly silty CLAY with occasional thin laminae of fine sand, organic odour.	
		Trial Pit complete at 3.00m on clients instruction.	

NOTES Cv/Cp: Approximate value of undrained shear strength from hand vane/penetrometer
Groundwater: Slight seepages at 0.88-1.00m.
Pumping: Not required.
Supports/Stability: Not required / Pit faces unstable.

British Geological Survey

Version 2.0.6.7

BGS ID: 888555 : BGS Reference: SJ68NW790
British National Grid (27700) : 361140,386780
Report an issue with this borehole

<< < Prev Page 1 of 1 Next > >>

Norwest Holst Soil Engineering Ltd.

CBR9

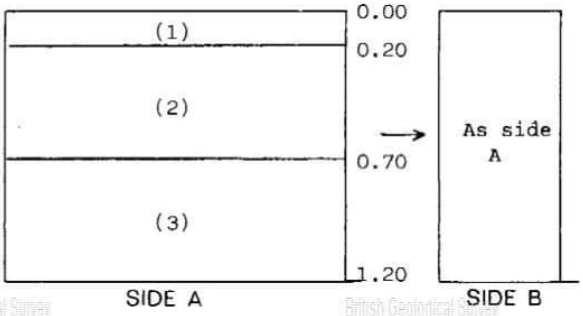
SJ68NW

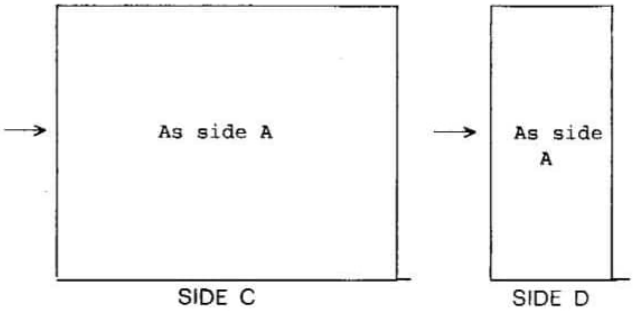
790

TRIAL PIT LOG

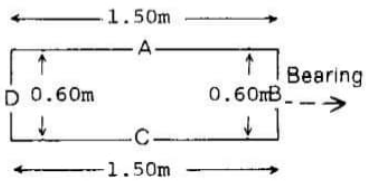
Contract No. F9056
Location Wilderspool Brewery, Warrington
Client Greenhall Whitley
Excavation Plant JCB 3CX Hammer master
Dimensions (l x b x h) 1.50 x 0.60 x 1.20m 61A 8678
Chainage
Ground Level 8.87 m.A.O.L
Date 12/3/91

ELEVATIONS:—





PLAN (Not to scale)



SAMPLES

No. & Type	Depth m.

No.	Depth m.	STRATA DESCRIPTION	Cv/Cp kN/m²
1	0.00 0.20	MADE GROUND: Grey clayey sandy coarse gravel sized limestone aggregate.	
2	0.20 0.70	MADE GROUND: Loose light greyish brown slightly silty fine sand.	
3	0.70 1.20	Soft dark blackish grey clayey silty fine SAND. Organic odour. Trial Pit complete at 1.20m after in-situ CBR test.	

NOTES Cv/Cp: Approximate value of undrained shear strength from hand vane/penetrometer
Groundwater: Slight seepage at 0.70m
Pumping: Not required
Supports/Stability: Not required / Pit faces unstable

IAN FARMER ASSOCIATES

Plant used: Dando 2000/Comacchio 205	Project: HyNet North West - Hydrogen Pipeline		Location ID: **BH338**
Dates: 29/11/2022 - 30/11/2022	Client: Cadent		Sheet 1 of 2
Cable Percussion and Rotary Boring Log	Location: 359374.00E 385868.02N	Ground level: 10.16mOD / Logged by: FH/TW / Vertical scale: 1:50	Project ID: 2230746

Depth	Sample ID	Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
0.00 - 0.20	B1				MADE GROUND: Grass over brown, very sandy, very silty, angular to subrounded, fine to coarse GRAVEL including limestone and brick. With occasional rootlets.			
0.10	ES2		9.96	0.20				
0.20 - 0.50	B3			(0.30)				
0.30	ES4		9.66	0.50	MADE GROUND			
0.50 - 0.80	B5			(0.30)	MADE GROUND: Brown, slightly gravelly, silty, fine SAND. Gravel is angular to subrounded, fine and medium including limestone, brick and mudstone.			
0.60	ES6		9.36	0.80				
0.80 - 1.20	B7			(0.40)	MADE GROUND			
1.00	ES8					1		
1.20		SPT(S) N=4 (1,1/1,1,1,1)	8.96	1.20	MADE GROUND: Black, very gravelly ashy SAND. Gravel is angular to subrounded, fine to coarse including siltstone and clinker.			
1.20 - 1.65	D10				MADE GROUND			
1.20 - 1.70	B9				Brown, very silty, fine SAND with occasional lenses of soft brown, sandy clay and occasional fine and medium gravel.			
					TIDAL FLAT DEPOSITS	2		
2.20		SPT(S) N=7 (1,1/2,2,1,2)			Soft, brown and grey, sandy CLAY with occasional bands of brown and grey silty, fine sand.			
2.20 - 2.65	D12			(2.20)	TIDAL FLAT DEPOSITS			
2.20 - 2.70	B11							
						3		
3.20		SPT(S) N=15 (2,2/3,4,3,5)						
3.20 - 3.65	D13							
3.40 - 3.70	B14		6.76	3.40	Firm, reddish brown, slightly silty, slightly gravelly, sandy CLAY. Gravel is subrounded to rounded, fine and medium including mudstone, siltstone and sandstone. (CLASS E) [HELSBY SANDSTONE FORMATION]			
				(0.60)				
			6.16	4.00	SHERWOOD SANDSTONE GROUP	4		
4.20		SPT(S) 50 (3,5/50 for 295mm)			Reddish brown, fine grained SANDSTONE recovered as slightly sandy, clayey, fine to coarse gravel. (CLASS E) [HELSBY SANDSTONE FORMATION]			
4.20 - 4.65	D16			(0.85)	SHERWOOD SANDSTONE GROUP			
4.20 - 4.70	B15							
		NIDD 4.80m - SPT(S) 50 (25 for 40mm/50 for 10mm)	5.31	4.85	Very weak, thinly to thickly laminated (0 to 10 degrees) reddish brown, fine and medium grained, micaceous SANDSTONE. Discontinuities are set 1: 0 to 10 degrees, closely spaced, planar, smooth, tight with soft, brown, clay infill (up to 0.25mm). Set 2: 20 to 40 degrees, closely spaced, planar, rough, clean. Set 3: 70 degrees, medium spaced, planar, rough clean. (CLASS B) [HELSBY SANDSTONE FORMATION]			
		5 4.80m - D17				5		
	90	NIDD		(1.25)				
4.85 - 6.30	75	6 5.78m - C18						
	75				SHERWOOD SANDSTONE GROUP			
			4.06	6.10	*Between 4.85m and 5.08m, 5.27m and 5.33m and 5.42m and 5.55m: non intact, drilling disturbed, recovered as angular, medium and coarse gravel.*	6		
		AZCL			*Between 6.03m and 6.04m: very soft, reddish brown, micaceous clay.*			
					Between 6.04m and 6.10m: thinly laminated (0 to 5 degrees).			
		6.80m - C19		(1.30)	Very weak, thinly bedded (0 to 10 degrees) dark reddish brown, medium and coarse grained SANDSTONE, with occasional dissolution vugs (up to 10mm) locally infilled with orange brown, fine sand. Discontinuities are 20 to 30 degrees, very closely spaced, undulating, rough, clean. (CLASS B) [HELSBY SANDSTONE FORMATION]			
	73							
6.30 - 7.80	73	5				7		
	60				SHERWOOD SANDSTONE GROUP			
		0	2.76	7.40	*Between 6.90m and 6.95m: up to 25 percent clasts (up to 10mm) of subrounded sandstone and siltstone.*			
		NIDD			*Between 6.98m and 7.10m: 80 degree joint, undulating, slightly rough, clean, with black staining (<1mm).*			
					Between 7.25m and 7.30m: 35 degree joint, undulating, rough, clean.			
		8.00m - C20		(1.30)	*Between 7.37m and 7.41m: moderately weak, light greenish grey siltstone.*	8		
	90	5						
7.80 - 8.90	81				Very weak, thinly to medium bedded (0 to 10 degrees) reddish brown, fine and medium grained SANDSTONE, with very closely to medium spaced, thick laminations and very thin beds of extremely weak, reddish brown mudstone and very weak, light greenish grey siltstone. Discontinuities are 10 to 30 degrees, very closely spaced, undulating, rough, clean. (CLASS A) [HELSBY SANDSTONE FORMATION]			
	81	8.54m - C21						
			1.46	8.70		9		
		0 9.00m - C22						
	45			(1.30)				
8.90 - 10.00	45							
	45	AZCL			SHERWOOD SANDSTONE GROUP			
					Between 7.50m and 7.70m: non intact, drilling disturbed, recovered as; sandy, subangular, medium and coarse gravel.			
					Between 7.70m and 7.90m: up to 25 percent subrounded clasts (up to 20mm) of sandstone and silstone.			
	TCR/SCR/RQD	FI Samples & Tests	0.16	10.00	Continued next sheet	10		

Chiselling

From (m)	To (m)	Time (mins)	Remarks
4.60	4.80	40	

Borehole Diameter

Depth (m)	Dia (mm)
10.00	121

Boring Progress

Date	Time	Depth (m)	Cased (m)	Water (m)
29/11	16:30	4.85	4.80	4.00
30/11	08:00	4.85	4.85	5.30
30/11	16:30	10.00	4.85	8.10

Remarks:
Service inspection pit hand excavated from GL to 1.20m.

SPT Hammer: AR2371 Energy Ratio: 62%

Casing Diameter

Depth (m)	Dia (mm)
4.80	150
10.00	139

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA CP
Log status:	FINAL	v01.01

CONTRACT. LANCASHIRE YORKSHIRE MOTORWAY M62 | SHEET No. 1

LOCATION. TARBOCK TO CROFT (Site 13) BH No 8117 | No. of sheets 1

CLIENT. SJ 59 SW/113 5114.9009. MINISTRY OF TRANSPORT

PERCUSSION U D | S.P.T. | B

Casing. Size to. Size to. Hand Auger

Ground level. 184.05

Commenced. 7/3/68

Completed. 7/3/68

Weather. FINE

ROTARY Cored runs | O/H

5 LEGEND

STRATUM (Scale: ½ inch to 1 foot) 1 Thickness	Depth 2	Sample No. 3	S.P.T. Blow Count (N) LL/PL/PI 4	M.C. % Core Rec. % 6	Type of Test 7	GRADING % PASSING SIEVE 3" N.7	1½" 25	¾" 52	⅜" 100	#14 200	TAQ. or U.C.T. Bulk Density p.c.f. Shear /o° p.s.f.	Dev. Stress p.s.i.	Lat. Pres. p.s.i. U.C.T. Stren. p.s.f. Shear/L° p.s.f.	WATER REMARKS 10
						8 RESULTS OF ANY OTHER TESTS								9
Top soil 2'0"	2'0"	M1		23.4										
Stiff brown sandy stony clay	4'6"	U1½s 1,2,3		20.6 18.1 16.5	UCT						U3 130.5		3002	
	8'6"	U1½s		20.6										
7'0"	9'0"	4,5,6		21.2										
				17.8										
			BOREHOLE COMPLETED											Water table not encountered

REMARKS:

Sample	Depth	M.C. % D.W.	S.G.	C. B. R. Air Voids	Type	TOP 0.1	TOP 0.2	BOTTOM 0.1	BOTTOM 0.2	Value	COMPACTION B.S. 1377 No	Max. Dry Density	Optr M.C

British Geological Survey

SJ 59 SW 187

SUB SOIL SURVEYS LTD
MANCHESTER

BOREHOLE No. 2
Ref:-

EXPLORATORY BORING RECORD

SITE St. Helens 5119 9007 Site Ref:- 73/03

Boring Method Shell Ground Level O.D.

DATE	DEPTH OF CASING BELOW G.L. (m)	WATER LEVEL MORNING & EVENING	DEPTH OF STRATA BELOW G.L.	STRATA (APPROX. SCALE)	NO. OF SAMP	TYPE OF SAMP	PENETRATION OF SAMPLER OR CORE BARREL (metres) FROM	TO	NO. OF BLOWS	CORE RECOVERY
26.6.73	0"		0.6	Sandy Topsoil	1	D	1.1			
					2	D	2.0			
				Stiff light brown sandy clay with stone inclusions	3	W	2.5			
					4	D	3.1			
					5	D	4.2			
			2.8		6	D	5.0			
					7	D	6.2			
					8	D	7.1			
				Stiff and very stiff brown clay with stone inclusions	9	D	8.3			
26.6.73	4.5	Dry			10	D	9.1			
27.6.73		Dry			11	D	10.0			
					12	D	11.2			
					13	D	12.0			
					14	D	13.2			
					15	D	14.3			
					15	W	15.4			
					17	D	16.3			
					18	D	17.0	17.2	0 94	
27.6.73	4.5	Dry								
28.6.73		10.6	15.0							
				Very stiff/hard brown sandy clay with stone inclusions						
			16.6							
				Lightly cemented red brown fine grained slightly micaceous sandstone with thin bands of marl						
28.6.73	4.5	13.2	17.2							

Samples shown thus: Disturbed D. Undisturbed U. Standard Pen. Test X. Water W. Bulk B.

WATER OBSERVED AT THE FOLLOWING DEPTHS * - overnight seepage	DEPTH OF CASING WHEN SEALED (N.S. – NOT SEALED)	ESTIMATED SEEPAGE	WATER ADDED AT FOLLOWING DEPTHS TO ASSIST BORING
1. 2.5	4.0	medium	
2.			
3.			
4.			
5.			
6.			

WATER LEVEL IN CASED / UNCASED BOREHOLE ON COMPLETION

DATE	WATER LEVEL	DEPTH OF CASING

DIA. OF CASING ____ m.m. to depth of ____ metres
____ m.m. to depth of ____ metres
____ m.m. to depth of ____ metres

REMARKS:

i) Waiting for engineer to confirm position of borehole (peg removed) 2 hrs

ii) Time spent chiselling – 4½ hours

SJ5098 9105 SJ59/121

GEOLOGICAL SURVEY AND MUSEUM. BOREHOLES AND SHAFTS.

Drawn 1.27 27.4.27 Rebt.

1.

BORE ~~or SHAFT~~ Borehole A of Sutton Manor Collieries, ~~Lane~~ Brook Works.

County Lancs 6-in. Map 108SW 108SW GSM

BROOK WORKS, MICKLEHEAD GREEN.

Surface level 180 ft. O.D. One-inch Map 97 ST HELENS

Communicated 24 June 1935 by Sutton Manor Collieries

Date of sinking 1897 Borer A. Twinnie & Co.

Specimens Bores for Water

Description.	Thickness. Feet.	Thickness. Inches.	Depth. Feet.	Depth. Inches.
Surface				
Red clay	40	6	40	6
Grit & rubble	1	6	42	-
Red clay	6	-	48	-
Grit & sand	4	-	52	-
Blue shale	69	-	121	-
Grey stone	10	6	131	6
Grey shale	2	6	134	-
Coarse grit	2	-	136	-
Grey grit	20	-	156	-
Dark grit	3	-	159	-
Stone grit	11	-	170	-
Shale	-	6	170	6
Grit	2	-	172	6
Grey marl	21	6	194	-
Dark shale	2	-	196	-
Blue shale	2	6	198	6
Grey shale	8	6	207	-
Light shale	10	-	217	-
Black shale	2	-	219	-
Coal	2	-	221	-
Shale	1	-	222	-
Coal	1	-	223	-
Grey shale	18	-	241	-
Light shale	25	-	266	-
Rock	2	-	268	-
Limestone	3	-	271	-
Grey rock	12	-	283	-
Red gritstone.	5	-	288	-

(B12368) Wt. 13119—6014 5000 9/27 Gp. 168 O.A.

SJ 59560 5104 9134

STRATA SURVEYS LTD.,
Telephone: 0606 834637 Fax: 0606 836657

Borehole Number : 3
Sheet 1 of 1.

Job Number : 6690 Location : Lea Green, St Helens.
Client : Ken Shone Associates.

Dia. & Drilling Methods
150mm Diameter
light cable percussion

Description of Strata	Red. Level	Legend	Thick -ness	Depth m	Sample Depths	Sample Types	N Value	Cu	ø	Water Level	Piezo -meter	Daily Prog.
	55.24			0.00								
TOPSOIL			(0.50)									
	54.74			0.50	0.50 - 0.95	U 1						
Stiff brown mottled grey sandy CLAY with fine to coarse gravel.					1.00	D 1		64	16			
			(2.20)		1.50 - 1.95	U 2						
					2.00	D 2		45	20			
					2.50 - 2.95	U 3						
	52.54			2.70								
Stiff brown very sandy CLAY with fine to medium gravel.					3.00	D 3		68	20			
					3.50 - 3.95	U 4						
			(2.10)		4.00	D 4						
					4.50 - 4.95	U 5						
	50.44			4.80								
Firm to stiff brown sandy CLAY with many laminations of fine to medium grained sand.			(0.90)		5.10	D 5		44	13			
	49.54			5.70								
Firm to stiff brown very sandy CLAY with occasional fine to medium gravel					6.00 - 6.45	U 6						
			(1.80)		6.60	D 6						
	47.74			7.50	7.50 - 7.90	U 7						
Firm brown slightly sandy laminated CLAY with occasional fine to medium gravel			(0.50)									
	47.24			8.00	8.00	D 7		50	0			26/8
Borehole Completed												

General Remarks :
No water encountered during excavation.

Dates : 26 AUG 92
Driller : GW
Engineer: GH

Coordinates :

British Geological Survey

British Geological Survey

Version 2.0.6.7

BGS ID: 173020 : BGS Reference: SJ59SW44
British National Grid (27700) : 351040,391600
Report an issue with this borehole

<< < Prev Page 1 of 4 Next > >>

SJ 59 SW 10 44/19

SECTION OF BOREHOLE A3/23/1

Exact Site Lea Green Road, Lea Green
E. 351039
N. 391598

Level at which drift commenced relative to O.D. 178.4 feet

Date of sinking or boring 1st November 1955
Sinker or Borer John Thom Limited
One Inch Geological Map 97
Six Inch Map (County and Quarter Sheet) Lancs. 10S S.E. SW

[redacted]

	Thickness		Depths		Thickness in Metres	Depths in Metres
Soil		10		10		
Yellow brown clay	1	2	2	0	0.25	0.25
Red brown clay with small pebbles	15	8	17	8	0.36 4.77	0.61 5.38
Red brown clay with few small pebbles, slightly sandy	1	4	19	0	0.41	5.79
Red brown clay with small pebbles	3	0	22	0	1.52	7.31
Boulder pebbles and hard sandstone pebbles	2	6	24	6	0.76	8.07
Grey sandstone, fine grained	2	4	26	10	0.71	8.78
Soft mudstone with harder limps	7	2	34	0	2.18	10.96
Grey mudstone, argillaceous		9	34	9	0.23	11.19
Grey fireclay-mudstone with few ironstone nodules	2	6	37	3	0.76	11.95
Grey sandstone, fine grained		4	37	7	0.10	12.05
Grey, argillaceous mudstone	1	5	39	0	0.43	12.48
Grey shaly sandstone with thin mudstone bands	3	6	42	6	1.06	13.54
Grey mudstone with plant debris	4	6	47	0	1.37	14.91
Grey fireclay with rootlets	1	0	48	0	0.31	15.22
Grey mudstone, slightly sandy, finely micaceous	2	5	50	5	3.78	19.00

Version 2.0.6.7
BGS ID: 173021 : BGS Reference: SJ59SW45
British National Grid (27700) : 350870,391490
Report an issue with this borehole

SJ 59 SW 45 La 108 20

SECTION OF BOREHOLE A3/23/2

NGR 5086 9148

[redacted]

Exact Site: Lea Green Road, Lea Green
E. 350869
N. 391489
Level at which drift commenced relative to O.D. 175.9 feet

Date of sinking or boring: 16th November 1955
Sinker or Borer: John Thom Limited
One Inch Geological Map: 97
Six Inch Map (County and Quarter Sheet): Lancs. 108 N.E. SW

SJ 59 SW/45

	Thickness		Depth. Metres.	
Soil	1 9	1 9	0.53	0.53
Yellow brown clay	1 6	3 3	0.46	0.99
Soft brown clay with some pebbles	7 5	10 8	2.21	3.20
Red brown sand	1 9	12 5	0.53	3.73
Red brown clay	8	12 11	0.20	3.93
Red brown sand	7	13 6	0.18	4.11
Red brown clay	6	14 0	0.15	4.26
Soft grey argillaceous mudstone	6	14 6	0.15	4.41
Soft grey mudstone	9 0	23 6	2.74	7.15
Grey mudstone with sandy bands	1 0	24 6	0.31	7.46
Grey mudstone, slightly sandy in places, ironstone nodules at 32' 6"	11 6	36 0	3.50	10.96
Grey mudstone with few mudstone bands and plant debris	24 0	60 0	7.31	18.27

[redacted]

SJ 59 SW 263

STRATA SURVEYS LTD.,
HOLMES CHAPEL ROAD,
MIDDLEWICH, CHESHIRE. CW10 0JB
Telephone: 0606 84 4637 Fax: 0606 84 6657

Borehole Number : 1
Sheet 1 of 1.
Scale 0 to 10 metres
Dates : 20 February 90

Job Number : 5321 Location : St. Helens
Client : Roy Billington Associates

Dia. & Drilling Methods
150mm Diameter light cable percussion.
Drilled by A.C.
Drilled by I.W.

Description of Strata	Reduced Level	Legend	Thickness	Depth m	Sample Depths	Sample Types	N Value	Cu	ø	Water Level	Piezo	Daily Prog.
MADE GROUND (small gravel size fragments of bricks broken concrete topsoily clay fill.)			(0.15)	0.00 0.15	0.00 - 0.45	U 1						
					0.50 - 0.70	B 1						
					0.70 - 1.15	U 2						
MADE GROUND (grey black clayey gravelly gravel size mudstone, topsoily with occasional pieces of wood and coal.)			(1.95)		1.20 - 1.40	B 2						
					1.40 - 1.75	U 3						
					1.70	W 1				▽ TSI		
					1.90 - 2.10	B 3						
MADE GROUND (loose black wet odourous sandy clayey fill with occasional small brick fragments.)				2.10	2.10 - 2.55	S 1	N 6					
					2.60	D 1						
			(1.90)		3.00 - 3.45	S 2	N 7					
					3.50	D 2						
Firm brown slightly odourous sandy slightly gravelly CLAY.			(0.60)	4.00	4.00 - 4.45	S 3	N 11					
				4.60	4.60 - 5.05	U 4						
Stiff brown sandy fine to coarse gravelly CLAY with occasional coal fragments (Boulder Clay) ...in places firm 5.90m, 8.00m.					5.10	D 3						
					5.90 - 6.35	U 5		35	11			
					6.40	D 4						
										▽ TSI		
			(5.40)		7.50 - 7.95	U 6		92	0			
					8.00	D 5						
					9.10 - 9.55	U 7						
					9.60	D 6						
Borehole Completed				10.00								20/2

Key :

Sample Types
U Undisturbed
D Disturbed
B Bulk Disturbed
W Water
P Piston
S SPT

In-Situ Tests
N N Value
+ Sampler Sank

Progress / Water Levels
Borehole Depth
Casing Depth
▽ Water Level
▼ Water Strike

◊ Piezometer Level

General Remarks :
Temporary standing water level at 1.7m and 7.0m, dry from 7.1m.
Methane monitoring pipe installed at 4.60m, 1 hour.

British Geological Survey

K. WARDELL & PARTNERS - LOG SHEET

SJ59SW 67

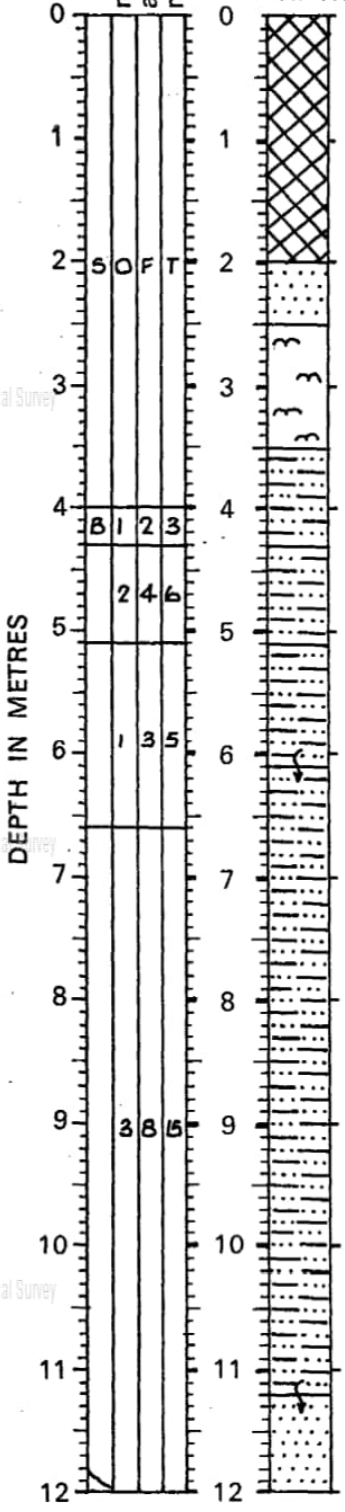
B.H. No. P15
Page 1

CLIENT: PILKINGTON BROTHERS LTD.

JOB: UK5 PROJECT: GREENGATE JOB No. 3540/5

5097 9442

B.H. No. P15 HEIGHT A.O.D. 32·77 m.



FILL, BLACK, SOFT, FRIABLE.

SAND, BROWN, SOFT.

CLAY, BROWN, SOFT / STIFF.

SILTSTONE, GREY/BROWN, SOFT · FRIABLE, VERY WEATHERED.
DRY CORE DRILLING
DIAMOND DRILLING.

SILTSTONE, GREY, HARD-FRIABLE / SOFT · FRIABLE, WEATHERED.

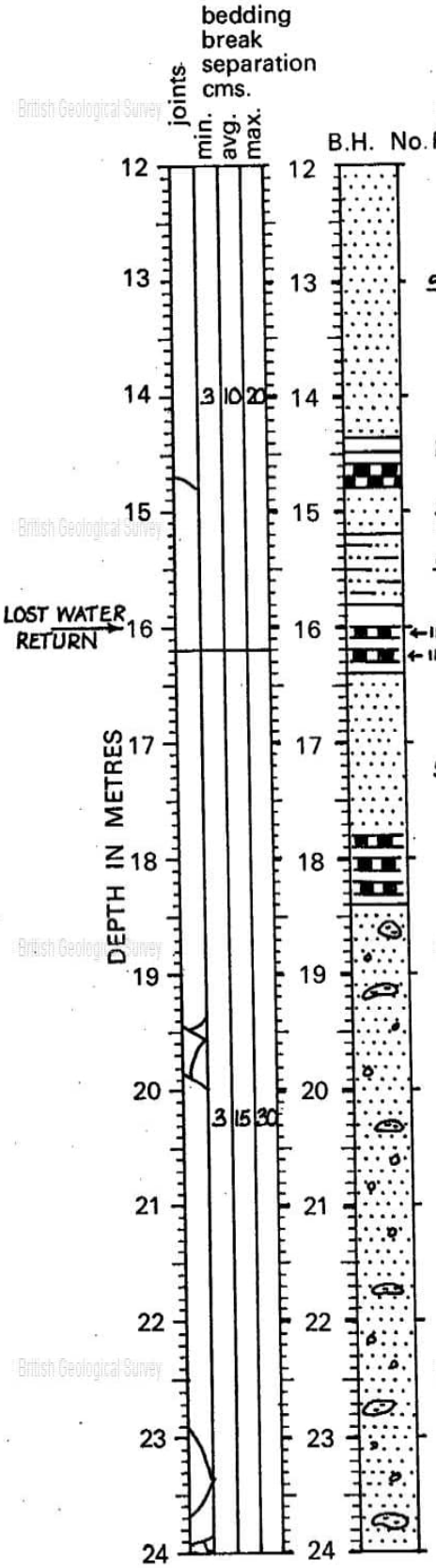
SILTSTONE WITH SANDSTONE STRIPES, GREY, HARD/ FRIABLE, LAMINATED/ SUBLAMINATED.

SILTSTONE WITH SANDSTONE STRIPES, GREY, VERY HARD, LAMINATED / SUBLAMINATED.

SANDSTONE WITH SILTSTONE STRIPES, LIGHT GREY, VERY HARD, SUBLAMINATED.

British Geological Survey

SJ59 SW/67



SANDSTONE WITH SILTSTONE STRIPES, LIGHT GREY, VERY HARD, SUBLAMINATED.

MUDSTONE, GREY, VERY HARD, SUBLAMINATED.

SANDSTONE, LIGHT GREY, VERY HARD, SUBLAMINATED.

SILTSTONE, GREY, VERY HARD, NON-LAMINATED.

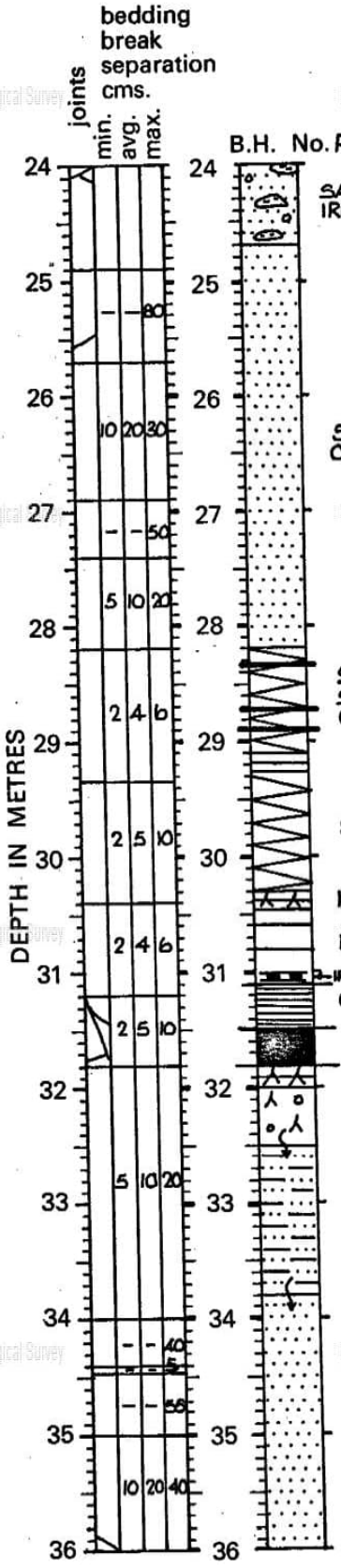
MUDSTONE, SILTY, GREY, VERY HARD, SUBLAMINATED.

SANDSTONE, GREY/LIGHT GREY, VERY HARD, NON-LAMINATED.

SANDSTONE WITH SILTSTONE CLASTS & BANDS AND IRONSTONE NODULES, LIGHT GREY/GREY, VERY HARD, NON-LAMINATED.

British Geological Survey

SJ 59 SW/67



SANDSTONE WITH SILTSTONE CLASTS & BANDS AND IRONSTONE NODULES, LIGHT GREY/GREY, VERY HARD, NON-LAMINATED.

SANDSTONE, LIGHT GREY, VERY HARD, NON-LAMINATED, OCCASIONAL SILTSTONE CLASTS & IRONSTONE NODULES.

SHALE, DARK GREY-BLACK, VERY HARD, LAMINATED/SUBLAMINATED, CARBONACEOUS WITH THIN BANDS OF COAL

HIGHER FLORIDA MINE.

MUDSTONE, DARK GREY, HARD/FRIABLE, SUBLAMINATED.

SHALE, DARK GREY-BLACK, VERY HARD, SUBLAMINATED. PLANT DEBRIS.

MUDSTONE - SEAT EARTH, GREY, HARD-FRIABLE, NON-LAMINATED, ROOTS.

MUDSTONE, GREY, HARD-VERY HARD, SUBLAMINATED, PLANT DEBRIS.

CANNEL COAL 30cm. SEEN INTACT. CANNEL MINE.

COAL 30cm SEEN INTACT.

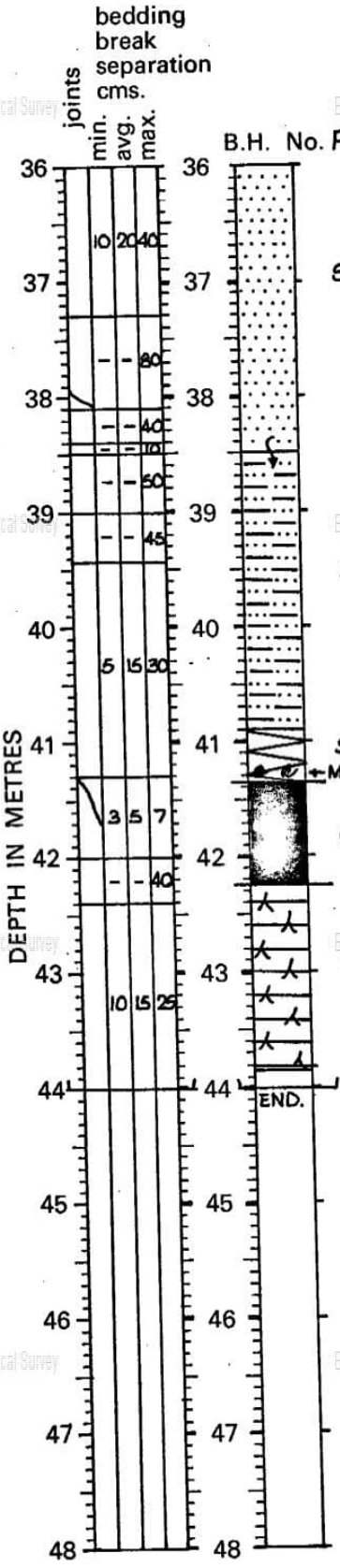
MUDSTONE - SEAT EARTH, GREY, HARD: FRIABLE, NON-LAMINATED, ROOTS.

MUDSTONE, GREY, VERY HARD, NON-LAMINATED, ROOTS, IRONSTONE NODULES.

SILTSTONE, GREY, VERY HARD, SUBLAMINATED.

SANDSTONE, WITH SILTSTONE STRIPES, LIGHT GREY, VERY HARD, SUBLAMINATED/NON LAMINATED

SJ59SW/67



SANDSTONE WITH SILTSTONE STRIPES, LIGHT GREY, VERY HARD, SUBLAMINATED; NON-LAMINATED

SILTSTONE WITH SANDSTONE STRIPES, GREY, VERY HARD, NON-LAMINATED/SUBLAMINATED

SHALE, DARK GREY, VERY HARD, LAMINATED/SUBLAMINATED.

COAL 85cm SEEN INTACT. LOWER FLORIDA MINE.

MUDSTONE, GREY, HARD/FRIABLE, NON-LAMINATED, ROOTS, PLANT DEBRIS.

MUDSTONE, GREY; DARK GREY, VERY HARD, SUBLAMINATED, PLANT DEBRIS.

SJ5140 94 34 SJ 59/105

5

(D11867) Wt. 17852—8154—8,000 12/29 Sp. 160. O.A.

SECTION OF No 10 Pit at Ravenhead Colliery (widened from 10ft. 6 in. ft diameter)

Maps: One-inch N.S. 84 Six-inch 108NW(W) County Lancs.

Height above O.D. 115·38 (ground) 111·38 (top of ground) Latitude Longitude

Communicated by St. Helens Collieries Ltd. Date of Sinking

Made by Dip of Strata

	Thickness.		Depth from Surface.	
Filled up Stuff	4 -		4 -	
Clay	7 -		11 -	
Shale	25 -		36 -	
Coal } [illegible]		9	36	9
Warrant	11	3	48 -	
Sandstone	21	10	69	10
Shale	12 -		81	10
Coal } Lyons Delf	4 -		85	10
Shale	13	9	99	7
Coal } London Delf	3	3	102	10
Warrant }	1	2	104	0
Coal }	1	6	105	6
Warrant	10	8	116	2
Shale	21 -		137	-
Bass		7	137	7
Coal } Tiers Delf.	1	10	139	5
Warrant	1 -		140	5
Shale	8	6	148	11
Sandstone	4 -		153	11
Shale	23	4	177	3
Coal POTATO DELF 68·85 - O.D	6 -		183	3
Warrant	6	10	190	1
Sandstone	2	3	192	4
Shale	18 -		210	4
Coal }	1	5	211	9
Bass } 99·12 - O.D EARTHY DELF		10	212	7
Coal }	1	11	214	6
Black Bass	1	3	215	9

K. WARDELL & PARTNERS - LOG SHEET

B.H. No. P14
Page 1

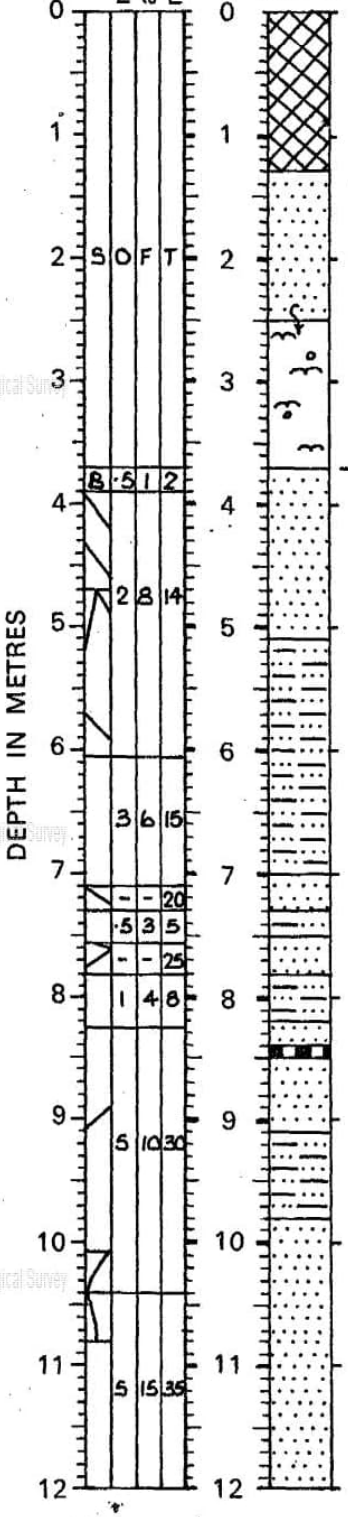
SJ 59 SW 66

CLIENT: PILKINGTON BROTHERS LTD.

JOB: UK5 PROJECT - GREENGATE JOB No. 3540/5

5095 9456

B.H. No. P14 HEIGHT A.O.D. 31·62 m.



FILL. BLACK, SOFT, FRIABLE, ASH, SHALE, MUDSTONE, COAL DEBRIS.

CLAY-SAND, BROWN, SOFT.

SANDY CLAY, YELLOW-BROWN, SOFT, FRIABLE, SOME PEBBLES.

DRY-CORE DRILLING
WATER FLUSH DRILLING

SANDSTONE, LIGHT GREY, VERY HARD, NON-LAMINATED, IRON-STAINING ON JOINTS.

SILTSTONE WITH SANDSTONE BANDS, GREY/LIGHT GREY, HARD/VERY HARD, SUBLAMINATED/NON-LAMINATED.

SANDSTONE, LIGHT GREY, VERY HARD, NON-LAMINATED.
SILTSTONE, DARK GREY, HARD, LAMINATED.
SANDSTONE, LIGHT GREY, VERY HARD, NON-LAMINATED.
SILTSTONE WITH SANDSTONE STRIPES, GREY/DARK GREY, VERY HARD, LAMINATED.
SANDSTONE, LIGHT GREY, VERY HARD, NON-LAMINATED.
IRONSTONE, BROWN, BRITTLE HARD, NON-LAMINATED.
SANDSTONE, LIGHT GREY, VERY HARD, NON-LAMINATED.

SILTSTONE WITH SANDSTONE BANDS, GREY, HARD, SUBLAMINATED.

SANDSTONE, LIGHT GREY, YELLOW-BROWN STAINING ON JOINTS AND BEDDING BREAKS.

British Geological Survey

B.H. No. P17
Page 1

K. WARDELL & PARTNERS - LOG SHEET

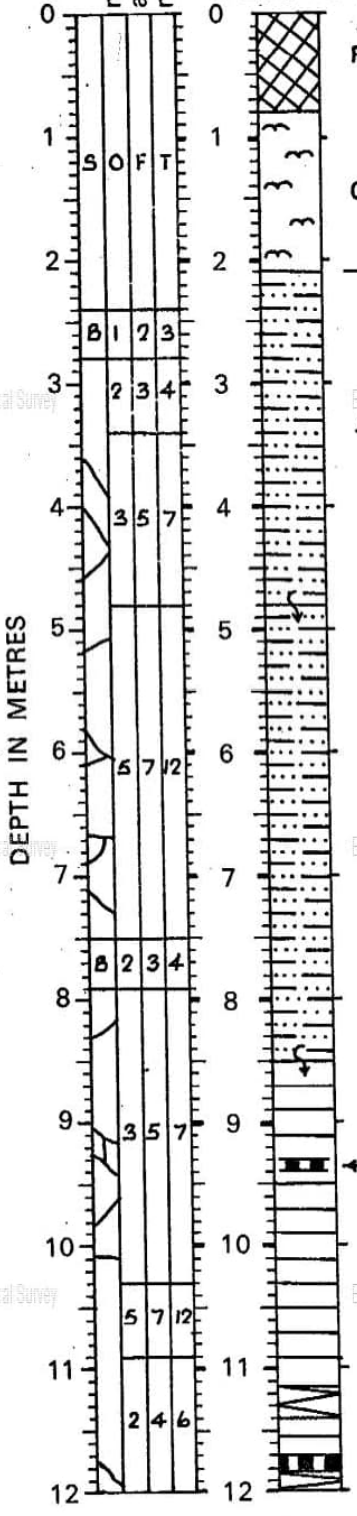
SJ 59 SW 69

CLIENT: PILKINGTON BROTHERS LTD.

JOB: UK5 PROJECT- GREENGATE JOB No. 3540/5

5101 9447

B.H. No. P17 HEIGHT A.O.D. 33·30 m.



FILL, DARK GREY/BROWN, SOFT.

CLAY, BROWN, SOFT, SANDY.

DRY CORE DRILLING.
DIAMOND DRILLING.

SILTSTONE WITH SANDSTONE STRIPES & BANDS, GREY, HARD, SUBLAMINATED, WEATHERED, IRON STAINING.

SILTSTONE WITH SANDSTONE STRIPES, GREY, VERY HARD, SUBLAMINATED.

MUDSTONE, GREY, HARD, SUBLAMINATED, THIN IRONSTONE BANDS.

SHALE, DARK GREY, VERY HARD, LAMINATED, MUSSELS.
MUDSTONE, GREY, HARD, SUBLAMINATED.
IRONSTONE, BROWN, BRITTLE HARD, NON-LAMINATED.
SHALE, DARK GREY/BLACK, HARD/VERY HARD, SUBLAMINATED WITH COAL STREAKS.

British Geological Survey

SJ57NW 105

BeWT

MACHINE EXCAVATED TRIAL PIT

Location Runcorn Industrial Supply Job No. 8156/81 Project Ref 5296 7951 Ground Level (m AOD) Co-ordinates E N Trial Pit No. TP23

Field Records Cohesion(kN/m2)	Depth (m)	Samples Type & No.	DESCRIPTION OF STRATA	Reduced Level m AOD	Strata Legend	Depth (Thickness) m
	0.30	B 1	MADE GROUND (Fine to coarse limestone gravel)			(0.30) 0.30
	0.40		MADE GROUND (Black fine to medium grained sand with some fine to coarse gravel and occasional bricks and wire fragments)			(0.40) 0.70
	0.90	B 1	MADE GROUND (Black clayey ash & cinders with occasional bricks, glass bottles and metal fragments)			
	1.80	W 1				
	1.90	B 2				(1.80)
25	2.60					2.50
	2.70	B 3	Soft brown slightly sandy CLAY with a little fine to coarse gravel			(0.80)
21	2.90					3.30
29	3.00					
	3.20	B 4	Trial Pit Complete			

Scale 1:50

Trial Pit excavated using a mechanical excavator.

Remarks

1) Fast groundwater entries at 1.80m.
2) Sides of pit collapsing below 2.00m.
3) Pit dangerous after reinstatement so pit toped off overnight.
4) Spoil excavated on 14-11-96 and pit reinstated with road planings.
5) Original spoil from pit dumped at Morgans nearby tip.

Plan

Logged By G.L.	DATE 13-11
Checked By:	
Approved By:	
FIG No.	

British Geological Survey

FOUNDATION ENGINEERING Ltd.

BOREHOLE LOG

LOCATION : WEAVER VIADUCT

BOREHOLE No. : 21 Sheet 1 of 2

BOREHOLE DIA. : 8"

GROUND LEVEL : 25 · 54' O.D.

DATE (Start) : 11 · 2 · 66

WATER LEVEL : See note

Dates	Description	Thickness	Depth	Sample	Remarks
			0'-0"		
	MADE GROUND	13'-6"		1	12 blows/ft
				2	19 blows/ft
			13'-6"	3	U4 failed
	Soft grey silty CLAY	6'-0"		4	U4 failed
			19'-6"	5	
				6	
	Soft PEAT	13'-6"		7	
				8	
				9	
				10	
			33'-0"		
	silty CLAY	9'-6"		11	
				12	
				13	17 blows/ft
			42'-6"		
	peaty silty CLAY	3'-0"		14	
			45'-6"	15	
	Med. dens. grey silty SAND	4'-6"		16	17 blows/ft
			50'-0"		

BOREHOLE SCALE 1" = 5' DISTURBED SAMPLE U = UNDISTURBED SAMPLE

FOUNDATION ENGINEERING Ltd.

BOREHOLE LOG

LOCATION : WEAVER VIADUCT BOREHOLE No. : 21 Sheet 2 of 2

BOREHOLE DIA. : GROUND LEVEL :

DATE (Start) : WATER LEVEL :

Dates	Description	Thickness	Depth	Sample	Remarks
			50'-0"		
	Very compact sandy GRAVEL	8'-6"		17	56 blows/ft
				18	70 blows/6"
			58'-6"	19	
	Stiff silty sandy peaty CLAY with gravel	1'-6"			
			60'-0"	20	50 blows/4"
	Compact red SILT with bands of sand	3'-0"		21	U4 failed
			63'-0"		
	Very compact brown SAND	9'-0"		22	60 blows/6"
				23	56 blows/6"
			72'-0"	24	60 blows/6"
	Very compact f.m.c. GRAVEL	4'-0"+		25	
			76'-0"	26	70 blows/6"
	Note: Seepage of water at 6'-0" B.G.L. With borehole drilled & cased to 47'-0" depth, water stood at 3'-6" B.G.L.				BOREHOLE COMPLETE

D - DISTURBED SAMPLE U - UNDISTURBED SAMPLE + STANDARD PENETRATION TEST

5297 1963 SJ57NW 107

BeWT | STRATA SURVEYS LIMITED

MACHINE EXCAVATED TRIAL PIT

Location Runcorn Industrial Supply | Job No. 8156/81 | Project Ref 9-00-05-949 | Ground Level (m AOD) | Co-ordinates E N | Trial Pit No. TP25

Field Records Samples: Cohesion(kN/m2)	Depth (m)	Type & No.	DESCRIPTION OF STRATA	Reduced Level m AOD	Strata Legend	Depth (Thickness) m
	0.50	D 1	Reeds over very soft black clayey odorous SILT with much organic matter			(0.30) 1.30
	1.40	D 2	Brown clayey fine to medium grained SAND ..peaty below 2.60m			(1.70) 3.00
	2.70	D 3				
			Trial Pit Complete			

Scale 1:50

Trial Pit excavated using a mechanical excavator.

Remarks

1) Whole side of pit collapsed at 3.00m
2) No groundwater encountered during excavation.

Plan

Logged By GL	DATE 19-11
Checked By:	
Approved By:	
FIG No.	

British Geological Survey

SJ 57 NW / 131
NGR 5301 7990

BeWT

STRATA SURVEYS LIMITED

CABLE PERCUSSION RECORD SHEET

Location Rocksavage Power Station WWD
Job No. 8156/107A Project Ref: 9-00-06-027

Borehole No. BH6
Sheet 1 of 1.

Equipment and methods Light Cable Percussion
Casing Diameter (mm) 150
Casing Depth (m) 3.20

Drilled by G.B
Ground level ca +31 m AOD
Co-ordinates E N
Date 26-03-97

Casing Depth (m)	Water Depth (m)	Field Records	Samples / Tests: Depth (m) from	to	Sample Type & No	SPT N Value	Description	Depth & Thickness (m)	Reduced Level (m AOD)	Strata Legend
							MADE GROUND (Grass over brown clay with some gravel)	(0.30) 0.30		
			0.50	0.50	D 1		MADE GROUND (Tarmac)	(0.35) 0.65		
							MADE GROUND (Ash with some gravel)	(0.55) 1.20		
			1.25	1.25	D 2					
1.50	NIL	2,3-2,2,3,3	1.50 1.50	1.95 1.95	B 1 S 1	10	Medium dense dark brown clayey slightly silty fine to medium grained SAND with occasional fine to medium gravel	(1.10) 2.30		
2.50	NIL		2.50	2.95	U 1		Stiff dark brown sandy CLAY with a little fine to coarse gravel			
			3.00	3.00	D 3			(1.50) 3.80		
3.20	NIL		3.50	3.95	U 2					
3.20	NIL	9,21-38,44/No penetration	4.00	4.30	S 1	164	Grey/reddish brown highly weathered MUDSTONE	(0.70) 4.50		
3.20	NIL	25/55mm,100/70mm -(26-03)-	4.50	4.62	S 2	300	Borehole Complete			

Remarks
1) Service pit dug 0.80m x 0.80m x 1.20m.
2) No groundwater encountered during drilling.

Logged by G.L Date 11/04
Checked by
Approved by

Scale 1:50

FIG No.

British Geological Survey

SGL-WWW-cable per -10/93 Rev B

SJ 57 NW /133

BeWT

STRATA SURVEYS LIMITED

ROTARY CORE DRILL RECORD SHEET

Location Rocksavage Power Station WWD

Job No. 8156/107 Project Ref: 9-00-06-027

Borehole No. R1

Sheet 1 of 2.

Equipment and methods Rotary Coring

Casing Diameter (mm) 113

Casing Depth (m) 9.20

Drilled by G.D

Ground level m AOD

Co-ordinates ~~NGR~~ 5294 7987

Date 03-12-96

CASING DEPTH (m)	WATER DEPTH (m)	Field Records	Drilling Records Depth (m) from	to	RUN No	Mechanical core log TCR %	SCR %	RQD %	If mm	Description	Depth & Thickness (m)	Reduced Level (m AOD)	Strata Legend
										Grass over TOPSOIL	(0.25) 0.25		
										Stiff brown very sandy CLAY with a little fine to medium gravel and occasional roots	(1.05) 1.30		
										Medium dense light brown silty fine to medium grained SAND	(3.10) 4.40		
										Firm reddish brown sandy CLAY with a little fine gravel	(0.20) 4.60		
										Medium dense brown slightly clayey silty fine to medium grained SAND with occasional fine to coarse gravel and a slight solvent odour at 6.30m	(3.50) 8.10		
										Very stiff dark brown slightly sandy CLAY with a little fine to medium gravel	(0.90) 9.00		
										Brown highly weathered MUDSTONE	(0.20) 9.20		
										Reddish brown highly weathered MUDSTONE with occasional grey spots	(0.72) 9.92		
										(Continued.....)			

Remarks

1) Borehole drilled to 9.20m by light cable percussion methods.
2) Borehole flushed with water for 20 mins - very little water ejected.
3) Water level 30 mins later 13.07m.
4) Piezometer installed with tip at 14.70m and seal from 12.20m to 13.20m.
5) Reading 9.21m 17-12.

Scale 1:50

Logged by	Date
G.L	
Checked by	
Approved by	
FIG No.	

British Geological Survey

SSL-HAN-rot core -10/93 Rev. B

SJ 57 NW /133

BeWT

STRATA SURVEYS LIMITED

ROTARY CORE DRILL RECORD SHEET

Location Rocksavage Power Station WWD

Job No. 8156/107 Project Ref: 9-00-06-027

Borehole No. R1

Sheet 2 of 2.

Equipment and methods Rotary Coring

Casing Diameter (mm) 113

Casing Depth (m) 9.20

Drilled by G.D

Ground level m AOD

Co-ordinates NGR 5294 7987

Date 03-12-96

CASING DEPTH (m)	WATER DEPTH (m)	Field Records	Drilling Records Depth (m) from	to	RUN No	Mechanical core log TCR %	SCR %	RQD %	If mm	Description	Depth & Thickness (m)	Reduced Level (m AOD)	Strata Legend
			9.10	12.14	1	97	89	85	221	(...cont.) Reddish brown thinly bedded (subhorizontal) highly weathered MUDSTONE with occasional grey bands, moderately weak to moderately strong. Subhorizontal slightly rough fractures with some infilled with fine to coarse mudstone gravel in a clay matrix. occasional subvertical (70 degrees) slightly rough open fractures. No visible bedding below 12.14m. with occasional grey bands below 12.87m	(3.05) (2.26) (0.00) (5.31)		
			12.14	15.23	2	97	91	76	82 / 218				
		-(03-12)-								Borehole Complete	15.23		

Remarks

Logged by G.L Date

Checked by

Approved by

Scale 1:50

FIG No.

FOUNDATION ENGINEERING Ltd.

BOREHOLE LOG

Sheet 1.

LOCATION : Frodsham

BOREHOLE No. : 1.

BOREHOLE DIA. : 6"

GROUND LEVEL : -

DATE (Start) : 1st May, 1967.

WATER LEVEL : See note.

Dates	Description	Thickness	Depth	Sample	Remarks
			0'-0"		
	Embankment Fill (Firm Boulder clay).	4' 0"		▮ 1	U4 failed.
	Soft sandy TOPSOIL.	1' 0"	4' 0" 5' 0"	+ 2	N = 11
				+ 3	N = 14
	Alternating layers of fine reddish brown clayey SAND with fine and coarse brown SAND.	15' 0"		+ 4	N = 24
			20' 0"	+ 5	N = 50/2"
	Green silty MARL with fragments of friable grey siltstone.	6' 0"		▮ 6	
			26' 0"	▮ 7	
	Red and green hard MARL with layers of sandstone.	12' 6"		+ 8	N = 80/3"
	Dry decomposed hard green silty MARL with fragments of sandstone.	2' 6"	38' 6"	+ 9	N = 80/¼"
			41' 0"		
	Very hard red and green MARL.	15' 0"		+ 10	N = 100/3"
				+ 11	N = 100/¼"
			50' 0"		

BOREHOLE SCALE : 1"=5' • : DISTURBED SAMPLE ▮ : UNDISTURBED SAMPLE + STANDARD PENETRATION TEST

British Geological Survey

3226 7992 SJ57NW 106

BeWT

MACHINE EXCAVATED TRIAL PIT

Location Runcorn Industrial Supply Job No. 8156/81 Project Ref 9-00-05-949

Ground Level (m AOD) Co-ordinates E N

Trial Pit No. TP24

Field Records Cohesion(kN/m2)	Depth (m)	Samples Type & No.	DESCRIPTION OF STRATA	Reduced Level m AOD	Strata Legend	Depth (Thickness) m
	0.80	B 1	MADE GROUND (Brunkles over limestone hardcore with occasional metal fence railings, concrete and tarmac fragments)			(0.90) 0.90
	1.20	D 1	MADE GROUND (Grey/brown/black clayey fine to coarse grained sand with much fine to coarse gravel)			(0.80) 1.70
140+	1.80		MADE GROUND (Very stiff dark brown sandy clay with occasional bricks, concrete, metal and wire fragments)			(0.30) 2.00
7	2.00	D 2	MADE GROUND (Very soft black odorous soap waste)			(0.50) 2.50
	2.10	D 3	Trial Pit Complete			

Scale 1:50

Trial Pit excavated using a mechanical excavator.

Remarks

1) No progress below 2.50m due to armco barrier in way.
2) No groundwater encountered during excavation.
3) Sides of pit stable.

Plan

Logged By	GL	DATE 19-11
Checked By:		
Approved By:		
FIG No.		

PROJECT: RUNCORN NEW TOWN

LOCATION : Expressway 8 Borrow Pit

GROUND LEVEL : 36.58

INCLINATION : Vertical

SCALE OF LOG : 1:50

DIA. OF CASING: 154 mm. to 4.0 metres

mm. to metres

DATE DRILLED: 25.2.71

TYPE OF BORING : Shell and Auger

Reduced Level	Depth m	Legend	Sampling Type	Sampling Depth m	Soil Description	Key to Laboratory Tests
36.33	0.25				TOPSOIL -	
			D B	0.5	CLAY - firm, brown, sandy, stoney.	
			D U4	1.0		
35.18	1.4		B		SAND - red, clayey.	
					GWL 2.0'	
			D B	2.1		
			D S(30)	2.5	MARL - red and grey weathered, hard.	
			D	3.0		
			D S(30)	3.5		
32.58	4.0		S(5.5)*	4.0	BOTTOM OF BOREHOLE	

Moisture Content and plot of Atterberg Limits

Percent

10 20 30 40

Ground water encountered at 2.0'

Quantity

SHEET 1 OF 1

Borehole No. 17

3226 7992 SJ57NW 106

BeWT

MACHINE EXCAVATED TRIAL PIT

Location Runcorn Industrial Supply Job No. 8156/81 Project Ref 9-00-05-949

Ground Level (m AOD) Co-ordinates E N

Trial Pit No. TP24

Field Records Cohesion(kN/m2)	Depth (m)	Samples Type & No.	DESCRIPTION OF STRATA	Reduced Level m AOD	Strata Legend	Depth (Thickness) m
	0.80	B 1	MADE GROUND (Brunkles over limestone hardcore with occasional metal fence railings, concrete and tarmac fragments)			(0.90) 0.90
	1.20	D 1	MADE GROUND (Grey/brown/black clayey fine to coarse grained sand with much fine to coarse gravel)			(0.80) 1.70
140+	1.80		MADE GROUND (Very stiff dark brown sandy clay with occasional bricks, concrete, metal and wire fragments)			(0.30) 2.00
7	2.00	D 2	MADE GROUND (Very soft black odorous soap waste)			(0.50) 2.50
	2.10	D 3	Trial Pit Complete			

Scale 1:50

Trial Pit excavated using a mechanical excavator.

Remarks

1) No progress below 2.50m due to armco barrier in way.
2) No groundwater encountered during excavation.
3) Sides of pit stable.

Plan

Logged By	GL	DATE 19-11
Checked By:		
Approved By:		
FIG No.		

PROJECT: RUNCORN NEW TOWN

LOCATION: Expressway 8 Borrow Pit

GROUND LEVEL: 34.84 DIA. OF CASING: 154 mm. to 3.0 metres

INCLINATION: Vertical mm. to metres

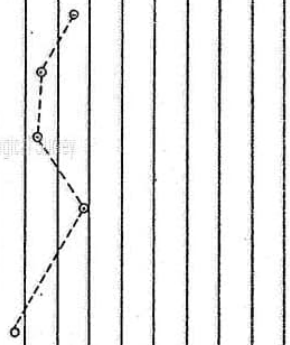
SCALE OF LOG: 1:50 DATE DRILLED: 24.2.71

TYPE OF BORING: Shell and Auger

Reduced Level	Depth m	Legend	Sampling Type	Sampling Depth m	Soil Description	Key to Laboratory Tests
34.59	0.25				TOPSOIL	
			D B	0.5	MARL - red/brown/grey, weathered with pieces of sandstone.	
			D U4	1.0		
			D B	1.5		
			D B	2.0		
32.64	2.20		D S(9)*	2.5	SANDSTONE- hard, red with traces of weathered marl.	
31.84	3.0		S(4.75)*	3.0	BOTTOM OF BOREHOLE	

Moisture Content and plot of Atterberg Limits

Percent 10 20 30 40



Ground water encountered at

Quantity

SHEET 1 OF 1

PROJECT: RUNCORN NEW TOWN
LOCATION: Expressway 8 Borrow Pit

GROUND LEVEL: 34.59
INCLINATION: Vertical
SCALE OF LOG: 1 : 50

DIA. OF CASING: 154 mm. to metres
mm. to metres
DATE DRILLED: 25.2.71.

TYPE OF BORING: Shell and Auger

Reduced Level	Depth	Legend	Sampling Type	Sampling Depth	Soil Description	Key to Laboratory Tests
34.34	0.25				TOPSOIL	
			D	0.5	CLAY - firm, brown, sandy, stoney	
			B			
			D	1.0		
			U4.			
			D	1.5	▼GWL 1.5m	
32.59	2.0	C	D	2.0	MARL - red/grey, weathered	
		C	S(28)	2.5		
31.59	3 0	C	S(5.5)*	3.0	BOTTOM OF BOREHOLE	

Moisture Content and plot of Atterberg Limits
Percent
10 20 30 40

Ground water encountered at 1.5
Quantity

SHEET 1 OF 1

PROJECT: RUNCORN NEW TOWN
LOCATION: Expressway 8 Borrow Pit

GROUND LEVEL: 34.59
INCLINATION: Vertical
SCALE OF LOG: 1 : 50

DIA. OF CASING: 154 mm. to metres
mm. to metres
DATE DRILLED: 25.2.71.

TYPE OF BORING: Shell and Auger

Reduced Level	Depth	Legend	Sampling Type	Sampling Depth	Soil Description	Key to Laboratory Tests
34.34	0.25				TOPSOIL	
			D	0.5	CLAY - firm, brown, sandy, stoney	
			B			
			D	1.0		
			U4.			
			D	1.5	▼GWL 1.5m	
32.59	2.0	C	D	2.0	MARL - red/grey, weathered	
		C	S(28)	2.5		
31.59	3 0	C	S(5.5)*	3.0	BOTTOM OF BOREHOLE	

Moisture Content and plot of Atterberg Limits
Percent
10 20 30 40

Ground water encountered at 1.5
Quantity

SHEET 1 OF 1

Version 2.0.6.7

British Geological Survey

BGS ID: 17095640 : BGS Reference: SJ58SW2202

British National Grid (27700) : 352090,380270

Report an issue with this borehole

<< < Prev Page 1 of 5 Next > >>

PROJECT: RUNCORN NEW TOWN
LOCATION: Expressway CE56
GROUND LEVEL: 192.1
INCLINATION: Vertical
SCALE OF LOG: 1" = 4'

DIA. OF CASING: 6 INS. TO FT.
INS. TO FT.
SHEET 1 OF 1

TYPE OF BORING: Shell and auger

Daily Progress	Reduced Level	Depth ft.	Legend	Sampling Type	Sampling Depth	Nat. m %	Description and Remarks, Including Water Observations.	Key to Laboratory Tests
5.2.1969	191.1	1.0		D	1.0	23	TOPSOIL - Black, sandy, fibrous	
				U4	2.0		CLAY - Firm, brown, sandy, stoney 1370/5/128·0/20·6 LL 38 PL 18 PI 20	I TX
	187.6	4.5		D	4.0	24		
				U4	5.0		MARL - Brown, firm, weathered 720/19/129·7/18·3 LL 38 PL 21 PI 17.	I TX
				D	7.0	19		
				D	9.0	9		
				U4	10.0			
	180.1	12.0		D	12.0	11	Hard, red brown	
	178.1	14.0					Bottom of borehole	

CONTINUED

U(4) = 4" Dia. Undisturbed Sample
D = Disturbed Sample
Δ = Water Sample
S( ) = Standard Penetration Test
C( ) = Cone Penetration Test

TX = Triaxial Test
CV = Consolidation Test
I = Index Test
O = Compaction Test

British Geological Survey

Version 2.0.6.7

BGS ID: 17095669 : BGS Reference: SJ58SW2228

British National Grid (27700) : 352160,380370

Report an issue with this borehole

<< < Prev Page 1 of 6 Next > >>

PROJECT : RUNCORN NEW TOWN

LOCATION : Expressway CE56.

GROUND LEVEL : 200.8 DIA. OF CASING : 6 INS. TO FT.

INCLINATION : Vertical INS. TO FT.

SCALE OF LOG : 1" = 4' SHEET 1 OF 2

TYPE OF BORING : Shell and auger

Daily Progress	Reduced Level	Depth ft.	Legend	Sampling Type	Sampling Depth	Nat. m %	Description and Remarks, including Water Observations.	Key to Laboratory Tests
	200.3	0.5					TOPSOIL - Black, sandy, fibrous	
							SAND - Brown, medium grained, stoney	
				D				
				S(16)	2.0	12 15		
				D	4.0	13		
				C(20)	5.0	14		
				D	6.0	13		
	193.3	7.5		D	8.0	9	CLAY - Firm, brown, sandy, stoney	
	191.8	9.0					MARL - Soft, brown, weathered	
				D				
				U4	10.0		504/9/13617/4.6.	TX CV
				D	11.5	15		
11.6.1969				D	14.0	18		
				C(3.0)	15.0	12		
	184.8	16.0		D	16.0		Grey	
				D	18.0	13		
				D				
				C(3.5)	20.0	9		
				D	22.0	20		
				D	24.0			
				C(3.0)	25.0	5		
				D	26.0	12		
				D	28.0			
				D				
				C(2.0)	30.0	11	CONTINUED	

U(4) = 4" Dia. Undisturbed Sample
D = Disturbed Sample
Δ = Water Sample
S( ) = Standard Penetration Test
C( ) = Cone Penetration Test

TX = Triaxial Test
CV = Consolidation Test
I = Index Test
O = Compaction Test
Ch = Chemical Test

PROJECT: RUNCORN NEW TOWN

LOCATION: Expressway CE56

GROUND LEVEL: 200.8 DIA. OF CASING: 6 INS. TO FT

INCLINATION: Vertical INS. TO FT

SCALE OF LOG: 1" = 4' SHEET 2 OF 2

TYPE OF BORING: Shell and auger

Daily Progress	Reduced Level	Depth ft.	Legend	Sampling Type	Sampling Depth	Nat. m %	Description and Remarks, Including Water Observations.	Key to Laboratory Tests
						10	MARL - Grey, weathered	
11.6.1969				D	32.0	14		
				D	34.0	14		
	166.3	34.5		C(1.0)	35.0	3	Hard, brown, unweathered	
	164.8	36.0		D	36.0		Bottom of borehole	

CONTINUED

U(4) = 4" Dia. Undisturbed Sample
D = Disturbed Sample
Δ = Water Sample
S( ) = Standard Penetration Test
C( ) = Cone Penetration Test

TX = Triaxial Test
CV = Consolidation Test
I = Index Test
O = Compaction Test
Ch = Chemical Test

Version 2.0.6.7

British Geological Survey

BGS ID: 17095680 : BGS Reference: SJ58SW2238

British National Grid (27700) : 352080,380340

Report an issue with this borehole

<< < Prev Page 1 of 5 Next > >>

PROJECT: RUNCORN NEW TOWN

LOCATION: Expressway C.E. 56

GROUND LEVEL: 201.3 DIA. OF CASING: 6 INS. TO

INCLINATION: Vertical INS. TO

SCALE OF LOG: 1" = 4' SHEET 1 OF 1

TYPE OF BORING: Shell and auger

Daily Progress	Reduced Level	Depth ft.	Legend	Sampling Type	Sampling Depth	Nat. m %	Description and Remarks, including Water Observations.	Key Labo Tes
	200.3	1.0					TOPSOIL - Black, sandy, fibrous	
				D			CLAY - Soft, brown, sandy, stoney LL PL PI	
				S(9)	2.0	14	- - 2	I
						14		
							▽ GWL 3.8' LL PL PI	C
				D	4.0	14	27 14 13	I
29.8.1969	196.3	5.0		U4	5.0			
							MARL - Brown, weathered	
				D	6.5	19	LL PL PI 30 18 12	I
				D			LL PL PI	
				U4	8.0	24	34 20 14	I
	191.3	10.0		D	10.0	16	Bottom of borehole	

~~CONTINUED~~

U(4) = 4" Dia. Undisturbed Sample
D = Disturbed Sample
△ = Water Sample
S( ) = Standard Penetration Test

TX = Triaxial Test
CV = Consolidation Test
I = Index Test
O = Compaction Test

BGS ID: 17101879 : BGS Reference: SJ58SW2535

British National Grid (27700) : 352218,380060

Report an issue with this borehole

PROJECT: RUNCORN NEW TOWN

LOCATION: Expressway 8 Borrow Pit

GROUND LEVEL: 38.71 DIA. OF CASING: 154 mm. to 3.0 metres

INCLINATION: Vertical mm. to metres

SCALE OF LOG: 1:50 DATE DRILLED: 24.2.71

TYPE OF BORING: Shell and Auger

Reduced Level	Depth m	Legend	Sampling Type	Sampling Depth m	Soil Description	Key to Laboratory Tests
38.46	0.25				TOPSOIL	
			D B	0.5	CLAY - firm, brown, very sandy.	
			D U4	1.0		
			D B	1.5		
			D B	2.0		
			S(8.5)*	2.5		
35.71	3.0		S(5)*	3.0		
					BOTTOM OF BOREHOLE	

Moisture Content and plot of Atterberg Limits

Percent 10 20 30 40

Ground water encountered at

Quantity

SHEET 1 OF 1

PROJECT: RUNCORN NEW TOWN
LOCATION: Expressway 8 Borrow Pit

GROUND LEVEL: 34.59
INCLINATION: Vertical
SCALE OF LOG: 1 : 50

DIA. OF CASING: 154 mm. to metres
mm. to metres
DATE DRILLED: 25.2.71.

TYPE OF BORING: Shell and Auger

Reduced Level	Depth	Legend	Sampling Type	Sampling Depth	Soil Description	Key to Laboratory Tests
34.34	0.25				TOPSOIL	
			D	0.5	CLAY - firm, brown, sandy, stoney	
			B			
			D	1.0		
			U4.			
			D	1.5	▼GWL 1.5m	
32.59	2.0	C	D	2.0	MARL - red/grey, weathered	
		C	S(28)	2.5		
31.59	3 0	C	S(5.5)*	3.0	BOTTOM OF BOREHOLE	

Moisture Content and plot of Atterberg Limits
Percent
10 20 30 40

Ground water encountered at 1.5
Quantity

SHEET 1 OF 1

IAN FARMER ASSOCIATES	Plant used: Comacchio 205	Project: HyNet North West - Hydrogen Pipeline	Location ID: **BH206**
	Dates: 20/10/2022 - 31/10/2022	Client: Cadent	Sheet 1 of 4

Dynamic Sampling and Rotary Boring Log	Location: 351967.97E 380416.96N	Ground level: 70.40mOD	Logged by: CG/CE	Vertical scale: 1:50	Project ID: 2230746

Samples & In Situ Testing				Strata Details				Groundwater	
Depth	Sample ID	Test Result		Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
0.10	D1			70.15	0.25	Grass over, dark greyish brown, slightly sandy, slightly gravelly SILT with frequent rootlets. Gravel is subangular to subrounded, fine including chert, mudstone and siltstone.			
0.30	D2				(0.45)	TOPSOIL			
0.40 - 0.70	B3			69.70	0.70	Brown, slightly clayey, slightly gravelly, sandy SILT. Gravel is subangular to subrounded, fine including chert, quartzite, mudstone and siltstone.			
0.50	ES4				(0.50)	GLACIAL TILL			
0.80	D5			69.20	1.20	Orangish brown, gravelly, clayey, silty, fine to coarse SAND. Gravel is subangular to rounded, fine including chert, quartzite, siltstone and other mixed lithologies.			
0.90 - 1.20	B6					GLACIAL TILL			
1.20		SPT(S) N=37 (7,12/10,9,8,10)				*Below 0.90m: becoming less clayey, silty, increase in gravel, sand is fine.*			
1.20 - 1.65	D8								
1.50 - 1.55	D10								
2.00		SPT(S) N=33 (5,4/5,9,8,11)			(1.55)	Very stiff, light reddish brown, silty CLAY, with up to 5 percent angular lithorelicts (up to 10mm) of extremely weak, reddish brown mudstone, with black surface staining (1mm) (GRADE IVa) [TARPORLEY SILTSTONE FORMATION] MERCIA MUDSTONE GROUP			
2.00 - 2.45	D9					*Between 2.62m and 2.80m: light greenish grey discolouration.*			
				67.65	2.75 (0.45)	Very stiff, reddish brown, silty CLAY, with up to 50 percent angular lithorelicts (up to 30mm) of extremely weak, reddish brown mudstone. (GRADE III) [TARPORLEY SILTSTONE FORMATION] MERCIA MUDSTONE GROUP			
		NA	3.00m - SPT(S) 50 (25 for 140mm/50 for 45mm)	67.20	3.20				
3.00 - 4.00	100 80 42	13	3.00m - D10 3.00m - D11			Very weak, thinly bedded (5 to 15 degrees) reddish brown SILTSTONE, with rare, light greenish grey, reduction spots (up to 5mm). Discontinuities are set 1: 0 to 10 degrees, closely spaced, planar, smooth, clean with black staining (<1mm). Set 2: 50 to 70 degrees, closely to medium spaced, planar, rough, clean. Set 3: 80 to 90 degrees, very closely to closely spaced, planar, smooth, clean, with black surface staining (<1mm). (GRADE I) [TARPORLEY SILTSTONE FORMATION] MERCIA MUDSTONE GROUP			
		NIDD	4.00m - C12						
4.00 - 5.50	100 100 23	13			(3.48)	*Between 3.90m and 4.00m: non intact, drilling disturbed, recovered as; subangular, coarse gravel.*			
		NIDD				*Between 5.09m and 5.20m: non intact, drilling disturbed, recovered as; angular, coarse gravel.*			
5.50 - 7.00	100 100 67	11		63.72	6.68				
7.00 - 8.50	100 100 67	8			(2.73)	Weak, thinly laminated (0 to 15 degrees) reddish brown, mottled light greenish grey SILTSTONE. Discontinuities are set 1: 0 to 10 degrees, closely to medium spaced, planar, rough and smooth, clean, with black staining (<1mm). Set 2: 30 to 50 degrees, medium spaced, planar, smooth, clean with black staining (<1mm). Set 3: 70 to 90 degrees, smooth and rough, clean, with black staining (<1mm). (GRADE II) [TARPORLEY SILTSTONE FORMATION] MERCIA MUDSTONE GROUP			
8.50 - 10.00	93 93 67		8.60m - C13			*At 8.60m: very weak diametrically.*			
		1		60.99	9.41	Weak, thinly laminated (0 to 15 degrees) reddish brown and light grey SILTSTONE. Discontinuities are set 1: 0 to 10 degrees, widely spaced, planar, smooth, clean, with black staining (<1mm). Set 2: 30 to 50 degrees, widely spaced, planar, smooth, with			
		AZCL				Continued next sheet			
	TCR/SCR/RQD	FI	Samples & Tests						

Dynamic Sample Recovery

Top (m)	Base (m)	Dia (mm)	Recovery %	Remarks
1.20	2.00		100	
2.00	3.00		100	
3.00	4.00		100	
4.00	5.50		100	

Remarks:
Service inspection pit hand excavated from GL to 1.20m.

SPT Hammer: JN01 Energy Ratio: 65%

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)

Checked by:	MHW	IFA DS v01.01
Log status:	FINAL	

IAN FARMER ASSOCIATES

Plant used: Comacchio 205	Project: HyNet North West - Hydrogen Pipeline		Location ID: **BH206**
Dates: 20/10/2022 - 31/10/2022	Client: Cadent		Sheet 2 of 4
Rotary Boring Log	Location: 351967.97E 380416.96N	Ground level: 70.40mOD / Logged by: CG/CE / Vertical scale: 1:50	Project ID: 2230746

Coring, Samples & In Situ Testing				Strata Details				Groundwater	
Depth	TCR/SCR/RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend	Water Strike	Backfill/ Installation
10.00 - 11.00	100 100 100	3			(2.15)	Weak, thinly laminated (0 to 15 degrees) reddish brown and light grey SILTSTONE. Discontinuities are set 1: 0 to 10 degrees, widely spaced, planar, smooth, clean, with black staining (<1mm). Set 2: 30 to 50 degrees, widely spaced, planar, smooth, with black staining (<1mm). (GRADE I) [TARPORLEY SILTSTONE FORMATION] MERCIA MUDSTONE GROUP *Between 9.53m and 9.62m: non intact, drilling disturbed.* *Between 9.72 and 9.90m: non intact, drilling disturbed, recovered as; clayey, angular, medium and coarse gravel.* *Between 9.90m and 10.00m: assessed zone of core loss.*			
11.00 - 12.20	100 100 89		11.61m - C14	58.84	11.56	Weak, thinly bedded (0 to 10 degrees) reddish brown SILTSTONE. (GRADE I) [TARPORLEY SILTSTONE FORMATION] MERCIA MUDSTONE GROUP			
12.20 - 13.30	100 100 64	2			(2.69)	*Between 12.70m and 13.10m: 2 no. intersecting 85 degree fractures, planar, rough, clean.*			
13.30 - 14.70	100 100 100		13.97m - C15			*At 13.97m: very weak.*			
				56.15	14.25				
14.70 - 16.10	100 100 100	2			(1.30)	Weak, thickly laminated (0 to 10 degrees) reddish brown and light greenish grey MUDSTONE. Discontinuities are 80 to 90 degrees, planar and undulating, rough with black staining (<1mm). (GRADE I) [TARPORLEY SILTSTONE FORMATION] MERCIA MUDSTONE GROUP *Between 14.46m and 14.69m: non intact, drilling disturbed, recovered as; angular, coarse gravel.*			
				54.85	15.55				
16.10 - 17.40	100 100 100		16.72m - C16			Weak, thinly bedded (0 to 10 degrees) reddish brown, mottled light bluish grey SILTSTONE, with rare, light bluish grey, reduction spots (up to 5mm). Discontinuities are set 1: 10 to 20 degrees, medium spaced, planar, rough and smooth, clean. Set 2: 60 to 75 degrees, closely to medium spaced, planar, rough, clean with black staining (<1mm). (GRADE I) [TARPORLEY SILTSTONE FORMATION] MERCIA MUDSTONE GROUP *At 16.72m: very weak.*			
17.40 - 18.60	100 100 71	5			(5.90)				
18.60 - 20.10	100 100 87		19.59m - C17						
						Continued next sheet			

Flush Details			
Top (m)	Base (m)	Flush Type	Flush Return %
5.50	7.00	Air	100
7.00	8.50	Air	100
8.50	10.00	Air	100
10.00	11.00	Air	100
11.00	12.20	Air	100
12.20	13.30	Water	100
13.30	14.70	Water	100
14.70	16.10	Water	100

Checked by:	MHW	IFA RC
Log status:	FINAL	v01.01

Borehole Diameter	
Depth (m)	Dia (mm)
40.00	121

Casing Diameter	
Depth (m)	Dia (mm)
40.00	139

Boring Progress				
Date	Time	Depth (m)	Cased (m)	Water (m)
19/10	16:30	5.50	3.00	Dry
20/10	08:00	5.50	3.00	1.98
20/10	16:30	12.20	3.00	4.20
21/10	08:00	12.20	3.00	5.60

Water Strikes					
Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Monitoring Installations			
Top (m)	Base (m)	Pipe Type	Dia (mm)

Remarks:

SPT Hammer: JN01 Energy Ratio: 65%

IAN FARMER ASSOCIATES

Plant used: Comacchio 205	Project: HyNet North West - Hydrogen Pipeline	Location ID: **BH206**	
Dates: 20/10/2022 - 31/10/2022	Client: Cadent	Sheet 3 of 4	
Rotary Boring Log	Location: 351967.97E 380416.96N	Ground level: 70.40mOD	Logged by: CG/CE	Vertical scale: 1:50	Project ID: 2230746

Depth	TCR/SCR/RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend		Groundwater: Water Strike	Groundwater: Backfill/ Installation
20.10 - 21.60	100 100 100					Weak, thinly bedded (0 to 10 degrees) reddish brown, mottled light bluish grey SILTSTONE, with rare, light bluish grey, reduction spots (up to 5mm). Discontinuities are set 1: 10 to 20 degrees, medium spaced, planar, rough and smooth, clean. Set 2: 60 to 75 degrees, closely to medium spaced, planar, rough, clean with black staining (<1mm). (GRADE I) [TARPORLEY SILTSTONE FORMATION] MERCIA MUDSTONE GROUP		21		
				48.95	21.45					
21.60 - 23.10	93 93 93	2	22.26m - C18			Weak, thinly to thickly laminated (0 to 15 degrees) reddish brown, interlaminated MUDSTONE and SILTSTONE. Discontinuities are set 1: 5 to 15 degrees, medium spaced, planar, rough, clean, with black staining (<1mm). Set 2: 40 to 60 degrees, widely spaced, planar, smooth, clean with black staining (<1mm). (GRADE I) [TARPORLEY SILTSTONE FORMATION] MERCIA MUDSTONE GROUP *Between 21.50m and 21.60m: light bluish grey discolouration.*		22		
		AZCL						23		
23.10 - 24.10	90 90 90	2	23.55m - C19		(3.92)	*At 23.55m: very weak, extremely weak diametrically.*		24		
		AZCL								
24.10 - 25.10	100 78 78	0 NA 3				*Between 24.34m and 24.56m: stiff, reddish brown clay, with up to 70 percent angular lithorelicts (up to 35mm) of weak mudstone and siltstone. (grade III)* *Between 24.95m and 25.10m: 85 degree joint, planar, rough, with black staining (<1mm).*		25		
		NA		45.03	25.37					
25.10 - 26.60	100 35 18	20 NA 25	25.95m - C20			Very weak, thickly laminated (5 to 15 degrees) reddish brown MUDSTONE. Discontinuities are set 1: 0 to 10 degrees, extremely closely to closely spaced, planar and undulating, smooth, tight with soft, brown clay infill (up to 0.25mm). Set 2: 40 to 70 degrees, closely spaced, planar and undulating, rough locally smooth with black staining (<1mm). Set 3: 80 to 90 degrees, very closely spaced, planar, smooth, clean. (GRADE II) [TARPORLEY SILTSTONE FORMATION] MERCIA MUDSTONE GROUP *Between 25.37m and 25.52m: stiff, reddish brown clay, with up to 50 percent subangular lithorelicts (up to 30mm) of weak mudstone. (grade III)* *Between 25.83m and 25.94m: stiff, reddish brown clay, with up to 60 percent subangular lithorelicts (up to 25mm) of weak mudstone. (grade III)*		26		
					(2.59)			27		
26.60 - 28.10	100 92 7	5 20 NA 7				*Between 27.39m and 27.58m: medium strong, reddish brown siltstone.* *Between 27.48m and 27.96m: stiff, reddish brown clay, with up to 50 percent subangular lithorelicts (up to 30mm) of weak, reddish brown mudstone. (grade III)*				
				42.44	27.96			28		
28.10 - 29.50	100 71 44	NIDD 10	28.96m - C21		(1.14)	Weak, thickly laminated (0 to 10 degrees) reddish brown and bluish grey MUDSTONE. Discontinuities are Set 1: 0 to 15 degrees, closely spaced, undulating, smooth, clean with black staining (<1mm). Set 2: 60 to 75 degrees, medium spaced, planar and undulating, smooth, clean with black staining (<1mm). (GRADE I) [TARPORLEY SILTSTONE FORMATION] MERCIA MUDSTONE GROUP *Between 28.10m and 28.46m: non intact, drilling disturbed, recovered as; angular, medium and coarse gravel.* *At 28.90m: extremely weak diametrically.*		29		
		NA		41.30	29.10	Very stiff, reddish brown and bluish grey, silty CLAY, with up to 75 percent angular lithorelicts (up to 35mm) of weak, reddish brown mudstone. (GRADE III) [TARPORLEY SILTSTONE FORMATION] MERCIA MUDSTONE GROUP				
						Continued next sheet		30		

Flush Details

Top (m)	Base (m)	Flush Type	Flush Return %
16.10	17.40	Water	100
17.40	18.60	Water	100
18.60	20.10	Water	100
20.10	21.60	Water	100
21.60	23.10	Water	100
23.10	24.10	Water	100
24.10	25.10	Water	100
25.10	26.60	Air	95

Checked by: MHW | IFA RC v01.01
Log status: FINAL

Borehole Diameter

Depth (m)	Dia (mm)

Casing Diameter

Depth (m)	Dia (mm)

Boring Progress

Date	Time	Depth (m)	Cased (m)	Water (m)
21/10	16:30	18.60	5.00	4.15
24/10	08:00	18.60	5.00	25.10
24/10	16:30	25.10	5.00	4.35
25/10	08:00	25.10	5.00	7.70

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Remarks:

SPT Hammer: JN01 Energy Ratio: 65%

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)

IAN FARMER ASSOCIATES

Plant used: Comacchio 205	Project: HyNet North West - Hydrogen Pipeline		Location ID: **BH206**
Dates: 20/10/2022 - 31/10/2022	Client: Cadent		Sheet 4 of 4
Rotary Boring Log	Location: 351967.97E 380416.96N	Ground level: 70.40mOD / Logged by: CG/CE / Vertical scale: 1:50	Project ID: 2230746

Depth	TCR/SCR/RQD	FI	Samples & Test Result	Level (mOD)	Depth (m) (Thickness)	Strata Description	Legend		Groundwater: Water Strike	Groundwater: Backfill/ Installation
29.50 - 31.00	100 26 26	0 NA 0			(2.60)	Very stiff, reddish brown and bluish grey, silty CLAY, with up to 75 percent angular lithorelicts (up to 35mm) of weak, reddish brown mudstone. (GRADE III) [TARPORLEY SILTSTONE FORMATION] MERCIA MUDSTONE GROUP *Between 30.05m and 30.17m: medium strong, bluish grey siltstone.* *Between 30.40m and 30.54m: medium strong, bluish grey siltstone.*		31		
31.00 - 32.00	100 30 30	NA	31.50m - D22	38.70	31.70					
32.00 - 33.00	86 86 70	6 0 AZCL	32.50m - C23	37.70	(1.00) 32.70	Weak, thinly bedded (0 to 10 degrees) reddish brown SILTSTONE. Discontinuities are set 1: 0 to 15 degrees, closely spaced, undulating, smooth, with black staining (<1mm). Set 2: 50 to 70 degrees, medium spaced, planar, smooth, with black staining (<1mm). (GRADE I) [TARPORLEY SILTSTONE FORMATION] MERCIA MUDSTONE GROUP *At 32.50m: extremely weak diametrically.*		32		
33.00 - 34.00	100 100 100	3	33.40m - C24	36.54	(1.16) 33.86	Very weak, thinly to thickly laminated (0 to 20 degrees) bluish grey SILTSTONE. Discontinuities are 5 to 20 degrees, medium spaced, planar, smooth, clean with reduction in wall strength (up to 2mm). (GRADE I) [TARPORLEY SILTSTONE FORMATION] MERCIA MUDSTONE GROUP		33		
34.00 - 35.00	80 70 55	7 NA 4	34.82m - C25		(1.64)	Very weak, thickly laminated (5 to 20 degrees) reddish brown and bluish grey SILTSTONE. Discontinuities are set 1: 10 to 20 degrees, closely spaced, planar, smooth, open with soft, reddish brown clay infill (up to 2mm). Set 2: 50 to 70 degrees, medium spaced, planar, smooth, clean with slight black and orange brown surface staining (<1mm). (GRADE I) [TARPORLEY SILTSTONE FORMATION] MERCIA MUDSTONE GROUP *Between 34.00m and 35.00m: core slipped and recovered.* *Between 34.57m and 34.72m: stiff, reddish brown and bluish grey, silty clay, with up to 40 percent angular lithorelicts (up to 30mm) of weak mudstone and siltstone. (grade III)* *Between 35.14m and 35.50m: assessed zone of core loss, possibly dropped and scrubbed.*		34		
35.00 - 35.50	28 14 0	AZCL		34.90	35.50			35		
35.50 - 36.00	100 76 76	NA				Very weak locally weak, thinly bedded (0 to 10 degrees) reddish brown SILTSTONE. Discontinuities are set 1: 20 to 30 degrees, closely to medium spaced, planar, smooth and rough, clean with black surface staining (<1mm). Set 2: 50 to 70 degrees, medium spaced, planar, rough, clean, with black and orange brown surface staining (<1mm). (GRADE I) [TARPORLEY SILTSTONE FORMATION] MERCIA MUDSTONE GROUP *Between 35.50m and 35.62m: stiff, reddish brown, silty clay, with up to 60 percent angular lithorelicts (up to 35mm) of weak mudstone. (grade III)* *Between 35.55m and 35.68m: light greyish white gypsum growth along very closely spaced, incipient fractures (80 degrees).* *Between 37.16m and 37.40m: stiff, reddish brown, silty clay, with up to 50 percent angular lithorelicts (up to 30mm) of weak, reddish brown mudstone. (grade III)* *Between 37.55m and 37.88m: stiff reddish brown, silty clay, with up to 50 percent subangular lithorelicts (up to 35mm) of weak mudstone.* *At 38.00m: very weak diametrically.* *Between 39.50m and 39.63m: non intact, drilling disturbed, recovered as; angular, medium and coarse gravel.*		36		
36.00 - 37.50	93 76 66	5 NA AZCL	36.27m - C26					37		
37.50 - 38.50	100 87 87	4 NA	38.00m - C27		(4.50)			38		
38.50 - 40.00	100 100 84	4 NIDD 8	39.00m - C28					39		
				30.40	40.00	End of Borehole at 40.00m		40		

Flush Details

Top (m)	Base (m)	Flush Type	Flush Return %
26.60	28.10	Air	100
28.10	29.50	Air	100
29.50	31.00	Air	100
31.00	32.50	Air	100
32.50	34.00	Air	100
34.00	35.50	Air	100
35.50	36.00	Air	100
36.00	37.50	Air	100

Checked by: MHW
Log status: FINAL
IFA RC v01.01

Borehole Diameter

Depth (m)	Dia (mm)

Casing Diameter

Depth (m)	Dia (mm)

Boring Progress

Date	Time	Depth (m)	Cased (m)	Water (m)
25/10	16:30	34.00	5.00	7.60
26/10	08:00	34.00	5.00	7.90
26/10	16:30	40.00	5.00	8.10

Water Strikes

Strike (m)	Cased (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks

Remarks:

SPT Hammer: JN01 Energy Ratio: 65%

Monitoring Installations

Top (m)	Base (m)	Pipe Type	Dia (mm)

LOCATION : Rapid Transit

GROUND LEVEL: 211.9 DIA. OF CASING : 6 INS. TO FT.

INCLINATION : Vertical INS. TO FT.

SCALE OF LOG : 1" = 4' SHEET 1 OF 1

TYPE OF BORING: Shell and auger

Daily Progress	Reduced Level	Depth ft.	Legend	Sampling Type	Sampling Depth	Nat. m %	Description and Remarks, including Water Observations.	Key to Laboratory Tests
	210.9	1.0					TOPSOIL - black, sandy, fibrous	
				D				
				U4	2.0	20	MARL - brown/grey, weathered	
				D	4.0	13		
	206.9	5.0		U4	5.0			
3.3.70.				D				
				S(9)*	6.0	11	firm	
				D	8.0			
				S(8)*	9.0	12		
				D	10.0	14		
				S(9)*	11.5	12		
	199.9	12.0					hard	
				D				
	197.4	14.5		S(5.5)*	14.0	9		
							Bottom of borehole	

CONTINUED

U(4) = 4" Dia. Undisturbed Sample
D = Disturbed Sample
Δ = Water Sample
S( ) = Standard Penetration Test
C( ) = Cone Penetration Test
Figures in Brackets Indicate No. of Blows
* Indicates Penetration in ins. for 50 Blows
V = Vane Test

TX = Triaxial Test
CV = Consolidation Test
I = Index Test
O = Compaction Test
Ch = Chemical Test

Borehole No.5

LOCATION : Rapid Transit

GROUND LEVEL: 195.6 DI. OF CASING : 6 INS. TO FT.

INCLINATION : Vertical INS. TO FT.

SCALE OF LOG: 1" = 4' SHEET 1 OF 1

TYPE OF BORING: Shell and auger

Daily Progress	Reduced Level	Depth ft.	Legend	Sampling Type	Sampling Depth	Nat. m %	Description and Remarks, Including Water Observations.	Key to Laboratory Tests
	194.6	1.0					TOPSOIL - black, sandy, fibrous	
				D			CLAY - firm, brown, silty	
				U4	2.0	20		
				D	4.0	28		
				U4	5.0			
				D	6.0	28		
				D	8.0	14		
				D	10.0	18		
	185.1	10.5		U4				
1.3.70.				S(9)*	10.8	11	MARL - brown, weathered, medium hard	
				D	12.0	25		
				D	14.0	20		
				U4	15.0			
				D	16.0	13		
				S(10)*		12		
				D	18.0			
	175.6	20.0		D	20.0			
	174.8	20.8		S(9)*				
							Bottom of borehole	
							CONTINUED	

U(4) = 4" Dia. Undisturbed Sample
D = Disturbed Sample
Δ = Water Sample
S( ) = Standard Penetration Test
C( ) = Cone Penetration Test
Figures in Brackets Indicate No. of Blows
* Indicates Penetration in Ins. for 50 Blows
V = Vane Test

TX = Triaxial Test
CV = Consolidation Test
I = Index Test
O = Compaction Test
Ch = Chemical Test

Borehole No.6

APPENDIX C
HAZARD RISK ASSESSMENT TABLES

RSK GEOSCIENCES

Hynet - Geology List

Project Number: 322968

Discipline	Geological Formation	Description
Superficial Geology		
Geological Formation	Till, Devansian - Diamicton	Heterogenous mixture of clay, sand, gravel, and boulders varying widely in size and shape
Geological Formation	Alluvium	Clay, Silt, Sand and Gravel
Geological Formation	Tidal Flat Deposits	Clay, Silt, Sand
Geological Formation	Glaciofluvial Sheet Deposits - Devensian	Sand and Gravel
Geological Formation	Peat	Peat, Soils with High Content of Organic Material
Geological Formation	River Terrrace Deposits (Undifferentiated)	Sand and Gravel
Geological Formation	Shirdley Hill Sand Formation	Sand
Geological Formation	Made Ground	Filled or Made Ground (Including Landfills)
Geological Formation		
Bedrock Geology:		
Geological Formation	Wilmslow Sandstone Formation	Sandstone
Geological Formation	Chester Formation	Sandstone, pebbly and gravelly
Geological Formation	Kinnerton Sandstone Formation	Sandstone
Geological Formation	Helsby Sandstone Formation	Sandstone, pebbly and gravelly
Geological Formation	Tarporley Siltstone Formation	Siltstone, Mudstone and Sandstone
Geological Formation	Bollin Mudstone Member	Mudstone
Geological Formation	Sidmouth Mudstone Formation	Mudstone
Geological Formation	Northwich Halite Member	Halite Stone and Mudstone
Geological Formation	Etruria Formation	Mudstone, Sandstone and Conglomerate
Geological Formation	Pennione Middle Coal Measures Formation	Mudstone, Siltstone and Sandstone
Geological Formation	Pennione Middle Coal Measures Formation	Sandstone
Geological Formation	Pennione Lower Coal Measures Formation	Mudstone

RSK GEOSCIENCES

Hynet - Geology and Geohazards List

Project Number: 322968

GS = Groundsure. (GS + Number = report section)

No.	Discipline	Condition / Hazard ID	Affected Geological formation / Unit	Groundsure Section or dataset to use	Description of Condition / Hazard	RSK Description on Impact of Hazard	Mitigation
1	Geotechnical/Hydrogeological/Geohazards	Filled / Made Ground	N/A	3.1 to 3.4 + RSK Conjectural Gd Models	Fill materials of anthropogenic origin, potentially contaminated material and unpredictable engineering conditions and instability.	Insufficient design, delay, excessive displacement, differential displacement, failure of foundations, slopes and excavation instability. Potentia injury or exposure of construction workers. Pollution of controlled waters and environment. Potential to add cost, time, risk to the project	- Ground investigation to determine exact Geology - Designer to consider conservative soil parameters - Foundations to be taken to competent strata - Excavations to have trench support systems available. - Consider reroute to avoid infilled ground / potentially unstable ground. - Consider application of ground improvement techniques
4	Geotechnical/Hydrogeological/Geohazards	Fault	N/A	BGS Mapping. (GS15.10)	Plane fracture or discontinuity in rock mass with visible displacement. Either observed or inferred from BGS data / mapping.	Reactivation of faults could lead to displacement across fault and movements at ground surface.	- Designer to consider seismicity and seismic design for sensitive structures in accordance with BS EN 1998-1:2004 Eurocode8: Design of structures for earthquake resistance.
5	Geotechnical/Hydrogeological/Geohazards	Adverse Ground Chemistry / Adverse Groundwater Chemistry	High Sulphates/Sulfides: MADE GROUND, Alluvium, Peat, Mercia Mudstone Group (Tarporley Siltstone Fm, Bollin Mudstone Member, Sidmouth Mudstone Fm, Northwich Halite Member Medium Risk Sulphates/Sulfides: Till, Etruria Fm, Coal Measures Low: Glaciofluvial Sheet Deposits, River Terrace Deposits, Shirdley Hill Sand Fm, Sherwood Sandstone Fm (Wilslow Stone Fm, Chester Fm, Kinnerton Stone Fm, Helsby Stone Fm)	BGS Mapping + RSK Conjectural Gd Models	Potential for high concentrations of Sulphates, Chloride, W504 and aggressive chemical environment	Insufficient design, long-term excessive displacement and corrosion and potential failure of both concrete and metal permanent works. Potential to add cost & risk to the project	- Ground investigation to determine exact geology and groundwater conditions allow for determination of chemical agents for soil and groundwater. - Designer to assess concentrations of chemicals in accordance with BS 8500-1:2006 and BS EN 206:2013 to determine the "Aggressive Chemical Environment for Concrete (ACEC) Classification" in and a Design Sulphate Class. - Designer to include protective coatings to pipelines & buried metal structures, and suitable cover depth of steel reinforcement within concrete structures. - Designer to consider soil resistivity and specify appropriate cathodic protection measures.
7	Geotechnical/Hydrogeological/Geohazards	High Groundwater Table	Low lying ground near river, streams and Mersey Estuary. Geological Units: Alluvium, Tidal Flat Deposits, Glaciofluvial Sheet Deposits, Peat, River Terrace Deposits, Made Ground, Shirdley Hill Sandstone Formation, Some Bedrock Units without overlying superficials. Areas ID'd as at risk of GW flooding	BGS Mapping, Topo Contours, DTM, Satellite Imagery, (GS 9.1)	Shallow groundwater table	Insufficient design, delay, excessive displacement, buoyancy, failure, instability of excavations, running sands, environmental impacts / pollution Potential to add cost, time, risk to the project	- Ground investigation to determine exact geology and groundwater conditions. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; such as dewatering systems, trial excavations, excavation support systems. - Designer to consider appropriate temporary and permanent drainage - Designer to consider conservative groundwater conditions in temporary and permanent design
8	Geotechnical/Hydrogeological/Geohazards	Groundwater Flooding	Refer to GS reports	(GS 9.1)	Caused by unusually high groundwater levels. Can last for weeks or months. Risk is assessed in the Groundsure report based on a 1:100 year return period.	Insufficient design, delay, excessive displacement, buoyancy, failure, instability of excavations, environmental impacts / pollution, maintenance / repair access issues. Potential to add cost, time, risk to the project	- Ground investigation to determine exact geology and groundwater conditions. - Flood Risk Assessment to determine flood risk. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; raising ground levels, re-routing, anchoring to prevent buoyancy issues. - Designer to consider appropriate temporary and permanent drainage
10	Geotechnical/Hydrogeological/Geohazards	Potentially Liquifiable Soils	Alluvium, Tidal Flat Deposits, Glaciofluvial Sheet Deposits, Shirdley Hill Sand Formation - loose water bearing sands	BGS Mapping + RSK Conjectural Gd Models	Soils that are potentially susceptible to liquefaction due to seismic activity. Saturated, very loose and loose, silty sand layers may be locally present	Insufficient design, delay, excessive displacement, differential displacement, failure of foundations, slopes and excavation instability. Potential to add cost and risk to the project	- Ground investigation to determine exact geology and groundwater conditions and determine liquefaction potential. - Designer to consider seismicity and seismic design for sensitive structures in accordance with BS EN 1998-1:2004 Eurocode8: Design of structures for earthquake resistance. - Consider application of ground improvement techniques
11	Geotechnical/Hydrogeological/Geohazards	Collapsible Soils	Negligible / Very Low Likelihood for all soils across project area	(GS 17.4)	Soil that has potential to reduces in volume on wetting, typically responding rapidly to inundation.	Insufficient design, delay, excessive displacement, differential displacement, failure of foundations, slopes and excavation instability. Potential to add cost and risk to the project	- Ground investigation to determine exact geology and groundwater conditions and determine potential for presence of collapsible soils. Design to consider engineering mitigation which includes in-situ compaction, removal and replacement, pre-wetting to induce volume reduction prior to construction, chemical stabilization or grouting, transfer of loads to competent strata not susceptible to collapse.
12	Geotechnical/Hydrogeological/Geohazards	Highly Compressible & Low Bearing Capacity Ground	Alluvium, Tidal Flat Deposits, Peat, Made Ground	(GS 17.5) + Areas of Filled Ground / Made Ground identified in Conjectural Gd Models.	Soft, low strength compressible soils with low bearing capacity	Insufficient design, delay, excessive displacement, failure. Potential to add cost, time, risk to the project	- Ground investigation to determine exact geology and groundwater conditions. - Design to consider conservative soil parameters. - Foundation loads taken to competent strata. - Designer to consider potential for consolidation settlement, secondary (creep) settlement as a result of applied structural loads or raising ground levels. - Use of engineering mitigation such as ground improvement, surcharging / band drain, consideration of negative skin friction.
13	Geotechnical/Hydrogeological/Geohazards	Swelling/Shrinkage Potential Soils	Alluvium, Tidal Flat Deposits, Till, Some Weathered Bedrock Units. NOTE: GS classes all as potentially Low Plasticity. Probably all are potential for Low to Intermediate Plasticity.	(GS 17.1) + BGS Mapping+ RSK Conjectural Gd Models	Typically intermediate to high plasticity soils susceptible to significant volume changes due to moisture content changes. Low Plasticity soils can be susceptible to small volume changes and should be considered in design	Insufficient design, delay, excessive displacement, failure Swelling / shrinkage of ground following vegetation removal / planting as moisture content rebounds / reduces. Insufficient design, excessive displacement, differential displacement, failure of foundations. Potential to add cost, time, risk to the project	- Ground investigation to determine exact geology and groundwater conditions to allow for site-specific assessment of the soils susceptibility to swelling/shrinkage - Design of foundations in accordance with NHBC guidance on building near trees. - Designer to consider engineering mitigation such as voids, void formers, use of compressible materials, construction of foundations below zone of influence of vegetation.
14	Geotechnical/Hydrogeological/Geohazards	Running Sands	Alluvium, TFD, RTG, Glaciofluvial Sheet Deposits, Chester Formation, Till , Shirley Hill Sandstone,	(GS 17.2) + BGS Mapping+ RSK Conjectural Gd Models	Soils that potentially contain loosely packed sand layers that can become fluidised by water flow and 'run' into an excavation	Insufficient design, delay, excessive displacement, failure Running sands' occurs when a sand layer/unit becomes fluidised by water flowing through it, causing it to 'run' into open excavations if sides are left unsupported. They typically comprise loose clean fine to medium sand. Such sands can 'run', removing support from overlying buildings, excavation sidewalls and causing potential damage and / or stability issues. Other engineering risks include HDD / borehole instability, sudden changes in drilling parameters. Potential to add cost, time, risk to the project	- Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment of the soils susceptibility to running / blowing sands conditions. - Designer to consider engineering mitigation such as excavation support systems, use of casing for rotary bored piles or CFA piling, use of appropriate drilling fluid type and / or viscosity, redesign HDD profiles to avoid or limit drill time in unstable soils.
15	Geotechnical/Hydrogeological/Geohazards	Ground Subject to or at risk of Landslide / Mudflows / Slope Instability	N/A - refer to GS, DTM, Imagery, Topo	(GS 14.4, 17.5)	Potential for movement of rock, soil, debris down a sloping section of land. Can be due to natural ground conditions and geomorphological conditions or as a results of man made features such as cut slopes, embankments, quarries etc.	Insufficient design, delay, excessive displacement, failure. Potential to add cost, time, risk to the project	- Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment of temporary and permanent slopes. - Topographic survey to determine existing slope gradients and geomorphology - Assessment of existing and proposed slope stability to current British and Eurocode standards and CoP documents. -Adoption of conservative parameters in assessment and design. - Designer to consider application of engineering mitigation such as regrading existing slopes, slope / cliff stabilisation with soil nails, rock bolts etc. - Consider reroute or bylass with HDD
16	Geotechnical/Hydrogeological/Geohazards	Excavatability - Solid Rock Geology Outcrop / Potential for Shallow buried solid r	Solid Rock outcropping of bedrock formations. Areas without superficial and with bedrock from surface, (depending in BGS BH records show regarding weathered upper layers)	BGS Mapping - based on geology. + RSK Conjectural Gd Models	How easy the shallow soils can be excavated.	Some ground conditions such as solid rock , cemented soils resulting in potential issues / limitations of standard plant to form excavations and need for heavier plant, hydraulic machinery, breakers, or blasting. Insufficient design, planning, delay. Potential to add cost, time, risk to the project	- Ground investigation to determine presence of solid rock geology and establish discontinuity index and rock strength. - Assessment of excavatability - Designer to consider rock parameters in assessment of trenching techniques - Consider reroute or bypass with HDD
17	Geotechnical/Hydrogeological/Geohazards	Excavation Stability	Areas underlain by Superficial soils with potential for loose water bearing granular soils, made ground. Tidal Flat Deposits, Peat, Made Ground, Alluvium, River Terrace Gravels, Glacio-fluvial Deposits, Shirdley Hill Sand Formation	BGS Mapping - based on geology. + RSK Conjectural Gd Models	Potential for side wall or base instability of excavations due to difficult ground conditions such as loose granular deposits, water bearing granular soils, made ground etc	Insufficient design, delay, excessive displacement, differential displacement, failure of temporary and permanent slopes and excavation instability. Potential to add cost, time, risk to the project	- Ground investigation to determine exact geology and groundwater conditions. - Designer to consider appropriate engineering mitigation to facilitate temporary works; such as dewatering systems, trial excavations, excavation support systems.
18	Geotechnical/Hydrogeological/Geohazards	Potential for dissolution of soluble rocks	Refer to GS reports	(GS 17.6)	Potential for formation of cavity / cave systems in the ground caused by the dissolution of minerals within the parent rock.	- Ground instability can result from movement of loose material contained within these cavities, and / or void migration towards the surface, often triggered by water. - Insufficient design, delay, excessive displacement, differential displacement, failure of foundations, slopes and excavation instability. Hole instability if HDD or pile bore penetrates deep filled hollow Potential to add cost, time, risk to the project	- Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment. - Designer to consider rerouting to avoid unstable geology. - Consider mitigation remedial measures such as compaction grouting, void filling, foam concrete etc
19	Geotechnical/Hydrogeological/Geohazards	Recorded Natural Cavity	Refer to GS reports	(GS 18.1)	Industry recognised national database of natural cavities. Sinkholes and caves are formed by the dissolution of soluble rock, such as chalk and limestone, gulls and fissures by cambering	- Ground instability can result from movement of loose material contained within these cavities, and / or void migration towards the surface, often triggered by water. - Insufficient design, delay, excessive displacement, differential displacement, failure of foundations, slopes and excavation instability. Hole instability if HDD or pile bore penetrates deep filled hollow. Potential to add cost, time, risk to the project	- Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment. - Designer to consider rerouting to avoid unstable geology. - Consider mitigation remedial measures such as compaction grouting, void filling foam concrete etc
20	Geomorphological	Landslides / Mudflows / Slope Instability		(GS 14.4, 17.5), DTM, Imagery, Topo	Evidence of historic or recent slope instability, either recorded within Groundsure dataset, or observed through reference to DTM, satellite imagery.	Insufficient design, delay, excessive displacement, failure. Potential to add cost, time, risk to the project	- Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment of temporary and permanent slopes. - Topographic survey to determine existing slope gradients and geomorphology - Engineering geological assessment of existing slope / failed slope - Assessment of existing and proposed slope stability to current British and Eurocode standards and CoP documents. -Adoption of conservative parameters in assessment and design. - Consider rerouting or bypass with HDD - Designer to consider application of engineering mitigation such as regrading existing slopes, slope / cliff stabilisation with soil nails, rock bolts etc.

21	Geomorphological	Escarpments		DTM / Satellite Imagery / Topo	Steep slope or cliff the separates two relatively flat level areas - sudden change in elevation	Potential slope stability issues, potential constructability difficulties. Insufficient design, delay, excessive displacement, failure. Potential to add cost, time, risk to the project	- Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment of temporary and permanent slopes. - Topographic survey to determine existing slope gradients and geomorphology - Engineering geological assessment of existing slope / failed slope - Assessment of existing and proposed slope stability to current British and Eurocode standards and CoP documents. -Adoption of conservative parameters in assessment and design. - Designer to consider application of engineering mitigation such as regrading existing slopes, slope / cliff stabilisation with soil nails, rock bolts etc. - Consider re-routing or bypass with HDD
22	Geomorphological	Terraces		DTM / Satellite Imagery / Topo	Step like landform	Potential slope stability issues, potential constructability difficulties. Insufficient design, delay, excessive displacement, failure. Potential to add cost, time, risk to the project	- Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment of temporary and permanent slopes. - Topographic survey to determine existing slope gradients and geomorphology - Engineering geological assessment of existing slope / failed slope - Assessment of existing and proposed slope stability to current British and Eurocode standards and CoP documents. -Adoption of conservative parameters in assessment and design. - Designer to consider application of engineering mitigation such as regrading existing slopes, slope / cliff stabilisation with soil nails, rock bolts etc. - Consider re-routing or bypass with HDD
23	Geomorphological	Break in Slope		DTM / Satellite Imagery / Topo	Marked change in slope gradient	Potential slope stability issues, potential constructability difficulties. Insufficient design, delay, excessive displacement, failure. Potential to add cost, time, risk to the project	- Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment of temporary and permanent slopes. - Topographic survey to determine existing slope gradients and geomorphology - Engineering geological assessment of existing slope / failed slope - Assessment of existing and proposed slope stability to current British and Eurocode standards and CoP documents. -Adoption of conservative parameters in assessment and design. - Designer to consider application of engineering mitigation such as regrading existing slopes, slope / cliff stabilisation with soil nails, rock bolts etc. - Consider re-routing or bypass with HDD
25	Geomorphological	Gully / Gully Erosion / Incised channels (Buried Valley)		DTM / Satellite Imagery / Topo	A small hollow or channel incised into sediments or unconsolidated rock by running water, sudden lateral changes in ground conditions. Or the potential for incised channels based on geology and / or surface water regime.	Potential excavation stability issues, sudden lateral changes in ground conditions & engineer parameters. Potential constructability difficulties. Insufficient design, delay, excessive displacement, failure. Potential to add cost, time, risk to the project	- Ground investigation to determine exact Geology and groundwater conditions and profile presence of buried channels. - Topographic / bathymetric survey to determine depth of channels, depth of loose sediment and geomorphology -Adoption of conservative parameters in assessment and design. - Designer to consider application of engineering mitigation such as redesigning HDD profile to avoid unstable geology, trench / excavation support systems.
26	Geomorphological	Ridges		DTM / Satellite Imagery / Topo	A raised area of the land that is generally narrow and long.	Potential constructability difficulties. Insufficient design, delay, excessive displacement, failure. Potential to add cost, time, risk to the project	- Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment of temporary and permanent slopes. - Topographic survey to determine existing slope gradients and geomorphology - Engineering geological assessment of existing slope / failed slope - Assessment of existing and proposed slope stability to current British and Eurocode standards and CoP documents. -Adoption of conservative parameters in assessment and design. - Designer to consider application of engineering mitigation for temporary / permanent works
27	Geomorphological	Large Hill and / or Steep Terrain		DTM / Satellite Imagery / Topo	A significant change in elevation over a relatively short lateral distance	Potential constructability difficulties. Insufficient design, delay, excessive displacement, failure. Potential to add cost, time, risk to the project	- Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment of temporary and permanent slopes. - Topographic survey to determine existing slope gradients and geomorphology - Engineering geological assessment of existing slope / failed slope - Assessment of existing and proposed slope stability to current British and Eurocode standards and CoP documents. -Adoption of conservative parameters in assessment and design. - Designer to consider application of engineering mitigation for temporary / permanent works
28	Geomorphological	Excavations		DTM / Satellite Imagery / Topo, (GS3.1 to 3.5 & 18.2, 18.3, 18.6, 18.7)	A hole, opening or cavity formed by the removal of materials. Possibly related to mining and subsequent landfill practices.	Potential constructability difficulties. Insufficient design, delay, excessive displacement, failure. Potential slope stability issues and/or contamination from any backfilled / landfilled materials. Potential to add cost, time, risk to the project	- Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment of temporary and permanent slopes and assessment of infilled materials for contamination. - Topographic survey to determine existing slope gradients and geomorphology - Engineering geological assessment of existing slope / failed slope - Assessment of existing and proposed slope stability to current British and Eurocode standards and CoP documents. -Adoption of conservative parameters in assessment and design. - Contamination assessment of any fill materials. - Consider reroute - Designer to consider application of engineering mitigation for temporary / permanent works - Consider remediation of voids by grouting etc
31	Geomorphological	Potential Dissolution Feature		DTM / Satellite Imagery / Topo / (GS18.1)	Depression or cavity in the ground caused by the dissolution of minerals within the parent rock. Features noted in topographic data and / or DTM within 25m either side of pipeline.	Ground instability can result from movement of loose material contained within these cavities, and / or void migration towards the surface, often triggered by water. Insufficient design, delay, excessive displacement, differential displacement, failure of foundations, slopes and excavation instability. Hole instability if HDD or pile bore penetrates deep filled hollow. Potential to add cost, time, risk to the project	- Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment. - Designer to consider rerouting to avoid unstable geology.
32	Geomorphological	Surface Ground Workings		(GS3.1 to 3.5 & 18.2, 18.3, 18.6, 18.7)	Historical Land uses identified from OS Mapping indicate ground excavation at surface may have occurred. (ponds, cuttings, pits, canals, heaps, mounds, reservoir, refuse heap, water bodies, colliery, brick works etc). Possibly subsequent landfilling (recorded or unrecorded). Any feature identified in the datasets within 25m of pipeline centreline are included.	Insufficient design, delay, excessive displacement, differential displacement, failure of foundations, slopes and excavation instability. Potential injury or exposure of construction workers. Pollution of controlled waters and environment. Potential to add cost, time, risk to the project	- Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment of temporary and permanent slopes and assessment of infilled materials for contamination. - Topographic survey to determine existing slope gradients and geomorphology - Engineering geological assessment of existing slope / failed slope - Assessment of existing and proposed slope stability to current British and Eurocode standards and CoP documents. -Adoption of conservative parameters in assessment and design. - Contamination assessment of any fill materials. - Consider reroute - Designer to consider application of engineering mitigation for temporary / permanent works
33	Geomorphological	British Pits		(GS3.1 to 3.5 & 18.2, 18.3, 18.6, 18.7, 18.8)	Surface mineral workings. Possibly subsequent landfilling (recorded or unrecorded). Any feature identified in the datasets within 25m of pipeline centreline are included.	Insufficient design, delay, excessive displacement, differential displacement, failure of foundations, slopes and excavation instability. Potential injury or exposure of construction workers. Pollution of controlled waters and environment. Potential to add cost, time, risk to the project	- Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment of temporary and permanent slopes and assessment of infilled materials for contamination. - Topographic survey to determine existing slope gradients and geomorphology - Engineering geological assessment of existing slope / failed slope - Assessment of existing and proposed slope stability to current British and Eurocode standards and CoP documents. -Adoption of conservative parameters in assessment and design. - Contamination assessment of any fill materials. - Consider reroute - Designer to consider application of engineering mitigation for temporary / permanent works
34	Geomorphological	Underground workings		(GS18.4, 18.5, 18.7, 18.8, 18.9, 18.10, 18.11, 18.12, 18.13)	Potential for underground mine workings including shafts, unspecified mine workings depths, Tunnels etc, potentially at shallow depth	Insufficient design, delay, excessive displacement, subsidence, differential displacement, failure of foundations, slopes and excavation instability. Old shafts, tunnels, mine workings within depth of proposed alignment, foundations, HDD bores. Potential injury or exposure of construction workers. Pollution of controlled waters and environment. Potential to add cost, time, risk to the project	- Obtain Coal Mining Report from Coal Authority - Designer to complete detailed Coal Mining Risk Assessment for the route alignment. - Obtain necessary permits from Coal Authority to undertake any investigation of construction works that interact with or disturb any coal assets. - Suitable ground investigation in areas with identified potential for shallow workings, to inform design. - Designer to consider engineer mitigation to deal with relict coal mine workings (Shafts etc).
35	Geomorphological	Brine Area		(GS18.10)	Cheshire Brine Compensation District indicates areas that may be affected by salt and brine extraction in Cheshire. The extraction of brine over many years has caused some properties within the Cheshire area to be at risk of subsidence. This subsidence can occur a considerable distance from the location of the extraction and further assessment is recommended.	Insufficient design, delay, excessive displacement, subsidence, differential displacement, failure of foundations, slopes and excavation instability. Potential to add cost, time, risk to the project	- Obtain Cheshire Salt Search report and complete detailed Brine extraction risk assessment for route alignment.
36	Hydrology, Hydrological	Flooding - Risk of Flooding from rivers and the sea		(GS7.1)	Risk of Flooding from Rivers and Sea (RoFRaS)/FloBased on rd Risk Assessment Wales (FRAW) models. The risk categories for RoFRaS for rivers and the sea and FRAW for rivers are: Very low (less than 1 in 1000 chance in any given year), Low (less than 1 in 100 but greater than or equal to 1 in 1000 chance), Medium (less than 1 in 30 but greater than or equal to 1 in 100 chance) or High (greater than or equal to 1 in 30 chance). The risk categories for FRAW for the sea are: Very low (less than 1 in 1000 chance in any given year), Low (less than 1 in 200 but greater than or equal to 1 in 1200 chance), Medium (less than 1 in 30 but greater than or equal to 1 in 200 chance) or High (greater than or equal to 1 in 30 chance)	Insufficient design, delay, excessive displacement, buoyancy, failure, instability of excavations, environmental impacts / pollution, maintenance / repair access issues.	- Flood Risk Assessment to determine flood risk. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; raising ground levels, re-routing, anchoring to prevent buoyancy issues. - Designer to consider appropriate temporary and permanent drainage & flood defences
37	Hydrology, Hydrological	Surface Water Flooding		(GS8.1)	Ambiental Risk Analytics surface water (pluvial) Flood Map identifies areas likely to flood as a result of extreme rainfall events, i.e. land naturally vulnerable to surface water ponding or flooding. This data set was produced by simulating 1 in 10 year, 1 in 100 year, 1 in 250 year and 1 in 1,000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though some older ones may flood in a 1 in 5 year rainfall event.	Insufficient design, delay, excessive displacement, buoyancy, failure, instability of excavations, environmental impacts / pollution, maintenance / repair access issues.	- Flood Risk Assessment to determine flood risk. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; raising ground levels, re-routing, anchoring to prevent buoyancy issues. - Designer to consider appropriate temporary and permanent drainage & flood defences
38							

RSK GEOSCIENCES

Hynet Geohazards Desk Study - Risk Assessment Approach and Rationale

Project Number: 322968

			Before Control/Mitigation						Residual Risk			
Hazard	Dataset used to Identify	Probability Source	Probability Rationale	Probability Score	Impact Score (subjective RSK Assessment)	Risk	Risk Term	Mitigation	Probability Score	Impact Score (subjective RSK Assessment)	Risk	Risk Term
Filled / Made Ground	3.1 to 3.4 + RSK Conjectural Gd Models	RSK	If any known registered current or historic landfill or infilled pits, quarries, surface ground workings, refuse tips / mounds etc are present.	5	5	25	Severe	- Ground investigation to determine exact Geology - Designer to consider conservative soil parameters - Foundations to be taken to competent strata - Excavations to have trench support systems available. - Consider reroute to avoid infilled ground / potentially unstable ground. - Consider application of ground improvement techniques	5	4	12	Moderate
		RSK	If Filled ground shown on BGS mapping + BGS Logs,	4	4	16	Substantial		2	3	6	Minor
		RSK	If BGS or RSK BH records within 25m either side of centreline show MG> 2m, or historic ponds / excavations not registered as infilled but that topographic, DTM and satellite imagery indicate may have been infilled.	3	4	12	Moderate		2	3	6	Minor
Fault	BGS Mapping. (GS15.10)	GS 15.10 / BGS	If BGS Mapping identifies Fault	4	3	12	Moderate	- Designer to consider seismicity and seismic design for sensitive structures in accordance with BS EN 1998-1:2004 Eurocode 8: Design of structures for earthquake resistance.	3	2	6	Minor
Adverse Ground Chemistry / Adverse Groundwater Chemistry	BGS Mapping + RSK Conjectural Gd Models	RSK	High Sulphates/Sulfides: Made Ground, Alluvium, Peat, Tidal Flat Deposits Mercia Mudstone Group (Tarporley Siltstone Fm, Bollin Mudstone Member, Sidmouth Mudstone Fm, Northwich Halite Member)	5	4	20	Severe	- Ground investigation to determine exact geology and groundwater conditions allow for determination of chemical agents for soil and groundwater. - Designer to assess concentrations of chemicals in accordance with BS 8500-1:2006 and BS EN 206:2013 to determine the "Aggressive Chemical Environment for Concrete (ACEC) Classification" is and is Design Sulphate Class. - Designer to include protective coatings to pipelines & buried metal structures, and suitable cover depth of steel reinforcement within concrete structures. - Designer to consider soil resistivity and specify appropriate cathodic protection measures.	4	3	12	Moderate
		RSK	Medium Risk Sulphates/Sulfides: Till - Devensian - Diamicton, Etruria Formation, Pennine Lower, Middle Coal Measures	4	4	16	Substantial		3	3	9	Minor
		RSK	Low: Glaciofluvial Sheet Deposits, River Terrace Deposits, Shirdley Hill Sand Fm, Sherwood Sandstone Formation (Wilslow Sandstone Formation, Chester Formation, Kinston Sandstone Formation, Helsby Sandstone Formation)	2	3	6	Minor		2	2	4	None/Neligible
High Groundwater Table	BGS Mapping, Topo Contours, DTM, Satellite Imagery, (GS 9.1)	RSK	Low lying ground near rivers, streams and Mersey Estuary. Geological Units: Alluvium, Tidal Flat Deposits, Glaciofluvial Sheet Deposits, Peat, River Terrace Deposits, Made Ground, Shirdley Hill Sandstone Formation, Some Bedrock units without overlying superficials. Areas ID'd as at risk of GW flooding	4	4	16	Substantial	- Ground investigation to determine exact geology and groundwater conditions. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; such as dewatering systems, trial excavations, excavation support systems. - Designer to consider appropriate temporary and permanent drainage - Designer to consider conservative groundwater conditions in temporary and permanent design	4	2	8	Minor
Groundwater Flooding	(GS 9.1)	Groundsure	High	5	4	20	Severe	- Ground investigation to determine exact geology and groundwater conditions. - Flood Risk Assessment to determine flood risk. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; raising ground levels, re-routing, anchoring to prevent buoyancy issues. - Designer to consider appropriate temporary and permanent drainage	5	3	15	Substantial
		Groundsure	Mod-High	4	4	16	Substantial		4	3	12	Moderate
		Groundsure	Moderate	3	4	12	Moderate		3	3	9	Minor
		Groundsure	Low	2	4	8	Minor		2	3	6	Minor
		Groundsure	Negligible	1	4	4	None/Neligible		1	3	3	None/Neligible
Potentially Liquifiable Soils	BGS Mapping + RSK Conjectural Gd Models	RSK	Alluvium, Tidal Flat Deposits, Glaciofluvial Sheet Deposits, Shirdley Hill Sand Formation - loose water bearing sands	4	3	12	Moderate	- Ground investigation to determine exact geology and groundwater conditions and determine liquefaction potential. - Designer to consider seismicity and seismic design for sensitive structures in accordance with BS EN 1998-1:2004 Eurocode 8: Design of structures for earthquake resistance. - Consider application of ground improvement techniques	3	2	6	Minor
Collapsible Soils	(GS 17.4)	Groundsure	High	5	4	20	Severe	- Ground investigation to determine exact geology and groundwater conditions and determine potential for presence of collapsible soils. Design to consider engineering mitigation which includes in-situ compaction, removal and replacement, pre-wetting to induce volume reduction prior to construction, chemical stabilization or grouting, transfer of loads to competent strata not susceptible to collapse.	5	2	10	Moderate
		Groundsure	Moderate	4	4	16	Substantial		4	2	8	Minor
		Groundsure	Low	3	4	12	Moderate		3	2	6	Minor
		Groundsure	Very Low	2	4	8	Minor		2	2	4	None/Neligible
		Groundsure	Negligible	1	4	4	None/Neligible		1	2	2	None/Neligible
Highly Compressible & Low Bearing Capacity Ground	(GS 17.3) + Areas of Filled Ground / Made Ground identified in Conjectural Gd Models.	Groundsure + RSK	High	5	4	20	Severe	- Ground investigation to determine exact geology and groundwater conditions. - Design to consider conservative soil parameters. - Foundation loads taken to competent strata. - Designer to consider potential for consolidation settlement, secondary (creep) settlement as a result of applied structural loads or raising ground levels.	5	2	10	Moderate
		Groundsure + RSK	Moderate	4	4	16	Substantial		4	2	8	Minor
		Groundsure + RSK	Low	3	4	12	Moderate		3	2	6	Minor
		Groundsure + RSK	Very Low	2	4	8	Minor		2	2	4	None/Neligible
		Groundsure + RSK	Negligible	1	4	4	None/Neligible		1	2	2	None/Neligible
Swelling/Shrinkage Potential Soils	(GS 17.1) + BGS Mapping+ RSK Conjectural Gd Models	Groundsure + RSK	High	5	3	15	Substantial	- Ground investigation to determine exact geology and groundwater conditions to allow for site-specific assessment of the soils susceptibility to swelling/shrinkage - Design of foundations in accordance with NHBC guidance on building near trees. - Designer to consider engineering mitigation such as voids, void formers, use of compressible materials, construction of foundations below zone of influence of vegetation.	5	2	10	Moderate
		Groundsure + RSK	Moderate	4	3	12	Moderate		4	2	8	Minor
		Groundsure + RSK	Low	3	3	9	Minor		3	2	6	Minor
		Groundsure + RSK	Very Low	2	3	6	Minor		2	2	4	None/Neligible
		Groundsure + RSK	Negligible	1	3	3	None/Neligible		1	2	2	None/Neligible
Running Sands	(GS 17.2) + BGS Mapping + RSK Conjectural Gd Models	Groundsure + RSK	High	5	3	15	Substantial	- Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment of the soils susceptibility to running / blowing sands conditions. - Designer to consider engineering mitigation such as excavation support systems, use of casing for rotary bored piles or CFA piling, use of appropriate drilling fluid type and / or viscosity, redesign HDD profiles to avoid or limit drill time in unstable soils.	5	2	10	Moderate
		Groundsure + RSK	Moderate	4	3	12	Moderate		4	2	8	Minor
		Groundsure + RSK	Low	3	3	9	Minor		3	2	6	Minor
		Groundsure + RSK	Very Low	2	3	6	Minor		2	2	4	None/Neligible
		Groundsure + RSK	Negligible	1	3	3	None/Neligible		1	2	2	None/Neligible
Ground Subject to or at risk of Landslide / Mudflows / Slope Instability	(GS 14.4, 17.5)	Groundsure + RSK	High	5	5	25	Severe	- Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment of temporary and permanent slopes. -Topographic survey to determine existing slope gradients and geomorphology - Assessment of existing and proposed slope stability to current British and Eurocode standards and CoP documents. -Adoption of conservative parameters in assessment and design. - Designer to consider application of engineering mitigation such as regrading existing slopes, slope / cliff stabilisation with soil nails, rock bolts etc. - *Consider reroute or bypass with HDD*	5	2	10	Moderate
		Groundsure + RSK	Moderate	4	5	20	Severe		4	2	8	Minor
		Groundsure + RSK	Low	3	5	15	Substantial		3	2	6	Minor
		Groundsure + RSK	Very Low	2	5	10	Moderate		2	2	4	None/Neligible
		Groundsure + RSK	Negligible	1	5	5	Minor		1	2	2	None/Neligible
Excavatability - Solid Rock Geology Outcrop / Potential for Shallow buried solid rock	BGS Mapping - based on geology. + RSK Conjectural Gd Models	RSK	Solid Rock outcropping of bedrock formations. If Solid rock outcrops in satellite imagery or BGS / RSK BH records show solid geology from GL to 3m BGL	5	3	15	Substantial	- Ground investigation to determine presence of solid rock geology and establish discontinuity index and rock strength. - Assessment of excavatability - Designer to consider rock parameters in assessment of trenching techniques - Consider reroute or bypass with HDD	4	2	8	Minor
		RSK	Areas without superficials and with bed rock from surface, (depending in BGS BH records show regarding weathered upper layers). If BGS / RSK BH records + Conjectural Gd Models show solid geology from GL to 3m BGL	3	3	9	Minor		2	2	4	None/Neligible
Excavation Stability	BGS Mapping - based on geology. + RSK Conjectural Gd Models	RSK	Areas underlain by Superficial soils with potential for loose water bearing granular soils, made ground. Tidal Flat Deposits, Peat, Made Ground, Alluvium, River Terrace Gravels, Glacio-Fluvial Deposits, Shirdley Hill Sand Formation	4	3	12	Moderate	- Ground investigation to determine exact geology and groundwater conditions. - Designer to consider appropriate engineering mitigation to facilitate temporary works; such as dewatering systems, trial excavations, excavation support systems.	4	2	8	Minor
Potential for dissolution of soluble rocks	(GS 17.6)	Groundsure	High	5	3	15	Substantial	- Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment. - Designer to consider rerouting to avoid unstable geology. - Consider mitigation remedial measures such as compaction grouting, void filling foam concrete etc	5	2	10	Moderate
		Groundsure	Moderate	4	3	12	Moderate		4	2	8	Minor
		Groundsure	Low	3	3	9	Minor		3	2	6	Minor
		Groundsure	Very Low	2	3	6	Minor		2	2	4	None/Neligible
		Groundsure	Negligible	1	3	3	None/Neligible		1	2	2	None/Neligible
Recorded Natural Cavity	(GS 18.1)	Groundsure	High Likelihood if one recorded on route	5	5	25	Severe	- Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment. - Designer to consider rerouting to avoid unstable geology. - Consider mitigation remedial measures such as compaction grouting, void filling foam concrete etc	5	3	15	Substantial

GEOMORPHOLOGICAL												
Hazard	Dataset used to Identify	Probability Source	Probability Rationale	Probability Score	Impact Score (subjective RSK Assessment)	Risk	Risk Term	Mitigation	Probability Score	Impact Score (subjective RSK Assessment)	Risk	Risk Term
Landslides / Mudflows / Slope Instability	(GS 14.4, 17.5), DTM, Imagery, Topo	RSK	Evidence of historic or recent slope instability, either recorded within Groundsure dataset, or observed through reference to DTM, satellite imagery.	5	5	25	Severe	- Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment of temporary and permanent slopes. -Topographic survey to determine existing slope gradients and geomorphology - Engineering geological assessment of existing slope / failed slope - Assessment of existing and proposed slope stability to current British and Eurocode standards and CoP documents. -Adoption of conservative parameters in assessment and design. - Consider re-routing or bypass with HDD - Designer to consider application of engineering mitigation such as regrading existing slopes, slope / cliff stabilisation with soil nails, rock bolts etc.	4	3	12	Moderate
Escarpments	DTM / Satellite Imagery / Topo	RSK	Steep slope or cliff the separates two relatively flat level areas - sudden change in elevation	4	3	12	Moderate	- Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment of temporary and permanent slopes. -Topographic survey to determine existing slope gradients and geomorphology - Engineering geological assessment of existing slope / failed slope - Assessment of existing and proposed slope stability to current British and Eurocode standards and CoP documents. -Adoption of conservative parameters in assessment and design. - Designer to consider application of engineering mitigation such as regrading existing slopes, slope / cliff stabilisation with soil nails, rock bolts etc. - Consider re-routing or bypass with HDD	3	3	9	Minor
Terraces	DTM / Satellite Imagery / Topo	RSK	Step like landform	4	3	12	Moderate	- Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment of temporary and permanent slopes. -Topographic survey to determine existing slope gradients and geomorphology - Engineering geological assessment of existing slope / failed slope - Assessment of existing and proposed slope stability to current British and Eurocode standards and CoP documents. -Adoption of conservative parameters in assessment and design. - Designer to consider application of engineering mitigation such as regrading existing slopes, slope / cliff stabilisation with soil nails, rock bolts etc. - Consider re-routing or bypass with HDD	3	3	9	Minor
Break in Slope	DTM / Satellite Imagery / Topo	RSK	Marked change in slope gradient	4	3	12	Moderate	- Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment of temporary and permanent slopes. -Topographic survey to determine existing slope gradients and geomorphology - Engineering geological assessment of existing slope / failed slope - Assessment of existing and proposed slope stability to current British and Eurocode standards and CoP documents. -Adoption of conservative parameters in assessment and design. - Designer to consider application of engineering mitigation such as regrading existing slopes, slope / cliff stabilisation with soil nails, rock bolts etc. - Consider re-routing or bypass with HDD	3	3	9	Minor
Gully / Gully Erosion / Incised channels (Buried Valley)	DTM / Satellite Imagery / Topo	RSK	A small hollow or channel incised into sediments or unconsolidated rock by running water, sudden lateral changes in ground conditions. Or the potential for incised channels based on geology and / or surface water regime.	4	4	16	Substantial	- Ground investigation to determine exact Geology and groundwater conditions and profile presence of buried channels. -Topographic / bathymetric survey to determine depth of channels, depth of loose sediment and geomorphology -Adoption of conservative parameters in assessment and design. - Designer to consider application of engineering mitigation such as redesigning HDD profile to avoid unstable geology, trench / excavation support systems.	3	3	9	Minor
Ridges	DTM / Satellite Imagery / Topo	RSK	A raised area of the land that is generally narrow and long.	4	3	12	Moderate	- Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment of temporary and permanent slopes. -Topographic survey to determine existing slope gradients and geomorphology - Engineering geological assessment of existing slope / failed slope - Assessment of existing and proposed slope stability to current British and Eurocode standards and CoP documents. -Adoption of conservative parameters in assessment and design. - Designer to consider application of engineering mitigation for temporary / permanent works	3	2	6	Minor
Large Hill and / or Steep Terrain	DTM / Satellite Imagery / Topo	RSK	A significant change in elevation over a relatively short lateral distance	4	3	12	Moderate	- Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment of temporary and permanent slopes. -Topographic survey to determine existing slope gradients and geomorphology - Engineering geological assessment of existing slope / failed slope - Assessment of existing and proposed slope stability to current British and Eurocode standards and CoP documents. -Adoption of conservative parameters in assessment and design. - Designer to consider application of engineering mitigation for temporary / permanent works	3	2	6	Minor
Excavations	DTM / Satellite Imagery / Topo, (GS 3.1 to 3.6 & 18.2, 18.3, 18.6, 18.7)	Groundsure + RSK	A hole, opening or cavity formed by the removal of materials. Possibly related to mining and subsequent landfill practices.	5	5	25	Severe	- Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment of temporary and permanent slopes and assessment of infilled materials for contamination. -Topographic survey to determine existing slope gradients and geomorphology - Engineering geological assessment of existing slope / failed slope - Assessment of existing and proposed slope stability to current British and Eurocode standards and CoP documents. -Adoption of conservative parameters in assessment and design. - Contamination assessment of any fill materials. - Consider reroute - Designer to consider application of engineering mitigation for temporary / permanent works - Consider remediation of voids by grouting etc.	4	3	12	Moderate
Potential Dissolution Feature	DTM / Satellite Imagery / Topo / (GS 18.1)	Groundsure + RSK	Depression or cavity in the ground caused by the dissolution of minerals within the parent rock. Features noted in topographic data and / or DTM within 25m either side of pipeline.	3	3	9	Minor	- Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment. - Designer to consider rerouting to avoid unstable geology.	2	3	6	Minor
Surface Ground Workings	(GS 3.1 to 3.6 & 18.2, 18.3, 18.6, 18.7)	Groundsure + RSK	Historical Land uses identified from OS mapping indicate ground excavation at surface may have occurred. (ponds, cuttings, pits, canals, heaps, mounds, reservoir, refuse heap, water bodies, colliery, brick works etc). Possibly subsequent landfilling (recorded or unrecorded).	5	5	25	Severe	- Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment of temporary and permanent slopes and assessment of infilled materials for contamination. -Topographic survey to determine existing slope gradients and geomorphology - Engineering geological assessment of existing slope / failed slope - Assessment of existing and proposed slope stability to current British and Eurocode standards and CoP documents. -Adoption of conservative parameters in assessment and design. - Contamination assessment of any fill materials. - Consider reroute - Designer to consider application of engineering mitigation for temporary / permanent works	4	3	12	Moderate
British Pits	(GS 3.1 to 3.6 & 18.2, 18.3, 18.6, 18.7, 18.10)	Groundsure + RSK	Surface mineral workings. Possibly subsequent landfilling (recorded or unrecorded).	5	5	25	Severe	- Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment of temporary and permanent slopes and assessment of infilled materials for contamination. -Topographic survey to determine existing slope gradients and geomorphology - Engineering geological assessment of existing slope / failed slope - Assessment of existing and proposed slope stability to current British and Eurocode standards and CoP documents. -Adoption of conservative parameters in assessment and design. - Contamination assessment of any fill materials. - Consider reroute - Designer to consider application of engineering mitigation for temporary / permanent works	4	3	12	Moderate
			Potential for underground mine workings including shafts, unspecified mine workings depths, Tunnels etc, potentially at shallow depth CATEGORY - E (Underground mining is known to have occurred within or very close to the area. Potential for difficult ground conditions should be investigated. Potential for localised subsidence is at a level where it should be considered)	4	4	16	Substantial	- Obtain Coal Mining Report from Coal Authority - Designer to complete detailed Coal Mining Risk Assessment for the route alignment. - Obtain necessary permits from Coal Authority to undertake any investigation of construction works that interact with or disturb any coal assets. - Suitable ground investigation in areas with identified potential for shallow workings, to inform design. - Designer to consider engineer mitigation to deal with relict coal mine workings (Shafts etc).	4	3	12	Moderate

Underground workings	(GS 18.4, 18.5, 18.7, 18.8, 18.9, 18.10, 18.11, 18.12, 18.13)	Groundsure	Potential for underground mine workings including shafts, unspecified mine workings depths, Tunnels etc, potentially at shallow depth CATEGORY - C (Small scale underground mining may have occurred; mine adits, shafts and tunnels may be present. Potential for localised difficult ground conditions are at a level where they should be considered)	3	3	9	Minor		3	2	6	Minor
			Potential for underground mine workings including shafts, unspecified mine workings depths, Tunnels etc, potentially at shallow depth CATEGORY - A (Sporadic underground mining of restricted extent may have occurred. Potential for difficult ground conditions are unlikely and localised and are at a level where they need not be considered)	2	2	4	None/Neligible		2	2	4	None/Neligible
Brine Area	(GS18.10)	Groundsure	Cheshire Brine Compensation District indicates areas that may be affected by salt and brine extraction in Cheshire. The extraction of brine over many years has caused some properties within the Cheshire area to be at risk of subsidence. This subsidence can occur a considerable distance from the location of the extraction and further assessment is recommended.	3	3	9	Minor	- Obtain Cheshire Salt Search report and complete detailed Brine extraction risk assessment for route alignment.	3	2	6	Minor
HYDROLOGICAL													
Hazard	Dataset used to Identify	Probability Source	Probability Rationale	Probability Score	Impact Score (subjective RSK Assessment)	Risk	Risk Term	Mitigation	Probability Score	Impact Score (subjective RSK Assessment)	Risk	Risk Term	
Flooding - Risk of Flooding from rivers and the sea	(GS 7.1)	Groundsure	The risk categories for RoFRaS for rivers and the sea and FRAW for rivers are; High (greater than or equal to 1 in 30 chance). The risk categories for FRAW for the sea are; High (greater than or equal to 1 in 30 chance)	4	4	16	Substantial	- Flood Risk Assessment to determine flood risk. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; raising ground levels, re-routing, anchoring to prevent buoyancy issues. - Designer to consider appropriate temporary and permanent drainage & flood defences	4	2	8	Minor	
			The risk categories for RoFRaS for rivers and the sea and FRAW for rivers are; Medium (less than 1 in 30 but greater than or equal to 1 in 100 chance) The risk categories for FRAW for the sea are; Medium (less than 1 in 30 but greater than or equal to 1 in 200 chance)	3	4	12	Moderate		3	2	6	Minor	
			The risk categories for RoFRaS for rivers and Low (less than 1 in 100 but greater than or equal to 1 in 1000 chance), The risk categories for FRAW for the sea are; Low (less than 1 in 200 but greater than or equal to 1 in 1000 chance)	2	4	8	Minor		2	2	4	Nose/Neligible	
			The risk categories for RoFRaS for rivers and the sea and FRAW for rivers are; Very low (less than 1 in 1000 chance in any given year), The risk categories for FRAW for the sea are; Very low (less than 1 in 1000 chance in any given year)	1	4	4	None/Neligible		1	2	2	Nose/Neligible	
Surface Water Flooding	(GS8.1)	Groundsure	1 in 30 year rainfall event	4	4	16	Substantial	- Flood Risk Assessment to determine flood risk. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; raising ground levels, re-routing, anchoring to prevent buoyancy issues. - Designer to consider appropriate temporary and permanent drainage & flood defences	4	2	8	Minor	
			1 in 100 year rainfall event	3	4	12	Moderate		3	2	6	Minor	
			1 in 1000 year rainfall event	2	4	8	Minor		2	2	4	Nose/Neligible	

APPENDIX C
RISK ASSESSMENT TABLE – GEOHAZARDS - MADE GROUND

RSK GEOSCIENCES

Hynet Geohazards Desk Study

Hazard Title: Made Ground

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Fill materials of anthropogenic origin, potentially contaminated material and unpredictable engineering conditions and instability.	Insufficient design, delay, excessive displacement, differential displacement, failure of foundations, slopes and excavation instability. - Potential injury or exposure of construction workers. Pollution of controlled waters and environment.- Potential to add cost, time, risk to the project	Preferred Route Centreline - E	E-KP134+296	E-KP135+300	Unspecified works heap, brick works, brickfield. Potential for made ground.	4	4	16 (Substantial)	Ground investigation to determine exact Geology- Designer to consider conservative soil parameters- Foundations to be taken to competent strata- Excavations to have trench support systems available. - Consider reroute to avoid infilled ground / potentially unstable ground. - Consider application of ground improvement techniques	2	3	6 (Minor)
		Preferred Route Centreline - E	E-KP204+842	E-KP214+662	Fill materials of anthropogenic origin, potentially contaminated material and unpredictable engineering conditions and instability.	5	5	25 (Severe)		3	4	12 (Moderate)
		Preferred Route Centreline - E	E-KP134+448	E-KP134+649	Brick works and brick fields, potential for made ground.	4	4	16 (Substantial)		2	3	6 (Minor)
		Preferred Route Centreline - E	E-KP174+675	E-KP174+697	Historical industrial use cuttings Potential for made ground	5	5	25 (Severe)		3	4	12 (Moderate)
		Preferred Route Centreline - E	E-KP084+571	E-KP084+587	Possibly infilled historical pond.	4	4	16 (Substantial)		2	3	6 (Minor)
		Preferred Route Centreline - E	E-KP084+949	E-KP084+996	Possible infilled ponds.	4	4	16 (Substantial)		2	3	6 (Minor)
		Preferred Route Centreline - E	E-KP094+371	E-KP094+400	Possibly infilled historical pond.	4	4	16 (Substantial)		2	3	6 (Minor)
		Preferred Route Centreline - E	E-KP013+59	E-KP134+608	Fill materials of anthropogenic origin, potentially contaminated material and unpredictable engineering conditions and instability.	4	4	16 (Substantial)		2	3	6 (Minor)
		Preferred Route Centreline - E	E-KP144+378	E-KP144+425	Possibly infilled historic pond.	4	4	16 (Substantial)		2	3	6 (Minor)
		Preferred Route Centreline - E	E-KP204+523	E-KP204+535	Possible infilled ponds.	4	4	16 (Substantial)		2	3	6 (Minor)
		Preferred Route Centreline - E	E-KP134+300	E-KP134+448	Unspecified works heap, brick works, brick field. Potential for made ground.	4	4	16 (Substantial)		2	3	6 (Minor)
		Preferred Route Centreline - E	E-KP134+300	E-KP134+448	Brick works and brick fields, potential for made ground.	4	4	16 (Substantial)		2	3	6 (Minor)
		Preferred Route Centreline - N1	N1-KP104+000	N1-KP104+189	Landfill site, potential for made ground.	3	4	12 (Moderate)		2	3	6 (Minor)
		Preferred Route Centreline - N1	N1-KP104+521	N1-KP114+338	Landfill site, potential for made ground.	3	4	12 (Moderate)		2	3	6 (Minor)
		Preferred Route Centreline - N1	N1-KP094+558	N1-KP094+612	Unspecified heap, potential for fill materials of anthropogenic origin, potentially contaminated material and unpredictable engineering conditions and instability.	5	5	25 (Severe)		3	4	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP134+842	N1-KP134+876	Possible infilled pond	5	5	25 (Severe)		3	4	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP034+392	N2-KP034+836	Colliery and refuse tip, potential for made ground.	5	5	25 (Severe)		3	4	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP054+211	N2-KP064+129	Land refuse tip, waste clearance, potential for made ground.	5	5	25 (Severe)		3	4	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP024+648	N2-KP024+764	Possible infilled former quarry.	5	5	25 (Severe)		3	4	12 (Moderate)
		Preferred Route Centreline - S	S-KP034+885	S-KP044+004	Potential historic recorded landfill.	5	5	25 (Severe)		3	4	12 (Moderate)
		Preferred Route Centreline - S	S-KP134+57	S-KP134+599	Fill materials of anthropogenic origin, potentially contaminated material and unpredictable engineering conditions and instability.	3	4	12 (Moderate)		2	3	6 (Minor)
		Preferred Route Centreline - S	S-KP174+612	S-KP174+655	Cuttings, potential for made ground.	3	4	12 (Moderate)		2	3	6 (Minor)
		Preferred Route Centreline - S	S-KP074+899	S-KP084+279	Gravel pit, potential for made ground.	4	4	16 (Substantial)		2	3	6 (Minor)
		Preferred Route Centreline - S	S-KP034+709	S-KP034+762	Recorded historic landfill. Fill mitterials of anthropogenic origin, potentially contaminated material and unpredictable engineering conditions and instability.	5	5	25 (Severe)		3	4	12 (Moderate)
		Preferred Route Centreline - S	S-KP014+913	S-KP024+151	Disposal site. Potential for made ground.	3	4	12 (Moderate)		2	3	6 (Minor)
		Preferred Route Centreline - S	S-KP014+913	S-KP024+151	Disposal site. Potential for made ground.	3	4	12 (Moderate)		2	3	6 (Minor)
		Preferred Route Centreline - W	W-KP104+596	W-KP010+492	Refuse tip, potential for made ground.	5	5	25 (Severe)		3	4	12 (Moderate)
		Preferred Route Centreline - W	W-KP074+919	W-KP084+053	Disused and active brick field.	5	5	25 (Severe)		3	4	12 (Moderate)
		Preferred Route Centreline - W	W-KP004+925	W-KP004+963	Potentially infilled historic ponds.	3	4	12 (Moderate)		2	3	6 (Minor)
		Preferred Route Centreline - W	W-KP10+105	W-KP10+575	Raised ground seen in DTM consitent with that seen at historic refuse tip to the S/SE	5	5	25 (Severe)		3	4	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP074+153	C-01-KP074+651	Historic Brick works, waste management facility and subsequent development. Potential for made ground.	3	4	12 (Moderate)		2	3	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP064+053	C-01-KP064+270	Brick Works. Potential for made ground.	3	4	12 (Moderate)		2	3	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP064+655	C-01-KP064+930	Unspecified works, potential for made ground.	4	4	16 (Substantial)		2	3	6 (Minor)
		Preferred Spurs Centreline - E-01	E-01-KP004+000	E-01-KP004+454	Fill materials of anthropogenic origin, potentially contaminated material and unpredictable engineering conditions and instability.	5	5	25 (Severe)		3	4	12 (Moderate)
		Preferred Spurs Centreline - E-04	E-04-KP004+000	E-04-KP004+586	Fill materials of anthropogenic origin, potentially contaminated material and unpredictable engineering conditions and instability.	5	5	25 (Severe)		3	4	12 (Moderate)
		Preferred Spurs Centreline - E-05	E-05-KP004+000	E-05-KP004+124	Fill materials of anthropogenic origin, potentially contaminated material and unpredictable engineering conditions and instability.	5	5	25 (Severe)		3	4	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP004+107	N1-02-KP004+274	Unspecified heap, potential for made ground.	4	4	16 (Substantial)		2	3	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP024+077	N1-02-KP024+134	Refuse heap and associated housing. Potential for made ground.	4	4	16 (Substantial)		2	3	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP014+611	N1-02-KP014+672	Disused canal, potential for made ground.	4	4	16 (Substantial)		2	3	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP014+304	N1-02-KP014+467	Disused canal, potential for made ground.	4	4	16 (Substantial)		2	3	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP004+000	N1-02-KP004+025	Unspecified heap, potential for fill materials of anthropogenic origin, potentially contaminated material and unpredictable engineering conditions and instability.	5	5	25 (Severe)		3	4	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP024+310	N1-02-KP024+381	Unspecified heap potential for made ground.	4	4	16 (Substantial)		2	3	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP024+826	N1-02-KP024+894	Refuse tip, potential for made ground.	4	4	16 (Substantial)		2	3	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP034+943	N1-02-KP034+965	Unspecified pit, potential for made ground.	4	4	16 (Substantial)		2	3	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP064+001	N1-02-KP064+052	Unspecified tip, unspecified heap, unspecified factory and refuse tip. Potential for made ground.	4	4	16 (Substantial)		2	3	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP024+549	N1-02-KP024+574	Unspecified heap potential for made ground.	5	5	25 (Severe)		3	4	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP014+118	N1-02-KP014+155	Possible infilled disused canal.	4	4	16 (Substantial)		2	3	6 (Minor)
		Preferred Spurs Centreline - N1-05	N1-05-KP004+137	N1-05-KP004+253	Unspecified heap, potential for made ground.	4	4	16 (Substantial)		2	3	6 (Minor)
		Preferred Spurs Centreline - N1-05	N1-05-KP004+001	N1-05-KP004+062	Unspecified heap, potential for fill materials of anthropogenic origin, potentially contaminated material and unpredictable engineering conditions and instability.	5	5	25 (Severe)		3	4	12 (Moderate)
		Preferred Spurs Centreline - N1-05	N1-05-KP004+272	N1-05-KP004+436	Railway embankment. Fill materials of anthropogenic origin, potentially contaminated material and unpredictable engineering conditions and instability.	5	5	25 (Severe)		3	4	12 (Moderate)
		Preferred Spurs Centreline - N1-05	N1-05-KP004+253	N1-05-KP004+272	Unspecified heap, potential for made ground.	4	4	16 (Substantial)		2	3	6 (Minor)
		Preferred Spurs Centreline - N1-05	N1-05-KP004+253	N1-05-KP004+272	Railway embankment. Fill materials of anthropogenic origin, potentially contaminated material and unpredictable engineering conditions and instability.	5	5	25 (Severe)		3	4	12 (Moderate)
		Preferred Spurs Centreline - N2-04	N2-04-KP014+917	N2-04-KP024+035	Area of raised ground possibly indicative of former cut/fill earthworks.	4	4	16 (Substantial)		2	3	6 (Minor)
		Preferred Spurs Centreline - N2-06	N2-KP064+129	N2-06-KP014+199	Land refuse tip, waste clearance, potential for made ground.	5	5	25 (Severe)		3	4	12 (Moderate)
		Preferred Spurs Centreline - N2-07	N2-KP064+129	N2-07-KP004+157	Land refuse tip, waste clearance, potential for made ground	5	5	25 (Severe)		3	4	12 (Moderate)
		Preferred Spurs Centreline - W-01	W-01-KP004+120	W-01-KP004+444	Refuse tip/heap, potential for made ground.	5	5	25 (Severe)		3	4	12 (Moderate)
		Preferred Spurs Centreline - W-01	W-01-KP004+000	W-01-KP004+086	Raised ground seen in DTM consistent with that seen at historic refuse tip to the S/SE.	5	5	25 (Severe)		3	4	12 (Moderate)
		Preferred Spurs Centreline - W-01	W-01-KP004+552	W-01-KP004+928	Historic landfill immediately to south and potentially extending onto pipeline.	5	5	25 (Severe)		3	4	12 (Moderate)

RSK GEOSCIENCES

Hynet Geohazards Desk Study

Hazard Title: Made Ground

Project Number: 322960

Hazard Description	Impact Description	Nearest Project Infrastructure	Closest KP	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Fill materials of anthropogenic origin, potentially contaminated material and unpredictable engineering conditions and instability.	Insufficient design, delay, excessive displacement, differential displacement, failure of foundations, slopes and excavation instability. - Potential injury or exposure of construction workers. Pollution of controlled waters and environment. - Potential to add cost, time, risk to the project	Block Valve - NULL	S-8269m	Gravel pit, potential for made ground.	4	4	16 (Substantial)	Ground Investigation to determine exact Geology- Designer to consider conservative soil parameters- Foundations to be taken to competent strata- Excavations to have trench support systems available. - Consider reroute to avoid infilled ground / potentially unstable ground. - Consider application of ground improvement techniques	2	3	6 (Minor)
		HAGI - Higher Walton HAGI	N1-9559m	Unspecified heap, potential for fill materials.	5	5	25 (Severe)		3	4	12 (Moderate)
		HAGI - Partington HAGI	E-21602m	Fill materials of anthropogenic origin, potentially contaminated material and unpredictable engineering conditions and instability.	5	5	25 (Severe)		3	4	12 (Moderate)
		HAGI - Rocksavage HAGI	W-10364m	Raised ground seen in DTM consistent with that seen at historic refuse tip to the S/SE.	5	5	25 (Severe)		3	4	12 (Moderate)
		Trenchless Crossing - A6144 Manchester Road	E-01-351m	Fill materials of anthropogenic origin, potentially contaminated material and unpredictable engineering conditions and instability.	5	5	25 (Severe)		3	4	12 (Moderate)
		Trenchless Crossing - Eastford Road and Canal	N1-02-1612m	Fill materials of anthropogenic origin, potentially contaminated material and unpredictable engineering conditions and instability. Disused canal, potential for made ground.	4	4	16 (Substantial)		2	3	6 (Minor)
		Trenchless Crossing - M6 Motorway	E-9391m	Possibly infilled historical pond.	4	4	16 (Substantial)		2	3	6 (Minor)
		Trenchless Crossing - Middlewich Branch Line Railway	S-17621m	Cuttings, potential for made ground.	3	4	12 (Moderate)		2	3	6 (Minor)
		Trenchless Crossing - United Utilities Water	W-10597m	Refuse tip, potential for made ground.	5	5	25 (Severe)		3	4	12 (Moderate)
		Trenchless Crossing - United Utilities Water	W-10554m	Raised ground seen in DTM consistent with that seen at historic refuse tip to the S/SE.	5	5	25 (Severe)		3	4	12 (Moderate)
		Trenchless Crossing - Weaver Navigation Canal	W-01-121m	Refuse tip/heap, potential for made ground.	5	5	25 (Severe)		3	4	12 (Moderate)
		Trenchless Crossing - Weaver Navigation Canal	W-01-95m	Raised ground seen in DTM consistent with that seen at historic refuse tip to the S/SE.	5	5	25 (Severe)		3	4	12 (Moderate)
		Trenchless Crossing - Weaver Navigation Canal	S-2119m	Disposal site. Potential for made ground.	3	4	12 (Moderate)		2	3	6 (Minor)
		Trenchless Crossing - Weaver Navigation Canal	S-2119m	Disposal site. Potential for made ground.	3	4	12 (Moderate)		2	3	6 (Minor)
		Trenchless Crossing - West Coast Mainline Railway	N1-05-229m	Unspecified heap, potential for made ground	4	4	16 (Substantial)		2	3	6 (Minor)
		Trenchless Crossing - West Coast Mainline Railway	N1-05-273m	Railway embankment. Fill materials of anthropogenic origin, potentially contaminated material and unpredictable engineering conditions and instability.	5	5	25 (Severe)		3	4	12 (Moderate)
		Trenchless Crossing - West Coast Mainline Railway	N1-05-254m	Unspecified heap, potential for made ground	4	4	16 (Substantial)		2	3	6 (Minor)
		Trenchless Crossing - West Coast Mainline Railway	N1-05-254m	Railway embankment. Fill materials of anthropogenic origin, potentially contaminated material and unpredictable engineering conditions and instability.	5	5	25 (Severe)		3	4	12 (Moderate)

APPENDIX C
RISK ASSESSMENT TABLE – GEOHAZARDS - FAULT

Hynet Geohazards Desk Study

Hazard Title: Fault (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Planar fracture or discontinuity in rock mass with visible displacement. Either observed or inferred from BGS data / mapping.	Reactivation of faults could lead to displacement across fault and movements at ground surface.	Preferred Spurs Centreline - N2-06	N2-06-KP01+086	N2-06-KP01+056	Coal seam, observed	4	3	12 (Moderate)	Designer to consider seismicity and seismic design for sensitive structures in accordance with BS EN 1998-1:2004 Eurocode 8: Design of structures for earthquake resistance.	3	2	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+646	N1-02-KP01+389	Fault, observed	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP03+849	N2-KP04+185	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP01+688	W-KP01+977	Fault, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP01+056	N2-06-KP01+086	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP02+611	N2-KP04+146	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP05+730	N2-KP05+579	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP03+640	N2-KP05+503	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP05+051	W-KP03+953	Fault, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP18+904	N1-KP18+262	Fault, observed	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-04	N2-04-KP01+691	N2-04-KP01+901	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP11+575	N1-KP11+575	Fault, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP01+543	N2-KP03+301	Fault, observed	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+157	N2-07-KP00+157	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP04+141	N2-KP05+470	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP03+350	N2-KP05+427	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP01+056	N2-06-KP01+056	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+091	N2-06-KP01+086	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP18+265	N2-04-KP02+035	Fault, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+680	N1-02-KP01+646	Fault, observed	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP17+718	N1-KP17+957	Fault, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP03+593	N2-KP05+427	Fault, inferred, displacement unknown	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP04+435	W-KP03+953	Fault, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+157	N2-KP05+531	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-04	N2-04-KP02+035	N2-04-KP00+209	Fault, observed	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP04+526	N2-KP05+521	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+254	N2-06-KP00+196	Coal seam, observed	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N1-KP18+904	N2-KP01+543	Fault, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP00+700	N1-KP03+455	Fault, observed	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP05+572	N2-KP04+611	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP02+574	N2-KP04+161	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP05+657	N2-KP05+842	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP02+599	N2-KP04+151	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP15+606	S-KP15+605	Fault, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP05+820	N2-KP05+888	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP05+427	N2-KP05+427	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP17+843	W-KP16+803	Fault, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP18+396	N1-KP17+386	Fault, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP04+611	N2-KP04+445	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+157	N2-07-KP00+157	Coal seam, observed	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP17+826	S-KP17+205	Fault, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-04	N2-KP01+846	N2-04-KP02+035	Fault, observed	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP03+591	N2-KP04+143	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+091	N2-KP05+797	Coal seam, observed	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP17+957	N1-KP18+904	Fault, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-03-KP01+948	W-KP09+206	Fault, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+157	N2-KP05+648	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP05+427	N2-KP05+495	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-07	N2-KP05+730	N2-07-KP00+157	Coal seam, observed	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP015+58	E-KP15+308	Fault, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP05+760	N2-KP05+686	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP18+262	N1-KP17+386	Fault, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP01+601	N2-KP01+553	Marine band	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-03-KP01+921	W-KP08+969	Fault, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP00+000	W-KP00+000	Fault, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+157	N2-06-KP01+056	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP05+465	N2-KP04+135	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP15+802	N1-KP14+174	Fault, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-07	N2-KP06+033	N2-06-KP01+086	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-07	N2-KP05+495	N2-07-KP00+157	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP16+065	N1-KP18+297	Fault, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-04-KP01+691	N2-KP00+895	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-04	N2-04-KP02+035	N2-04-KP02+035	Fault, observed	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP03+583	N2-KP03+659	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP04+469	N2-KP05+427	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+196	N2-06-KP01+086	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP13+159	W-KP13+113	Fault, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP15+994	S-KP15+557	Fault, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP05+427	N2-KP05+427	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP03+573	N2-KP05+502	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+646	N1-KP08+347	Fault, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP05+427	N2-KP05+451	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+157	N2-07-KP00+157	Coal seam, observed	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-06-KP00+254	N2-KP05+305	Coal seam, observed	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-07	N2-KP05+436	N2-07-KP00+157	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP05+427	N2-KP05+427	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP01+086	N2-06-KP01+086	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP17+375	S-KP15+994	Fault, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP18+297	N1-KP17+386	Fault, inferred	4	3	12 (Moderate)		3	2	6 (Minor)

Hynet Geohazards Desk Study

Hazard Title: Fault (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Planar fracture or discontinuity in rock mass with visible displacement. Either observed or inferred from BGS data / mapping.		Preferred Spurs Centreline - N2-07	N2-KP05+470	N2-07-KP00+157	Coal seam, inferred	4	3	12 (Moderate)	Designer to consider seismicity and seismic design for sensitive structures in accordance with BS EN 1998-1:2004 Eurocode 8: Design of structures for earthquake resistance.	3	2	6 (Minor)
		Preferred Route Centreline - N1	N2-04-KP02+035	N1-KP18+297	Fault, observed	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP18+125	E-KP18+508	Fault, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP05+427	N2-KP05+470	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP05+436	N2-KP05+427	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP15+606	S-KP15+606	Fault, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+157	N2-07-KP00+157	Coal seam, observed	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP07+458	N1-KP08+347	Fault, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+157	N2-07-KP00+157	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP16+211	E-KP16+297	Fault, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP17+495	N1-KP18+297	Fault, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP01+199	N2-06-KP00+614	Marine band	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP08+490	W-KP08+187	Fault, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP01+304	W-KP01+688	Fault, inferred, displacement unknown	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP05+428	N2-KP05+427	Marine band	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP17+399	N1-KP16+736	Fault, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP11+575	N1-KP14+989	Fault, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP05+435	N2-KP05+648	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP07+462	C-01-KP07+486	Fault, inferred, displacement unknown	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP05+797	N2-KP05+760	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP017+33	N1-KP18+262	Fault, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-07	N2-KP05+686	N2-06-KP01+056	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP03+576	N2-KP04+196	Fault, observed	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+196	N2-06-KP01+086	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP05+427	N2-KP05+427	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP00+000	W-KP00+370	Fault, inferred, displacement unknown	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-06-KP00+379	N2-KP04+181	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-07	N2-KP05+522	N2-07-KP00+157	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+157	N2-07-KP00+157	Coal seam, observed	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP14+174	N1-KP15+044	Fault, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+157	N2-KP05+599	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP05+427	N2-KP03+372	Marine band	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP17+386	N1-KP15+887	Fault, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP08+121	N1-KP08+122	Fault, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP05+427	N2-KP05+522	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+157	N2-06-KP01+086	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP05+786	N2-KP05+763	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP04+331	N2-KP03+590	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP13+087	S-KP13+394	Fault, inferred, displacement unknown	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP03+593	N2-KP02+671	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP18+297	N2-04-KP02+035	Fault, observed	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP01+086	N2-06-KP01+086	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-07-KP00+157	N2-KP05+427	Fault, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP05+888	N2-KP05+991	Coal seam, observed	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N2-04-KP00+209	N1-KP18+706	Fault, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP02+587	N2-KP04+155	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP08+347	N1-KP05+989	Fault, observed	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-07	N2-KP05+685	N2-07-KP00+157	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+157	N2-KP05+599	Marine band	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP05+886	N2-KP05+786	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP13+917	S-KP15+013	Fault, inferred, displacement unknown	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP18+618	N2-04-KP02+035	Fault, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP01+056	N2-06-KP00+379	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP04+149	N2-KP05+644	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP03+585	N2-KP04+269	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - F	E-KP16+345	E-KP18+125	Fault, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+389	N1-02-KP01+261	Fault, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+196	N2-06-KP01+056	Coal seam, observed	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP16+297	E-KP16+345	Fault, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N2-04-KP02+035	N1-KP18+396	Fault, observed	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP01+086	N2-06-KP01+130	Fault, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP05+553	N2-KP05+427	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP13+132	N1-KP14+174	Fault, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP06+033	N2-KP05+886	Coal seam, observed	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+196	N2-06-KP01+038	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP02+480	N2-KP01+679	Marine band	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP07+891	N1-KP08+121	Fault, observed	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP05+448	N2-KP05+685	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+196	N2-06-KP01+086	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP05+563	N2-KP05+427	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP01+086	N2-06-KP01+086	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N1-KP19+023	N2-KP03+301	Fault, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP15+806	E-KP16+211	Fault, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP05+121	N2-KP04+995	Fault, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP04+408	N2-KP05+427	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP05+820	N2-KP05+770	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP05+531	N2-KP05+427	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP04+504	N2-KP03+410	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)

Hynet Geohazards Desk Study

Hazard Title: Fault (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Planar fracture or discontinuity in rock mass with visible displacement. Either observed or inferred from BGS data / mapping.	Reactivation of faults could lead to displacement across fault and movements at ground surface.	Preferred Route Centreline - N2	N2-KP03+409	N2-KP03+180	Coal seam, inferred	4	3	12 (Moderate)	Designer to consider seismicity and seismic design for sensitive structures in accordance with BS EN 1998-1:2004 Eurocode 8: Design of structures for earthquake resistance.	3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-04-KP02+035	N2-KP02+480	Fault, observed	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP02+512	N2-KP02+621	Fault, observed	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP10+534	S-KP08+403	Fault, inferred, displacement unknown	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP04+025	S-KP03+592	Fault, inferred, displacement unknown	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP05+427	N2-KP03+409	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP03+327	N2-KP03+301	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+614	N2-KP03+959	Marine band	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-06	N2-04-KP01+901	N2-04-KP01+901	Marine band	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP03+301	N2-KP03+372	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP03+409	N2-KP05+427	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP03+852	E-KP04+222	Fault, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - E	C-01-KP05+501	C-01-KP07+462	Fault, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP02+987	N2-KP03+410	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP03+410	N2-KP04+437	Coal seam, inferred	4	3	12 (Moderate)		3	2	6 (Minor)

APPENDIX C
RISK ASSESSMENT TABLE – GEOHAZARDS - ADVERSE GROUND CHEMISTRY

RSK GEOSCIENCES

Hynet Geohazards Desk Study

Hazard Title: Adverse Ground Chemistry

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Potential for high concentrations of Sulphates, Chloride, WS04 and aggressive chemical environment	Insufficient design, long-term excessive displacement and corrosion and potential failure of both concrete and metal permanent works. - Potential to add cost & risk to the project	Preferred Route Centreline - W	W-KP16+864	W-KP17+143	Adverse Ground Chemistry - High	5	4	20 (Severe)	Ground investigation to determine exact geology and groundwater conditions allow for determination of chemical agents for soil and groundwater. - Designer to assess concentrations of chemicals in accordance with BS 8500-1:2006 and BS EN 206:2013 to determine the "Aggressive Chemical Environment for Concrete (ACEC) Classification" is and a Design Sulphate Class. - Designer to include protective coatings to pipelines & buried metal structures, and suitable cover depth of steel reinforcement within concrete structures. - Designer to consider soil resistivity and specify appropriate cathodic protection measures.	4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP09+573	W-KP02+292	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP00+963	W-KP00+925	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP09+541	E-KP04+158	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP13+296	E-KP13+608	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP16+882	E-KP15+295	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP14+722	E-KP013+77	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP18+698	E-KP18+128	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP19+991	E-KP18+698	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP17+315	E-KP17+107	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP04+158	E-KP00+000	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP20+842	E-KP20+728	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP20+177	E-KP20+125	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP21+662	E-KP21+058	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP17+697	E-KP17+675	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP20+535	E-KP20+523	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP18+444	S-KP17+655	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP013+57	S-KP13+599	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP17+612	S-KP16+173	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP03+709	S-KP11+333	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP01+913	S-KP02+800	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP07+865	N1-KP07+517	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP07+512	N1-KP00+000	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP12+526	N1-KP09+305	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP14+502	N1-KP14+494	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP11+338	N1-KP10+521	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP13+876	N1-KP13+842	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP03+836	N2-KP03+392	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP06+129	N2-KP05+211	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP02+764	N2-KP02+648	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP06+053	C-01-KP06+997	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP07+966	C-01-KP07+651	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP05+773	C-01-KP00+000	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - W-03	W-03-KP01+315	W-03-KP00+404	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - W-03	W-03-KP01+948	W-03-KP01+315	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - W-03	W-03-KP00+404	W-03-KP00+000	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP06+110	N1-02-KP00+023	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+965	N1-02-KP03+943	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - E-01	E-01-KP00+438	E-01-KP00+000	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-04	N2-04-KP02+035	N2-04-KP01+917	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+677	N1-05-KP00+000	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP01+199	N2-06-KP00+504	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - E-04	E-04-KP00+531	E-04-KP00+522	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - E-04	E-04-KP00+261	E-04-KP00+000	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+157	N2-KP06+129	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - W-01	W-01-KP01+465	W-01-KP00+458	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - W-02	W-02-KP00+171	W-02-KP00+000	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - E-05	E-05-KP00+124	E-05-KP00+000	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP10+105	W-KP09+573	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP10+105	W-KP09+573	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP10+596	W-KP010+92	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP10+596	W-KP010+92	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP17+143	W-KP17+318	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP17+143	W-KP17+318	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP08+053	W-KP07+919	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP08+053	W-KP07+919	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP07+222	E-KP06+052	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP07+222	E-KP06+052	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP09+728	E-KP09+541	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP09+728	E-KP09+541	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP08+587	E-KP08+571	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP08+587	E-KP08+571	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP08+996	E-KP08+949	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP08+996	E-KP08+949	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP09+400	E-KP09+371	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP09+400	E-KP09+371	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP10+524	E-KP09+728	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP10+524	E-KP09+728	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)

Hynet Geohazards Desk Study

Hazard Title: Adverse Ground Chemistry

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Potential for high concentrations of Sulphates, Chloride, WS04 and aggressive chemical environment	Insufficient design, long-term excessive displacement and corrosion and potential failure of both concrete and metal permanent works. - Potential to add cost & risk to the project	Preferred Route Centreline - E	E-KP13+300	E-KP13+296	Adverse Ground Chemistry - High	5	4	20 (Severe)	Ground investigation to determine exact geology and groundwater conditions allow for determination of chemical agents for soil and groundwater. - Designer to assess concentrations of chemicals in accordance with BS 8500-1:2006 and BS EN 206:2013 to determine the "Aggressive Chemical Environment for Concrete (ACEC) Classification" is and a Design Sulphate Class. - Designer to include protective coatings to pipelines & buried metal structures, and suitable cover depth of steel reinforcement within concrete structures. - Designer to consider soil resistivity and specify appropriate cathodic protection measures.	4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP13+300	E-KP13+296	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP13+449	E-KP13+448	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP13+449	E-KP13+448	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP13+608	E-KP013+59	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP13+608	E-KP013+59	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP16+991	E-KP16+882	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP16+991	E-KP16+882	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP14+425	E-KP14+378	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP14+425	E-KP14+378	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP19+961	E-KP19+897	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP19+961	E-KP19+897	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP17+107	E-KP16+991	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP17+107	E-KP16+991	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP00+864	E-KP00+784	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP00+864	E-KP00+784	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP21+500	E-KP21+123	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP21+500	E-KP21+123	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP21+058	E-KP20+842	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP21+058	E-KP20+842	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP17+655	S-KP017+65	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP17+655	S-KP017+65	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP15+366	S-KP15+309	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP15+366	S-KP15+309	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP16+125	S-KP16+081	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP16+125	S-KP16+081	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP13+599	S-KP013+57	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP13+599	S-KP013+57	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP16+377	S-KP16+222	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP16+377	S-KP16+222	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP17+532	S-KP17+489	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP17+532	S-KP17+489	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP017+65	S-KP17+612	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP017+65	S-KP17+612	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP08+940	S-KP08+786	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP08+940	S-KP08+786	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP04+649	S-KP04+608	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP04+649	S-KP04+608	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP11+103	S-KP11+234	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP11+103	S-KP11+234	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP04+004	S-KP03+885	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP04+004	S-KP03+885	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP08+279	S-KP07+899	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP08+279	S-KP07+899	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP03+762	S-KP03+709	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP03+762	S-KP03+709	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP02+800	S-KP02+151	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP02+800	S-KP02+151	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP10+189	N1-KP10+000	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP10+189	N1-KP10+000	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP09+612	N1-KP09+558	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP09+612	N1-KP09+558	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP06+997	C-01-KP06+930	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP06+997	C-01-KP06+930	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP07+215	C-01-KP07+153	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP07+215	C-01-KP07+153	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP06+270	C-01-KP06+053	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP06+270	C-01-KP06+053	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP06+837	C-01-KP06+655	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP06+837	C-01-KP06+655	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP07+467	C-01-KP07+215	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP07+467	C-01-KP07+215	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP07+651	C-01-KP07+467	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP07+651	C-01-KP07+467	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+274	N1-02-KP00+107	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+274	N1-02-KP00+107	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+134	N1-02-KP02+077	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+134	N1-02-KP02+077	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+672	N1-02-KP01+611	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+672	N1-02-KP01+611	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+467	N1-02-KP01+304	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+467	N1-02-KP01+304	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+023	N1-02-KP00+000	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)

RSK GEOSCIENCES

Hynet Geohazards Desk Study

Hazard Title: Adverse Ground Chemistry

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Potential for high concentrations of Sulphates, Chloride, WS04 and aggressive chemical environment	Insufficient design, long-term excessive displacement and corrosion and potential failure of both concrete and metal permanent works. - Potential to add cost & risk to the project	Preferred Spurs Centreline - N1-02	N1-02-KP00+023	N1-02-KP00+000	Adverse Ground Chemistry - High	5	4	20 (Severe)	Ground investigation to determine exact geology and groundwater conditions allow for determination of chemical agents for soil and groundwater. - Designer to assess concentrations of chemicals in accordance with BS 8500-1:2006 and BS EN 206:2013 to determine the "Aggressive Chemical Environment for Concrete (ACEC) Classification" is and a Design Sulphate Class. - Designer to include protective coatings to pipelines & buried metal structures, and suitable cover depth of steel reinforcement within concrete structures. - Designer to consider soil resistivity and specify appropriate cathodic protection measures.	4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+381	N1-02-KP02+310	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+381	N1-02-KP02+310	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+894	N1-02-KP02+826	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+894	N1-02-KP02+826	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP06+052	N1-02-KP06+001	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP06+052	N1-02-KP06+001	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+574	N1-02-KP02+549	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+574	N1-02-KP02+549	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+155	N1-02-KP01+118	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+155	N1-02-KP01+118	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - E-01	E-01-KP00+430	E-01-KP00+438	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - E-01	E-01-KP00+430	E-01-KP00+438	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+253	N1-05-KP00+137	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+253	N1-05-KP00+137	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+062	N1-05-KP00+001	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+062	N1-05-KP00+001	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+436	N1-05-KP00+272	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+436	N1-05-KP00+272	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+504	N2-06-KP00+445	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+504	N2-06-KP00+445	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+962	N2-06-KP00+774	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+962	N2-06-KP00+774	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - E-04	E-04-KP00+588	E-04-KP00+261	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - E-04	E-04-KP00+588	E-04-KP00+261	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - W-01	W-01-KP01+201	W-01-KP00+086	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - W-01	W-01-KP01+201	W-01-KP00+086	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - W-01	W-01-KP00+928	W-01-KP00+552	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - W-01	W-01-KP00+928	W-01-KP00+552	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP10+156	W-KP10+105	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP10+156	W-KP10+105	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP10+156	W-KP10+105	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP010+92	W-KP10+596	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP010+92	W-KP10+596	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP010+92	W-KP10+596	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP10+575	W-KP10+156	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP10+575	W-KP10+156	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP10+575	W-KP10+156	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP13+448	E-KP13+300	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP13+448	E-KP13+300	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP13+448	E-KP13+300	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP01+977	S-KP01+913	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP01+977	S-KP01+913	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP01+977	S-KP01+913	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP06+930	C-01-KP06+837	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP06+930	C-01-KP06+837	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP06+930	C-01-KP06+837	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+272	N1-05-KP00+253	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+272	N1-05-KP00+253	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+272	N1-05-KP00+253	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - W-01	W-01-KP00+444	W-01-KP00+120	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - W-01	W-01-KP00+444	W-01-KP00+120	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - W-01	W-01-KP00+444	W-01-KP00+120	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - W-01	W-01-KP00+086	W-01-KP00+000	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - W-01	W-01-KP00+086	W-01-KP00+000	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - W-01	W-01-KP00+086	W-01-KP00+000	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP02+151	S-KP01+977	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP02+151	S-KP01+977	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP02+151	S-KP01+977	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP02+151	S-KP01+977	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP01+748	W-KP00	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP02+292	W-KP01+500	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP15+366	W-KP15+000	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - E	E-KP11+249	E-KP10+500	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - E	E-KP09+541	E-KP01+500	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - E	E-KP15+123	E-KP13+000	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - S	S-KP06+998	S-KP07+500	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - S	S-KP11+407	S-KP15+500	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - S	S-KP18+444	S-KP16+500	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - S	S-KP04+608	S-KP10+000	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - S	S-KP03+662	S-KP03+500	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - S	S-KP00+978	S-KP01+000	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - N1	N1-KP07+930	N1-KP01+500	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)

Hynet Geohazards Desk Study

Hazard Title: Adverse Ground Chemistry

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Potential for high concentrations of Sulphates, Chloride, WS04 and aggressive chemical environment	Insufficient design, long-term excessive displacement and corrosion and potential failure of both concrete and metal permanent works. - Potential to add cost & risk to the project	Preferred Route Centreline - N1	N1-KP19+023	N1-KP13+500	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)	Ground investigation to determine exact geology and groundwater conditions allow for determination of chemical agents for soil and groundwater. - Designer to assess concentrations of chemicals in accordance with BS 8500-1:2006 and BS EN 206:2013 to determine the "Aggressive Chemical Environment for Concrete (ACEC) Classification" is and a Design Sulphate Class. - Designer to include protective coatings to pipelines & buried metal structures, and suitable cover depth of steel reinforcement within concrete structures. - Designer to consider soil resistivity and specify appropriate cathodic protection measures.	3	3	9 (Minor)
		Preferred Route Centreline - N2	N2-KP05+841	N2-KP05+000	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - N2	N2-KP05+948	N2-KP06+000	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - N2	N2-KP03+609	N2-KP00	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP07+487	C-01-KP07+000	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP07+059	C-01-KP07+000	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP03+757	C-01-KP05+500	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Spurs Centreline - W-03	W-03-KP01+948	W-03-KP01+500	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Spurs Centreline - N2-04	N2-04-KP00+017	N2-04-KP00	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+504	N2-06-KP0+500	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+962	N2-06-KP0+500	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+464	W-01-KP01+000	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Spurs Centreline - W-02	W-02-KP00+112	W-02-KP00	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - N2	N2-KP01+466	N2-04-KP01+000	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - N2	N2-KP01+466	N2-04-KP01+000	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - N2	N2-KP01+557	N2-KP01+500	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - N2	N2-KP01+557	N2-KP01+500	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - N2	N2-KP01+205	N2-KP01+000	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - N2	N2-KP01+205	N2-KP01+000	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - N2	N2-KP01+604	N2-KP01+500	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - N2	N2-KP01+604	N2-KP01+500	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - N2	N2-KP00+941	N2-KP01+000	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - N2	N2-KP00+941	N2-KP01+000	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - N2	N2-KP00+827	N2-KP0+500	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - N2	N2-KP00+827	N2-KP0+500	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - N2	N2-KP00+710	N2-KP00	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - N2	N2-KP00+710	N2-KP00	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - N2	N2-KP03+861	N2-KP04+000	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - N2	N2-KP03+861	N2-KP04+000	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - N2	N2-KP03+814	N2-KP03+500	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - N2	N2-KP03+814	N2-KP03+500	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - N2	N2-KP03+589	N2-KP03+500	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - N2	N2-KP03+589	N2-KP03+500	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - N2	N2-KP03+566	N2-KP03+500	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - N2	N2-KP03+566	N2-KP03+500	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - N2	N2-KP03+504	N2-KP03+500	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - N2	N2-KP03+504	N2-KP03+500	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - N2	N2-KP05+848	N2-KP04+000	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - N2	N2-KP05+848	N2-KP04+000	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - N2	N2-KP06+129	N2-KP06+000	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - N2	N2-KP06+129	N2-KP06+000	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Spurs Centreline - N2-04	N2-04-KP01+301	N2-KP01+000	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Spurs Centreline - N2-04	N2-04-KP01+301	N2-KP01+000	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Spurs Centreline - N2-04	N2-04-KP01+458	N2-KP01+000	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Spurs Centreline - N2-04	N2-04-KP01+458	N2-KP01+000	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Spurs Centreline - N2-04	N2-04-KP01+685	N2-KP0+500	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Spurs Centreline - N2-04	N2-04-KP01+685	N2-KP0+500	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Spurs Centreline - N2-04	N2-04-KP00+713	N2-04-KP00	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Spurs Centreline - N2-04	N2-04-KP00+713	N2-04-KP00	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Spurs Centreline - N2-04	N2-04-KP02+035	N2-04-KP01+500	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Spurs Centreline - N2-04	N2-04-KP02+035	N2-04-KP01+500	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+445	N2-06-KP0+500	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+445	N2-06-KP0+500	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP01+199	N2-06-KP0+500	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP01+199	N2-06-KP0+500	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+436	N2-07-KP00	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+436	N2-07-KP00	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+157	N2-07-KP00	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+157	N2-07-KP00	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP01+748	W-KP01+500	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP01+669	W-KP00	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP04+909	W-KP03+500	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP09+573	W-KP09+000	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP08+371	W-KP05+000	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP09+181	W-KP08+500	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP03+551	W-KP01+500	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP06+608	W-KP06+500	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP08+439	W-KP08+500	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP17+318	W-KP17+000	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP15+123	E-KP14+500	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP21+058	E-KP20+000	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP21+500	E-KP21+000	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP16+882	E-KP16+500	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)

Hynet Geohazards Desk Study

Hazard Title: Adverse Ground Chemistry

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Potential for high concentrations of Sulphates, Chloride, WS04 and aggressive chemical environment	Insufficient design, long-term excessive displacement and corrosion and potential failure of both concrete and metal permanent works. - Potential to add cost & risk to the project	Preferred Route Centreline - E	E-KP015+96	E-KP15+500	Adverse Ground Chemistry - Low	2	3	6 (Minor)	Ground investigation to determine exact geology and groundwater conditions allow for determination of chemical agents for soil and groundwater. - Designer to assess concentrations of chemicals in accordance with BS 8500-1:2006 and BS EN 206:2013 to determine the "Aggressive Chemical Environment for Concrete (ACEC) Classification" is and a Design Sulphate Class. - Designer to include protective coatings to pipelines & buried metal structures, and suitable cover depth of steel reinforcement within concrete structures. - Designer to consider soil resistivity and specify appropriate cathodic protection measures.	2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP16+692	E-KP16+000	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP19+991	E-KP17+000	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP19+741	E-KP18+000	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP16+173	S-KP16+000	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP16+222	S-KP16+000	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP16+544	S-KP16+500	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP11+071	S-KP11+000	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP03+505	S-KP03+000	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP01+977	S-KP02+000	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP18+297	N1-KP17+500	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP17+545	N1-KP17+000	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP19+023	N1-KP18+500	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP18+681	N1-KP18+500	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP09+747	N1-KP09+000	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP12+963	N1-KP12+500	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP14+037	N1-KP13+500	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP12+526	N1-KP08+000	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP14+142	N1-KP14+000	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP14+601	N1-KP14+000	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP15+791	N1-KP14+500	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP17+109	N1-KP16+000	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP00+017	N2-KP00	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP03+316	N2-KP01+500	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP07+966	C-01-KP07+500	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP07+199	C-01-KP07+000	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+637	N1-02-KP00	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP06+110	N1-02-KP01+500	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - E-01	E-01-KP00+430	E-05-KP00	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-04	N2-04-KP00+017	N2-04-KP00	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+677	N1-05-KP00	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - E-04	E-04-KP00+588	E-KP21+500	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - F	E-KP18+128	E-KP17+500	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP18+128	E-KP17+500	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP17+571	E-KP17+500	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP17+571	E-KP17+500	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP15+295	E-KP15+000	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP15+295	E-KP15+000	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP21+062	E-KP20+000	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP21+062	E-KP20+000	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP21+662	E-KP21+000	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP21+662	E-KP21+000	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP09+305	N1-KP08+500	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP09+305	N1-KP08+500	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP13+645	N1-KP13+500	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP13+645	N1-KP13+500	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP011+48	N1-KP08+000	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP011+48	N1-KP08+000	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP13+308	N1-KP13+000	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP13+308	N1-KP13+000	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP15+136	N1-KP15+000	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP15+136	N1-KP15+000	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP04+888	N1-02-KP04+500	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP04+888	N1-02-KP04+500	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP05+813	N1-02-KP03+500	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP05+813	N1-02-KP03+500	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - E-01	E-01-KP00+438	E-01-KP00	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - E-01	E-01-KP00+438	E-01-KP00	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - E-02	E-02-KP00+155	E-02-KP00	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - E-02	E-02-KP00+155	E-02-KP00	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - E-04	E-04-KP00+261	E-04-KP00	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - E-04	E-04-KP00+261	E-04-KP00	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - E-05	E-05-KP00+124	E-05-KP00	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - E-05	E-05-KP00+124	E-05-KP00	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)

Hynet Geohazards Desk Study

Hazard Title: Adverse Ground Chemistry

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	Closest KP	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Potential for high concentrations of Sulphates, Chloride, WS04 and aggressive chemical environment	Insufficient design, long-term excessive displacement and corrosion and potential failure of both concrete and metal permanent works. - Potential to add cost & risk to the project	HAGI - Stanlow HPP HAGI	W-KP00	Adverse Ground Chemistry - High	5	4	20 (Severe)	Ground investigation to determine exact geology and groundwater conditions allow for determination of chemical agents for soil and groundwater. - Designer to assess concentrations of chemicals in accordance with BS 8500-1:2006 and BS EN 206:2013 to determine the "Aggressive Chemical Environment for Concrete (ACEC) Classification" is and a Design Sulphate Class. - Designer to include protective coatings to pipelines & buried metal structures, and suitable cover depth of steel reinforcement within concrete structures. - Designer to consider soil resistivity and specify appropriate cathodic protection measures.	4	3	12 (Moderate)
		HAGI - Central Hub HAGI	S-KP00	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		HAGI - Higher Walton HAGI	N1-05-KP00	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		HAGI - Partington HAGI	E-01-KP00	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		HAGI - Runcorn HAGI	W-02-KP00	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		HAGI - Inoyvn Gas Storage HAGI	S-KP18+000	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Ellesmere Port to Warrington Line Railway	W-KP03+000	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - River Weaver	W-KP09+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Sutton Weaver Canal	W-KP11+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - United Utilities Sewer	W-KP11+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - A56 Chester Road	W-KP12+000	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line Railway	W-KP16+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Trent and Mersey Canal	W-KP18+000	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - A533 Northwich Road	W-KP18+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - A533 Northwich Road	C-01-KP0+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Trent and Mersey Canal	S-KP01+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line Railway	S-KP04+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - A49 Warrington Road	S-KP06+000	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Mid Cheshire Line Railway	S-KP07+000	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - A556 Chester Road	S-KP08+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+000	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - A533 Road	S-KP15+000	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Trent and Mersey Canal	S-KP16+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Middlewich Branch Line Railway	S-KP17+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Middlewich Branch Line Railway	S-KP17+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - A530 King Street Road	S-KP18+000	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - A49 Tarporley Road	E-KP01+000	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - A559 Northwich Road	E-KP04+000	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - M6 Motorway	E-KP09+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - A50 Road	E-KP11+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - M56 Motorway	E-KP14+000	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - A56 Lymm Road	E-KP15+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Bridgewater Canal + road	E-KP15+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - M56 Motorway	N1-KP05+000	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - River Mersey, Sanky Canal + Skelton Junction to Ditton Junction Line	N1-KP12+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - A557 Weston Point Expressway - Rocksavage Way	W-03-KP0+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - A557 Weston Point Expressway - Rocksavage Way	W-03-KP0+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - A6144 Manchester Road	E-05-KP00	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Mainline Railway	N1-05-KP0+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Eastford Road and Canal	N1-02-KP01+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - London Road	S-KP15+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - NULL	N1-02-KP02+000	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Block Valve - NULL	E-KP12+000	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Block Valve - NULL	S-KP08+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		HAGI - Higher Walton HAGI	N1-02-KP00	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		HAGI - Higher Walton HAGI	N1-02-KP00	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - River Weaver	W-KP10+000	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - River Weaver	W-KP10+000	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - United Utilities Water	W-KP10+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - United Utilities Water	W-KP10+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Chester to Manchester Line Railway	W-KP11+000	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Chester to Manchester Line Railway	W-KP11+000	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Sutton Weaver Canal	W-KP11+000	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Sutton Weaver Canal	W-KP11+000	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Weaver Navigation Canal	S-KP02+000	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Weaver Navigation Canal	S-KP02+000	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+000	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+000	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - River Dane	S-KP16+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - River Dane	S-KP16+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Middlewich Branch Line Railway	S-KP17+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Middlewich Branch Line Railway	S-KP17+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Middlewich Branch Line Railway	S-KP17+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Middlewich Branch Line Railway	S-KP17+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - M6 Motorway	E-KP09+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - M6 Motorway	E-KP09+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - River Bolin	E-KP17+000	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - River Bolin	E-KP17+000	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Weaver Navigation Canal	W-KP10+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Weaver Navigation Canal	W-KP10+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - A6144 Manchester Road	E-05-KP00	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - A6144 Manchester Road	E-05-KP00	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Mainline Railway	N1-KP09+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Mainline Railway	N1-KP09+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Mainline Railway	N1-05-KP0+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Mainline Railway	N1-05-KP0+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)

Hynet Geohazards Desk Study

Hazard Title: Adverse Ground Chemistry

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	Closest KP	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Potential for high concentrations of Sulphates, Chloride, WS04 and aggressive chemical environment	Insufficient design, long-term excessive displacement and corrosion and potential failure of both concrete and metal permanent works. · Potential to add cost & risk to the project	Trenchless Crossing - Eastford Road and Canal	N1-02-KP01+500	Adverse Ground Chemistry - High	5	4	20 (Severe)	Ground investigation to determine exact geology and groundwater conditions allow for determination of chemical agents for soil and groundwater. - Designer to assess concentrations of chemicals in accordance with BS 8500-1:2006 and BS EN 206:2013 to determine the "Aggressive Chemical Environment for Concrete (ACEC) Classification" is and a Design Sulphate Class. - Designer to include protective coatings to pipelines & buried metal structures, and suitable cover depth of steel reinforcement within concrete structures. - Designer to consider soil resistivity and specify appropriate cathodic protection measures.	4	3	12 (Moderate)
		Trenchless Crossing - Eastford Road and Canal	N1-02-KP01+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Block Valve - NULL	S-KP08+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Block Valve - NULL	S-KP08+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		HAGI - Rocksavage HAGI	W-01-KP00	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		HAGI - Rocksavage HAGI	W-01-KP00	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		HAGI - Rocksavage HAGI	W-01-KP00	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - United Utilities Water	W-KP10+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - United Utilities Water	W-KP10+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - United Utilities Water	W-KP10+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - United Utilities Water	W-KP10+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - United Utilities Water	W-KP10+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - United Utilities Water	W-KP10+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Weaver Navigation Canal	W-KP10+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Weaver Navigation Canal	W-KP10+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Weaver Navigation Canal	W-KP10+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Weaver Navigation Canal	W-KP10+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Weaver Navigation Canal	W-KP10+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Weaver Navigation Canal	W-KP10+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Mainline Railway	N1-KP09+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Mainline Railway	N1-KP09+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Mainline Railway	N1-KP09+500	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Weaver Navigation Canal	S-KP02+000	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Weaver Navigation Canal	S-KP02+000	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Weaver Navigation Canal	S-KP02+000	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Weaver Navigation Canal	S-KP02+000	Adverse Ground Chemistry - High	5	4	20 (Severe)		4	3	12 (Moderate)
		HAGI - Stanlow HPP HAGI	W-KP00	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		HAGI - Stanlow HPP HAGI	W-KP00	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		HAGI - Clockface HAGI	N2-KP00	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		HAGI - Runcorn HAGI	W-03-KP00	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		HAGI - Inovyn Gas Storage HAGI	S-KP18+000	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Trenchless Crossing - Stanlow	W-KP00	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Trenchless Crossing - A5117 Road	W-KP01+500	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Trenchless Crossing - A5117 Road	W-KP02+000	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Trenchless Crossing - West Coast Main Line Railway	S-KP04+500	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Trenchless Crossing - A49 Warrington Road	S-KP06+000	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Trenchless Crossing - Mid Cheshire Line Railway	S-KP07+000	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+500	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+000	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Trenchless Crossing - A533 Road	S-KP15+000	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Trenchless Crossing - Trent and Mersey Canal	S-KP16+500	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Trenchless Crossing - Middlewich Branch Line Railway	S-KP17+500	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Trenchless Crossing - A530 King Street Road	S-KP18+000	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Trenchless Crossing - M6 Motorway	E-KP09+500	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Trenchless Crossing - M56 Motorway	E-KP14+000	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Trenchless Crossing - M56 Motorway	N1-KP05+000	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Trenchless Crossing - A56 Chester Road	N1-KP08+000	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Trenchless Crossing - A562 Widnes Road	N1-KP13+500	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Trenchless Crossing - A5080 South Lane Road	N1-KP14+500	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Trenchless Crossing - Manchester and Allerton Junction Line Railway	N1-KP15+000	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Trenchless Crossing - A57 Warrington Road	N1-KP18+000	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Trenchless Crossing - Liverpool to Manchester Line Railway	N2-KP02+500	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		HAGI - Stanlow HPP HAGI	W-KP00	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Trenchless Crossing - Stanlow	W-KP00	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		HAGI - Clockface HAGI	N2-KP00	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		HAGI - Clockface HAGI	N2-KP00	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Trenchless Crossing - M62 Motorway	N2-04-KP00	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Trenchless Crossing - M62 Motorway	N2-04-KP00	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Trenchless Crossing - A570 St Helens Linkway Road	N2-KP01+500	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		Trenchless Crossing - A570 St Helens Linkway Road	N2-KP01+500	Adverse Ground Chemistry - Medium	4	4	16 (Substantial)		3	3	9 (Minor)
		HAGI - Stanlow HPP HAGI	W-KP00	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		HAGI - Stanlow HPP HAGI	W-KP00	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		HAGI - Clockface HAGI	N2-KP00	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		HAGI - Higher Walton HAGI	N1-05-KP00	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Stanlow	W-KP00	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A5117 Road	W-KP01+500	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A5117 Road	W-KP01+500	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A5117 Road	W-KP02+000	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A5117 Road	W-KP01+500	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Ellesmere Port to Warrington Line Railway	W-KP03+000	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - River Weaver	W-KP09+500	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+000	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Trent and Mersey Canal	S-KP16+500	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A56 Lymm Road	E-KP15+500	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)

Hynet Geohazards Desk Study

Hazard Title: Adverse Ground Chemistry

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	Closest KP	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Potential for high concentrations of Sulphates, Chloride, WS04 and aggressive chemical environment	Insufficient design, long-term excessive displacement and corrosion and potential failure of both concrete and metal permanent works. - Potential to add cost & risk to the project	Trenchless Crossing - Bridgewater Canal + road	E-KP15+500	Adverse Ground Chemistry - Low	2	3	6 (Minor)	Ground investigation to determine exact geology and groundwater conditions allow for determination of chemical agents for soil and groundwater. - Designer to assess concentrations of chemicals in accordance with BS 8500-1:2006 and BS EN 206:2013 to determine the "Aggressive Chemical Environment for Concrete (ACEC) Classification" is and a Design Sulphate Class. - Designer to include protective coatings to pipelines & buried metal structures, and suitable cover depth of steel reinforcement within concrete structures. - Designer to consider soil resistivity and specify appropriate cathodic protection measures.	2	2	4 (None / Negligible)
		Trenchless Crossing - A56 Chester Road	N1-KP08+000	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+500	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - River Mersey, Sanky Canal + Skelton Junction to Ditton Junction Line	N1-KP12+500	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - River Mersey, Sanky Canal + Skelton Junction to Ditton Junction Line	N1-KP12+500	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A562 Widnes Road	N1-KP13+500	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A5080 South Lane Road	N1-KP14+500	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Manchester and Allerton Junction Line Railway	N1-KP15+000	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A57 Warrington Road	N1-KP18+000	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Liverpool to Manchester Line Railway	N2-KP02+500	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A6144 Manchester Road	E-05-KP00	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - West Coast Mainline Railway	N1-05-KP0+500	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Eastford Road and Canal	N1-02-KP01+500	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Eastford Road and Canal	N1-02-KP01+500	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - NULL	N1-02-KP02+000	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		HAGI - Stanlow HPP HAGI	W-KP00	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Stanlow	W-KP00	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		HAGI - Warburton HAGI	E-02-KP00	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		HAGI - Warburton HAGI	E-02-KP00	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		HAGI - Partington HAGI	E-01-KP00	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		HAGI - Partington HAGI	E-01-KP00	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Bridgewater Canal	N1-KP08+500	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Bridgewater Canal	N1-KP08+500	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - River Mersey, Sanky Canal + Skelton Junction to Ditton Junction Line	N1-KP12+500	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - River Mersey, Sanky Canal + Skelton Junction to Ditton Junction Line	N1-KP12+500	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A6144 Manchester Road	E-05-KP00	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A6144 Manchester Road	E-05-KP00	Adverse Ground Chemistry - Low	2	3	6 (Minor)		2	2	4 (None / Negligible)

APPENDIX C
RISK ASSESSMENT TABLE – GEOHAZARDS – HIGH GROUNDWATER TABLE

RSK GEOSCIENCES

Hynet Geohazards Desk Study

Hazard Title: High Groundwater Table

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
High groundwater table	Insufficient design, delay, excessive displacement, buoyancy, failure, instability of excavations, running sands, environmental impacts / pollution - Potential to add cost, time, risk to the project	Preferred Route Centreline - W	W-KP09+685	W-KP00+066	Shallow groundwater table	4	4	16 (Substantial)	Ground investigation to determine exact geology and groundwater conditions. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; such as dewatering systems, trial excavations, excavation support systems. - Designer to consider appropriate temporary and permanent drainage - Designer to consider conservative groundwater conditions in temporary and permanent design	4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP11+735	W-KP11+367	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP14+874	W-KP12+616	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP10+025	W-KP10+048	<Null>	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP011+36	W-KP11+043	<Null>	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP10+884	W-KP10+145	Potential for shallow groundwater	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP11+037	W-KP10+903	Potential for shallow groundwater	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP00+013	W-KP00+000	Potential for shallow groundwater	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP17+754	W-KP16+992	Potential for high groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP02+419	E-KP02+209	Potentially shallow groundwater table based on Groundsure groundwater flooding risk category moderate.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP04+351	E-KP03+922	Potentially shallow groundwater table based on Groundsure groundwater flooding risk category moderate.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP17+596	E-KP015+92	Potentially shallow groundwater table based on Groundsure groundwater flooding risk category moderate.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP19+602	E-KP19+423	Potentially shallow groundwater table based on Groundsure groundwater flooding risk category moderate.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP20+676	E-KP20+175	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP21+605	E-KP21+494	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP00+876	E-KP00+845	Potentially shallow groundwater associated with brook.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP06+787	E-KP06+650	Potentially high groundwater table associated with brook	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP19+413	E-KP18+803	Potentially high groundwater table associated with brook	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP20+173	E-KP19+633	Potentially high groundwater table associated with brook	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP016+54	S-KP16+377	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP16+222	S-KP16+123	Potentially shallow groundwater table based on Groundsure groundwater flooding risk category moderate.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP016+06	S-KP15+995	Potentially shallow groundwater table based on Groundsure groundwater flooding risk category moderate.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP15+947	S-KP15+463	Potentially shallow groundwater table based on Groundsure groundwater flooding risk category moderate.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP14+048	S-KP12+934	Potentially shallow groundwater table based on Groundsure groundwater flooding risk category moderate.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP12+524	S-KP11+406	Potentially shallow groundwater table based on Groundsure groundwater flooding risk category moderate.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP09+775	S-KP08+931	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP08+398	S-KP07+514	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP07+144	S-KP07+012	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP06+964	S-KP06+559	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP04+766	S-KP04+646	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP01+189	S-KP00+975	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP03+122	S-KP01+933	Potentially high groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP03+513	S-KP03+298	Potential for high groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP04+644	S-KP04+606	Potential for high groundwater table associated with brook	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP07+271	S-KP07+148	Potential for high groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP08+779	S-KP08+398	Potential for high groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP11+334	S-KP11+021	Potential for high groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP15+348	S-KP15+313	Potentially localised high groundwater table associated with stream / brook.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP17+487	S-KP017+45	Potentially high groundwater table associated with brook	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP16+944	N1-KP09+705	Shallow groundwater table. Area identified in Groundsure as moderate risk of groundwater flooding	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP09+520	N1-KP09+606	Potential for high groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP08+493	N1-KP08+447	Potential for localised high groundwater table associated with surface water feature/stream	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N2	N2-KP01+867	N2-KP01+845	Potential for localised shallow or perched groundwater table in vicinity of stream / brook.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP07+964	C-01-KP07+489	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP05+502	C-01-KP05+350	Potentially shallow groundwater table based on Groundsure groundwater flooding risk category moderate.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP04+005	C-01-KP03+704	Potentially shallow groundwater table based on Groundsure groundwater flooding risk category moderate.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP07+487	C-01-KP06+771	Potentially high groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+550	N1-02-KP00+101	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+548	N1-02-KP01+509	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+222	N1-02-KP01+951	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP04+398	N1-02-KP02+464	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP06+107	N1-02-KP05+800	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+478	N1-02-KP01+557	Potential for high groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP05+795	N1-02-KP04+401	Potential for high groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - E-01	E-01-KP00+009	E-01-KP00+001	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - E-01	E-01-KP00+451	E-01-KP00+036	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N2-04	N2-04-KP01+371	N2-04-KP01+348	Potential for localised shallow or perched groundwater table in vicinity of stream / brook.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+269	N1-05-KP00+138	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+675	N1-05-KP00+413	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+014	N1-05-KP00+000	Potential for high groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - E-04	E-04-KP00+015	E-04-KP00+011	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - E-04	E-04-KP00+267	E-04-KP00+104	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+336	W-01-KP00+000	Potential for shallow groundwater	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - E-05	E-05-KP00+066	E-05-KP00+004	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - E-05	E-05-KP00+114	E-05-KP00+091	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP09+686	W-KP09+685	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP09+686	W-KP09+685	<Null>	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP00+066	W-KP00+013	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP00+066	W-KP00+013	Potential for shallow groundwater	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP11+367	W-KP011+36	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP11+367	W-KP011+36	<Null>	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP10+048	W-KP10+025	<Null>	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP10+048	W-KP10+025	Potential for shallow groundwater	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP11+043	W-KP11+037	<Null>	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP11+043	W-KP11+037	Potential for shallow groundwater	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP10+903	W-KP10+884	Potential for shallow groundwater	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP10+903	W-KP10+884	Potential for shallow groundwater	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP19+897	E-KP19+746	Potentially shallow groundwater table based on Groundsure groundwater flooding risk category moderate.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP19+897	E-KP19+746	Potentially high groundwater table associated with brook	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP20+113	E-KP19+983	Potentially shallow groundwater table based on Groundsure groundwater flooding risk category moderate.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP20+113	E-KP19+983	Potentially high groundwater table associated with brook	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP20+175	E-KP20+173	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP20+175	E-KP20+173	Potentially high groundwater table associated with brook	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP21+662	E-KP21+605	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP21+662	E-KP21+605	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)

RSK GEOSCIENCES

Hynet Geohazards Desk Study

Hazard Title: High Groundwater Table

Project Number: 322968

High groundwater table	Insufficient design, delay, excessive displacement, buoyancy, failure, instability of excavations, running sands, environmental impacts / pollution - Potential to add cost, time, risk to the project	Preferred Route Centreline - N1	N1-KP09+705	N1-KP09+700	Shallow groundwater table. Area identified in Groundsure as moderate risk of groundwater flooding	4	4	16 (Substantial)	Ground investigation to determine exact geology and groundwater conditions. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; such as dewatering systems, trial excavations, excavation support systems. - Designer to consider appropriate temporary and permanent dralnage - Designer to consider conservative groundwater conditions in temporary and permanent design	4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP09+705	N1-KP09+700	Potential for high groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP09+606	N1-KP09+520	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP09+606	N1-KP09+520	Potential for high groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP07+489	C-01-KP07+487	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP07+489	C-01-KP07+487	Potentially high groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+101	N1-02-KP00+000	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+101	N1-02-KP00+000	Potential for high groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+553	N1-02-KP00+550	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+553	N1-02-KP00+550	Potential for high groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+509	N1-02-KP01+548	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+509	N1-02-KP01+548	Potential for high groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+951	N1-02-KP01+937	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+951	N1-02-KP01+937	Potential for high groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - E-01	E-01-KP00+001	E-01-KP00+000	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - E-01	E-01-KP00+001	E-01-KP00+000	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+138	N1-05-KP00+014	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+138	N1-05-KP00+014	Potential for high groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - E-04	E-04-KP00+104	E-04-KP00+015	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - E-04	E-04-KP00+104	E-04-KP00+015	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)

RSK GEOSCIENCES

Hynet Geohazards Desk Study

Hazard Title: High Groundwater Table

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	Closest KP	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
High groundwater table	Insufficient design, delay, excessive displacement, buoyancy, failure, instability of excavations, running sands, environmental impacts / pollution - Potential to add cost, time, risk to the project	HAGI - Stanlow HPP HAGI	W-KP00	Potential for shallow groundwater	4	4	16 (Substantial)	Ground investigation to determine exact geology and groundwater conditions. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; such as dewatering systems, trial excavations, excavation support systems. - Designer to consider appropriate temporary and permanent drainage - Designer to consider conservative groundwater conditions in temporary and permanent design	4	2	8 (Minor)
		HAGI - Rocksavage HAGI	W-01-KP00	Potential for shallow groundwater	4	4	16 (Substantial)		4	2	8 (Minor)
		HAGI - Higher Walton HAGI	N1-05-KP00	Potential for high groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		HAGI - Partington HAGI	E-01-KP00	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		HAGI - Partington HAGI	E-05-KP00	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		HAGI - Partington HAGI	E-04-KP00	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Stanlow	W-KP00	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - A5117 Road	W-KP02+000	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Ellesmere Port to Warrington Line Railway	W-KP03+000	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - River Weaver	W-KP09+500	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - River Weaver	W-KP10+000	<Null>	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - River Weaver	W-KP10+000	Potential for shallow groundwater	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - United Utilities Water	W-KP10+500	Potential for shallow groundwater	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Chester to Manchester Line Railway	W-KP11+000	<Null>	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Chester to Manchester Line Railway	W-KP11+000	Potential for shallow groundwater	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Chester to Manchester Line Railway	W-KP11+000	Potential for shallow groundwater	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Sutton Weaver Canal	W-KP11+500	<Null>	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - United Utilities Sewer	W-KP11+500	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Weaver Navigation Canal	S-KP02+000	Potentially high groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Mid Cheshire Line Railway	S-KP07+000	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Mid Cheshire Line Railway	S-KP07+000	Potential for high groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - A556 Chester Road	S-KP08+500	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - A556 Chester Road	S-KP08+500	Potential for high groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+500	Potentially shallow groundwater table based on Groundsure groundwater flooding risk category moderate.	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+000	Potential for high groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Trent and Mersey Canal	S-KP16+500	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - A559 Northwich Road	E-KP04+000	Potentially shallow groundwater table based on Groundsure groundwater flooding risk category moderate.	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - River Bollin	E-KP17+000	Potentially shallow groundwater table based on Groundsure groundwater flooding risk category moderate.	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Bridgewater Canal	N1-KP08+500	Potential for localised high groundwater table associated with surface water feature/stream	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+500	Potential for high groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - River Mersey, Sankey Canal + Skelton Junction to Ditton Junction Line	N1-KP12+500	Shallow groundwater table. Area identified in Groundsure as moderate risk of groundwater flooding	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - A562 Widnes Road	N1-KP13+500	Shallow groundwater table. Area identified in Groundsure as moderate risk of groundwater flooding	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - A5080 South Lane Road	N1-KP14+500	Shallow groundwater table. Area identified in Groundsure as moderate risk of groundwater flooding	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Manchester and Allerton Junction Line Railway	N1-KP15+000	Shallow groundwater table. Area identified in Groundsure as moderate risk of groundwater flooding	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Weaver Navigation Canal	W-KP10+500	Potential for shallow groundwater	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - A6144 Manchester Road	E-05-KP00	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - West Coast Mainline Railway	N1-KP09+500	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - West Coast Mainline Railway	N1-05-KP0+500	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Eastford Road and Canal	N1-02-KP01+500	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Eastford Road and Canal	N1-02-KP01+500	Potential for high groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - London Road	S-KP15+500	Potentially shallow groundwater table based on Groundsure groundwater flooding risk category moderate.	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - NULL	N1-02-KP02+000	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - NULL	N1-02-KP02+000	Potential for high groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Block Valve - NULL	S-KP08+500	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		HAGI - Stanlow HPP HAGI	W-KP00	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		HAGI - Stanlow HPP HAGI	W-KP00	Potential for shallow groundwater	4	4	16 (Substantial)		4	2	8 (Minor)
		HAGI - Higher Walton HAGI	N1-02-KP00	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		HAGI - Higher Walton HAGI	N1-02-KP00	Potential for high groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		HAGI - Partington HAGI	E-01-KP00	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		HAGI - Partington HAGI	E-01-KP00	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Stanlow	W-KP00	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Stanlow	W-KP00	Potential for shallow groundwater	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - River Weaver	W-KP09+500	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - River Weaver	W-KP09+500	<Null>	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Chester to Manchester Line Railway	W-KP11+000	<Null>	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Chester to Manchester Line Railway	W-KP11+000	Potential for shallow groundwater	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - A556 Chester Road	S-KP08+500	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - A556 Chester Road	S-KP08+500	Potential for high groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Eastford Road and Canal	N1-02-KP01+500	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Eastford Road and Canal	N1-02-KP01+500	Potential for high groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - NULL	N1-02-KP02+000	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - NULL	N1-02-KP02+000	Potential for high groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		HAGI - Stanlow HPP HAGI	W-KP00	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		HAGI - Stanlow HPP HAGI	W-KP00	Potential for shallow groundwater	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Stanlow	W-KP00	Shallow groundwater table	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Stanlow	W-KP00	Potential for shallow groundwater	4	4	16 (Substantial)		4	2	8 (Minor)

APPENDIX C
RISK ASSESSMENT TABLE – GEOHAZARDS - GROUNDWATER FLOODING

Hynet Geohazards Desk Study

Hazard Title: Groundwater Flooding (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Caused by unusually high groundwater levels. Can last for weeks or months. Risk is assessed in the Groundsure report based on a 1:100 year return period.	Insufficient design, delay, excessive displacement, buoyancy, failure, instability of excavations, environmental impacts / pollution, maintenance / repair access issues. - Potential to add cost, time, risk to the project	Preferred Route Centreline - W	W-KP18+343	W-KP19+303	Groundwater Flooding	1	4	4 (None / Negligible)	Ground investigation to determine exact geology and groundwater conditions. - Flood Risk Assessment to determine flood risk. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; raising ground levels, re-routing, anchoring to prevent buoyancy issues. - Designer to consider appropriate temporary and permanent drainage	1	3	3 (None / Negligible)
		Preferred Route Centreline - E	E-KP00+000	E-KP00+776	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Preferred Route Centreline - S	S-KP00+000	S-KP00+492	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP00+000	N1-KP01+585	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP00+000	N2-KP03+126	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP07+481	C-01-KP07+966	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Spurs Centreline - W-03	W-03-KP00+000	W-03-KP01+828	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP05+356	N1-02-KP05+805	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Spurs Centreline - E-01	E-01-KP00+000	E-01-KP00+372	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Spurs Centreline - N2-04	N2-04-KP00+000	N2-04-KP02+035	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+590	N1-05-KP00+677	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Spurs Centreline - N2-06	N2-KP06+129	N2-06-KP01+199	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Spurs Centreline - E-02	E-02-KP00+000	E-02-KP00+155	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Spurs Centreline - E-04	E-04-KP00+000	E-04-KP00+263	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Spurs Centreline - N2-07	N2-KP06+129	N2-07-KP00+157	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP00+178	W-01-KP00+456	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Spurs Centreline - W-02	W-02-KP00+042	W-02-KP00+121	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Spurs Centreline - E-05	E-05-KP00+000	E-05-KP00+124	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - N2	N2-KP05+856	N2-KP06+129	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Route Centreline - N2	N2-KP05+051	N2-KP05+856	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP03+316	N2-KP05+051	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Route Centreline - N2	N2-KP03+126	N2-KP03+316	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP16+945	N1-KP19+023	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Route Centreline - N1	N1-KP16+746	N1-KP16+945	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - N1	N1-KP16+497	N1-KP16+746	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Route Centreline - N1	N1-KP15+262	N1-KP16+497	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - N1	N1-KP15+237	N1-KP15+262	Groundwater Flooding	4	4	16 (Substantial)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP15+011	N1-KP15+237	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - N1	N1-KP14+974	N1-KP15+011	Groundwater Flooding	4	4	16 (Substantial)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP14+938	N1-KP14+974	Groundwater Flooding	5	4	20 (Severe)		5	3	15 (Substantial)
		Preferred Route Centreline - N1	N1-KP14+903	N1-KP14+938	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - N1	N1-KP14+813	N1-KP14+903	Groundwater Flooding	4	4	16 (Substantial)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP14+698	N1-KP14+813	Groundwater Flooding	4	4	16 (Substantial)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP14+522	N1-KP14+636	Groundwater Flooding	4	4	16 (Substantial)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP14+481	N1-KP14+522	Groundwater Flooding	5	4	20 (Severe)		5	3	15 (Substantial)
		Preferred Route Centreline - N1	N1-KP13+756	N1-KP14+481	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - N1	N1-KP13+399	N1-KP13+756	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - N1	N1-KP13+133	N1-KP13+399	Groundwater Flooding	5	4	20 (Severe)		5	3	15 (Substantial)
		Preferred Route Centreline - N1	N1-KP12+909	N1-KP13+133	Groundwater Flooding	4	4	16 (Substantial)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP12+765	N1-KP12+909	Groundwater Flooding	5	4	20 (Severe)		5	3	15 (Substantial)
		Preferred Route Centreline - N1	N1-KP12+749	N1-KP12+765	Groundwater Flooding	4	4	16 (Substantial)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP12+669	N1-KP12+749	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - N1	N1-KP12+645	N1-KP12+669	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP12+604	N1-KP12+645	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - N1	N1-KP12+527	N1-KP12+604	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP12+466	N1-KP12+527	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - N1	N1-KP12+453	N1-KP12+466	Groundwater Flooding	4	4	16 (Substantial)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP012+44	N1-KP12+453	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - N1	N1-KP11+686	N1-KP012+44	Groundwater Flooding	5	4	20 (Severe)		5	3	15 (Substantial)
		Preferred Route Centreline - N1	N1-KP11+636	N1-KP11+686	Groundwater Flooding	4	4	16 (Substantial)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP011+61	N1-KP11+636	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Route Centreline - N1	N1-KP11+554	N1-KP011+61	Groundwater Flooding	4	4	16 (Substantial)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP10+573	N1-KP11+554	Groundwater Flooding	5	4	20 (Severe)		5	3	15 (Substantial)
		Preferred Route Centreline - N1	N1-KP10+519	N1-KP10+573	Groundwater Flooding	4	4	16 (Substantial)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP10+374	N1-KP10+519	Groundwater Flooding	5	4	20 (Severe)		5	3	15 (Substantial)
		Preferred Route Centreline - N1	N1-KP10+045	N1-KP10+374	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - N1	N1-KP09+983	N1-KP10+045	Groundwater Flooding	5	4	20 (Severe)		5	3	15 (Substantial)
		Preferred Route Centreline - N1	N1-KP09+831	N1-KP09+983	Groundwater Flooding	4	4	16 (Substantial)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP14+636	N1-KP14+698	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - N1	N1-KP09+704	N1-KP09+831	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - N1	N1-KP09+609	N1-KP09+704	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Route Centreline - N1	N1-KP09+565	N1-KP09+609	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - N1	N1-KP09+493	N1-KP09+565	Groundwater Flooding	5	4	20 (Severe)		5	3	15 (Substantial)
		Preferred Route Centreline - N1	N1-KP09+451	N1-KP09+493	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - N1	N1-KP09+415	N1-KP09+451	Groundwater Flooding	5	4	20 (Severe)		5	3	15 (Substantial)
		Preferred Route Centreline - N1	N1-KP09+385	N1-KP09+415	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP09+365	N1-KP09+385	Groundwater Flooding	4	4	16 (Substantial)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP09+300	N1-KP09+365	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP09+147	N1-KP09+300	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Route Centreline - N1	N1-KP09+084	N1-KP09+147	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)

RSK GEOSCIENCES

Hynet Geohazards Desk Study

Hazard Title: Groundwater Flooding (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Caused by unusually high groundwater levels. Can last for weeks or months. Risk is assessed in the Groundsure report based on a 1:100 year return period.	Insufficient design, delay, excessive displacement, buoyancy, failure, instability of excavations, environmental impacts / pollution, maintenance / repair access issues. - Potential to add cost, time, risk to the project	Preferred Route Centreline - N1	N1-KP08+483	N1-KP09+084	Groundwater Flooding	2	4	8 (Minor)	Ground investigation to determine exact geology and groundwater conditions. - Flood Risk Assessment to determine flood risk. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; raising ground levels, re-routing, anchoring to prevent buoyancy issues. - Designer to consider appropriate temporary and permanent drainage	2	3	6 (Minor)
		Preferred Route Centreline - N1	N1-KP08+465	N1-KP08+483	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP08+075	N1-KP08+465	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Route Centreline - N1	N1-KP07+923	N1-KP08+075	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP07+681	N1-KP07+923	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Route Centreline - N1	N1-KP07+646	N1-KP07+681	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP05+499	N1-KP07+646	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Route Centreline - N1	N1-KP02+000	N1-KP05+499	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP02+668	N1-KP02+000	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Route Centreline - N1	N1-KP02+304	N1-KP02+668	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP01+585	N1-KP02+304	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+000	N1-02-KP00+022	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+022	N1-02-KP00+069	Groundwater Flooding	5	4	20 (Severe)		5	3	15 (Substantial)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+069	N1-02-KP00+136	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+136	N1-02-KP00+208	Groundwater Flooding	5	4	20 (Severe)		5	3	15 (Substantial)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+208	N1-02-KP00+995	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+995	N1-02-KP01+111	Groundwater Flooding	4	4	16 (Substantial)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+111	N1-02-KP01+477	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+477	N1-02-KP01+556	Groundwater Flooding	4	4	16 (Substantial)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+556	N1-02-KP01+755	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+755	N1-02-KP01+773	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+773	N1-02-KP02+241	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+241	N1-02-KP02+442	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+442	N1-02-KP02+894	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+894	N1-02-KP02+981	Groundwater Flooding	4	4	16 (Substantial)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+981	N1-02-KP03+255	Groundwater Flooding	4	4	16 (Substantial)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+255	N1-02-KP03+285	Groundwater Flooding	5	4	20 (Severe)		5	3	15 (Substantial)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+285	N1-02-KP04+672	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP04+672	N1-02-KP04+947	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP04+947	N1-02-KP05+143	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP05+143	N1-02-KP05+240	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP05+805	N1-02-KP06+110	Groundwater Flooding	4	4	16 (Substantial)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP05+240	N1-02-KP05+300	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP05+300	N1-02-KP05+356	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+000	N1-05-KP00+028	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+028	N1-05-KP00+078	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+078	N1-05-KP00+119	Groundwater Flooding	5	4	20 (Severe)		5	3	15 (Substantial)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+119	N1-05-KP00+196	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+196	N1-05-KP00+240	Groundwater Flooding	5	4	20 (Severe)		5	3	15 (Substantial)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+240	N1-05-KP00+290	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+290	N1-05-KP00+422	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+422	N1-05-KP00+533	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+533	N1-05-KP00+590	Groundwater Flooding	4	4	16 (Substantial)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP00+000	W-KP00+039	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP00+039	W-KP00+055	Groundwater Flooding	4	4	16 (Substantial)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP00+055	W-KP00+073	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Route Centreline - W	W-KP00+073	W-KP00+108	Groundwater Flooding	5	4	20 (Severe)		5	3	15 (Substantial)
		Preferred Route Centreline - W	W-KP00+108	W-KP00+721	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP00+721	W-KP00+740	Groundwater Flooding	4	4	16 (Substantial)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP00+740	W-KP00+793	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP00+793	W-KP00+822	Groundwater Flooding	4	4	16 (Substantial)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP00+822	W-KP01+427	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP01+427	W-KP01+444	Groundwater Flooding	4	4	16 (Substantial)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP01+444	W-KP01+863	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP01+863	W-KP01+878	Groundwater Flooding	4	4	16 (Substantial)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP01+878	W-KP02+282	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP02+282	W-KP02+296	Groundwater Flooding	4	4	16 (Substantial)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP02+296	W-KP08+084	Groundwater Flooding	5	4	20 (Severe)		5	3	15 (Substantial)
		Preferred Route Centreline - W	W-KP08+084	W-KP08+137	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP08+137	W-KP08+191	Groundwater Flooding	4	4	16 (Substantial)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP08+191	W-KP09+022	Groundwater Flooding	5	4	20 (Severe)		5	3	15 (Substantial)
		Preferred Route Centreline - W	W-KP09+055	W-KP09+151	Groundwater Flooding	5	4	20 (Severe)		5	3	15 (Substantial)
		Preferred Route Centreline - W	W-KP09+022	W-KP09+055	Groundwater Flooding	4	4	16 (Substantial)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP09+151	W-KP09+182	Groundwater Flooding	4	4	16 (Substantial)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP09+182	W-KP09+351	Groundwater Flooding	5	4	20 (Severe)		5	3	15 (Substantial)
		Preferred Route Centreline - W	W-KP09+351	W-KP09+397	Groundwater Flooding	4	4	16 (Substantial)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP09+397	W-KP09+604	Groundwater Flooding	5	4	20 (Severe)		5	3	15 (Substantial)
		Preferred Route Centreline - W	W-KP09+604	W-KP09+641	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP09+641	W-KP09+671	Groundwater Flooding	5	4	20 (Severe)		5	3	15 (Substantial)
		Preferred Route Centreline - W	W-KP09+671	W-KP09+858	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)

RSK GEOSCIENCES

Hynet Geohazards Desk Study

Hazard Title: Groundwater Flooding (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Caused by unusually high groundwater levels. Can last for weeks or months. Risk is assessed in the Groundsure report based on a 1:100 year return period.	Insufficient design, delay, excessive displacement, buoyancy, failure, instability of excavations, environmental impacts / pollution, maintenance / repair access issues. - Potential to add cost, time, risk to the project	Preferred Route Centreline - W	W-KP09+858	W-KP09+956	Groundwater Flooding	1	4	4 (None / Negligible)	Ground investigation to determine exact geology and groundwater conditions. - Flood Risk Assessment to determine flood risk. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; raising ground levels, re-routing, anchoring to prevent buoyancy issues. - Designer to consider appropriate temporary and permanent drainage	1	3	3 (None / Negligible)
		Preferred Route Centreline - W	W-KP09+956	W-KP10+117	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP10+117	W-KP11+222	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Route Centreline - W	W-KP11+222	W-KP11+358	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Preferred Route Centreline - W	W-KP11+358	W-KP11+735	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP11+735	W-KP12+346	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Route Centreline - W	W-KP12+346	W-KP14+874	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP14+874	W-KP15+104	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Route Centreline - W	W-KP15+104	W-KP15+187	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Preferred Route Centreline - W	W-KP15+187	W-KP15+345	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Route Centreline - W	W-KP15+345	W-KP16+873	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Preferred Route Centreline - W	W-KP16+873	W-KP017+92	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Route Centreline - W	W-KP017+92	W-KP17+937	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Preferred Route Centreline - W	W-KP17+937	W-KP18+343	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Spurs Centreline - E-01	E-01-KP00+387	E-01-KP00+454	Groundwater Flooding	5	4	20 (Severe)		5	3	15 (Substantial)
		Preferred Spurs Centreline - E-01	E-01-KP00+372	E-01-KP00+387	Groundwater Flooding	4	4	16 (Substantial)		4	3	12 (Moderate)
		Preferred Spurs Centreline - E-04	E-04-KP00+511	E-04-KP00+588	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Spurs Centreline - E-04	E-04-KP00+498	E-04-KP00+511	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Preferred Spurs Centreline - E-04	E-04-KP00+439	E-04-KP00+498	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Spurs Centreline - E-04	E-04-KP00+263	E-04-KP00+439	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Preferred Route Centreline - E	E-KP21+500	E-KP21+662	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - E	E-KP21+126	E-KP21+500	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Preferred Route Centreline - E	E-KP21+056	E-KP21+126	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - E	E-KP20+727	E-KP21+056	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Preferred Route Centreline - E	E-KP20+674	E-KP20+727	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Route Centreline - E	E-KP20+177	E-KP20+674	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - E	E-KP20+117	E-KP20+177	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Route Centreline - E	E-KP19+961	E-KP20+117	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - E	E-KP19+897	E-KP19+961	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Route Centreline - E	E-KP19+735	E-KP19+897	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - E	E-KP19+608	E-KP19+735	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Route Centreline - E	E-KP19+427	E-KP19+608	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - E	E-KP17+600	E-KP19+427	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Route Centreline - E	E-KP17+358	E-KP17+600	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - E	E-KP17+327	E-KP17+358	Groundwater Flooding	5	4	20 (Severe)		5	3	15 (Substantial)
		Preferred Route Centreline - E	E-KP17+265	E-KP17+327	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - E	E-KP17+200	E-KP17+265	Groundwater Flooding	4	4	16 (Substantial)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP17+113	E-KP17+200	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - E	E-KP17+061	E-KP17+113	Groundwater Flooding	4	4	16 (Substantial)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP16+961	E-KP17+061	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - E	E-KP16+939	E-KP16+961	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Preferred Route Centreline - E	E-KP015+96	E-KP16+939	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - E	E-KP15+654	E-KP015+96	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Route Centreline - E	E-KP15+628	E-KP15+654	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Preferred Route Centreline - E	E-KP14+723	E-KP15+628	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Route Centreline - E	E-KP14+678	E-KP14+723	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Preferred Route Centreline - E	E-KP12+933	E-KP14+678	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Route Centreline - E	E-KP11+248	E-KP12+933	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Preferred Route Centreline - E	E-KP10+529	E-KP11+248	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Route Centreline - E	E-KP09+538	E-KP10+529	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Preferred Route Centreline - E	E-KP08+816	E-KP09+538	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Route Centreline - E	E-KP08+726	E-KP08+816	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Preferred Route Centreline - E	E-KP05+058	E-KP08+726	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Route Centreline - E	E-KP04+510	E-KP05+058	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Preferred Route Centreline - E	E-KP04+342	E-KP04+510	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Route Centreline - E	E-KP03+926	E-KP04+342	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - E	E-KP03+485	E-KP03+926	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Route Centreline - E	E-KP03+159	E-KP03+485	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Preferred Route Centreline - E	E-KP02+416	E-KP03+159	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Route Centreline - E	E-KP02+194	E-KP02+416	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - E	E-KP01+586	E-KP02+194	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Route Centreline - E	E-KP00+866	E-KP01+586	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Preferred Route Centreline - E	E-KP00+776	E-KP00+866	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Spurs Centreline - W-03	W-03-KP01+828	W-03-KP01+948	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Spurs Centreline - W-02	W-02-KP00+000	W-02-KP00+042	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Preferred Spurs Centreline - W-02	W-02-KP00+121	W-02-KP00+171	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP01+221	W-01-KP01+465	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+166	W-01-KP01+221	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP00+866	W-01-KP01+166	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP00+823	W-01-KP00+866	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)

RSK GEOSCIENCES

Hynet Geohazards Desk Study

Hazard Title: Groundwater Flooding (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Caused by unusually high groundwater levels. Can last for weeks or months. Risk is assessed in the Groundsure report based on a 1:100 year return period.	Insufficient design, delay, excessive displacement, buoyancy, failure, instability of excavations, environmental impacts / pollution, maintenance / repair access issues. - Potential to add cost, time, risk to the project	Preferred Spurs Centreline - W-01	W-01-KP00+553	W-01-KP00+823	Groundwater Flooding	2	4	8 (Minor)	Ground investigation to determine exact geology and groundwater conditions. - Flood Risk Assessment to determine flood risk. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; raising ground levels, re-routing, anchoring to prevent buoyancy issues. - Designer to consider appropriate temporary and permanent drainage	2	3	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP00+456	W-01-KP00+553	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP00+000	W-01-KP00+138	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP00+138	W-01-KP00+178	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Preferred Route Centreline - S	S-KP016+57	S-KP18+444	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Route Centreline - S	S-KP16+548	S-KP016+57	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Preferred Route Centreline - S	S-KP16+372	S-KP16+548	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - S	S-KP16+285	S-KP16+372	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Route Centreline - S	S-KP16+264	S-KP16+285	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Preferred Route Centreline - S	S-KP16+221	S-KP16+264	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Route Centreline - S	S-KP16+124	S-KP16+221	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - S	S-KP16+059	S-KP16+124	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Route Centreline - S	S-KP15+999	S-KP16+059	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - S	S-KP15+948	S-KP15+999	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Route Centreline - S	S-KP015+46	S-KP15+948	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - S	S-KP14+066	S-KP015+46	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Route Centreline - S	S-KP12+937	S-KP14+066	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - S	S-KP12+531	S-KP12+937	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Route Centreline - S	S-KP11+403	S-KP12+531	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - S	S-KP11+353	S-KP11+403	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Route Centreline - S	S-KP11+325	S-KP11+353	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Preferred Route Centreline - S	S-KP11+300	S-KP11+325	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Route Centreline - S	S-KP11+252	S-KP11+300	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Preferred Route Centreline - S	S-KP11+218	S-KP11+252	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Route Centreline - S	S-KP11+111	S-KP11+218	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - S	S-KP11+078	S-KP11+111	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Route Centreline - S	S-KP11+023	S-KP11+078	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - S	S-KP09+769	S-KP11+023	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Route Centreline - S	S-KP08+933	S-KP09+769	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - S	S-KP08+774	S-KP08+933	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Preferred Route Centreline - S	S-KP07+517	S-KP08+774	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - S	S-KP07+255	S-KP07+517	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Route Centreline - S	S-KP07+007	S-KP07+255	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - S	S-KP06+973	S-KP07+007	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Route Centreline - S	S-KP06+554	S-KP06+973	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - S	S-KP04+763	S-KP06+554	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Route Centreline - S	S-KP04+643	S-KP04+763	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - S	S-KP03+614	S-KP04+643	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Route Centreline - S	S-KP03+501	S-KP03+614	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Preferred Route Centreline - S	S-KP02+179	S-KP03+501	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Route Centreline - S	S-KP02+135	S-KP02+179	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Preferred Route Centreline - S	S-KP01+667	S-KP02+135	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Route Centreline - S	S-KP01+640	S-KP01+667	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Preferred Route Centreline - S	S-KP01+197	S-KP01+640	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Route Centreline - S	S-KP00+973	S-KP01+197	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - S	S-KP00+492	S-KP00+973	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP00+000	C-01-KP00+482	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP00+482	C-01-KP00+758	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP00+758	C-01-KP00+847	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP00+847	C-01-KP03+814	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP03+814	C-01-KP04+006	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP04+006	C-01-KP05+349	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP05+349	C-01-KP05+510	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP05+510	C-01-KP06+056	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP06+056	C-01-KP06+086	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP06+086	C-01-KP06+925	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP06+925	C-01-KP06+970	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP06+970	C-01-KP07+136	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP07+136	C-01-KP07+198	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP07+198	C-01-KP07+481	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)

Hynet Geohazards Desk Study

Hazard Title: Groundwater Flooding (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	Closest KP	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Caused by unusually high groundwater levels. Can last for weeks or months. Risk is assessed in the Groundsure report based on a 1:100 year return period.	Insufficient design, delay, excessive displacement, buoyancy, failure, instability of excavations, environmental impacts / pollution, maintenance / repair access issues. - Potential to add cost, time, risk to the project	HAGI - Stanlow HPP HAGI	W-KP00	Groundwater Flooding	3	4	12 (Moderate)	Ground investigation to determine exact geology and groundwater conditions. - Flood Risk Assessment to determine flood risk. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; raising ground levels, re-routing, anchoring to prevent buoyancy issues. - Designer to consider appropriate temporary and permanent drainage	3	3	9 (Minor)
		HAGI - Central Hub HAGI	S-KP00	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		HAGI - Clockface HAGI	N2-KP00	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		HAGI - Rocksavage HAGI	W-01-KP00	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		HAGI - Higher Walton HAGI	N1-02-KP00	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		HAGI - Warburton HAGI	E-02-KP00	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		HAGI - Partington HAGI	E-01-KP00	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		HAGI - Runcorn HAGI	W-02-KP00	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		HAGI - Inovyn Gas Storage HAGI	S-KP18+000	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Trenchless Crossing - Stanlow	W-KP00	Groundwater Flooding	5	4	20 (Severe)		5	3	15 (Substantial)
		Trenchless Crossing - A5117 Road	W-KP02+000	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Trenchless Crossing - Ellesmere Port to Warrington Line Railway	W-KP03+500	Groundwater Flooding	5	4	20 (Severe)		5	3	15 (Substantial)
		Trenchless Crossing - River Weaver	W-KP09+500	Groundwater Flooding	5	4	20 (Severe)		5	3	15 (Substantial)
		Trenchless Crossing - United Utilities Water	W-KP10+500	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Trenchless Crossing - Chester to Manchester Line Railway	W-KP11+000	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Trenchless Crossing - Sutton Weaver Canal	W-KP11+000	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Trenchless Crossing - United Utilities Sewer	W-KP11+500	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Trenchless Crossing - A56 Chester Road	W-KP12+000	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Trenchless Crossing - West Coast Main Line Railway	W-KP16+500	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Trenchless Crossing - Trent and Mersey Canal	W-KP18+000	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Trenchless Crossing - A533 Northwich Road	W-KP18+500	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Trenchless Crossing - A533 Northwich Road	C-01-KP0+500	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Trenchless Crossing - Trent and Mersey Canal	S-KP01+500	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Trenchless Crossing - Weaver Navigation Canal	S-KP02+000	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Trenchless Crossing - West Coast Main Line Railway	S-KP04+500	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Trenchless Crossing - A49 Warrington Road	S-KP06+000	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Trenchless Crossing - Mid Cheshire Line Railway	S-KP07+000	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Trenchless Crossing - A556 Chester Road	S-KP08+500	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+000	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Trenchless Crossing - A533 Road	S-KP15+000	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Trenchless Crossing - River Dane	S-KP16+500	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Trenchless Crossing - Trent and Mersey Canal	S-KP16+500	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Trenchless Crossing - Middlewich Branch Line Railway	S-KP17+500	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Trenchless Crossing - A530 King Street Road	S-KP18+000	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Trenchless Crossing - A49 Tarporley Road	E-KP01+000	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Trenchless Crossing - A559 Northwich Road	E-KP04+000	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Trenchless Crossing - M6 Motorway	E-KP09+500	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Trenchless Crossing - A50 Road	E-KP11+500	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Trenchless Crossing - M56 Motorway	E-KP14+000	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Trenchless Crossing - A56 Lymm Road	E-KP15+500	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Trenchless Crossing - Bridgewater Canal + road	E-KP15+500	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Trenchless Crossing - River Bolin	E-KP17+000	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Trenchless Crossing - M56 Motorway	N1-KP05+000	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Trenchless Crossing - A56 Chester Road	N1-KP08+000	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Trenchless Crossing - Bridgewater Canal	N1-KP08+500	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+500	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Trenchless Crossing - River Mersey, Sanky Canal + Skelton Junction to Ditton Junction Line	N1-KP12+500	Groundwater Flooding	5	4	20 (Severe)		5	3	15 (Substantial)
		Trenchless Crossing - A562 Widnes Road	N1-KP13+500	Groundwater Flooding	4	4	16 (Substantial)		4	3	12 (Moderate)
		Trenchless Crossing - A5080 South Lane Road	N1-KP14+500	Groundwater Flooding	4	4	16 (Substantial)		4	3	12 (Moderate)
		Trenchless Crossing - Manchester and Allerton Junction Line Railway	N1-KP15+000	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Trenchless Crossing - A57 Warrington Road	N1-KP18+000	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Trenchless Crossing - M62 Motorway	N2-04-KP00	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Trenchless Crossing - A570 St Helens Linkway Road	N2-KP01+500	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Trenchless Crossing - Liverpool to Manchester Line Railway	N2-KP02+500	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Trenchless Crossing - Weaver Navigation Canal	W-KP10+500	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Trenchless Crossing - A557 Weston Point Expressway - Rocksavage Way	W-03-KP0+500	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Trenchless Crossing - A6144 Manchester Road	E-05-KP00	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Trenchless Crossing - West Coast Mainline Railway	N1-05-KP0+500	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Trenchless Crossing - Eastford Road and Canal	N1-02-KP01+500	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Trenchless Crossing - London Road	S-KP15+500	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Trenchless Crossing - NULL	N1-02-KP02+000	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Block Valve - NULL	E-KP12+000	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Block Valve - NULL	S-KP08+500	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Trenchless Crossing - Manchester and Allerton Junction Line Railway	N1-KP15+000	Groundwater Flooding	5	4	20 (Severe)		5	3	15 (Substantial)
		Trenchless Crossing - Manchester and Allerton Junction Line Railway	N1-KP15+000	Groundwater Flooding	4	4	16 (Substantial)		4	3	12 (Moderate)
		Trenchless Crossing - A562 Widnes Road	N1-KP13+500	Groundwater Flooding	5	4	20 (Severe)		5	3	15 (Substantial)
		Trenchless Crossing - A562 Widnes Road	N1-KP14+000	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Trenchless Crossing - River Mersey, Sanky Canal + Skelton Junction to Ditton Junction Line	N1-KP12+500	Groundwater Flooding	4	4	16 (Substantial)		4	3	12 (Moderate)
		Trenchless Crossing - River Mersey, Sanky Canal + Skelton Junction to Ditton Junction Line	N1-KP13+000	Groundwater Flooding	4	4	16 (Substantial)		4	3	12 (Moderate)
		Trenchless Crossing - River Mersey, Sanky Canal + Skelton Junction to Ditton Junction Line	N1-KP12+500	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Trenchless Crossing - River Mersey, Sanky Canal + Skelton Junction to Ditton Junction Line	N1-KP13+000	Groundwater Flooding	5	4	20 (Severe)		5	3	15 (Substantial)
		Trenchless Crossing - River Mersey, Sanky Canal + Skelton Junction to Ditton Junction Line	N1-KP12+500	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Trenchless Crossing - River Mersey, Sanky Canal + Skelton Junction to Ditton Junction Line	N1-KP12+500	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)

Hynet Geohazards Desk Study

Hazard Title: Groundwater Flooding (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	Closest KP	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Caused by unusually high groundwater levels. Can last for weeks or months. Risk is assessed in the Groundsure report based on a 1:100 year return period.	Insufficient design, delay, excessive displacement, buoyancy, failure, instability of excavations, environmental impacts / pollution, maintenance / repair access issues. - Potential to add cost, time, risk to the project	Trenchless Crossing - River Mersey, Sanky Canal + Skelton Junction to Ditton Junction Line	N1-KP12+500	Groundwater Flooding	3	4	12 (Moderate)	Ground investigation to determine exact geology and groundwater conditions. - Flood Risk Assessment to determine flood risk. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; raising ground levels, re-routing, anchoring to prevent buoyancy issues. - Designer to consider appropriate temporary and permanent drainage	3	3	9 (Minor)
		Trenchless Crossing - River Mersey, Sanky Canal + Skelton Junction to Ditton Junction Line	N1-KP12+500	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Trenchless Crossing - Eastford Road and Canal	N1-02-KP01+500	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Trenchless Crossing - Eastford Road and Canal	N1-02-KP02+000	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Trenchless Crossing - West Coast Mainline Railway	N1-05-KP0+500	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Trenchless Crossing - West Coast Mainline Railway	N1-KP09+500	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		HAGI - Higher Walton HAGI	N1-02-KP00	Groundwater Flooding	5	4	20 (Severe)		5	3	15 (Substantial)
		HAGI - Higher Walton HAGI	N1-05-KP00	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		HAGI - Higher Walton HAGI	N1-05-KP00	Groundwater Flooding	4	4	16 (Substantial)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+500	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+500	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+500	Groundwater Flooding	5	4	20 (Severe)		5	3	15 (Substantial)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+500	Groundwater Flooding	4	4	16 (Substantial)		4	3	12 (Moderate)
		Trenchless Crossing - Bridgewater Canal	N1-KP08+500	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Trenchless Crossing - Bridgewater Canal	N1-KP08+500	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Trenchless Crossing - Stanlow	W-KP00	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		HAGI - Stanlow HPP HAGI	W-KP00	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		HAGI - Stanlow HPP HAGI	W-KP00	Groundwater Flooding	5	4	20 (Severe)		5	3	15 (Substantial)
		HAGI - Stanlow HPP HAGI	W-KP00	Groundwater Flooding	4	4	16 (Substantial)		4	3	12 (Moderate)
		HAGI - Stanlow HPP HAGI	W-KP00	Groundwater Flooding	4	4	16 (Substantial)		4	3	12 (Moderate)
		HAGI - Stanlow HPP HAGI	W-KP00	Groundwater Flooding	4	4	16 (Substantial)		4	3	12 (Moderate)
		HAGI - Stanlow HPP HAGI	W-KP00	Groundwater Flooding	4	4	16 (Substantial)		4	3	12 (Moderate)
		HAGI - Stanlow HPP HAGI	W-KP00	Groundwater Flooding	4	4	16 (Substantial)		4	3	12 (Moderate)
		Trenchless Crossing - A5117 Road	W-KP02+000	Groundwater Flooding	4	4	16 (Substantial)		4	3	12 (Moderate)
		Trenchless Crossing - A5117 Road	W-KP02+000	Groundwater Flooding	4	4	16 (Substantial)		4	3	12 (Moderate)
		Trenchless Crossing - Ellesmere Port to Warrington Line Railway	W-KP03+000	Groundwater Flooding	4	4	16 (Substantial)		4	3	12 (Moderate)
		Trenchless Crossing - Ellesmere Port to Warrington Line Railway	W-KP03+000	Groundwater Flooding	5	4	20 (Severe)		5	3	15 (Substantial)
		HAGI - Runcorn HAGI	W-03-KP00	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Trenchless Crossing - River Weaver	W-KP09+500	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Trenchless Crossing - River Weaver	W-KP10+000	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Trenchless Crossing - River Weaver	W-KP10+000	Groundwater Flooding	5	4	20 (Severe)		5	3	15 (Substantial)
		Trenchless Crossing - River Weaver	W-KP10+000	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Trenchless Crossing - River Weaver	W-KP09+500	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Trenchless Crossing - River Weaver	W-KP09+500	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Trenchless Crossing - River Weaver	W-KP09+500	Groundwater Flooding	4	4	16 (Substantial)		4	3	12 (Moderate)
		Trenchless Crossing - River Weaver	W-KP09+500	Groundwater Flooding	5	4	20 (Severe)		5	3	15 (Substantial)
		Trenchless Crossing - Weaver Navigation Canal	W-KP10+500	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Trenchless Crossing - Weaver Navigation Canal	W-KP10+500	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Trenchless Crossing - United Utilities Water	W-KP10+500	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Trenchless Crossing - United Utilities Water	W-KP10+500	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Trenchless Crossing - Sutton Weaver Canal	W-KP11+500	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Trenchless Crossing - Mid Cheshire Line Railway	S-KP07+000	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+500	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+500	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+500	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+000	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+500	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+000	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+000	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+500	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Trenchless Crossing - River Dane	S-KP16+500	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Trenchless Crossing - River Dane	S-KP16+500	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Trenchless Crossing - Tren: and Mersey Canal	S-KP16+500	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Trenchless Crossing - Tren: and Mersey Canal	S-KP16+500	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Trenchless Crossing - Weaver Navigation Canal	S-KP02+000	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Trenchless Crossing - Weaver Navigation Canal	S-KP02+000	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Trenchless Crossing - Tren: and Mersey Canal	S-KP01+500	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Trenchless Crossing - Tren: and Mersey Canal	S-KP01+500	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Trenchless Crossing - Tren: and Mersey Canal	W-KP18+000	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Trenchless Crossing - Tren: and Mersey Canal	W-KP18+000	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Trenchless Crossing - Bridgewater Canal + road	E-KP15+500	Groundwater Flooding	2	4	8 (Minor)		2	3	6 (Minor)
		Trenchless Crossing - Bridgewater Canal + road	E-KP15+500	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Trenchless Crossing - River Bolin	E-KP17+000	Groundwater Flooding	3	4	12 (Moderate)		3	3	9 (Minor)
		Trenchless Crossing - River Bolin	E-KP17+000	Groundwater Flooding	1	4	4 (None / Negligible)		1	3	3 (None / Negligible)
		Trenchless Crossing - A6144 Manchester Road	E-05-KP00	Groundwater Flooding	5	4	20 (Severe)		5	3	15 (Substantial)
		Trenchless Crossing - A6144 Manchester Road	E-05-KP00	Groundwater Flooding	4	4	16 (Substantial)		4	3	12 (Moderate)

APPENDIX C
RISK ASSESSMENT TABLE – GEOHAZARDS - POTENTIALLY LIQUIFIABLE SOILS

Hynet Geohazards Desk Study

Hazard Title: Potentially Liquifiable Soils

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Soils that are potentially susceptible to liquefaction due to seismic activity. Saturated, very loose and loose, silty sand layers may be locally present	Insufficient design, delay, excessive displacement, differential displacement, failure of foundations, slopes and excavation instability. - Potential to add cost and risk to the project	Preferred Route Centreline - W	W-KP02+292	W-KP11+305	TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	4	3	12 (Moderate)	Ground investigation to determine exact geology and groundwater conditions and determine liquefaction potential. - Designer to consider seismicity and seismic design for sensitive structures in accordance with BS EN 1998-1:2004 Eurocode 8: Design of structures for earthquake resistance. - Consider application of ground improvement techniques	3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP17+143	W-KP17+318	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP17+318	W-KP17+143	ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP00+784	E-KP00+864	ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP06+052	E-KP07+222	ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP15+123	E-KP015+96	SHIRDLEY HILL SAND FORMATION - SAND	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP015+96	E-KP16+692	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP17+107	E-KP21+662	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP17+571	E-KP19+741	SHIRDLEY HILL SAND FORMATION - SAND	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP16+882	E-KP20+177	ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP15+309	S-KP15+366	ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP16+222	S-KP16+377	ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP17+489	S-KP17+532	ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP11+103	S-KP11+071	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP04+608	S-KP04+649	ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP16+081	S-KP11+103	ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP02+800	S-KP03+505	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP01+822	S-KP01+977	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP01+977	S-KP02+800	ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP08+078	N1-KP011+48	SHIRDLEY HILL SAND FORMATION - SAND	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP12+963	N1-KP13+645	SHIRDLEY HILL SAND FORMATION - SAND	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP09+305	N1-KP12+526	TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP14+494	N1-KP14+502	ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP14+972	N1-KP15+136	SHIRDLEY HILL SAND FORMATION - SAND	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP07+487	C-01-KP07+966	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP07+059	C-01-KP07+199	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP06+837	C-01-KP06+997	ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP04+682	N1-02-KP04+888	SHIRDLEY HILL SAND FORMATION - SAND	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+275	N1-02-KP05+813	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+000	N1-02-KP06+110	TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - E-01	E-01-KP00+000	E-01-KP00+438	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - E-01	E-01-KP00+438	E-01-KP00+430	ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+000	N1-05-KP00+677	TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+445	N2-06-KP00+504	ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+774	N2-06-KP00+962	ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - E-02	E-02-KP00+000	E-02-KP00+155	SHIRDLEY HILL SAND FORMATION - SAND	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - E-04	E-04-KP00+000	E-04-KP00+261	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP00+000	W-01-KP01+201	TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - E-05	E-05-KP00+000	E-05-KP00+124	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		3	2	6 (Minor)

Hynet Geohazards Desk Study

Hazard Title: Potentially Liquifiable Soils

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	Closest KP	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Soils that are potentially susceptible to liquefaction due to seismic activity. Saturated, very loose and loose, silty sand layers may be locally present	Insufficient design, delay, excessive displacement, differential displacement, failure of foundations, slopes and excavation instability. - Potential to add cost and risk to the project	HAGI - Stanlow HPP HAGI	W-KP00	ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	4	3	12 (Moderate)	Ground investigation to determine exact geology and groundwater conditions and determine liquefaction potential. - Designer to consider seismicity and seismic design for sensitive structures in accordance with BS EN 1998-1:2004 Eurocode 8: Design of structures for earthquake resistance. - Consider application of ground improvement techniques	3	2	6 (Minor)
		HAGI - Rocksavage HAGI	W-01-KP00	TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	4	3	12 (Moderate)		3	2	6 (Minor)
		HAGI - Higher Walton HAGI	N1-05-KP00	TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	4	3	12 (Moderate)		3	2	6 (Minor)
		HAGI - Warburton HAGI	E-02-KP00	SHIRDLEY HILL SAND FORMATION - SAND	4	3	12 (Moderate)		3	2	6 (Minor)
		HAGI - Partington HAGI	E-01-KP00	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - Ellesmere Port to Warrington Line Railway	W-KP03+000	TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	4	3	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - River Weaver	W-KP10+000	TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	4	3	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - United Utilities Water	W-KP10+500	TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	4	3	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - Chester to Manchester Line Railway	W-KP11+000	TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	4	3	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - Sutton Weaver Canal	W-KP11+000	TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	4	3	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - Weaver Navigation Canal	S-KP02+000	ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	4	3	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+000	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+000	ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	4	3	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - River Dane	S-KP16+500	ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	4	3	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - A56 Lymm Road	E-KP15+500	SHIRDLEY HILL SAND FORMATION - SAND	4	3	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - Bridgewater Canal + road	E-KP15+500	SHIRDLEY HILL SAND FORMATION - SAND	4	3	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - River Bolin	E-KP17+000	ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	4	3	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - Bridgewater Canal	N1-KP08+500	SHIRDLEY HILL SAND FORMATION - SAND	4	3	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+500	TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	4	3	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - River Mersey, Sanky Canal + Skelton Junction to Ditton Junction Line	N1-KP12+500	SHIRDLEY HILL SAND FORMATION - SAND	4	3	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - River Mersey, Sanky Canal + Skelton Junction to Ditton Junction Line	N1-KP12+500	TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	4	3	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - Weaver Navigation Canal	W-KP10+500	TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	4	3	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - A6144 Manchester Road	E-05-KP00	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - A6144 Manchester Road	E-05-KP00	ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	4	3	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - West Coast Mainline Railway	N1-05-KP0+500	TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	4	3	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - Eastford Road and Canal	N1-02-KP01+500	TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	4	3	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - NULL	N1-02-KP02+000	TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	4	3	12 (Moderate)		3	2	6 (Minor)

APPENDIX C
RISK ASSESSMENT TABLE – GEOHAZARDS – COLLAPSIBLE SOILS

Hynet Geohazards Desk Study

Hazard Title: Collapsible Soils (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Soils that has potential to reduces in volume on wetting, typically responding rapidly to inundation.	Insufficient design, delay, excessive displacement, differential displacement, failure of foundations, slopes and excavation instability. *Potential to add cost and risk to the project*	Preferred Route Centreline - W	W-KP00+464	W-KP01+809	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8	Ground investigation to determine exact geology and groundwater conditions and determine potential for presence of collapsible soils. Design to consider engineering mitigation which includes in-situ compaction, removal and replacement, pre-wetting to induce volume reduction prior to construction, chemical stabilization or grouting, transfer of loads to competent strata not susceptible to collapse.	2	2	4
		Preferred Route Centreline - W	W-KP01+809	W-KP02+292	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Route Centreline - W	W-KP17+143	W-KP17+318	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Route Centreline - W	W-KP13+305	W-KP13+087	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Route Centreline - W	W-KP06+752	W-KP11+305	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4		1	2	2
		Preferred Route Centreline - W	W-KP19+216	W-KP19+303	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Route Centreline - W	W-KP02+292	W-KP06+752	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4		1	2	2
		Preferred Route Centreline - W	W-KP00+000	W-KP00+464	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Route Centreline - E	E-KP12+898	E-KP12+961	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Route Centreline - E	E-KP16+882	E-KP17+107	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4		1	2	2
		Preferred Route Centreline - E	E-KP06+329	E-KP06+748	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Route Centreline - E	E-KP06+052	E-KP06+187	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4		1	2	2
		Preferred Route Centreline - E	E-KP09+541	E-KP10+524	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4		1	2	2
		Preferred Route Centreline - E	E-KP12+961	E-KP16+882	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Route Centreline - E	E-KP21+123	E-KP21+500	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4		1	2	2
		Preferred Route Centreline - E	E-KP17+107	E-KP19+659	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Route Centreline - E	E-KP00+000	E-KP00+784	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Route Centreline - E	E-KP20+728	E-KP21+058	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4		1	2	2
		Preferred Route Centreline - E	E-KP00+784	E-KP00+864	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4		1	2	2
		Preferred Route Centreline - S	S-KP12+604	S-KP12+803	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Route Centreline - S	S-KP15+309	S-KP15+366	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4		1	2	2
		Preferred Route Centreline - S	S-KP01+977	S-KP02+796	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4		1	2	2
		Preferred Route Centreline - S	S-KP02+800	S-KP03+489	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Route Centreline - S	S-KP11+333	S-KP12+266	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Route Centreline - S	S-KP08+786	S-KP08+940	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4		1	2	2
		Preferred Route Centreline - S	S-KP12+266	S-KP12+479	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Route Centreline - S	S-KP17+489	S-KP17+532	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4		1	2	2
		Preferred Route Centreline - S	S-KP04+608	S-KP04+649	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4		1	2	2
		Preferred Route Centreline - S	S-KP01+638	S-KP01+977	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Route Centreline - S	S-KP00+000	S-KP01+638	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Route Centreline - S	S-KP02+796	S-KP02+800	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4		1	2	2
		Preferred Route Centreline - N1	N1-KP12+963	N1-KP14+129	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Route Centreline - N1	N1-KP14+494	N1-KP14+502	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4		1	2	2
		Preferred Route Centreline - N1	N1-KP00+137	N1-KP02+495	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Route Centreline - N1	N1-KP00+000	N1-KP00+137	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Route Centreline - N2	N2-KP00+000	N2-KP00+033	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Route Centreline - N2	N2-KP02+359	N2-KP03+352	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Spurs Centreline - C-01	C-01-KP06+184	C-01-KP06+837	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Spurs Centreline - C-01	C-01-KP06+837	C-01-KP06+935	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4		1	2	2
		Preferred Spurs Centreline - C-01	C-01-KP06+935	C-01-KP06+997	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4		1	2	2
		Preferred Spurs Centreline - C-01	C-01-KP00+000	C-01-KP06+184	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Spurs Centreline - W-03	W-03-KP00+000	W-03-KP01+948	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Spurs Centreline - N1-02	N1-02-KP00+000	N1-02-KP01+609	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4		1	2	2
		Preferred Spurs Centreline - N2-04	N2-04-KP00+024	N2-04-KP02+035	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Spurs Centreline - N2-04	N2-04-KP00+000	N2-04-KP00+024	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Spurs Centreline - N1-05	N1-05-KP00+000	N1-05-KP00+677	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4		1	2	2
		Preferred Spurs Centreline - E-02	E-02-KP00+000	E-02-KP00+155	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Spurs Centreline - E-04	E-04-KP00+000	E-04-KP00+261	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Spurs Centreline - E-04	E-04-KP00+261	E-04-KP00+588	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4		1	2	2
		Preferred Spurs Centreline - N2-07	N2-KP06+129	N2-07-KP00+157	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Spurs Centreline - W-01	W-01-KP01+416	W-01-KP01+465	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Spurs Centreline - W-02	W-02-KP00+048	W-02-KP00+171	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Spurs Centreline - W-02	W-02-KP00+000	W-02-KP00+048	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Spurs Centreline - E-05	E-05-KP00+000	E-05-KP00+124	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Spurs Centreline - W	W-KP16+864	W-KP17+143	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4		1	2	2
		Preferred Spurs Centreline - W	W-KP17+318	W-KP17+648	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4		1	2	2
		Preferred Spurs Centreline - W	W-KP13+087	W-KP16+864	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Spurs Centreline - W	W-KP17+648	W-KP19+216	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Spurs Centreline - E	E-KP20+125	E-KP20+177	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4		1	2	2
		Preferred Spurs Centreline - E	E-KP19+897	E-KP19+961	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4		1	2	2
		Preferred Spurs Centreline - E	E-KP21+500	E-KP21+662	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Spurs Centreline - E	E-KP21+058	E-KP21+123	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Spurs Centreline - E	E-KP20+177	E-KP20+728	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Spurs Centreline - E	E-KP19+961	E-KP20+125	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Spurs Centreline - E	E-KP19+659	E-KP19+897	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Spurs Centreline - E	E-KP04+034	E-KP06+052	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Spurs Centreline - E	E-KP03+671	E-KP03+984	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Spurs Centreline - E	E-KP03+984	E-KP04+034	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Spurs Centreline - E	E-KP00+864	E-KP03+671	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Spurs Centreline - E	E-KP07+161	E-KP07+222	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4		1	2	2
		Preferred Spurs Centreline - E	E-KP06+748	E-KP07+020	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4		1	2	2
		Preferred Spurs Centreline - E	E-KP06+187	E-KP06+329	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4		1	2	2
		Preferred Spurs Centreline - E	E-KP10+524	E-KP12+898	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Spurs Centreline - E	E-KP07+222	E-KP09+541	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Spurs Centreline - E	E-KP07+020	E-KP07+161	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Spurs Centreline - S	S-KP12+479	S-KP12+604	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Spurs Centreline - S	S-KP12+803	S-KP15+309	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Spurs Centreline - S	S-KP16+125	S-KP16+222	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Spurs Centreline - S	S-KP15+366	S-KP16+081	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Spurs Centreline - S	S-KP18+001	S-KP18+365	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Spurs Centreline - S	S-KP18+401	S-KP18+444	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Spurs Centreline - S	S-KP11+071	S-KP11+103	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4		1	2	2
		Preferred Spurs Centreline - S	S-KP11+234	S-KP11+333	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4		1	2	2
		Preferred Spurs Centreline - S	S-KP18+365	S-KP18+401	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Spurs Centreline - S	S-KP17+532	S-KP18+001	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Spurs Centreline - S	S-KP16+377	S-KP17+489	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Spurs Centreline - S	S-KP03+489	S-KP04+608	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Spurs Centreline - S	S-KP04+649	S-KP08+786	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Spurs Centreline - S	S-KP08+940	S-KP11+071	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Spurs Centreline - S	S-KP11+103	S-KP11+234	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Spurs Centreline - S	S-KP16+222	S-KP16+377	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4		1	2	2
		Preferred Spurs Centreline - S	S-KP16+081	S-KP16+125	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4		1	2	2
		Preferred Route Centreline - N1	N1-KP10+338	N1-KP11+48	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Route Centreline - N1	N1-KP08+700	N1-KP09+305	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4

Hynet Geohazards Desk Study

Hazard Title: Collapsible Soils (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Soils that has potential to reduces in volume on wetting, typically responding rapidly to inundation.	Insufficient design, delay, excessive displacement, differential displacement, failure of foundations, slopes and excavation instability. Potential to add cost and risk to the project	Preferred Route Centreline - N1	N1-KP14+502	N1-KP19+023	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8	Ground investigation to determine exact geology and groundwater conditions and determine potential for presence of collapsible soils. Design to consider engineering mitigation which includes in-situ compaction, removal and replacement, pre-wetting to induce volume reduction prior to construction, chemical stabilization or grouting, transfer of loads to competent strata not susceptible to collapse.	2	2	4
		Preferred Route Centreline - N1	N1-KP14+129	N1-KP14+494	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Route Centreline - N1	N1-KP07+168	N1-KP08+700	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Route Centreline - N1	N1-KP06+159	N1-KP06+986	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Route Centreline - N1	N1-KP05+685	N1-KP06+115	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Route Centreline - N1	N1-KP02+455	N1-KP05+190	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Route Centreline - N1	N1-KP01+48	N1-KP17+526	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4		1	2	2
		Preferred Route Centreline - N1	N1-KP09+905	N1-KP10+338	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4		1	2	2
		Preferred Route Centreline - N2	N2-KP03+352	N2-KP06+129	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Route Centreline - N2	N2-KP00+033	N2-KP02+399	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Spurs Centreline - C-01	C-01-KP07+022	C-01-KP07+297	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Spurs Centreline - C-01	C-01-KP07+315	C-01-KP07+966	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Spurs Centreline - C-01	C-01-KP06+997	C-01-KP07+022	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Spurs Centreline - C-01	C-01-KP07+297	C-01-KP07+315	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Spurs Centreline - N1-02	N1-02-KP05+813	N1-02-KP06+110	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4		1	2	2
		Preferred Spurs Centreline - N1-02	N1-02-KP05+664	N1-02-KP05+716	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4		1	2	2
		Preferred Spurs Centreline - N1-02	N1-02-KP01+609	N1-02-KP03+275	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4		1	2	2
		Preferred Spurs Centreline - N1-02	N1-02-KP05+716	N1-02-KP05+813	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Spurs Centreline - N1-02	N1-02-KP03+275	N1-02-KP05+664	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Spurs Centreline - E-01	E-01-KP00+363	E-01-KP00+430	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4		1	2	2
		Preferred Spurs Centreline - E-01	E-01-KP00+438	E-01-KP00+454	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4		1	2	2
		Preferred Spurs Centreline - E-01	E-01-KP00+430	E-01-KP00+438	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Spurs Centreline - E-01	E-01-KP00+000	E-01-KP00+363	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Spurs Centreline - N2-06	N2-06-KP00+962	N2-06-KP01+199	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Spurs Centreline - N2-06	N2-KP05+129	N2-06-KP00+445	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Spurs Centreline - N2-06	N2-06-KP00+873	N2-06-KP00+881	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Spurs Centreline - N2-06	N2-06-KP00+504	N2-06-KP00+774	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Spurs Centreline - N2-06	N2-06-KP00+881	N2-06-KP00+962	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4		1	2	2
		Preferred Spurs Centreline - N2-06	N2-06-KP00+774	N2-06-KP00+873	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4		1	2	2
		Preferred Spurs Centreline - N2-06	N2-06-KP00+445	N2-06-KP00+504	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4		1	2	2
		Preferred Spurs Centreline - W-01	W-01-KP01+201	W-01-KP01+416	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Spurs Centreline - W-01	W-01-KP00+458	W-01-KP01+073	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8		2	2	4
		Preferred Spurs Centreline - W-01	W-01-KP01+073	W-01-KP01+201	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4		1	2	2
		Preferred Spurs Centreline - W-01	W-01-KP00+000	W-01-KP00+458	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4		1	2	2

Hynet Geohazards Desk Study

Hazard Title: Collapsible Soils (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	Closest KP	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Soils that has potential to reduces in volume on wetting, typically responding rapidly to inundation.	Insufficient design, delay, excessive displacement, differential displacement, failure of foundations, slopes and excavation instability. Potential to add cost and risk to the project	HAGI - Stanlow HPP HAGI	W-KP00	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4 (None / Negligible)	Ground investigation to determine exact geology and groundwater conditions and determine potential for presence of collapsible soils. Design to consider engineering mitigation which includes in-situ compaction, removal and replacement, pre-wetting to induce volume reduction prior to construction, chemical stabilisation or grouting, transfer of loads to competent strata not susceptible to collapse.	1	2	2 (None / Negligible)
		HAGI - Stanlow HPP HAGI	W-KP00	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		HAGI - Stanlow HPP HAGI	W-KP00	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		HAGI - Central Hub HAGI	S-KP00	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		HAGI - Clockface HAGI	N2-04-KP00	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		HAGI - Clockface HAGI	N2-KP00	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		HAGI - Rocksavage HAGI	W-01-KP00	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		HAGI - Higher Walton HAGI	N1-05-KP00	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		HAGI - Warburton HAGI	E-02-KP00	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		HAGI - Partington HAGI	E-01-KP00	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		HAGI - Runcorn HAGI	W-02-KP00	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		HAGI - Runcorn HAGI	W-02-KP00	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		HAGI - Ingvyn Gas Storage HAGI	S-KP18+000	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		HAGI - Ingvyn Gas Storage HAGI	S-KP18+000	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Stanlow	W-KP00	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A5117 Road	W-KP01+500	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A5117 Road	W-KP02+000	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Ellesmere Port to Warrington Line Railway	W-KP03+000	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - River Weaver	W-KP10+000	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - United Utilities Water	W-KP10+500	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Chester to Manchester Line Railway	W-KP11+000	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Sutton Weaver Canal	W-KP11+500	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Sutton Weaver Canal	W-KP11+000	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - United Utilities Sewer	W-KP11+500	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A56 Chester Road	W-KP12+000	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - West Coast Main Line Railway	W-KP16+500	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Trent and Mersey Canal	W-KP18+000	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A533 Northwich Road	W-KP18+500	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A533 Northwich Road	C-01-KP0+500	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Trent and Mersey Canal	S-KP01+500	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Trent and Mersey Canal	S-KP01+500	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Weaver Navigation Canal	S-KP02+000	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - West Coast Main Line Railway	S-KP04+500	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A49 Warrington Road	S-KP06+000	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Mid Cheshire Line Railway	S-KP07+000	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A556 Chester Road	S-KP08+500	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+000	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+500	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A533 Road	S-KP15+000	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - River Dane	S-KP16+500	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Trent and Mersey Canal	S-KP16+500	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Middlewich Branch Line Railway	S-KP17+500	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A530 King Street Road	S-KP18+000	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A530 King Street Road	S-KP18+000	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A49 Tarporley Road	E-KP01+000	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A559 Northwich Road	E-KP04+000	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - M6 Motorway	E-KP09+500	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A50 Road	E-KP11+500	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - M56 Motorway	E-KP14+000	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A56 Lymm Road	E-KP15+500	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Bridgewater Canal + road	E-KP15+500	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - River Bollin	E-KP17+000	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - M56 Motorway	N1-KP04+000	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A56 Chester Road	N1-KP08+000	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Bridgewater Canal	N1-KP08+500	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+500	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - River Mersey, Sanky Canal + Skelton Junction to Ditton Junction Line	N1-KP12+500	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A562 Widnes Road	N1-KP13+500	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A5080 South Lane Road	N1-KP14+500	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Manchester and Allerton Junction Line Railway	N1-KP15+000	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A57 Warrington Road	N1-KP18+000	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - M62 Motorway	N2-04-KP00	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A570 St Helens Linkway Road	N2-KP01+500	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Liverpool to Manchester ,ine Railway	N2-KP02+500	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Liverpool to Manchester ,ine Railway	N2-KP02+500	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Weaver Navigation Canal	W-KP10+500	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - A557 Weston Point Expressway - Rocksavage Way	W-03-KP0+500	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A6144 Manchester Road	E-05-KP00	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - A6144 Manchester Road	E-05-KP00	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - West Coast Mainline Railway	N1-05-KP0+500	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Eastford Road and Canal	N1-02-KP01+500	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Eastford Road and Canal	N1-02-KP01+500	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - London Road	S-KP15+500	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - NULL	N1-02-KP02+000	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Block Valve - NULL	E-KP12+000	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Block Valve - NULL	S-KP08+500	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		HAGI - Stanlow HPP HAGI	W-KP00	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)

Hynet Geohazards Desk Study

Hazard Title: Collapsible Soils (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	Closest KP	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Soils that has potential to reduces in volume on wetting, typically responding rapidly to inundation.	Insufficient design, delay, excessive displacement, differential displacement, failure of foundations, slopes and excavation instability. Potential to add cost and risk to the project	Trenchless Crossing - Stanlow	W-KP00	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)	Ground investigation to determine exact geology and groundwater conditions and determine potential for presence of collapsible soils. Design to consider engineering mitigation which includes in-situ compaction, removal and replacement, pre-wetting to induce volume reduction prior to construction, chemical stabilization or grouting, transfer of loads to competent strata not susceptible to collapse.	2	2	4 (None / Negligible)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+000	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+000	Deposits with potential to collapse when loaded and saturated are unlikely to be present.	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - River Mersey, Sanky Canal + Skelton Junction to Ditton Junction Line	N1-KP12+500	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - River Mersey, Sanky Canal + Skelton Junction to Ditton Junction Line	N1-KP12+500	Deposits with potential to collapse when loaded and saturated are believed not to be present.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)

APPENDIX C
RISK ASSESSMENT TABLE – GEOHAZARDS – COMPRESSIBLE SOILS

RSK GEOSCIENCES

Hynet Geohazards Desk Study

Hazard Title: Compressible Soils (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Soft, low strength compressible soils with low bearing capacity	Insufficient design, delay, excessive displacement, failure. - Potential to add cost, time, risk to the project	Preferred Route Centreline - W	W-KP00+464	W-KP01+809	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)	Ground investigation to determine exact geology and groundwater conditions. - Design to consider conservative soil parameters. - Foundation loads taken to competent strata. - Designer to consider potential for consolidation settlement, secondary (creep) settlement as a result of applied structural loads or raising ground levels. - Use of engineering mitigation such as ground improvement, surcharging / band drain, consideration of negative skin friction.	1	2	2 (None / Negligible)
		Preferred Route Centreline - W	W-KP19+216	W-KP19+303	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - W	W-KP06+752	W-KP10+596	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP17+648	W-KP15+854	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - W	W-KP01+809	W-KP02+292	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - W	W-KP11+305	W-KP13+087	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - W	W-KP17+143	W-KP17+318	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - W	W-KP17+318	W-KP17+143	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP00+000	W-KP00+464	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - W	W-KP02+292	W-KP06+752	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP00+784	E-KP00+864	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP16+882	E-KP17+107	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP00+864	E-KP04+034	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - E	E-KP09+541	E-KP10+524	Highly compressible strata present. Significant constraint on land use depending on thickness.	5	4	20 (Severe)		5	2	10 (Moderate)
		Preferred Route Centreline - E	E-KP07+020	E-KP12+898	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - E	E-KP19+897	E-KP20+177	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP20+728	E-KP20+842	Highly compressible strata present. Significant constraint on land use depending on thickness.	5	4	20 (Severe)		5	2	10 (Moderate)
		Preferred Route Centreline - E	E-KP17+107	E-KP19+659	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - E	E-KP00+000	E-KP00+784	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - E	E-KP06+187	E-KP07+222	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP19+659	E-KP20+728	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - E	E-KP06+329	E-KP06+748	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - E	E-KP13+449	E-KP16+882	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - E	E-KP06+052	E-KP06+187	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP03+671	E-KP06+052	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - E	E-KP12+898	E-KP12+961	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - S	S-KP04+608	S-KP04+649	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP08+786	S-KP08+940	Highly compressible strata present. Significant constraint on land use depending on thickness.	5	4	20 (Severe)		5	2	10 (Moderate)
		Preferred Route Centreline - S	S-KP02+796	S-KP02+800	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP18+401	S-KP18+365	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - S	S-KP11+734	S-KP11+103	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP16+377	S-KP18+401	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - S	S-KP00+000	S-KP01+638	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - S	S-KP12+266	S-KP12+479	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - S	S-KP11+333	S-KP12+266	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - S	S-KP01+638	S-KP01+913	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - S	S-KP15+309	S-KP15+366	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP17+489	S-KP17+532	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP12+604	S-KP12+803	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - S	S-KP16+081	S-KP16+377	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP11+103	S-KP03+709	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - S	S-KP02+151	S-KP02+796	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP13+599	S-KP12+604	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - S	S-KP02+800	S-KP03+489	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP12+963	N1-KP14+129	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP08+700	N1-KP10+571	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP14+494	N1-KP14+502	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP00+000	N1-KP00+137	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP02+495	N1-KP08+700	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP00+137	N1-KP02+495	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP14+129	N1-KP19+023	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP09+305	N1-KP12+526	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N2	N2-KP02+399	N2-KP03+352	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP00+033	N2-KP05+211	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP00+000	N2-KP00+033	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP06+930	C-01-KP06+935	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP06+270	C-01-KP06+655	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP00+000	C-01-KP06+053	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP06+935	C-01-KP06+997	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP07+651	C-01-KP07+153	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP06+997	C-01-KP07+022	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - W-03	W-03-KP00+000	W-03-KP01+948	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+609	N1-02-KP06+110	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+275	N1-02-KP05+813	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+023	N1-02-KP01+304	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N2-04	N2-04-KP00+024	N2-04-KP01+917	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - N2-04	N2-04-KP00+000	N2-04-KP00+024	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+000	N1-05-KP00+677	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - E-02	E-02-KP00+000	E-02-KP00+155	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - E-04	E-04-KP00+522	E-04-KP00+531	Highly compressible strata present. Significant constraint on land use depending on thickness.	5	4	20 (Severe)		5	2	10 (Moderate)
		Preferred Spurs Centreline - W-01	W-01-KP01+416	W-01-KP01+465	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP00+086	W-01-KP01+201	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP00+458	W-01-KP01+416	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - W-02	W-02-KP00+000	W-02-KP00+048	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - W-02	W-02-KP00+048	W-02-KP00+171	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - W	W-KP00+925	W-KP00+963	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - W	W-KP00+925	W-KP00+963	IF BGS or RSK BH records within 25m either side of centreline show MG>2m	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP10+596	W-KP010+92	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP10+596	W-KP010+92	If any landfill or infilled pits present	5	4	20 (Severe)		5	2	10 (Moderate)
		Preferred Route Centreline - W	W-KP07+919	W-KP08+053	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP07+919	W-KP08+053	If any landfill or infilled pits present	5	4	20 (Severe)		5	2	10 (Moderate)
		Preferred Route Centreline - W	W-KP10+105	W-KP10+575	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP10+105	W-KP10+575	If any landfill or infilled pits present	5	4	20 (Severe)		5	2	10 (Moderate)
		Preferred Route Centreline - E	E-KP08+571	E-KP08+587	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - E	E-KP08+571	E-KP08+587	If Filled ground shown on BGS mapping + BGS Logs	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP08+949	E-KP08+996	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - E	E-KP08+949	E-KP08+996	If Filled ground shown on BGS mapping + BGS Logs	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP09+371	E-KP09+400	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - E	E-KP09+371	E-KP09+400	If Filled ground shown on BGS mapping + BGS Logs	4	4	16 (Substantial)		4	2	8 (Minor)

Hynet Geohazards Desk Study

Hazard Title: Compressible Soils (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Soft, low strength compressible soils with low bearing capacity	Insufficient design, delay, excessive displacement, failure. - Potential to add cost, time, risk to the project	Preferred Route Centreline - E	E-KP20+842	E-KP21+058	Highly compressible strata present. Significant constraint on land use depending on thickness.	5	4	20 (Severe)	Ground investigation to determine exact geology and groundwater conditions. - Design to consider conservative soil parameters. - Foundation loads taken to competent strata. - Designer to consider potential for consolidation settlement, secondary (creep) settlement as a result of applied structural loads or raising ground levels. - Use of engineering mitigation such as ground improvement, surcharging / band drain, consideration of negative skin friction.	5	2	10 (Moderate)
		Preferred Route Centreline - E	E-KP20+842	E-KP21+058	If any landfill or infilled pits present	5	4	20 (Severe)		5	2	10 (Moderate)
		Preferred Route Centreline - E	E-KP17+675	E-KP17+697	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - E	E-KP17+675	E-KP17+697	If any landfill or infilled pits present	5	4	20 (Severe)		5	2	10 (Moderate)
		Preferred Route Centreline - E	E-KP21+058	E-KP21+662	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - E	E-KP21+058	E-KP21+662	If any landfill or infilled pits present	5	4	20 (Severe)		5	2	10 (Moderate)
		Preferred Route Centreline - E	E-KP20+523	E-KP20+535	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - E	E-KP20+523	E-KP20+535	If Filled ground shown on BGS mapping + BGS Logs	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP21+123	E-KP21+500	Highly compressible strata present. Significant constraint on land use depending on thickness.	5	4	20 (Severe)		5	2	10 (Moderate)
		Preferred Route Centreline - E	E-KP21+123	E-KP21+500	If any landfill or infilled pits present	5	4	20 (Severe)		5	2	10 (Moderate)
		Preferred Route Centreline - E	E-KP13+296	E-KP13+300	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - E	E-KP13+296	E-KP13+300	If Filled ground shown on BGS mapping + BGS Logs	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP13+448	E-KP13+449	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - E	E-KP13+448	E-KP13+449	If Filled ground shown on BGS mapping + BGS Logs	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP013+59	E-KP13+608	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - E	E-KP013+59	E-KP13+608	If Filled ground shown on BGS mapping + BGS Logs	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP14+378	E-KP14+425	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - E	E-KP14+378	E-KP14+425	If Filled ground shown on BGS mapping + BGS Logs	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP17+612	S-KP17+655	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - S	S-KP17+612	S-KP17+655	IF BGS or RSK BH records within 25m either side of centreline show MG>2m	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP03+885	S-KP04+004	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - S	S-KP03+885	S-KP04+004	If any landfill or infilled pits present	5	4	20 (Severe)		5	2	10 (Moderate)
		Preferred Route Centreline - S	S-KP07+899	S-KP08+279	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - S	S-KP07+899	S-KP08+279	If Filled ground shown on BGS mapping + BGS Logs	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP03+709	S-KP03+762	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - S	S-KP03+709	S-KP03+762	If any landfill or infilled pits present	5	4	20 (Severe)		5	2	10 (Moderate)
		Preferred Route Centreline - S	S-KP013+57	S-KP13+599	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - S	S-KP013+57	S-KP13+599	IF BGS or RSK BH records within 25m either side of centreline show MG>2m	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP13+842	N1-KP13+876	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP13+842	N1-KP13+876	If any landfill or infilled pits present	5	4	20 (Severe)		5	2	10 (Moderate)
		Preferred Route Centreline - N1	N1-KP10+521	N1-KP11+338	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP10+521	N1-KP11+338	IF BGS or RSK BH records within 25m either side of centreline show MG>2m	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP10+000	N1-KP10+189	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP10+000	N1-KP10+189	IF BGS or RSK BH records within 25m either side of centreline show MG>2m	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP09+558	N1-KP09+612	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP09+558	N1-KP09+612	If any landfill or infilled pits present	5	4	20 (Severe)		5	2	10 (Moderate)
		Preferred Route Centreline - N2	N2-KP02+648	N2-KP02+764	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP02+648	N2-KP02+764	If any landfill or infilled pits present	5	4	20 (Severe)		5	2	10 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+864	N2-KP05+948	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N2	N2-KP05+864	N2-KP05+948	If any landfill or infilled pits present	5	4	20 (Severe)		5	2	10 (Moderate)
		Preferred Route Centreline - N2	N2-KP03+392	N2-KP03+836	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP03+392	N2-KP03+836	If any landfill or infilled pits present	5	4	20 (Severe)		5	2	10 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+211	N2-KP06+129	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP05+211	N2-KP06+129	If any landfill or infilled pits present	5	4	20 (Severe)		5	2	10 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP06+837	C-01-KP06+930	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP06+837	C-01-KP06+930	If Filled ground shown on BGS mapping + BGS Logs	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP06+184	C-01-KP06+270	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP06+184	C-01-KP06+270	IF BGS or RSK BH records within 25m either side of centreline show MG>2m	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP06+655	C-01-KP06+837	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP06+655	C-01-KP06+837	If Filled ground shown on BGS mapping + BGS Logs	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP06+053	C-01-KP06+184	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP06+053	C-01-KP06+184	IF BGS or RSK BH records within 25m either side of centreline show MG>2m	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP07+315	C-01-KP07+297	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP07+315	C-01-KP07+297	IF BGS or RSK BH records within 25m either side of centreline show MG>2m	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP07+297	C-01-KP07+315	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP07+297	C-01-KP07+315	IF BGS or RSK BH records within 25m either side of centreline show MG>2m	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+077	N1-02-KP02+134	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+077	N1-02-KP02+134	If Filled ground shown on BGS mapping + BGS Logs	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+611	N1-02-KP01+672	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+611	N1-02-KP01+672	If Filled ground shown on BGS mapping + BGS Logs	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+310	N1-02-KP02+381	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+310	N1-02-KP02+381	If Filled ground shown on BGS mapping + BGS Logs	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+826	N1-02-KP02+894	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+826	N1-02-KP02+894	If Filled ground shown on BGS mapping + BGS Logs	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP06+001	N1-02-KP06+052	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP06+001	N1-02-KP06+052	If Filled ground shown on BGS mapping + BGS Logs	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+549	N1-02-KP02+574	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+549	N1-02-KP02+574	If any landfill or infilled pits present	5	4	20 (Severe)		5	2	10 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+943	N1-02-KP03+965	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+943	N1-02-KP03+965	If Filled ground shown on BGS mapping + BGS Logs	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+107	N1-02-KP00+274	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+107	N1-02-KP00+274	If Filled ground shown on BGS mapping + BGS Logs	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+304	N1-02-KP01+467	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+304	N1-02-KP01+467	If Filled ground shown on BGS mapping + BGS Logs	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+000	N1-02-KP00+023	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+000	N1-02-KP00+023	If any landfill or infilled pits present	5	4	20 (Severe)		5	2	10 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+118	N1-02-KP01+155	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+118	N1-02-KP01+155	If Filled ground shown on BGS mapping + BGS Logs	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - E-01	E-01-KP00+438	E-01-KP00+430	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - E-01	E-01-KP00+438	E-01-KP00+430	If any landfill or infilled pits present	5	4	20 (Severe)		5	2	10 (Moderate)
		Preferred Spurs Centreline - E-01	E-01-KP00+000	E-01-KP00+438	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - E-01	E-01-KP00+000	E-01-KP00+438	If any landfill or infilled pits present	5	4	20 (Severe)		5	2	10 (Moderate)
		Preferred Spurs Centreline - N2-04	N2-04-KP01+917	N2-04-KP02+035	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - N2-04	N2-04-KP01+917	N2-04-KP02+035	If Filled ground shown on BGS mapping + BGS Logs	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+137	N1-05-KP00+253	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+137	N1-05-KP00+253	If Filled ground shown on BGS mapping + BGS Logs	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+001	N1-05-KP00+062	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+001	N1-05-KP00+062	If any landfill or infilled pits present	5	4	20 (Severe)		5	2	10 (Moderate)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+272	N1-05-KP00+436	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+272	N1-05-KP00+436	If any landfill or infilled pits present	5	4	20 (Severe)		5	2	10 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+504	N2-06-KP01+199	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+504	N2-06-KP01+199	If any landfill or infilled pits present	5	4	20 (Severe)		5	2	10 (Moderate)

Hynet Geohazards Desk Study

Hazard Title: Compressible Soils (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Soft, low strength compressible soils with low bearing capacity	Insufficient design, delay, excessive displacement, failure. - Potential to add cost, time, risk to the project	Preferred Spurs Centreline - N2-06	N2-06-KP00+445	N2-06-KP00+962	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)	Ground investigation to determine exact geology and groundwater conditions. - Design to consider conservative soil parameters. - Foundation loads taken to competent strata. - Designer to consider potential for consolidation settlement, secondary (creep) settlement as a result of applied structural loads or raising ground levels. - Use of engineering mitigation such as ground improvement, surcharging / band drain, consideration of negative skin friction.	4	2	8 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+445	N2-06-KP00+962	If any landfill or infilled pits present	5	4	20 (Severe)		5	2	10 (Moderate)
		Preferred Spurs Centreline - E-04	E-04-KP00+000	E-04-KP00+261	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - E-04	E-04-KP00+000	E-04-KP00+261	If any landfill or infilled pits present	5	4	20 (Severe)		5	2	10 (Moderate)
		Preferred Spurs Centreline - E-04	E-04-KP00+261	E-04-KP00+588	Highly compressible strata present. Significant constraint on land use depending on thickness.	5	4	20 (Severe)		5	2	10 (Moderate)
		Preferred Spurs Centreline - E-04	E-04-KP00+261	E-04-KP00+588	If any landfill or infilled pits present	5	4	20 (Severe)		5	2	10 (Moderate)
		Preferred Spurs Centreline - N2-07	N2-KP06+129	N2-07-KP00+157	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - N2-07	N2-KP06+129	N2-07-KP00+157	If any landfill or infilled pits present	5	4	20 (Severe)		5	2	10 (Moderate)
		Preferred Spurs Centreline - W-01	W-01-KP00+120	W-01-KP00+444	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP00+120	W-01-KP00+444	If any landfill or infilled pits present	5	4	20 (Severe)		5	2	10 (Moderate)
		Preferred Spurs Centreline - W-01	W-01-KP00+000	W-01-KP00+086	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP00+000	W-01-KP00+086	If any landfill or infilled pits present	5	4	20 (Severe)		5	2	10 (Moderate)
		Preferred Spurs Centreline - W-01	W-01-KP00+552	W-01-KP00+928	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP00+552	W-01-KP00+928	If any landfill or infilled pits present	5	4	20 (Severe)		5	2	10 (Moderate)
		Preferred Spurs Centreline - E-05	E-05-KP00+000	E-05-KP00+124	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - E-05	E-05-KP00+000	E-05-KP00+124	If any landfill or infilled pits present	5	4	20 (Severe)		5	2	10 (Moderate)
		Preferred Route Centreline - E	E-KP13+300	E-KP13+448	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - E	E-KP13+300	E-KP13+448	If Filled ground shown on BGS mapping + BGS Logs	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP13+300	E-KP13+448	If Filled ground shown on BGS mapping + BGS Logs	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP01+913	S-KP01+977	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - S	S-KP01+913	S-KP01+977	IF BGS or RSK BH records within 25m either side of centreline show MG>2m	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP01+913	S-KP01+977	IF BGS or RSK BH records within 25m either side of centreline show MG>2m	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP01+977	S-KP02+151	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP01+977	S-KP02+151	IF BGS or RSK BH records within 25m either side of centreline show MG>2m	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP01+977	S-KP02+151	IF BGS or RSK BH records within 25m either side of centreline show MG>2m	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+253	N1-05-KP00+272	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+253	N1-05-KP00+272	If Filled ground shown on BGS mapping + BGS Logs	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+253	N1-05-KP00+272	If any landfill or infilled pits present	5	4	20 (Severe)		5	2	10 (Moderate)

Hynet Geohazards Desk Study

Hazard Title: Compressible Soils (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 222768

Hazard Description	Impact Description	Nearest Project Infrastructure	Closest KP	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Soft, low strength compressible soils with low bearing capacity	Insufficient design, delay, excessive displacement, failure. - Potential to add cost, time, risk to the project	HAGI - Stanlow HPP HAGI	W-KP00	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)	Ground investigation to determine exact geology and groundwater conditions. - Design to consider conservative soil parameters. - Foundation loads taken to competent strata. - Designer to consider potential for consolidation settlement, secondary (creep) settlement as a result of applied structural loads or raising ground levels. - Use of engineering mitigation such as ground improvement, surcharging / band drain, consideration of negative skin friction.	1	2	2 (None / Negligible)
		HAGI - Stanlow HPP HAGI	W-KP00	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		HAGI - Stanlow HPP HAGI	W-KP00	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		HAGI - Central Hub HAGI	S-KP00	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		HAGI - Clodface HAGI	N2-O4-KP00	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		HAGI - Clodface HAGI	N2-KP00	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		HAGI - Higher Walton HAGI	N1-O5-KP00	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		HAGI - Warburton HAGI	E-O2-KP00	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		HAGI - Runcorn HAGI	W-O2-KP00	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		HAGI - Runcorn HAGI	W-O2-KP00	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		HAGI - Ineos Gas Storage HAGI	S-KP18+000	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		HAGI - Ineos Gas Storage HAGI	S-KP18+000	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Stanlow	W-KP00	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - A5117 Road	W-KP01+500	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - A5117 Road	W-KP02+000	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Ellesmere Port to Warrington Line Railway	W-KP03+000	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - River Weaver	W-KP10+000	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - United Utilities Water	W-KP10+500	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Chester to Manchester Line Railway	W-KP11+000	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Sutton Weaver Canal	W-KP11+000	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Sutton Weaver Canal	W-KP11+500	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - United Utilities Sewer	W-KP11+500	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - A56 Chester Road	W-KP12+000	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - West Coast Main Line Railway	W-KP16+500	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Trent and Mersey Canal	W-KP18+000	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - A533 Northwich Road	W-KP18+500	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - A533 Northwich Road	C-01-KP04+500	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Trent and Mersey Canal	S-KP01+500	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Trent and Mersey Canal	S-KP01+500	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Weaver Navigation Canal	S-KP02+000	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - West Coast Main Line Railway	S-KP04+500	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - A49 Warrington Road	S-KP06+000	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Mid Cheshire Line Railway	S-KP07+000	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - A556 Chester Road	S-KP08+500	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+000	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+500	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+000	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - A533 Road	S-KP15+000	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - River Dane	S-KP16+500	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Trent and Mersey Canal	S-KP16+500	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Middlewich Branch Line Railway	S-KP17+500	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - A530 King Street Road	S-KP18+000	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - A530 King Street Road	S-KP18+000	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - A49 Tarporley Road	E-KP01+000	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - A559 Northwich Road	E-KP04+000	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - M6 Motorway	E-KP09+500	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - A50 Road	E-KP11+500	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - M56 Motorway	E-KP14+000	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - A561 Lymm Road	E-KP15+500	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Bridgewater Canal + road	E-KP15+500	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - River Bollin	E-KP17+000	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - M56 Motorway	N1- KP05+000	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - A56 Chester Road	N1- KP08+000	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Bridgewater Canal	N1- KP08+500	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1- KP09+500	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - River Mersey, Sanky Canal + Skelton Junction to Ditton Junction Line	N1- KP12+500	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - River Mersey, Sanky Canal + Skelton Junction to Ditton Junction Line	N1- KP12+500	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - A562 Widnes Road	N1- KP13+500	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - A5080 South Lane Road	N1- KP14+500	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Manchester and Allerton Junction Line Railway	N1- KP15+000	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - A57 Warrington Road	N1- KP19+000	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - M62 Motorway	N2-O4-KP00	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - A570 St Helens Linkway Road	N2-KP01+500	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Liverpool to Manchester Line Railway	N2-KP02+500	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Liverpool to Manchester Line Railway	N2-KP02+500	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Weaver Navigation Canal	W-KP10+500	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - A557 Weston Point Expressway - Rocksavage WAY	W-O3-KP04+500	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - West Coast Mainline Railway	N1-O5-KP04+500	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Eastford Road and Canal	N1-O2-KP01+500	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Eastford Road and Canal	N1-O2-KP01+500	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - London Road	S-KP15+500	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - NULL	N1-O2-KP02+000	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Block Valve - NULL	E-KP12+000	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Block Valve - NULL	S-KP03+500	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		HAGI - Stanlow HPP HAGI	W-KP00	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Stanlow	W-KP00	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		HAGI - Rocksavage HAGI	W-O1-KP00	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		HAGI - Rocksavage HAGI	W-O1-KP00	If any landfill or infilled pits present	5	4	20 (Severe)		5	2	10 (Moderate)
		HAGI - Higher Walton HAGI	N1-O2-KP00	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		HAGI - Higher Walton HAGI	N1-O2-KP00	If any landfill or infilled pits present	5	4	20 (Severe)		5	2	10 (Moderate)
		HAGI - Partington HAGI	E-O1-KP00	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		HAGI - Partington HAGI	E-O1-KP00	If any landfill or infilled pits present	5	4	20 (Severe)		5	2	10 (Moderate)
		Trenchless Crossing - United Utilities Water	W-KP10+000	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - United Utilities Water	W-KP10+500	If any landfill or infilled pits present	5	4	20 (Severe)		5	2	10 (Moderate)
		Trenchless Crossing - United Utilities Water	W-KP10+000	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - United Utilities Water	W-KP10+500	If any landfill or infilled pits present	5	4	20 (Severe)		5	2	10 (Moderate)
		Trenchless Crossing - Middlewich Branch Line Railway	S-KP17+500	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Middlewich Branch Line Railway	S-KP17+500	IF BGS or RSK BH records within 25m either side of centreline show MG>2m	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - M6 Motorway	E-KP09+500	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - M6 Motorway	E-KP09+500	If Filled ground shown on BGS mapping + BGS Logs	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Weaver Navigation Canal	W-KP10+500	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Weaver Navigation Canal	W-KP10+500	If any landfill or infilled pits present	5	4	20 (Severe)		5	2	10 (Moderate)
		Trenchless Crossing - Weaver Navigation Canal	W-KP10+500	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Weaver Navigation Canal	W-KP10+500	If any landfill or infilled pits present	5	4	20 (Severe)		5	2	10 (Moderate)
		Trenchless Crossing - A6144 Manchester Road	E-O5-KP00	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - A6144 Manchester Road	E-O5-KP00	If any landfill or infilled pits present	5	4	20 (Severe)		5	2	10 (Moderate)
		Trenchless Crossing - A6144 Manchester Road	E-O5-KP00	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - A6144 Manchester Road	E-O5-KP00	If any landfill or infilled pits present	5	4	20 (Severe)		5	2	10 (Moderate)
		Trenchless Crossing - West Coast Mainline Railway	N1- KP09+500	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - West Coast Mainline Railway	N1- KP09+500	If Filled ground shown on BGS mapping + BGS Logs	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - West Coast Mainline Railway	N1- O5-KP04+500	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - West Coast Mainline Railway	N1-O5-KP04+500	If any landfill or infilled pits present	5	4	20 (Severe)		5	2	10 (Moderate)
		Trenchless Crossing - Eastford Road and Canal	N1-O2-KP01+500	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Eastford Road and Canal	N1-O2-KP01+500	If Filled ground shown on BGS mapping + BGS Logs	4	4	16 (Substantial)		4	2	8 (Minor)

Hynet Geohazards Desk Study

Hazard Title: Compressible Soils (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322768

Hazard Description	Impact Description	Nearest Project Infrastructure	Closest KP	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Soft, low strength compressible soils with low bearing capacity	Insufficient design, delay, excessive displacement, failure. - Potential to add cost, time, risk to the project	Trenchless Crossing - Eastford Road and Canal	N1-02-KP01+500	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)	Ground investigation to determine exact geology and groundwater conditions. - Design to consider conservative soil parameters. - Foundation loads taken to competent strata. - Designer to consider potential for consolidation settlement, secondary (creep) settlement as a result of applied structural loads or raising ground levels. - Use of engineering mitigation such as ground improvement, surcharging / band drain, consideration of negative skin friction.	4	2	8 (Minor)
		Trenchless Crossing - Eastford Road and Canal	N1-02-KP01+500	If Filled ground shown on BGS mapping + BGS Logs	4	4	16 (Substantial)		4	2	8 (Minor)
		Block Valve - NULL	S-KP08+500	Compressible strata are not thought to occur.	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Block Valve - NULL	S-KP08+500	If Filled ground shown on BGS mapping + BGS Logs	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Weaver Navigation Canal	S-KP024+000	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Weaver Navigation Canal	S-KP024+000	IF BGS or RSK BH records within 25m either side of centreline show MG>2m	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Weaver Navigation Canal	S-KP024+000	F BGS or RSK BH records within 25m either side of centreline show MG>2m	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - West Coast Mainline Railway	N1-KP09+500	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - West Coast Mainline Railway	N1-KP09+500	If Filled ground shown on BGS mapping + BGS Logs	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - West Coast Mainline Railway	N1-KP09+500	If any landfill or infilled pits present	5	4	20 (Severe)		3	2	10 (Moderate)

APPENDIX C
RISK ASSESSMENT TABLE – GEOHAZARDS – SWELLING, SHRINKAGE POTENTIAL SOILS

RSK GEOSCIENCES

Hynet Geohazards Desk Study

Hazard Title: Swelling, Shrinkage Potential Soils (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Typically intermediate to high plasticity soils susceptible to significant volume changes due to moisture content changes. Low Plasticity soils can be susceptible to small volume changes and should be considered in design.	Insufficient design, delay, excessive displacement, failure. Swelling / shrinkage of ground following vegetation removal / planting as moisture content rebounds / reduces. Insufficient design, excessive displacement, differential displacement, failure of foundations. Potential to add cost, time, risk to the project	Preferred Route Centreline - W	W-KP00+059	W-KP00+093	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)	Ground investigation to determine exact geology and groundwater conditions to allow for site-specific assessment of the soils susceptibility to swelling/shrinkage - Design of foundations in accordance with NHBC guidance on building near trees. - Designer to consider engineering mitigation such as voids, void formers, use of compressible materials, construction of foundations below zone of influence of vegetation.	1	2	2 (None / Negligible)
		Preferred Route Centreline - W	W-KP18+159	W-KP018+29	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - W	W-KP012+25	W-KP13+087	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - W	W-KP13+087	W-KP15+014	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - W	W-KP11+305	W-KP11+747	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - W	W-KP01+809	W-KP06+752	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP19+216	W-KP19+303	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP00+464	W-KP01+809	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP02+202	E-KP02+473	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - E	E-KP03+984	E-KP04+034	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - E	E-KP14+681	E-KP14+722	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - E	E-KP15+123	E-KP16+882	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - E	E-KP17+107	E-KP19+659	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - E	E-KP12+898	E-KP12+961	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP16+882	E-KP17+107	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP06+187	E-KP12+898	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP16+125	S-KP16+222	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - S	S-KP16+377	S-KP16+544	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - S	S-KP11+333	S-KP011+36	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - S	S-KP11+407	S-KP12+266	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - S	S-KP12+266	S-KP12+479	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - S	S-KP04+649	S-KP04+765	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - S	S-KP03+609	S-KP03+616	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - S	S-KP01+638	S-KP01+977	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - S	S-KP01+461	S-KP01+638	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - S	S-KP00+978	S-KP01+196	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - S	S-KP01+977	S-KP02+796	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP12+604	S-KP12+803	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP12+531	S-KP12+604	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP07+652	N1-KP07+682	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP12+963	N1-KP13+645	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP07+930	N1-KP08+700	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP14+972	N1-KP15+136	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP00+137	N1-KP02+495	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP00+000	N1-KP00+137	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP03+135	N2-KP03+316	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP00+000	N2-KP00+033	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP05+347	C-01-KP05+510	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP03+757	C-01-KP04+007	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP06+184	C-01-KP06+935	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-03	W-03-KP00+404	W-03-KP01+315	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+000	N1-02-KP01+609	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-04	N2-04-KP00+024	N2-04-KP02+035	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-04	N2-04-KP00+000	N2-04-KP00+024	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+000	N1-05-KP00+677	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-06	N2-KP06+129	N2-06-KP01+199	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - E-02	E-02-KP00+000	E-02-KP00+155	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - E-04	E-04-KP00+000	E-04-KP00+588	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - N2-07	N2-KP06+129	N2-07-KP00+157	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP00+598	W-01-KP00+703	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP01+416	W-01-KP01+465	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-02	W-02-KP00+000	W-02-KP00+048	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-02	W-02-KP00+048	W-02-KP00+171	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - E-05	E-05-KP00+000	E-05-KP00+124	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - W	W-KP06+752	W-KP11+305	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP11+747	W-KP012+25	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP15+014	W-KP18+159	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP018+29	W-KP19+216	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP00+000	W-KP00+059	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP00+093	W-KP00+464	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP04+034	E-KP04+440	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - E	E-KP03+676	E-KP03+984	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - E	E-KP20+177	E-KP21+662	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - E	E-KP19+961	E-KP20+125	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - E	E-KP19+659	E-KP19+897	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - E	E-KP14+722	E-KP15+123	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP12+961	E-KP14+681	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP04+440	E-KP06+187	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP03+671	E-KP03+676	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP02+473	E-KP03+671	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP00+000	E-KP02+202	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP20+125	E-KP20+177	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP19+897	E-KP19+961	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP15+997	S-KP16+049	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - S	S-KP15+463	S-KP15+947	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - S	S-KP11+013	S-KP11+071	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - S	S-KP11+103	S-KP11+234	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - S	S-KP12+479	S-KP12+531	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)

RSK GEOSCIENCES

Hynet Geohazards Desk Study

Hazard Title: Swelling, Shrinkage Potential Soils (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Typically intermediate to high plasticity soils susceptible to significant volume changes due to moisture content changes. Low Plasticity soils can be susceptible to small volume changes and should be considered in design.	Insufficient design, delay, excessive displacement, failure. Swelling / shrinkage of ground following vegetation removal / planting as moisture content rebounds / reduces. Insufficient design, excessive displacement, differential displacement, failure of foundations. Potential to add cost, time, risk to the project	Preferred Route Centreline - S	S-KP12+945	S-KP14+063	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)	Ground investigation to determine exact geology and groundwater conditions to allow for site-specific assessment of the soils susceptibility to swelling/shrinkage - Design of foundations in accordance with NHBC guidance on building near trees. - Designer to consider engineering mitigation such as voids, void formers, use of compressible materials, construction of foundations below zone of influence of vegetation.	1	2	2 (None / Negligible)
		Preferred Route Centreline - S	S-KP06+555	S-KP06+977	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - S	S-KP06+998	S-KP07+192	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - S	S-KP07+236	S-KP07+265	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - S	S-KP07+521	S-KP09+769	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - S	S-KP06+977	S-KP06+998	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP07+192	S-KP07+236	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP07+265	S-KP07+521	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP00+000	S-KP00+978	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP01+196	S-KP01+461	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP02+796	S-KP03+489	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP18+001	S-KP18+365	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP18+401	S-KP18+444	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP18+365	S-KP18+401	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP16+544	S-KP18+001	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP12+803	S-KP12+945	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP16+222	S-KP16+377	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP16+049	S-KP16+125	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP15+947	S-KP15+997	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP14+063	S-KP15+463	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP03+489	S-KP03+609	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP03+616	S-KP04+649	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP04+765	S-KP06+555	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP09+769	S-KP11+013	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP11+071	S-KP11+103	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP11+234	S-KP11+333	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP011+36	S-KP11+407	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP10+338	N1-KP011+48	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP08+700	N1-KP09+305	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP15+136	N1-KP19+023	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP14+129	N1-KP14+972	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP13+645	N1-KP14+129	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP011+48	N1-KP12+526	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP09+305	N1-KP10+338	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP07+682	N1-KP07+930	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP07+168	N1-KP07+652	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP06+159	N1-KP06+986	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP05+685	N1-KP06+115	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP02+495	N1-KP05+190	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP05+864	N2-KP05+948	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP05+817	N2-KP05+841	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP03+316	N2-KP03+352	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP02+399	N2-KP03+135	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP05+948	N2-KP06+129	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP05+841	N2-KP05+864	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP03+352	N2-KP05+817	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP00+033	N2-KP02+399	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP07+059	C-01-KP07+199	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP07+487	C-01-KP07+966	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP00+000	C-01-KP03+757	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP04+007	C-01-KP05+347	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP05+510	C-01-KP06+184	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP06+935	C-01-KP07+022	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP07+297	C-01-KP07+315	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP07+022	C-01-KP07+059	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP07+199	C-01-KP07+297	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP07+315	C-01-KP07+487	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-03	W-03-KP01+315	W-03-KP01+948	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-03	W-03-KP00+000	W-03-KP00+404	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP05+716	N1-02-KP05+813	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+275	N1-02-KP05+664	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP05+813	N1-02-KP06+110	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP05+664	N1-02-KP05+716	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+609	N1-02-KP03+275	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - E-01	E-01-KP00+430	E-01-KP00+438	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - E-01	E-01-KP00+000	E-01-KP00+363	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - E-01	E-01-KP00+363	E-01-KP00+430	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - E-01	E-01-KP00+438	E-01-KP00+454	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP00+703	W-01-KP00+866	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP00+458	W-01-KP00+598	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP00+866	W-01-KP01+416	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP00+000	W-01-KP00+458	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)

Hynet Geohazards Desk Study

Hazard Title: Swelling, Shrinkage Potential Soils (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	Closest KP	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Typically intermediate to high plasticity soils susceptible to significant volume changes due to moisture content changes. Low Plasticity soils can be susceptible to small volume changes and should be considered in design.	Insufficient design, delay, excessive displacement, failure. Swelling / shrinkage of ground following vegetation removal / planting as moisture content rebounds / reduces. Insufficient design, excessive displacement, differential displacement, failure of foundations. Potential to add cost, time, risk to the project	HAGI - Stanlow HPP HAGI	W-KP00	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)	Ground investigation to determine exact geology and groundwater conditions to allow for site-specific assessment of the soils susceptibility to swelling/shrinkage - Design of foundations in accordance with NHBC guidance on building near trees. - Designer to consider engineering mitigation such as voids, void formers, use of compressible materials, construction of foundations below zone of influence of vegetation.	1	2	2 (None / Negligible)
		HAGI - Stanlow HPP HAGI	W-KP00	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		HAGI - Stanlow HPP HAGI	W-KP00	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		HAGI - Central Hub HAGI	S-KP00	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		HAGI - Clockface HAGI	N2-04-KP00	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		HAGI - Clockface HAGI	N2-KP00	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		HAGI - Rocksavage HAGI	W-01-KP00	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		HAGI - Higher Walton HAGI	N1-05-KP00	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		HAGI - Warburton HAGI	E-02-KP00	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		HAGI - Partington HAGI	E-01-KP00	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		HAGI - Runcorn HAGI	W-02-KP00	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		HAGI - Runcorn HAGI	W-02-KP00	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		HAGI - Inovyn Gas Storage HAGI	S-KP18+000	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		HAGI - Inovyn Gas Storage HAGI	S-KP18+000	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Stanlow	W-KP00	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - A5117 Road	W-KP02+000	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A5117 Road	W-KP01+500	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Ellesmere Port to Warrington Line Railway	W-KP03+000	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - River Weaver	W-KP10+000	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - United Utilities Water	W-KP10+500	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Chester to Manchester Line Railway	W-KP11+000	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Sutton Weaver Canal	W-KP11+500	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Sutton Weaver Canal	W-KP11+000	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - United Utilities Sewer	W-KP11+500	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - A56 Chester Road	W-KP12+000	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - West Coast Main Line Railway	W-KP16+500	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Trent and Mersey Canal	W-KP18+000	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A533 Northwich Road	W-KP18+500	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A533 Northwich Road	C-01-KP0+500	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Trent and Mersey Canal	S-KP01+500	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Trent and Mersey Canal	S-KP01+500	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Weaver Navigation Canal	S-KP02+000	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - West Coast Main Line Railway	S-KP04+500	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A49 Warrington Road	S-KP06+000	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Mid Cheshire Line Railway	S-KP07+000	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Mid Cheshire Line Railway	S-KP07+000	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A556 Chester Road	S-KP08+500	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+500	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+500	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - A533 Road	S-KP15+000	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - River Dane	S-KP16+500	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Trent and Mersey Canal	S-KP16+500	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Trent and Mersey Canal	S-KP16+500	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Middlewich Branch Line Railway	S-KP17+500	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A530 King Street Road	S-KP18+000	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A530 King Street Road	S-KP18+000	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A49 Tarporley Road	E-KP01+000	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A559 Northwich Road	E-KP04+000	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - M6 Motorway	E-KP09+500	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A50 Road	E-KP11+500	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - M56 Motorway	E-KP14+000	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A56 Lymm Road	E-KP15+500	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Bridgewater Cana + road	E-KP15+500	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - River Bolin	E-KP17+000	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - M56 Motorway	N1-KP05+000	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A56 Chester Road	N1-KP08+000	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - A56 Chester Road	N1-KP08+000	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Bridgewater Cana	N1-KP08+500	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+500	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - River Mersey, Sanky Canal + Skelton Junction to Ditton Junction Line	N1-KP12+500	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - A562 Widnes Road	N1-KP13+500	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A5080 South Lane Road	N1-KP14+500	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Manchester and Allerton Junction Line Railway	N1-KP15+000	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A57 Warrington Road	N1-KP18+000	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - M62 Motorway	N2-04-KP00	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A570 St Helens Linkway Road	N2-KP01+500	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Liverpool to Manchester Line Railway	N2-KP02+500	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Liverpool to Manchester Line Railway	N2-KP02+500	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Weaver Navigation Canal	W-KP10+500	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A557 Weston Point Expressway - Rocksavage Way	W-03-KP01+500	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - A557 Weston Point Expressway - Rocksavage Way	W-03-KP01+500	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A6144 Manchester Road	E-05-KP00	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - A6144 Manchester Road	E-05-KP00	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - West Coast Mainline Railway	N1-05-KP0+500	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Eastford Road anc Canal	N1-02-KP01+500	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Eastford Road anc Canal	N1-02-KP01+500	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - London Road	S-KP15+500	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - NULL	N1-02-KP02+000	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)

Hynet Geohazards Desk Study

Hazard Title: Swelling, Shrinkage Potential Soils (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	Closest KP	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Typically intermediate to high plasticity soils susceptible to significant volume changes due to moisture content changes. Low Plasticity soils can be susceptible to small volume changes and should be considered in design.	Insufficient design, delay, excessive displacement, failure. Swelling / shrinkage of ground following vegetation removal / planting as moisture content rebounds / reduces. Insufficient design, excessive displacement, differential displacement, failure of foundations. Potential to add cost, time, risk to the project	Block Valve - NULL	E-KP12+000	Ground conditions predominantly low plasticity.	2	3	6 (Minor)	Ground investigation to determine exact geology and groundwater conditions to allow for site-specific assessment of the soils susceptibility to swelling/shrinkage - Design of foundations in accordance with NHBC guidance on building near trees. - Designer to consider engineering mitigation such as voids, void formers, use of compressible materials, construction of foundations below zone of influence of vegetation.	2	2	4 (None / Negligible)
		Block Valve - NULL	S-KP08+500	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		HAGI - Stanlow HPP HAGI	W-KP00	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Stanlow	W-KP00	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		HAGI - Stanlow HPP HAGI	W-KP00	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Stanlow	W-KP00	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Stanlow	W-KP00	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Stanlow	W-KP00	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+000	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+000	Ground conditions predominantly non-plastic.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+000	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+000	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+000	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+500	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - River Mersey, Sanky Canal + Skelton Junction to Ditton Junction Line	N1-KP12+500	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - River Mersey, Sanky Canal + Skelton Junction to Ditton Junction Line	N1-KP12+500	Ground conditions predominantly low plasticity.	2	3	6 (Minor)		2	2	4 (None / Negligible)

APPENDIX C
RISK ASSESSMENT TABLE – GEOHAZARDS - RUNNING SANDS

Hynet Geohazards Desk Study

Hazard Title: Running Sand (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 329668

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Soils that potentially contain loosely packed sand layers that can become fluidised by water flow and 'run' into an excavation	Insufficient design, delay, excessive displacement, failure - Running sands' occurs when a sand layer/unit becomes fluidised by water flowing through it, causing it to 'run' into open excavations if sides are left unsupported. They typically comprise loose clean fine to medium sand. - Such sands can 'run', removing support from overlying buildings, excavation sidewalls and causing potential damage and / or stability issues. - Other engineering risks include HDD / borehole instability, sudden changes in drilling parameters. - Potential to add cost, time, risk to the project	Preferred Route Centreline - W	W-KP11+305	W-KP11+351	Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to running conditions.	1	3	3 (None / Negligible)	Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment of the soils susceptibility to running / blowing sands conditions. - Designer to consider engineering mitigation such as excavation support systems, use of casing for rotary bored piles or CFA piling, use of appropriate drilling fluid type and / or viscosity, redesign HDD profiles to avoid or limit drill time in unstable soils.	1	2	2 (None / Negligible)
		Preferred Route Centreline - W	W-KP18+339	W-KP19+216	Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to running conditions.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - W	W-KP13+216	W-KP13+303	Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to running conditions.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - W	W-KP11+351	W-KP13+387	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP00+092	W-KP00+464	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP17+648	W-KP19+339	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP17+145	W-KP17+318	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP00+000	W-KP00+059	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP00+464	W-KP01+809	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP01+809	W-KP02+292	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP00+059	W-KP00+093	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP02+292	W-KP06+752	Running sand conditions are probably present. Constraints may apply to land uses involving excavation or the addition or removal of water	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP06+752	W-KP11+305	Running sand conditions are probably present. Constraints may apply to land uses involving excavation or the addition or removal of water	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP00+864	E-KP01+584	Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to running conditions.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - E	E-KP00+000	E-KP00+784	Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to running conditions.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - E	E-KP03+168	E-KP03+435	Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to running conditions.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - E	E-KP04+519	E-KP05+051	Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to running conditions.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - E	E-KP08+731	E-KP08+810	Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to running conditions.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - E	E-KP12+838	E-KP12+929	Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to running conditions.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - E	E-KP11+249	E-KP12+838	Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to running conditions.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - E	E-KP14+681	E-KP14+722	Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to running conditions.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - E	E-KP12+929	E-KP12+961	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP015+96	E-KP16+882	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP06+052	E-KP06+187	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP00+784	E-KP00+864	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP11+333	S-KP011+36	Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to running conditions.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - S	S-KP03+505	S-KP03+616	Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to running conditions.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - S	S-KP00+000	S-KP00+495	Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to running conditions.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - S	S-KP01+638	S-KP01+977	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP00+439	S-KP01+638	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP02+800	S-KP03+489	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP03+489	S-KP03+505	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP011+36	S-KP12+266	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP12+266	S-KP12+479	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP12+604	S-KP12+803	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP15+309	S-KP15+366	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP17+452	S-KP17+488	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP04+608	S-KP04+643	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP01+977	S-KP02+796	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP02+796	S-KP02+800	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP02+495	N1-KP02+659	Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to running conditions.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP00+000	N1-KP00+137	Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to running conditions.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP07+682	N1-KP07+682	Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to running conditions.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP07+980	N1-KP08+078	Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to running conditions.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP05+004	N1-KP05+190	Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to running conditions.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP09+094	N1-KP09+147	Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to running conditions.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP01+579	N1-KP02+301	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP13+645	N1-KP14+129	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP08+078	N1-KP09+700	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP12+969	N1-KP13+645	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP14+494	N1-KP14+502	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP14+372	N1-KP15+136	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP05+066	N2-KP05+841	Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to running conditions.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP03+135	N2-KP03+316	Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to running conditions.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP00+000	N2-KP00+033	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - C-01	C-01-KP06+184	C-01-KP06+837	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP06+837	C-01-KP06+935	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP06+935	C-01-KP06+997	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-03	W-03-KP00+000	W-03-KP01+834	Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to running conditions.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - W-03	W-03-KP01+834	W-03-KP01+948	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP04+682	N1-02-KP04+888	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+000	N1-02-KP01+609	Running sand conditions are probably present. Constraints may apply to land uses involving excavation or the addition or removal of water	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Spurs Centreline - N2-04	N2-04-KP00+024	N2-04-KP02+036	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-04	N2-04-KP00+000	N2-04-KP00+024	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+000	N1-05-KP00+677	Running sand conditions are probably present. Constraints may apply to land uses involving excavation or the addition or removal of water	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Spurs Centreline - E-02	E-02-KP00+000	E-02-KP00+155	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - E-04	E-04-KP00+000	E-04-KP00+588	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-07	N2-KP06+129	N2-07-KP00+157	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP01+466	W-01-KP01+485	Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to running conditions.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP01+416	W-01-KP01+466	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-02	W-02-KP00+112	W-02-KP00+171	Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to running conditions.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - W-02	W-02-KP00+000	W-02-KP00+044	Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to running conditions.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - W-02	W-02-KP00+044	W-02-KP00+048	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-02	W-02-KP00+048	W-02-KP00+112	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - E-05	E-05-KP00+000	E-05-KP00+124	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP15+131	W-KP15+209	Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to running conditions.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - W	W-KP15+366	W-KP16+864	Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to running conditions.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - W	W-KP13+087	W-KP15+131	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP15+209	W-KP15+366	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP16+864	W-KP17+143	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP17+318	W-KP17+648	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP14+722	E-KP15+129	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP12+961	E-KP14+681	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP20+177	E-KP21+662	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP19+961	E-KP20+125	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP19+741	E-KP19+897	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP19+598	E-KP19+614	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP17+107	E-KP17+671	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP03+984	E-KP04+034	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP03+435	E-KP03+671	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP01+584	E-KP03+168	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP05+051	E-KP06+052	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP04+034	E-KP04+519	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP03+671	E-KP03+984	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP08+810	E-KP11+249	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP07+222	E-KP08+731	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP07+020	E-KP07+161	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP06+329	E-KP06+748	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP07+161	E-KP07+222	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP06+748	E-KP07+020	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP06+187	E-KP06+329	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP20+125	E-KP20+177	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP19+897	E-KP19+961	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP19+659	E-KP19+741	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP19+614	E-KP19+659	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.	3	3	9 (Minor)		3	2	6 (Minor)

Hynet Geohazards Desk Study

Hazard Title: Running Sand (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 329 68

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Soils that potentially contain loosely packed sand layers that can become fluidised by water flow and 'run' into an excavation	Insufficient design, delay, excessive displacement, failure - Running sands' occurs when a sand layer/unit becomes fluidised by water flowing through it, causing it to 'run' into open excavations if sides are left unsupported. They typically comprise loose clean fine to medium sand. - Such sands can 'run' removing support from overlying buildings, excavation sidewalls and causing potential damage and / or stability issues. - Other engineering risks include HDD / borehole instability, sudden changes in drilling parameters. - Potential to add cost, time, risk to the project	Preferred Route Centreline - E	E-KP17+571	E-KP18+938	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.	3	3	9 (Minor)	Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment of the soils susceptibility to running / blowing sands conditions. - Designer to consider engineering mitigation such as excavation support systems, use of casing for rotary bored piles or CFA piling, use of appropriate drilling fluid type and / or viscosity, redesign HDD profiles to avoid or limit drill time in unstable soils.	3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP16+882	E-KP17+107	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP15+123	E-KP015+96	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP03+616	S-KP04+608	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP04+649	S-KP11+071	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP11+103	S-KP11+234	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP18+001	S-KP18+365	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP18+401	S-KP18+444	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP18+365	S-KP18+401	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP17+532	S-KP18+001	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP16+377	S-KP17+483	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP17+478	S-KP17+604	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP12+803	S-KP15+309	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP16+125	S-KP16+222	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP15+366	S-KP16+081	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP11+071	S-KP11+103	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP11+234	S-KP11+333	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP16+222	S-KP16+377	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP16+081	S-KP16+125	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP02+301	N1-KP02+495	Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to running conditions.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP00+137	N1-KP01+579	Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to running conditions.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP07+682	N1-KP07+930	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP07+168	N1-KP07+652	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP06+153	N1-KP06+366	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP05+685	N1-KP06+115	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP02+859	N1-KP05+004	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP15+136	N1-KP13+023	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP14+502	N1-KP14+972	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP14+129	N1-KP14+494	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP10+336	N1-KP011+48	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP09+147	N1-KP09+305	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP08+700	N1-KP09+094	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP011+48	N1-KP12+526	Running sand conditions are probably present. Constraints may apply to land uses involving excavation or the addition or removal of water.	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP09+305	N1-KP10+338	Running sand conditions are probably present. Constraints may apply to land uses involving excavation or the addition or removal of water.	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - N2	N2-KP03+316	N2-KP03+352	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP02+399	N2-KP03+135	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP05+841	N2-KP06+129	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP03+352	N2-KP05+006	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP00+033	N2-KP02+399	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP00+000	C-01-KP00+487	Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to running conditions.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP00+761	C-01-KP00+846	Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to running conditions.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP00+487	C-01-KP00+761	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP00+846	C-01-KP06+194	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP07+022	C-01-KP07+297	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP07+315	C-01-KP07+966	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP06+997	C-01-KP07+022	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP07+297	C-01-KP07+315	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP05+716	N1-02-KP05+813	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP04+888	N1-02-KP05+664	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+275	N1-02-KP04+682	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP05+813	N1-02-KP06+110	Running sand conditions are probably present. Constraints may apply to land uses involving excavation or the addition or removal of water.	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP05+664	N1-02-KP05+716	Running sand conditions are probably present. Constraints may apply to land uses involving excavation or the addition or removal of water.	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+609	N1-02-KP03+275	Running sand conditions are probably present. Constraints may apply to land uses involving excavation or the addition or removal of water.	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Spurs Centreline - E-01	E-01-KP00+430	E-01-KP00+438	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - E-01	E-01-KP00+000	E-01-KP00+363	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - E-01	E-01-KP00+363	E-01-KP00+430	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - E-01	E-01-KP00+438	E-01-KP00+454	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+962	N2-06-KP01+199	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-06	N2-KP06+129	N2-06-KP00+445	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+873	N2-06-KP00+881	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+504	N2-06-KP00+774	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+881	N2-06-KP00+962	Running sand conditions are probably present. Constraints may apply to land uses involving excavation or the addition or removal of water.	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+774	N2-06-KP00+873	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+445	N2-06-KP00+504	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+201	W-01-KP01+416	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP00+458	W-01-KP01+073	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP01+073	W-01-KP01+201	Running sand conditions are probably present. Constraints may apply to land uses involving excavation or the addition or removal of water.	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP00+000	W-01-KP00+458	Running sand conditions are probably present. Constraints may apply to land uses involving excavation or the addition or removal of water.	4	3	12 (Moderate)		4	2	8 (Minor)

Hynet Geohazards Desk Study

Hazard Title: Running Sand (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	Closest KP	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Soils that potentially contain loosely packed sand layers that can become fluidised by water flow and 'run' into an excavation	Insufficient design, delay, excessive displacement, failure.- Running sands occurs when a sand layer/unit becomes fluidised by water flowing through it, causing it to 'run' into open excavations if sides are left unsupported. They typically comprise loose clean fine to medium sand. - Such sands can 'run', removing support from overlying buildings excavation sidewalls and causing potential damage and / or stability issues. - Other engineering risks include HDD / borehole instability, sudden changes in drilling parameters - Potential to add cost, time, risk to the project	HAGI - Stanlow HPP HAGI	W-KP00	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)	Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment of the soils susceptibility to running / blowing sands conditions. - Designer to consider engineering mitigation such as excavation support systems, use of casing for rotary bored piles or CFA piling, use of appropriate drilling fluid type and / or viscosity, redesign HDD profiles to avoid or limit drill time in unstable soils.	2	2	4 (None / Negligible)
		HAGI - Stanlow HPP HAGI	W-KP00	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		HAGI - Stanlow HPP HAGI	W-KP00	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.	3	3	9 (Minor)		3	2	6 (Minor)
		HAGI - Central Hub HAGI	C-KP0Y1	Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to *running conditions*.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		HAGI - Clockface HAGI	N2-04-KP00	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		HAGI - Clockface HAGI	N2-KP00	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		HAGI - Rocksavage HAGI	W-01-KP00	Running sand conditions are probably present. Constraints may apply to land uses involving excavation or the addition or removal of water.	4	3	12 (Moderate)		4	2	8 (Minor)
		HAGI - Higher Walton HAGI	N1-05-KP00	Running sand conditions are probably present. Constraints may apply to land uses involving excavation or the addition or removal of water.	4	3	12 (Moderate)		4	2	8 (Minor)
		HAGI - Warburton HAGI	E-02-KP00	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.	3	3	9 (Minor)		3	2	6 (Minor)
		HAGI - Partington HAGI	E-01-KP00	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		HAGI - Runcorn HAGI	W-02-KP00	Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to running conditions.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		HAGI - Runcorn HAGI	W-02-KP00	Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to running conditions.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		HAGI - Runcorn HAGI	W-03-KP00	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		HAGI - Runcorn HAGI	W-02-KP00	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		HAGI - Inovyn Gas Storage HAGI	S-KP184000	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		HAGI - Inovyn Gas Storage HAGI	S-KP184000	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Stanlow	W-KP00	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Stanlow	W-KP00	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Stanlow	W-KP00	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.	3	3	9 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - A5117 Road	W-KP01+600	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A5117 Road	W-KP02+000	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Ellesmere Port to Warrington Line Railway	W-KP03+000	Running sand conditions are probably present. Constraints may apply to land uses involving excavation or the addition or removal of water.	4	3	12 (Moderate)		4	2	8 (Minor)
		Trenchless Crossing - River Weaver	W-KP10+000	Running sand conditions are probably present. Constraints may apply to land uses involving excavation or the addition or removal of water.	4	3	12 (Moderate)		4	2	8 (Minor)
		Trenchless Crossing - United Utilities Water	W-KP10+500	Running sand conditions are probably present. Constraints may apply to land uses involving excavation or the addition or removal of water.	4	3	12 (Moderate)		4	2	8 (Minor)
		Trenchless Crossing - Chester to Manchester Line Railway	W-KP11+000	Running sand conditions are probably present. Constraints may apply to land uses involving excavation or the addition or removal of water.	4	3	12 (Moderate)		4	2	8 (Minor)
		Trenchless Crossing - Sutton Weaver Canal	W-KP11+500	Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to running conditions.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Sutton Weaver Canal	W-KP11+000	Running sand conditions are probably present. Constraints may apply to land uses involving excavation or the addition or removal of water.	4	3	12 (Moderate)		4	2	8 (Minor)
		Trenchless Crossing - United Utilities Sewer	W-KP11+500	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A56 Chester Road	W-KP12+000	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - West Coast Main Line Railway	W-KP13+500	Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to running conditions.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Trent and Mersey Canal	W-KP18+000	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A533 Northwich Road	W-KP18+500	Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to running conditions.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - A533 Northwich Road	C-01-KP0+500	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Trent and Mersey Canal	S-KP01+500	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Trent and Mersey Canal	S-KP01+500	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Weaver Navigation Canal	S-KP02+000	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.	3	3	9 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - West Coast Main Line Railway	S-KP04+500	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A49 Warrington Road	S-KP06+000	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Mid Cheshire Line Railway	S-KP07+000	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A556 Chester Road	S-KP08+500	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+500	Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to running conditions.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+500	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+000	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.	3	3	9 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - A533 Road	S-KP15+000	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - River Dane	S-KP16+800	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.	3	3	9 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - Trent and Mersey Canal	S-KP16+500	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Middlewich Branch Line Railway	S-KP17+500	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A530 King Street Road	S-KP18+000	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A530 King Street Road	S-KP18+000	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A49 Tarporley Road	E-KP01+000	Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to running conditions.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - A559 Northwich Road	E-KP04+000	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - M6 Motorway	E-KP09+500	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A50 Road	E-KP11+500	Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to running conditions.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - M6 Motorway	E-KP14+000	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A56 Lymm Road	E-KP15+500	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.	3	3	9 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - Bridgewater Canal + road	E-KP15+500	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.	3	3	9 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - River Bollin	E-KP17+000	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.	3	3	9 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - M6 Motorway	N1-KP05+000	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A56 Chester Road	N1-KP08+000	Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to running conditions.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - A56 Chester Road	N1-KP08+000	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Bridgewater Canal	N1-KP08+500	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.	3	3	9 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+500	Running sand conditions are probably present. Constraints may apply to land uses involving excavation or the addition or removal of water.	4	3	12 (Moderate)		4	2	8 (Minor)
		Trenchless Crossing - River Mersey, Sanky Canal + Skelton Junction to Ditton Junction Line	N1-KP13+500	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.	3	3	9 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - A562 Widnes Road	N1-KP13+500	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A5080 South Lane Road	N1-KP14+500	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Manchester and Allerton Junction Line Railway	N1-KP15+000	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A57 Warrington Road	N1-KP18+000	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - M62 Motorway	N2-04-KP00	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A570 St Helens Linkway Road	N2-KP01+500	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Liverpool to Manchester Line Railway	N2-KP02+500	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Liverpool to Manchester Line Railway	N2-KP02+500	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Weaver Navigation Canal	W-KP10+500	Running sand conditions are probably present. Constraints may apply to land uses involving excavation or the addition or removal of water.	4	3	12 (Moderate)		4	2	8 (Minor)
		Trenchless Crossing - A557 Weston Point Expressway - Rocksavage Way	W-03-KP04+500	Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to running conditions.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - A6144 Manchester Road	E-05-KP00	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A6144 Manchester Road	E-05-KP00	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.	3	3	9 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - West Coast Mainline Railway	N1-05-KP0+500	Running sand conditions are probably present. Constraints may apply to land uses involving excavation or the addition or removal of water.	4	3	12 (Moderate)		4	2	8 (Minor)
		Trenchless Crossing - Eastford Road and Canal	N1-02-KP01+500	Running sand conditions are probably present. Constraints may apply to land uses involving excavation or the addition or removal of water.	4	3	12 (Moderate)		4	2	8 (Minor)
		Trenchless Crossing - Eastford Road and Canal	N1-02-KP01+500	Running sand conditions are probably present. Constraints may apply to land uses involving excavation or the addition or removal of water.	4	3	12 (Moderate)		4	2	8 (Minor)
		Trenchless Crossing - London Road	S-KP15+500	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - NULL	N1-02-KP02+000	Running sand conditions are probably present. Constraints may apply to land uses involving excavation or the addition or removal of water.	4	3	12 (Moderate)		4	2	8 (Minor)
		Block Valve - NULL	E-KP12+000	Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to running conditions.	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Block Valve - NULL	S-KP04+500	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		HAGI - Stanlow HPP HAGI	W-KP00	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Stanlow	W-KP00	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		HAGI - Stanlow HPP HAGI	W-KP00	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.	3	3	9 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - Stanlow	W-KP00	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.	3	3	9 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+000	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+000	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.	2	3	6 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - River Mersey, Sanky Canal + Skelton Junction to Ditton Junction Line	N1-KP12+500	Running sand conditions are probably present. Constraints may apply to land uses involving excavation or the addition or removal of water.	4	3	12 (Moderate)		4	2	8 (Minor)
		Trenchless Crossing - River Mersey, Sanky Canal + Skelton Junction to Ditton Junction Line	N1-KP12+500	Running sand conditions are probably present. Constraints may apply to land uses involving excavation or the addition or removal of water.	4	3	12 (Moderate)		4	2	8 (Minor)

APPENDIX C
RISK ASSESSMENT TABLE – GEOHAZARDS - LANDSLIDES

Hynet Geohazards Desk Study

Hazard Title: Landslides (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Potential for movement of rock, soil, debris down a sloping section of land. Can be due to natural ground conditions and geomorphological conditions or as a results of man made features such as cut slopes, embankments, quarries etc.	Insufficient design, delay, excessive displacement, failure. - Potential to add cost, time, risk to the project	Preferred Spurs Centreline - C-01	C-01-KP06+745	C-01-KP06+767	D - Moderate	4	5	20 (Severe)	Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment of temporary and permanent slopes. - Topographic survey to determine existing slope gradients and geomorphology - Assessment of existing and proposed slope stability to current British and Eurocode standards and CoP documents.-Adoption of conservative parameters in assessment and design. Designer to consider application of engineering mitigation such as regrading existing slopes, slope / cliff stabilisation with soil nails, rock bolts etc. - Consider reroute or by[ass with HDD	4	2	8 (Minor)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+348	N1-05-KP00+404	D - Moderate	4	5	20 (Severe)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+278	N1-05-KP00+307	D - Moderate	4	5	20 (Severe)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP11+234	S-KP11+272	D - Moderate	4	5	20 (Severe)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP11+294	S-KP11+376	D - Moderate	4	5	20 (Severe)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP11+272	S-KP11+294	C - Low	3	5	15 (Substantial)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP11+376	S-KP11+407	C - Low	3	5	15 (Substantial)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP03+545	S-KP03+635	C - Low	3	5	15 (Substantial)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP07+693	N1-KP07+714	C - Low	3	5	15 (Substantial)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP09+366	N1-KP09+390	C - Low	3	5	15 (Substantial)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP05+412	N2-KP05+563	C - Low	3	5	15 (Substantial)		3	2	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP06+958	C-01-KP06+994	C - Low	3	5	15 (Substantial)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-03	W-03-KP00+000	W-03-KP00+101	C - Low	3	5	15 (Substantial)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+263	N1-02-KP01+327	C - Low	3	5	15 (Substantial)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+416	W-01-KP01+465	C - Low	3	5	15 (Substantial)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+334	W-01-KP01+416	C - Low	3	5	15 (Substantial)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-02	W-02-KP00+000	W-02-KP00+048	C - Low	3	5	15 (Substantial)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-02	W-02-KP00+048	W-02-KP00+171	C - Low	3	5	15 (Substantial)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP10+972	W-KP10+973	C - Low	3	5	15 (Substantial)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP11+001	W-KP11+033	C - Low	3	5	15 (Substantial)		3	2	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP06+716	C-01-KP06+745	C - Low	3	5	15 (Substantial)		3	2	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP06+767	C-01-KP06+799	C - Low	3	5	15 (Substantial)		3	2	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP06+893	C-01-KP06+931	C - Low	3	5	15 (Substantial)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+993	N1-02-KP01+035	C - Low	3	5	15 (Substantial)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+678	N1-02-KP00+696	C - Low	3	5	15 (Substantial)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+404	N1-05-KP00+437	C - Low	3	5	15 (Substantial)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+307	N1-05-KP00+348	C - Low	3	5	15 (Substantial)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+253	N1-05-KP00+278	C - Low	3	5	15 (Substantial)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP13+087	W-KP19+216	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP19+216	W-KP19+303	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP00+000	W-KP00+464	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP00+464	W-KP01+809	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP01+809	W-KP06+752	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP19+659	E-KP21+662	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP12+898	E-KP12+961	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP12+961	E-KP19+659	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP06+187	E-KP12+898	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP11+407	S-KP12+266	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP12+604	S-KP12+803	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP01+638	S-KP02+796	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP14+129	N1-KP19+023	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP00+137	N1-KP02+495	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP00+000	N1-KP00+137	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP02+399	N2-KP03+352	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP00+000	N2-KP00+033	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP06+931	C-01-KP06+935	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP06+935	C-01-KP06+958	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP00+000	C-01-KP06+184	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-03	W-03-KP00+101	W-03-KP01+948	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+609	N1-02-KP06+110	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - E-01	E-01-KP00+000	E-01-KP00+454	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-04	N2-04-KP00+024	N2-04-KP02+035	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-04	N2-04-KP00+000	N2-04-KP00+024	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-06	N2-KP06+129	N2-06-KP01+199	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - E-02	E-02-KP00+000	E-02-KP00+155	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - E-04	E-04-KP00+000	E-04-KP00+588	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-07	N2-KP06+129	N2-07-KP00+157	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP00+000	W-01-KP01+334	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - E-05	E-05-KP00+000	E-05-KP00+124	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP06+752	W-KP10+972	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP11+033	W-KP13+087	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP10+973	W-KP11+001	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP03+984	E-KP04+034	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP00+000	E-KP03+671	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP04+034	E-KP06+187	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP03+671	E-KP03+984	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)

Hynet Geohazards Desk Study

Hazard Title: Landslides (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Potential for movement of rock, soil, debris down a sloping section of land. Can be due to natural ground conditions and geomorphological conditions or as a results of man made features such as cut slopes, embankments, quarries etc.	Insufficient design, delay, excessive displacement, failure. - Potential to add cost, time, risk to the project	Preferred Route Centreline - S	S-KP03+489	S-KP03+545	B - Very Low	2	5	10 (Moderate)	Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment of temporary and permanent slopes. - Topographic survey to determine existing slope gradients and geomorphology - Assessment of existing and proposed slope stability to current British and Eurocode standards and CoP documents.-Adoption of conservative parameters in assessment and design. Designer to consider application of engineering mitigation such as regrading existing slopes, slope / cliff stabilisation with soil nails, rock bolts etc. - Consider reroute or by[ass with HDD	2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP03+635	S-KP11+234	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP12+266	S-KP12+479	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP18+001	S-KP18+365	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP18+401	S-KP18+444	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP00+000	S-KP01+638	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP02+796	S-KP03+489	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP18+365	S-KP18+401	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP12+803	S-KP18+001	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP12+479	S-KP12+604	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP12+963	N1-KP14+129	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP09+390	N1-KP12+526	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP08+700	N1-KP09+366	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP07+714	N1-KP08+700	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP07+168	N1-KP07+693	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP06+159	N1-KP06+986	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP05+685	N1-KP06+115	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP02+495	N1-KP05+190	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP05+563	N2-KP06+129	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP03+352	N2-KP05+412	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP00+033	N2-KP02+399	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP07+022	C-01-KP07+297	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP07+315	C-01-KP07+966	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP06+994	C-01-KP07+022	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP07+297	C-01-KP07+315	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP06+184	C-01-KP06+716	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP06+799	C-01-KP06+893	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+035	N1-02-KP01+263	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+327	N1-02-KP01+609	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+696	N1-02-KP00+993	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+000	N1-02-KP00+678	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+437	N1-05-KP00+677	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+000	N1-05-KP00+253	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)

Hynet Geohazards Desk Study

Hazard Title: Landslides (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	Closest KP	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Potential for movement of rock, soil, debris down a sloping section of land. Can be due to natural ground conditions and geomorphological conditions or as a results of man made features such as cut slopes, embankments, quarries etc.	'Insufficient design, delay, excessive displacement, failure - Running sands' occurs when a sand layer/unit becomes fluidised by water flowing through it, causing it to 'run' into open excavations if sides are left unsupported. They typically comprise loose clean fine to medium sand.- Such sands can 'run', removing support from overlying buildings, excavation sidewalls and causing potential damage and / or stability issues. - Other engineering risks include HDD / borehole instability, sudden changes in drilling parameters - Potential to add cost, time, risk to the project	HAGI - Stanlow HPP HAGI	W-KP00	B - Very Low	2	5	10 (Moderate)	Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment of temporary and permanent slopes. - Topographic survey to determine existing slope gradients and geomorphology - Assessment of existing and proposed slope stability to current British and Eurocode standards and CoP documents.-Adoption of conservative parameters in assessment and design. Designer to consider application of engineering mitigation such as regrading existing slopes, slope / cliff stabilisation with soil nails, rock bolts etc. - Consider reroute or by[ass with HDD	2	2	4 (None / Negligible)
		HAGI - Stanlow HPP HAGI	W-KP00	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		HAGI - Central Hub HAGI	S-KP00	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		HAGI - Clockface HAGI	N2-04-KP00	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		HAGI - Clockface HAGI	N2-KP00	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		HAGI - Rocksavage HAG	W-01-KP00	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		HAGI - Higher Walton HAGI	N1-05-KP00	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		HAGI - Warburton HAGI	E-02-KP00	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		HAGI - Partington HAGI	E-01-KP00	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		HAGI - Runcorn HAGI	W-02-KP00	C - Low	3	5	15 (Substantial)		3	2	6 (Minor)
		HAGI - Runcorn HAGI	W-02-KP00	C - Low	3	5	15 (Substantial)		3	2	6 (Minor)
		HAGI - Inoyvn Gas Storage HAGI	S-KP18+000	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		HAGI - Inoyvn Gas Storage HAGI	S-KP18+000	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - Stanlow	W-KP00	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - A5117 Road	W-KP01+500	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - A5117 Road	W-KP02+000	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - Ellesmere Port to Warrington Line Railway	W-KP03+000	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - River Weaver	W-KP10+000	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - United Utilities Water	W-KP10+500	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - Chester to Manchester Line Railway	W-KP11+000	C - Low	3	5	15 (Substantial)		3	2	6 (Minor)
		Trenchless Crossing - Sutton Weaver Canal	W-KP11+000	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - United Utilities Sewer	W-KP11+500	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - A56 Chester Road	W-KP12+000	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - West Coast Main Line Railway	W-KP16+500	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - Trent and Mersey Canal	W-KP18+000	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - A533 Northwich Road	W-KP18+500	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - A533 Northwich Road	C-01-KP0+500	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - Trent and Mersey Canal	S-KP01+500	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - Trent and Mersey Canal	S-KP01+500	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - Weaver Navigation Canal	S-KP02+000	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - West Coast Main Line Railway	S-KP04+500	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - A49 Warrington Road	S-KP06+000	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - Mid Cheshire Line Railway	S-KP07+000	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - A556 Chester Road	S-KP08+500	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+000	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+500	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+000	C - Low	3	5	15 (Substantial)		3	2	6 (Minor)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+000	C - Low	3	5	15 (Substantial)		3	2	6 (Minor)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+500	C - Low	3	5	15 (Substantial)		3	2	6 (Minor)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+500	C - Low	3	5	15 (Substantial)		3	2	6 (Minor)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+000	C - Low	3	5	15 (Substantial)		3	2	6 (Minor)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+500	D - Moderate	4	5	20 (Severe)		4	2	8 (Minor)
		Trenchless Crossing - A533 Road	S-KP15+000	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - River Dane	S-KP16+500	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - Trent and Mersey Canal	S-KP16+500	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - Middlewich Branch Line Railway	S-KP17+500	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - A530 King Street Road	S-KP18+000	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - A530 King Street Road	S-KP18+000	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - A49 Tarporley Roac	E-KP01+000	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - A559 Northwich Road	E-KP04+000	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - M6 Motorway	E-KP09+500	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - A50 Road	E-KP11+500	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - M56 Motorway	E-KP14+000	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - A56 Lymm Road	E-KP15+500	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - Bridgewater Canal - road	E-KP15+500	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - River Bolin	E-KP17+000	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - M56 Motorway	N1-KP05+000	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - A56 Chester Road	N1-KP08+000	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - Bridgewater Canal	N1-KP08+500	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+500	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+500	C - Low	3	5	15 (Substantial)		3	2	6 (Minor)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+500	C - Low	3	5	15 (Substantial)		3	2	6 (Minor)
		Trenchless Crossing - A562 Widnes Road	N1-KP13+500	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - A5080 South Lane Road	N1-KP14+500	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - Manchester and Allerton Junction Line Railway	N1-KP15+000	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - A57 Warrington Road	N1-KP18+000	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - M62 Motorway	N2-04-KP00	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - A570 St Helens Linkway Road	N2-KP01+500	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - Liverpool to Manchester Line Railway	N2-KP02+500	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - Liverpool to Manchester Line Railway	N2-KP02+500	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - Weaver Navigation Canal	W-KP10+500	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - A557 Weston Point Expressway - Rocksavage Way	W-03-KP0+500	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)

Hynet Geohazards Desk Study

Hazard Title: Landslides (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	Closest KP	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Potential for movement of rock, soil, debris down a sloping section of land. Can be due to natural ground conditions and geomorphological conditions or as a results of man made features such as cut slopes, embankments, quarries etc.	'Insufficient design, delay, excessive displacement, failure - Running sands' occurs when a sand layer/unit becomes fluidised by water flowing through it, causing it to 'run' into open excavations if sides are left unsupported. They typically comprise loose clean fine to medium sand.- Such sands can 'run', removing support from overlying buildings, excavation sidewalls and causing potential damage and / or stability issues. - Other engineering risks include HDD / borehole instability, sudden changes in drilling parameters - Potential to add cost, time, risk to the project	Trenchless Crossing - A6144 Manchester Road	E-05-KP00	B - Very Low	2	5	10 (Moderate)	Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment of temporary and permanent slopes. - Topographic survey to determine existing slope gradients and geomorphology - Assessment of existing and proposed slope stability to current British and Eurocode standards and CoP documents.-Adoption of conservative parameters in assessment and design. Designer to consider application of engineering mitigation such as regrading existing slopes, slope / cliff stabilisation with soil nails, rock bolts etc. - Consider reroute or by[ass with HDD	2	2	4 (None / Negligible)
		Trenchless Crossing - West Coast Mainline Railway	N1-KP09+500	D - Moderate	4	5	20 (Severe)		4	2	8 (Minor)
		Trenchless Crossing - West Coast Mainline Railway	N1-05-KP0+500	D - Moderate	4	5	20 (Severe)		4	2	8 (Minor)
		Trenchless Crossing - West Coast Mainline Railway	N1-05-KP0+500	D - Moderate	4	5	20 (Severe)		4	2	8 (Minor)
		Trenchless Crossing - Eastford Road and Canal	N1-02-KP01+500	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - Eastford Road and Canal	N1-02-KP01+500	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - London Road	S-KP15+500	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - NULL	N1-02-KP02+000	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Block Valve - NULL	E-KP12+000	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Block Valve - NULL	S-KP08+500	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		HAGI - Stanlow HPP HAGI	W-KP00	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - Stanlow	W-KP00	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - Chester to Manchester Line Railway	W-KP11+000	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - Chester to Manchester Line Railway	W-KP11+000	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - River Mersey, Sanky Canal + Skelton Junction to Ditton Junction Line	N1-KP12+500	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - River Mersey, Sanky Canal + Skelton Junction to Ditton Junction Line	N1-KP12+500	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - West Coast Mainline Railway	N1-KP09+500	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - West Coast Mainline Railway	N1-05-KP0+500	B - Very Low	2	5	10 (Moderate)		2	2	4 (None / Negligible)
		Trenchless Crossing - West Coast Mainline Railway	N1-KP09+500	C - Low	3	5	15 (Substantial)		3	2	6 (Minor)
		Trenchless Crossing - West Coast Mainline Railway	N1-05-KP0+500	C - Low	3	5	15 (Substantial)		3	2	6 (Minor)

APPENDIX C
RISK ASSESSMENT TABLE – GEOHAZARDS - EXCAVATABILITY

Hynet Geohazards Desk Study

Hazard Title: Excavatability

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
How easy the shallow soils can be excavated.	Some ground conditions such as solid rock , cemented soils resulting in potential issues / limitations of standard plant to form excavations and need for heavier plant, hydraulic machinery, breakers, or blasting. - Insufficient design, planning, delay.- Potential to add cost, time, risk to the project	Preferred Route Centreline - W	W-KP19+216	W-KP019+13	Bedrock potentially at or close to surface.	3	3	9 (Minor)	Ground Investigation to determine exact Geology- Designer to consider conservative soil parameters- Foundations to be taken to competent strata- Excavations to have trench support systems available. - Consider reroute to avoid infilled ground / potentially unstable ground. - Consider application of ground improvement techniques	2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP15+366	W-KP16+861	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP15+131	W-KP15+206	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP11+308	W-KP11+353	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP00+058	W-KP00+094	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP00+020	E-KP00+024	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP00+197	E-KP00+783	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP00+863	E-KP01+588	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP03+168	E-KP03+493	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP04+518	E-KP05+051	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP08+731	E-KP08+810	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP11+246	E-KP12+935	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP14+681	E-KP14+722	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP00+177	S-KP00+019	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP03+504	S-KP03+617	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP11+332	S-KP011+36	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP00+000	S-KP00+015	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP00+033	N1-KP01+578	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP02+302	N1-KP02+655	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP05+001	N1-KP05+673	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP06+115	N1-KP06+159	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP06+985	N1-KP07+172	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP07+652	N1-KP07+681	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP07+929	N1-KP08+077	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP09+096	N1-KP09+145	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP12+526	N1-KP12+963	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP00+000	N1-KP00+003	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP03+136	N2-KP03+316	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP05+865	N2-KP05+947	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP05+066	N2-KP05+837	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP00+165	C-01-KP00+492	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP00+755	C-01-KP00+845	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-03	W-03-KP00+000	W-03-KP01+844	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-02	W-02-KP00+111	W-02-KP00+171	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-02	W-02-KP00+000	W-02-KP00+044	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP019+13	W-KP19+216	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP019+13	W-KP19+216	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP00+024	E-KP00+197	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP00+024	E-KP00+197	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP00+174	S-KP00+022	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP00+174	S-KP00+022	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP00+015	S-KP00+019	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP00+015	S-KP00+019	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP00+000	C-01-KP00+165	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP00+000	C-01-KP00+165	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP00+022	S-KP00+174	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP00+022	S-KP00+174	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP00+022	S-KP00+174	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)

Hynet Geohazards Desk Study

Hazard Title: Excavatability

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	Closest KP	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
How easy the shallow soils can be excavated.	Some ground conditions such as solid rock , cemented soils resulting in potential issues / limitations of standard plant to form excavations and need for heavier plant, hydraulic machinery, breakers, or blasting. - Insufficient design, planning, delay.- Potential to add cost, time, risk to the project	HAGI - Central Hub HAGI	C-01-KP00	Bedrock potentially at or close to surface.	3	3	9 (Minor)	Ground Investigation to determine exact Geology- Designer to consider conservative soil parameters- Foundations to be taken to competent strata- Excavations to have trench support systems available. - Consider reroute to avoid infilled ground / potentially unstable ground. - Consider application of ground improvement techniques	2	2	4 (None / Negligible)
		HAGI - Central Hub HAGI	N1-KP00	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		HAGI - Central Hub HAGI	S-KP00	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		HAGI - Central Hub HAGI	E-KP00	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		HAGI - Central Hub HAGI	N1-KP00	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		HAGI - Runcorn HAGI	W-02-KP00	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		HAGI - Runcorn HAGI	W-03-KP00	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Stanlow	W-KP00	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Sutton Weaver Canal	W-KP11+500	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - West Coast Main Line Railway	W-KP16+500	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A533 Northwich Road	W-KP18+500	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+500	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A49 Tarporley Road	E-KP01+000	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A50 Road	E-KP11+500	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A56 Chester Road	N1-KP08+000	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - River Mersey, Sanky Canal + Skelton Junction to Ditton Junction Line	N1-KP12+500	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A557 Weston Point Expressway - Rocksavage Way	W-03-KP0+500	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Block Valve - NULL	E-KP12+000	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		HAGI - Stanlow HPP HAGI	W-KP00	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Stanlow	W-KP00	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		HAGI - Central Hub HAGI	C-01-KP00	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		HAGI - Central Hub HAGI	C-01-KP00	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		HAGI - Central Hub HAGI	S-KP00	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		HAGI - Central Hub HAGI	S-KP00	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		HAGI - Central Hub HAGI	C-01-KP00	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		HAGI - Central Hub HAGI	C-01-KP00	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		HAGI - Central Hub HAGI	C-01-KP00	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		HAGI - Central Hub HAGI	C-01-KP00	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		HAGI - Central Hub HAGI	E-KP00	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		HAGI - Central Hub HAGI	F-KP00	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		HAGI - Runcorn HAGI	W-02-KP00	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		HAGI - Runcorn HAGI	W-02-KP00	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		HAGI - Central Hub HAGI	C-01-KP00	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		HAGI - Central Hub HAGI	C-01-KP00	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)
		HAGI - Central Hub HAGI	C-01-KP00	Bedrock potentially at or close to surface.	3	3	9 (Minor)		2	2	4 (None / Negligible)

APPENDIX C
RISK ASSESSMENT TABLE – GEOHAZARDS – EXCAVATION STABILITY

Hynet Geohazards Desk Study

Hazard Title: Excavation Stability

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Potential for side wall or base instability of excavations due to difficult ground conditions such as loose granular deposits, water bearing granular soils, made ground etc	Insufficient design, delay, excessive displacement, differential displacement, failure of temporary and permanent slopes and excavation instability. - Potential to add cost, time, risk to the project	Preferred Route Centreline - W	W-KP02+292	W-KP11+305	TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	4	3	12 (Moderate)	Ground investigation to determine exact geology and groundwater conditions. - Designer to consider appropriate engineering mitigation to facilitate temporary works; such as dewatering systems, trial excavations, excavation support systems.	4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP17+143	W-KP17+318	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP17+648	W-KP18+339	GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP11+351	W-KP15+131	GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP17+318	W-KP17+143	ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP00+784	E-KP00+864	ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP02+202	E-KP02+498	GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP06+446	E-KP06+671	GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP06+052	E-KP07+222	ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP03+653	E-KP04+519	GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP09+541	E-KP09+728	PEAT - PEAT	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP09+728	E-KP10+524	PEAT - PEAT	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP16+692	E-KP16+882	RIVER TERRACE DEPOSITS (UNDIFFERENTIATED) - SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP15+123	E-KP015+96	SHIRDLEY HILL SAND FORMATION - SAND	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP015+96	E-KP16+692	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP21+123	E-KP21+500	PEAT - PEAT	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP17+107	E-KP21+662	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP17+571	E-KP19+741	SHIRDLEY HILL SAND FORMATION - SAND	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP20+728	E-KP21+058	PEAT - PEAT	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP16+882	E-KP20+177	ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP16+125	S-KP16+173	RIVER TERRACE DEPOSITS, 1 - SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP16+173	S-KP16+222	RIVER TERRACE DEPOSITS (UNDIFFERENTIATED) - SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP15+309	S-KP15+366	ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP16+222	S-KP16+377	ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP16+377	S-KP16+544	RIVER TERRACE DEPOSITS (UNDIFFERENTIATED) - SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP17+489	S-KP17+532	ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP15+463	S-KP16+049	GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP08+786	S-KP08+940	PEAT - PEAT	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP11+103	S-KP11+071	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP12+945	S-KP12+531	GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP04+649	S-KP04+765	GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP04+608	S-KP04+649	ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP16+081	S-KP11+103	ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP02+800	S-KP03+505	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP00+978	S-KP01+196	GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP01+822	S-KP01+977	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP01+461	S-KP00+779	GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP08+940	S-KP06+977	GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP01+977	S-KP02+800	ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP08+078	N1-KP011+48	SHIRDLEY HILL SAND FORMATION - SAND	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP12+963	N1-KP13+645	SHIRDLEY HILL SAND FORMATION - SAND	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP09+305	N1-KP12+526	TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP14+494	N1-KP14+502	ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP14+972	N1-KP15+136	SHIRDLEY HILL SAND FORMATION - SAND	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP07+487	C-01-KP07+966	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP07+059	C-01-KP07+199	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP05+347	C-01-KP05+510	GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP03+757	C-01-KP04+007	GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP00+487	C-01-KP00+761	GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP06+837	C-01-KP06+997	ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP04+682	N1-02-KP04+888	SHIRDLEY HILL SAND FORMATION - SAND	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+275	N1-02-KP05+813	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+000	N1-02-KP06+110	TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Spurs Centreline - E-01	E-01-KP00+000	E-01-KP00+438	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Spurs Centreline - E-01	E-01-KP00+438	E-01-KP00+430	ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+000	N1-05-KP00+677	TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+445	N2-06-KP00+504	ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+774	N2-06-KP00+962	ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Spurs Centreline - E-02	E-02-KP00+000	E-02-KP00+155	SHIRDLEY HILL SAND FORMATION - SAND	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Spurs Centreline - E-04	E-04-KP00+261	E-04-KP00+588	PEAT - PEAT	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Spurs Centreline - E-04	E-04-KP00+000	E-04-KP00+261	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP00+000	W-01-KP01+201	TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP00+458	W-01-KP00+866	GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Spurs Centreline - E-05	E-05-KP00+000	E-05-KP00+124	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP10+596	W-KP010+92	<Null>	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP07+919	W-KP08+053	<Null>	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP13+296	E-KP13+448	<Null>	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP20+842	E-KP21+662	<Null>	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP07+863	S-KP08+115	<Null>	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP03+885	S-KP04+004	<Null>	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP010+04	S-KP010+09	<Null>	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP013+57	S-KP13+599	<Null>	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP17+612	S-KP17+655	<Null>	4	3	12 (Moderate)		4	2	8 (Minor)

Hynet Geohazards Desk Study

Hazard Title: Excavation Stability

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Potential for side wall or base instability of excavations due to difficult ground conditions such as loose granular deposits, water bearing granular soils, made ground etc	Insufficient design, delay, excessive displacement, differential displacement, failure of temporary and permanent slopes and excavation instability. - Potential to add cost, time, risk to the project	Preferred Route Centreline - N1	N1-KP10+000	N1-KP10+189	<Null>	4	3	12 (Moderate)	Ground investigation to determine exact geology and groundwater conditions. - Designer to consider appropriate engineering mitigation to facilitate temporary works; such as dewatering systems, trial excavations, excavation support systems.	4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP10+521	N1-KP11+338	<Null>	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - N2	N2-KP03+392	N2-KP03+836	<Null>	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - N2	N2-KP05+211	N2-KP06+129	<Null>	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP07+153	C-01-KP07+651	<Null>	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP06+053	C-01-KP06+270	<Null>	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+107	N1-02-KP00+274	<Null>	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+077	N1-02-KP02+134	<Null>	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+611	N1-02-KP01+672	<Null>	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+304	N1-02-KP01+467	<Null>	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Spurs Centreline - E-01	E-01-KP00+000	E-01-KP00+454	<Null>	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+137	N1-05-KP00+272	<Null>	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Spurs Centreline - N2-06	N2-KP06+129	N2-06-KP01+199	<Null>	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Spurs Centreline - E-04	E-04-KP00+000	E-04-KP00+588	<Null>	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Spurs Centreline - N2-07	N2-KP06+129	N2-07-KP00+157	<Null>	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP00+120	W-01-KP00+444	<Null>	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Spurs Centreline - E-05	E-05-KP00+000	E-05-KP00+124	<Null>	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP01+913	S-KP02+151	<Null>	4	3	12 (Moderate)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP01+913	S-KP02+151	<Null>	4	3	12 (Moderate)		4	2	8 (Minor)

Hynet Geohazards Desk Study

Hazard Title: Excavation Stability

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	Closest KP	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Potential for side wall or base instability of excavations due to difficult ground conditions such as loose granular deposits, water bearing granular soils, made ground etc	Insufficient design, delay, excessive displacement, differential displacement, failure of temporary and permanent slopes and excavation instability. - Potential to add cost, time, risk to the project	HAGI - Stanlow HPP HAGI	W-KP00	ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	4	3	12 (Moderate)	Ground investigation to determine exact geology and groundwater conditions. - Designer to consider appropriate engineering mitigation to facilitate temporary works; such as dewatering systems, trial excavations, excavation support systems.	4	2	8 (Minor)
		HAGI - Rocksavage HAGI	W-01-KP00	TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	4	3	12 (Moderate)		4	2	8 (Minor)
		HAGI - Higher Walton HAGI	N1-05-KP00	TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	4	3	12 (Moderate)		4	2	8 (Minor)
		HAGI - Warburton HAGI	E-02-KP00	SHIRDLEY HILL SAND FORMATION - SAND	4	3	12 (Moderate)		4	2	8 (Minor)
		HAGI - Partington HAGI	E-01-KP00	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Trenchless Crossing - Ellesmere Port to Warrington Line Railway	W-KP03+000	TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	4	3	12 (Moderate)		4	2	8 (Minor)
		Trenchless Crossing - River Weaver	W-KP10+000	TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	4	3	12 (Moderate)		4	2	8 (Minor)
		Trenchless Crossing - United Utilities Water	W-KP10+500	TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	4	3	12 (Moderate)		4	2	8 (Minor)
		Trenchless Crossing - Chester to Manchester Line Railway	W-KP11+000	TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	4	3	12 (Moderate)		4	2	8 (Minor)
		Trenchless Crossing - Sutton Weaver Canal	W-KP11+000	TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	4	3	12 (Moderate)		4	2	8 (Minor)
		Trenchless Crossing - United Utilities Sewer	W-KP11+500	GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Trenchless Crossing - A56 Chester Road	W-KP12+000	GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Trenchless Crossing - Trent and Mersey Canal	W-KP18+000	GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Trenchless Crossing - A533 Northwich Road	C-01-KP0+500	GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Trenchless Crossing - Trent and Mersey Canal	S-KP01+500	GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Trenchless Crossing - Weaver Navigation Canal	S-KP02+000	ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Trenchless Crossing - Mid Cheshire Line Railway	S-KP07+000	GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Trenchless Crossing - A556 Chester Road	S-KP08+500	GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+000	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+500	GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+000	ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Trenchless Crossing - River Dane	S-KP16+500	ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Trenchless Crossing - Trent and Mersey Canal	S-KP16+500	RIVER TERRACE DEPOSITS (UNDIFFERENTIATED) - SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Trenchless Crossing - A559 Northwich Road	E-KP04+000	GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Trenchless Crossing - A56 Lymm Road	E-KP15+500	SHIRDLEY HILL SAND FORMATION - SAND	4	3	12 (Moderate)		4	2	8 (Minor)
		Trenchless Crossing - Bridgewater Canal + road	E-KP15+500	SHIRDLEY HILL SAND FORMATION - SAND	4	3	12 (Moderate)		4	2	8 (Minor)
		Trenchless Crossing - River Bollin	E-KP17+000	ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Trenchless Crossing - Bridgewater Canal	N1-KP08+500	SHIRDLEY HILL SAND FORMATION - SAND	4	3	12 (Moderate)		4	2	8 (Minor)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+500	TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	4	3	12 (Moderate)		4	2	8 (Minor)
		Trenchless Crossing - River Mersey, Sanky Canal + Skelton Junction to Ditton Junction Line	N1-KP12+500	SHIRDLEY HILL SAND FORMATION - SAND	4	3	12 (Moderate)		4	2	8 (Minor)
		Trenchless Crossing - River Mersey, Sanky Canal + Skelton Junction to Ditton Junction Line	N1-KP12+500	TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	4	3	12 (Moderate)		4	2	8 (Minor)
		Trenchless Crossing - Weaver Navigation Canal	W-KP10+500	TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	4	3	12 (Moderate)		4	2	8 (Minor)
		Trenchless Crossing - A6144 Manchester Road	E-05-KP00	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Trenchless Crossing - A6144 Manchester Road	E-05-KP00	ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Trenchless Crossing - West Coast Mainline Railway	N1-05-KP0+500	TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	4	3	12 (Moderate)		4	2	8 (Minor)
		Trenchless Crossing - Eastford Road and Cana	N1-02-KP01+500	TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	4	3	12 (Moderate)		4	2	8 (Minor)
		Trenchless Crossing - London Road	S-KP15+500	GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		Trenchless Crossing - NULL	N1-02-KP02+000	TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	4	3	12 (Moderate)		4	2	8 (Minor)
		Block Valve - NULL	S-KP08+500	GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	4	3	12 (Moderate)		4	2	8 (Minor)
		HAGI - Partington HAGI	E-01-KP00	<Null>	4	3	12 (Moderate)		4	2	8 (Minor)
		Trenchless Crossing - United Utilities Water	W-KP10+500	<Null>	4	3	12 (Moderate)		4	2	8 (Minor)
		Trenchless Crossing - Middlewich Branch Line Railway	S-KP17+500	<Null>	4	3	12 (Moderate)		4	2	8 (Minor)
		Trenchless Crossing - Weaver Navigation Canal	W-KP10+500	<Null>	4	3	12 (Moderate)		4	2	8 (Minor)
		Trenchless Crossing - A6144 Manchester Road	E-05-KP00	<Null>	4	3	12 (Moderate)		4	2	8 (Minor)
		Trenchless Crossing - West Coast Mainline Railway	N1-KP09+500	<Null>	4	3	12 (Moderate)		4	2	8 (Minor)
		Trenchless Crossing - Eastford Road and Cana	N1-02-KP01+500	<Null>	4	3	12 (Moderate)		4	2	8 (Minor)
		Trenchless Crossing - Weaver Navigation Canal	S-KP02+000	<Null>	4	3	12 (Moderate)		4	2	8 (Minor)
		Trenchless Crossing - Weaver Navigation Canal	S-KP02+000	<Null>	4	3	12 (Moderate)		4	2	8 (Minor)

APPENDIX C
RISK ASSESSMENT TABLE – GEOHAZARDS – GROUND DISSOLUTION OF SOLUBLE ROCKS

RSK GEOSCIENCES

Hynet Geohazards Desk Study

Hazard Title: Ground Dissolution of Soluble Rocks (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Rationale	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Potential for formation of cavity / cave systems in the ground caused by the dissolution of minerals within the parent rock.	Ground instability can result from movement of loose material contained within these cavities, and / or void migration towards the surface, often triggered by water.- Insufficient design, delay, excessive displacement, differential displacement, failure of foundations, slopes and excavation instability. Hole instability if HDD or pile bore penetrates deep filled hollow - Potential to add cost, time, risk to the project	Preferred Route Centreline - W	W-KP19+216	W-KP19+303	Soluble rocks are either not thought to be present within the ground, or not prone to dissolution. Dissolution features are unlikely to be present.	Negligible	1	3	3 (None / Negligible)	Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment. - Designer to consider rerouting to avoid unstable geology. - Consider mitigation remedial measures such as compaction grouting, void filling, foam concrete etc	1	2	2 (None / Negligible)
		Preferred Route Centreline - W	W-KP06+752	W-KP13+087		Negligible	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - W	W-KP00+000	W-KP00+464		Negligible	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - W	W-KP13+087	W-KP19+216		Negligible	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - W	W-KP01+809	W-KP06+752		Negligible	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - W	W-KP00+464	W-KP01+809		Negligible	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - E	E-KP19+659	E-KP21+662		Negligible	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - E	E-KP12+898	E-KP12+961		Negligible	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - E	E-KP06+187	E-KP12+898		Negligible	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - S	S-KP12+266	S-KP12+479		Negligible	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - S	S-KP01+638	S-KP02+796		Negligible	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - S	S-KP03+489	S-KP12+266		Negligible	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - S	S-KP12+604	S-KP12+803		Negligible	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP00+000	N1-KP00+137		Negligible	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP14+129	N1-KP19+023		Negligible	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP00+137	N1-KP02+495		Negligible	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP02+399	N2-KP03+352		Negligible	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP00+000	N2-KP00+033		Negligible	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP00+000	C-01-KP05+777		Negligible	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP07+493	C-01-KP07+965		Negligible	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - W-03	W-03-KP00+000	W-03-KP01+948		Negligible	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+609	N1-02-KP06+110		Negligible	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+000	N1-02-KP01+609		Negligible	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - E-01	E-01-KP00+000	E-01-KP00+454		Negligible	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - N2-04	N2-04-KP00+000	N2-04-KP00+024		Negligible	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - N2-04	N2-04-KP00+024	N2-04-KP02+035		Negligible	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+000	N1-05-KP00+677		Negligible	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - N2-06	N2-KP06+129	N2-06-KP01+199		Negligible	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - E-02	E-02-KP00+000	E-02-KP00+155		Negligible	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - E-04	E-04-KP00+000	E-04-KP00+588		Negligible	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - N2-07	N2-KP06+129	N2-07-KP00+157		Negligible	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP01+416	W-01-KP01+465		Negligible	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP00+000	W-01-KP01+416		Negligible	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - W-02	W-02-KP00+000	W-02-KP00+048		Negligible	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - W-02	W-02-KP00+048	W-02-KP00+171		Negligible	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - E-05	E-05-KP00+000	E-05-KP00+124		Negligible	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - E	E-KP16+991	E-KP19+659		Negligible	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - E	E-KP12+961	E-KP15+295		Negligible	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - E	E-KP03+984	E-KP04+034		Negligible	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - E	E-KP00+000	E-KP03+671		Negligible	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - E	E-KP04+034	E-KP06+187		Negligible	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - E	E-KP03+671	E-KP03+984		Negligible	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - S	S-KP00+000	S-KP01+638		Negligible	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - S	S-KP02+796	S-KP03+489		Negligible	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - S	S-KP12+479	S-KP12+604		Negligible	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - S	S-KP12+803	S-KP13+300		Negligible	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP07+168	N1-KP08+700		Negligible	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP06+159	N1-KP06+986		Negligible	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP05+685	N1-KP06+115		Negligible	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP02+495	N1-KP05+190		Negligible	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP12+963	N1-KP14+129		Negligible	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP08+700	N1-KP12+526		Negligible	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP03+352	N2-KP06+129		Negligible	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP00-033	N2-KP02+399		Negligible	1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - E	E-KP15+295	E-KP16+991	Soluble rocks are present within the ground. Numerous dissolution features may be present. Potential for difficult ground conditions should be investigated. Potential for localised subsidence is at a level where it should be considered.	High	5	3	15 (Substantial)		5	2	10 (Moderate)
		Preferred Route Centreline - S	S-KP13+300	S-KP17+967		High	5	3	15 (Substantial)		5	2	10 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP06+184	C-01-KP06+935		High	5	3	15 (Substantial)		5	2	10 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP05+772	C-01-KP06+184		High	5	3	15 (Substantial)		5	2	10 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP06+935	C-01-KP07+022		High	5	3	15 (Substantial)		5	2	10 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP07+297	C-01-KP07+315		High	5	3	15 (Substantial)		5	2	10 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP07+022	C-01-KP07+297		High	5	3	15 (Substantial)		5	2	10 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP07+315	C-01-KP07+493		High	5	3	15 (Substantial)		5	2	10 (Moderate)
		Preferred Route Centreline - S	S-KP18+365	S-KP18+401	Soluble rocks are present within the ground. Some dissolution features may be present. Potential for difficult ground conditions are at a level where they may be considered, localised subsidence need not be considered except in exceptional circumstances.	Low	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP17+967	S-KP18+001		Low	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP18+001	S-KP18+365		Low	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP18+401	S-KP18+444		Low	3	3	9 (Minor)		3	2	6 (Minor)

Hynet Geohazards Desk Study

Hazard Title: Ground Dissolution of Soluble Rocks (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	Closest KP	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Potential for formation of cavity / cave systems in the ground caused by the dissolution of minerals within the parent rock.	Ground instability can result from movement of loose material contained within these cavities, and / or void migration towards the surface, often triggered by water.- Insufficient design, delay, excessive displacement, differential displacement, failure of foundations, slopes and excavation instability. Hole instability if HDD or pile bore penetrates deep filled hollow - Potential to add cost, time, risk to the project	HAGI - Stanlow HPP HAGI	W-KP00	Soluble rocks are either not thought to be present within the ground, or not prone to dissolution. Dissolution features are unlikely to be present.	1	3	3 (None / Negligible)	Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment. - Designer to consider rerouting to avoid unstable geology. Consider mitigation remedial measures such as compaction grouting, void filling, foam concrete etc	1	2	2 (None / Negligible)
		HAGI - Stanlow HPP HAGI	W-KP00		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		HAGI - Central Hub HAGI	S-KP00		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		HAGI - Clockface HAGI	N2-KP00		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		HAGI - Clockface HAGI	N2-04-KP00		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		HAGI - Rocksavage HAGI	W-01-KP00		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		HAGI - Higher Walton HAGI	N1-05-KP00		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		HAGI - Warburton HAGI	E-02-KP00		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		HAGI - Partington HAGI	E-01-KP00		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		HAGI - Runcorn HAGI	W-02-KP00		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		HAGI - Runcorn HAGI	W-02-KP00		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Stanlow	W-KP00		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - A5117 Road	W-KP02+000		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - A5117 Road	W-KP01+500		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Ellesmere Port to Warrington Line Railway	W-KP03+000		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - River Weaver	W-KP10+000		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - United Utilities Water	W-KP10+500		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Chester to Manchester Line Railway	W-KP11+000		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Sutton Weaver Canal	W-KP11+000		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - United Utilities Sewer	W-KP11+500		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - A56 Chester Road	W-KP12+000		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - West Coast Main Line Railway	W-KP16+500		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Trent and Mersey Canal	W-KP18+000		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - A533 Northwich Road	W-KP18+500		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - A533 Northwich Road	C-01-KP0+500		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Trent and Mersey Canal	S-KP01+500		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Trent and Mersey Canal	S-KP01+500		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Weaver Navigation Canal	S-KP02+000		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - West Coast Main Line Railway	S-KP04+500		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - A49 Warrington Road	S-KP06+000		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Mid Cheshire Line Railway	S-KP07+000		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - A556 Chester Road	S-KP08+500		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+000		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - A49 Tarporley Road	E-KP01+000		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - A559 Northwich Road	E-KP04+000		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - M6 Motorway	E-KP09+500		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - A50 Road	E-KP11+500		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - M56 Motorway	E-KP14+000		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - M56 Motorway	N1-KP05+000		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - A56 Chester Road	N1-KP08+000		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Bridgewater Canal	N1-KP08+500		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+500		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - A562 Widnes Road	N1-KP13+500		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - A5080 South Lane Road	N1-KP14+500		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Manchester and Allerton Junction Line Railway	N1-KP15+000		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - A57 Warrington Road	N1-KP18+000		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - M62 Motorway	N2-04-KP00		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - A570 St Helens Linkway Road	N2-KP01+500		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Liverpool to Manchester Line Railway	N2-KP02+500		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Liverpool to Manchester Line Railway	N2-KP02+500		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Weaver Navigation Canal	W-KP10+500		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - A557 Weston Point Expressway - Rocksavage Way	W-03-KP0+500		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - A6144 Manchester Road	E-05-KP00		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - West Coast Mainline Railway	N1-05-KP0+500		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Eastford Road and Canal	N1-02-KP01+500		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Eastford Road and Canal	N1-02-KP01+500		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - NULL	N1-02-KP02+000		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Block Valve - NULL	E-KP12+000		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Block Valve - NULL	S-KP08+500		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		HAGI - Stanlow HPP HAGI	W-KP00		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - Stanlow	W-KP00		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - River Mersey, Sanky Canal + Skelton Junction to Ditton Junction Line	N1-KP12+500		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - River Mersey, Sanky Canal + Skelton Junction to Ditton Junction Line	N1-KP12+500		1	3	3 (None / Negligible)		1	2	2 (None / Negligible)
		Trenchless Crossing - A533 Road	S-KP15+000	Soluble rocks are present within the ground. Numerous dissolution features may be present. Potential for difficult ground conditions should be investigated. Potential for localised subsidence is at a level where it should be considered.	5	3	15 (Substantial)		5	2	10 (Moderate)
		Trenchless Crossing - River Dane	S-KP16+500		5	3	15 (Substantial)		5	2	10 (Moderate)
		Trenchless Crossing - Trent and Mersey Canal	S-KP16+500		5	3	15 (Substantial)		5	2	10 (Moderate)
		Trenchless Crossing - Middlewich Branch Line Railway	S-KP17+500		5	3	15 (Substantial)		5	2	10 (Moderate)
		Trenchless Crossing - A56 Lymm Road	E-KP15+500		5	3	15 (Substantial)		5	2	10 (Moderate)
		Trenchless Crossing - Bridgewater Canal + road	E-KP15+500		5	3	15 (Substantial)		5	2	10 (Moderate)
		Trenchless Crossing - River Bollin	E-KP17+000		5	3	15 (Substantial)		5	2	10 (Moderate)
		Trenchless Crossing - London Road	S-KP15+500		5	3	15 (Substantial)		5	2	10 (Moderate)
		HAGI - Inovyn Gas Storage HAGI	S-KP18+000		3	3	9 (Minor)		3	2	6 (Minor)
		HAGI - Inovyn Gas Storage HAGI	S-KP18+000		3	3	9 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - A530 King Street Road	S-KP18+000		3	3	9 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - A530 King Street Road	S-KP18+000		3	3	9 (Minor)		3	2	6 (Minor)

APPENDIX C
RISK ASSESSMENT TABLE – GEOMORPHOLOGY - ESCARPMENTS

Hynet Geohazards Desk Study

Hazard Title: Escarpments

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Category	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Steep slope or cliff the separates two relatively flat level areas - sudden change in elevation	Potential slope stability issues, potential constructability difficulties. - Insufficient design, delay, excessive displacement, failure. - Potential to add cost, time, risk to the project	Preferred Route Centreline - N1	N1-KP09+800	N1-KP09+845	Likely man-made steep slope of ~4m to 6m , possibly associated with unspecified surface ground workings.	4	3	12 (Moderate)	Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment of temporary and permanent slopes. - Topographic survey to determine existing slope gradients and geomorphology - Engineering geological assessment of existing slope / failed slope - Assessment of existing and proposed slope stability to current British and Eurocode standards and CoP documents. - Adoption of conservative parameters in assessment and design.- Designer to consider application of engineering mitigation such as regrading existing slopes, slope / cliff stabilisation with soil nails, rock bolts etc. - Consider re-routing or bypass with HDD	3	3	9 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP06+718	C-01-KP06+823	Steep slope down to river valley	4	3	12 (Moderate)		3	3	9 (Minor)

APPENDIX C
RISK ASSESSMENT TABLE – GEOMORPHOLOGY – BREAK IN SLOPE

Hynet Geohazards Desk Study

Hazard Title: Break In Slope

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Marked change in slope gradient	Potential slope stability issues, potential constructability difficulties. - Insufficient design, delay, excessive displacement, failure. - Potential to add cost, time, risk to the project	Preferred Route Centreline - W	W-KP16+441	W-KP16+493	Marked change in slope gradient approaching railway line. Steep slope.	4	3	12 (Moderate)	Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment of temporary and permanent slopes. - Topographic survey to determine existing slope gradients and geomorphology - Engineering geological assessment of existing slope / failed slope - Assessment of existing and proposed slope stability to current British and Eurocode standards and CoP documents.- Adoption of conservative parameters in assessment and design. - Designer to consider application of engineering mitigation such as regrading existing slopes, slope / cliff stabilisation with soil nails, rock bolts etc. - Consider re-routing or bypass with HDD	3	3	9 (Minor)
		Preferred Route Centreline - N1	N1-KP09+979	N1-KP10+066	Potential short steep slopes of a few meters	4	3	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - N1	N1-KP07+925	N1-KP07+999	Potential notable changes in slope gradient associated with Chester Road cutting	4	3	12 (Moderate)		3	3	9 (Minor)
		Preferred Route Centreline - N2	N2-KP03+249	N2-KP03+274	Short distance relatively steep slope of a few metres associated with NW-SE trending hedgerow.	4	3	12 (Moderate)		3	3	9 (Minor)

Hynet Geohazards Desk Study

Hazard Title: Break In Slope

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	Closest KP	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Marked change in slope gradient	Potential slope stability issues, potential constructability difficulties. - Insufficient design, delay, excessive displacement, failure. - Potential to add cost, time, risk to the project	Trenchless Crossing - West Coast Main Line Railway	W-KP16+500	Marked change in slope gradient approaching railway line. Steep slope.	4	3	12 (Moderate)	Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment of temporary and permanent slopes. - Topographic survey to determine existing slope gradients and geomorphology - Engineering geological assessment of existing slope / failed slope - Assessment of existing and proposed slope stability to current British and Eurocode standards and CoP documents.- Adoption of conservative parameters in assessment and design. - Designer to consider application of engineering mitigation such as regrading existing slopes, slope / cliff stabilisation with soil nails, rock bolts etc. - Consider re-routing or bypass with HDD	3	3	9 (Minor)
		Trenchless Crossing - A56 Chester Road	N1-KP08+000	Potential notable changes in slope gradient associated with Chester Road cutting	4	3	12 (Moderate)		3	3	9 (Minor)

APPENDIX C
RISK ASSESSMENT TABLE – GEOMORPHOLOGY – GULLY – GULLY ERIOSON, INCISED CHANNELS (BURRIED VALLEY)

Hynet Geohazards Desk Study

Hazard Title: Gully / Gully Erosion / Incised channels (Buried Valley)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
A small hollow or channel incised into sediments or unconsolidated rock by running water, sudden lateral changes in ground conditions. Or the potential for incised channels based on geology and / or surface water regime.	Potential excavation stability issues, sudden lateral changes in ground conditions & engineer parameters. - Potential constructability difficulties. - Insufficient design, delay, excessive displacement, failure. - Potential to add cost, time, risk to the project	Preferred Route Centreline - W	W-KP19+194	W-KP19+199	Potential shallow ditch	4	4	16 (Substantial)	Ground investigation to determine exact Geology and groundwater conditions and profile presence of buried channels. - Topographic / bathymetric survey to determine depth of channels, depth of loose sediment and geomorphology - Adoption of conservative parameters in assessment and design. - Designer to consider application of engineering mitigation such as redesigning HDD profile to avoid unstable geology, trench / excavation support systems.	3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP18+867	W-KP18+872	Potential shallow ditch	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP018+63	W-KP18+637	Potential shallow ditch	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP16+116	W-KP016+14	Gully crossing pipeline alignment.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP15+925	W-KP15+995	Potential shallow ditch	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP13+252	W-KP13+328	Shallow gully associated with stream.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP09+622	W-KP11+465	Potential incised channel (buried valley) associated with River Weaver	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP09+543	W-KP09+620	Potential gully and incised channel	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP09+015	W-KP09+040	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP08+721	W-KP08+745	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP08+400	W-KP08+426	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP08+070	W-KP08+088	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP07+912	W-KP07+928	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP07+827	W-KP07+842	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP07+568	W-KP07+590	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP07+374	W-KP07+389	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP07+240	W-KP07+259	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP07+097	W-KP07+115	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP06+936	W-KP06+952	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP06+741	W-KP06+761	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP06+632	W-KP06+653	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP06+244	W-KP06+261	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP06+038	W-KP06+054	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP05+751	W-KP05+770	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP05+545	W-KP05+564	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP05+418	W-KP05+438	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP05+128	W-KP05+143	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP04+819	W-KP04+831	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP04+546	W-KP04+561	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP04+232	W-KP04+251	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP04+041	W-KP04+057	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP03+647	W-KP03+667	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP03+449	W-KP03+486	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP03+341	W-KP03+366	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP03+265	W-KP03+282	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP03+176	W-KP03+198	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP03+060	W-KP03+085	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP02+872	W-KP02+903	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP02+701	W-KP02+743	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP02+588	W-KP02+617	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP00+096	W-KP00+106	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP07+748	W-KP07+757	Potential drainage / irrigation ditch	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP06+914	W-KP06+924	Potential drainage ditch / irrigation channel	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP05+455	W-KP05+497	Potential ancient / historic river / stream channel seen in DTM hillshade data. Possible for unmapped incised channel and loose sediments.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP04+170	W-KP04+208	Potential ancient / historic river / stream channel seen in DTM hillshade data. Possible for unmapped incised channel and loose sediments.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP02+397	W-KP02+417	Potential drainage / irrigation channel	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP01+949	W-KP01+965	Possible small channel / ditch at field boundary	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP00+556	W-KP00+573	Possible shallow ditch / drainage channel at field boundary	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP17+221	W-KP16+942	Potential significant ancient buried channels / valleys associated with historic course of River Weaver	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP17+824	W-KP18+021	Potentially ancient / relic gully seen in DTM / topo imagery	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP15+832	W-KP15+905	Start of gully / erosion channel	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP15+697	W-KP15+761	Start of gully / erosion channel	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP13+565	W-KP13+719	Start of gully and erosion channel	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - E	E-KP01+509	E-KP01+524	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - E	E-KP05+937	E-KP05+942	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - E	E-KP09+123	E-KP09+136	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - E	E-KP09+537	E-KP09+541	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - E	E-KP09+863	E-KP09+867	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - E	E-KP10+579	E-KP10+584	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - E	E-KP10+917	E-KP10+927	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - E	E-KP11+214	E-KP011+22	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - E	E-KP019+53	E-KP19+539	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - E	E-KP18+723	E-KP18+729	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - E	E-KP06+706	E-KP06+731	Shallow gully / incised channel associated with Gale Brook	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - E	E-KP16+899	E-KP17+111	Potential incised channel (buried valley) associated with River Bollin, Agden Brook and flood plain	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - E	E-KP17+341	E-KP17+355	Shallow irrigation / drainage channel or possible unnamed brook.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - E	E-KP20+748	E-KP20+837	Possible drainage ditch at field boundary.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - E	E-KP00+784	E-KP00+867	Shallow gully / incised channel (potential buried channel / valley) associated with Whitley Brook	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - E	E-KP06+132	E-KP06+126	Potential for buried historic incised channels associated with historic stream, in line with area of mapped alluvium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - E	E-KP06+743	E-KP07+021	Possible ancient incised channels associated with historic course of Gale Brook, in line with mapped extents of Alluvium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - E	E-KP07+160	E-KP07+223	Possible ancient incised channels associated with historic course of Brook, in line with mapped extents of Alluvium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - E	E-KP020+12	E-KP20+221	Shallow gully and incised channel associated with Sinderland Brook	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - E	E-KP19+889	E-KP19+972	Shallow gully / incised channel associated with Caldwell Brook	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - S	S-KP00+494	S-KP00+516	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - S	S-KP14+462	S-KP14+499	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - S	S-KP01+632	S-KP01+665	Potential gully / historic gully beneath canal, associated with linear feature/gully or valley seen in DTM and topographic contours.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - S	S-KP01+961	S-KP01+949	Potential incised channel (buried valley) associated with River Weaver	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - S	S-KP16+122	S-KP16+557	Potential incised channel (buried valley) associated with River Dane	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - S	S-KP17+434	S-KP17+467	Potential incised channel (buried valley) associated with Puddinglake Brook	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - S	S-KP11+026	S-KP11+327	Incised channel (buried valley) associated with River Weaver	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - S	S-KP04+578	S-KP04+659	Incised channel and gully associated with Grange Brooke	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - S	S-KP08+560	S-KP08+938	Possible ancient river course,, valley floor with area of peat, potential buried ancient river channels	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - S	S-KP15+308	S-KP15+369	Small stream with potential for incised channel	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - N1	N1-KP18+622	N1-KP018+63	Possible shallow drainage ditch/gully at field boundary.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - N1	N1-KP16+469	N1-KP16+475	Possible drainage ditch / gully at field boundary	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - N1	N1-KP14+513	N1-KP14+527	Small shallow gully associated with stream	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - N1	N1-KP07+660	N1-KP07+708	Incised channel / gully. Potential for a buried valley and loose fluvial sediments.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - N1	N1-KP00+656	N1-KP00+662	Potential shallow ditch	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - N1	N1-KP08+468	N1-KP08+486	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - N1	N1-KP11+264	N1-KP12+887	Potential for significant incised channel (buriedvalley) associated with River Mersley.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - N2	N2-KP02+012	N2-KP02+020	Possible shallow drainage ditch/gully	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - N2	N2-KP01+845	N2-KP01+864	Possible gully associated with small river / stream	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - N2	N2-KP01+472	N2-KP01+497	Shallow surface depression possibly associated with surface water drainage, land drain.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - N2	N2-KP05+295	N2-KP05+309	Gully located immediately south and north of Sutton Heath Road.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP01+998	C-01-KP02+001	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP04+231	C-01-KP04+233	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP00+485	C-01-KP00+502	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP03+386	C-01-KP03+395	Possible drainage / channel ditch at field boundary	4	4	16 (Substantial)		3	3	9 (Minor)

Hynet Geohazards Desk Study

Hazard Title: Gully / Gully Erosion / Incised channels (Buried Valley)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
A small hollow or channel incised into sediments or unconsolidated rock by running water, sudden lateral changes in ground conditions. Or the potential for incised channels based on geology and / or surface water regime.	Potential excavation stability issues, sudden lateral changes in ground conditions & engineer parameters. - Potential constructability difficulties. - Insufficient design, delay, excessive displacement, failure. - Potential to add cost, time, risk to the project	Preferred Spurs Centreline - C-01	C-01-KP03+543	C-01-KP03+550	Possible drainage ditch/channel	4	4	16 (Substantial)	Ground investigation to determine exact Geology and groundwater conditions and profile presence of buried channels. - Topographic / bathymetric survey to determine depth of channels, depth of loose sediment and geomorphology - Adoption of conservative parameters in assessment and design. - Designer to consider application of engineering mitigation such as redesigning HDD profile to avoid unstable geology, trench / excavation support systems.	3	3	9 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP04+572	C-01-KP04+585	<Null>	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP05+024	C-01-KP05+036	Possible small ditch / channel at field boundary	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP03+133	C-01-KP03+169	Possible small ditch / channel at field boundary	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP06+980	C-01-KP06+965	Potential incised channel (buried valley) associated with River Weaver	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+329	N1-02-KP01+465	Potential for buried valley / channel associated with River Mersey	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+750	N1-02-KP01+776	Potential gully / incised channel	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+000	N1-02-KP01+231	Potential for significant incised channel (buried valley) associated with River Mersey.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Spurs Centreline - E-01	E-01-KP00+360	E-01-KP00+454	Possible incised channel associated with ancient course of River Mersey and mapped extent of alluvium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+000	N1-05-KP00+376	Potential for significant incised channel (buried valley) associated with River Mersey.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+099	W-01-KP01+254	Potential incised channel (buried valley) associated with River Weaver	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP17+211	W-KP17+221	Possible shallow ditch	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP17+211	W-KP17+221	Potential significant ancient buried channels / valleys associated with historic course of River Weaver	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP16+942	W-KP16+966	Possibly shallow gully and incised channel associated with Longacre Brook	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP16+942	W-KP16+966	Potential significant ancient buried channels / valleys associated with historic course of River Weaver	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP10+406	W-KP10+501	Potential incised channel (buried valley) associated with River Weaver	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - W	W-KP10+406	W-KP10+501	Potential incised channel (buried valley) associated with River Weaver	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - E	E-KP06+126	E-KP06+132	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - E	E-KP06+126	E-KP06+132	Potential for buried historic incised channels associated with historic stream, in line with area of mapped alluvium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - E	E-KP07+195	E-KP07+202	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - E	E-KP07+195	E-KP07+202	Possible ancient incised channels associated with historic course of Brook, in line with mapped extents of Alluvium	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - S	S-KP01+949	S-KP01+961	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - S	S-KP01+949	S-KP01+961	Potential incised channel (buried valley) associated with River Weaver	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - N1	N1-KP12+208	N1-KP12+279	Shallow drainage ditch	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - N1	N1-KP12+208	N1-KP12+279	Potential for significant incised channel (buried valley) associated with River Mersey.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - N1	N1-KP011+96	N1-KP11+967	Shallow drainage ditch	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - N1	N1-KP011+96	N1-KP11+967	Potential for significant incised channel (buried valley) associated with River Mersey.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - N1	N1-KP11+906	N1-KP11+914	Shallow drainage ditch	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - N1	N1-KP11+906	N1-KP11+914	Potential for significant incised channel (buried valley) associated with River Mersey.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - N1	N1-KP011+71	N1-KP11+724	Shallow drainage ditch	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - N1	N1-KP011+71	N1-KP11+724	Potential for significant incised channel (buried valley) associated with River Mersey.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - N1	N1-KP11+545	N1-KP11+559	Shallow drainage ditch	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - N1	N1-KP11+545	N1-KP11+559	Potential for significant incised channel (buried valley) associated with River Mersey.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - N1	N1-KP11+034	N1-KP11+264	potential shallow gullies and channels	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Route Centreline - N1	N1-KP11+034	N1-KP11+264	Potential for significant incised channel (buried valley) associated with River Mersey.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP06+965	C-01-KP06+980	Potential incised channel (buried valley) associated with River Weaver	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP06+965	C-01-KP06+980	Steep slope associated with river bank	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+231	N1-02-KP01+329	Potential for buried valley / channel associated with River Mersey	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+231	N1-02-KP01+329	Potential for significant incised channel (buried valley) associated with River Mersey.	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP00+000	W-01-KP00+099	Potential incised channel (buried valley) associated with River Weaver	4	4	16 (Substantial)		3	3	9 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP00+000	W-01-KP00+099	Potential incised channel (buried valley) associated with River Weaver	4	4	16 (Substantial)		3	3	9 (Minor)

Hynet Geohazards Desk Study

Hazard Title: Gully / Gully Erosion / Incised channels (Buried Valley)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	Closest KP	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
A small hollow or channel incised into sediments or unconsolidated rock by running water, sudden lateral changes in ground conditions. Or the potential for incised channels based on geology and / or surface water regime.	Potential excavation stability issues, sudden lateral changes in ground conditions & engineer parameters. . Potential constructability difficulties. Insufficient design, delay, excessive displacement, failure. - Potential to add cost, time, risk to the project	HAGI - Rocksavage HAGI	W-01-KP00	Potential incised channel (buried valley) associated with River Weaver	4	4	16 (Substantial)	Ground investigation to determine exact Geology and groundwater conditions and profile presence of buried channels. - Topographic / bathymetric survey to determine depth of channels, depth of loose sediment and geomorphology - Adoption of conservative parameters in assessment and design. - Designer to consider application of engineering mitigation such as redesigning HDD profile to avoid unstable geology, trench / excavation support systems.	3	3	9 (Minor)
		HAGI - Higher Walton HAGI	N1-05-KP00	Potential for significant incised channel (buried valley) associated with River Mersey.	4	4	16 (Substantial)		3	3	9 (Minor)
		Trenchless Crossing - Stanlow	W-KP00	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Trenchless Crossing - Ellesmere Port to Warrington Line Railway	W-KP03+500	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Trenchless Crossing - Ellesmere Port to Warrington Line Railway	W-KP03+000	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Trenchless Crossing - River Weaver	W-KP10+000	Potential incised channel (buried valley) associated with River Weaver	4	4	16 (Substantial)		3	3	9 (Minor)
		Trenchless Crossing - River Weaver	W-KP09+500	Potential gully and incised channel	4	4	16 (Substantial)		3	3	9 (Minor)
		Trenchless Crossing - United Utilities Water	W-KP10+500	Potential incised channel (buried valley) associated with River Weaver	4	4	16 (Substantial)		3	3	9 (Minor)
		Trenchless Crossing - Chester to Manchester Line Railway	W-KP11+000	Potential incised channel (buried valley) associated with River Weaver	4	4	16 (Substantial)		3	3	9 (Minor)
		Trenchless Crossing - Sutton Weaver Canal	W-KP11+000	Potential incised channel (buried valley) associated with River Weaver	4	4	16 (Substantial)		3	3	9 (Minor)
		Trenchless Crossing - Trent and Mersey Canal	W-KP18+000	Potentially ancient / relic gully seen in DTM / topo imagery	4	4	16 (Substantial)		3	3	9 (Minor)
		Trenchless Crossing - Trent and Mersey Canal	S-KP01+500	Potential gully / historic gully beneath canal, associated with linear feature/gully or valley seen in DTM and topographic contours.	4	4	16 (Substantial)		3	3	9 (Minor)
		Trenchless Crossing - Weaver Navigation Canal	S-KP02+000	Potential incised channel (buried valley) associated with River Weaver	4	4	16 (Substantial)		3	3	9 (Minor)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+000	Incised channel (buried valley) associated with River Weaver	4	4	16 (Substantial)		3	3	9 (Minor)
		Trenchless Crossing - River Dane	S-KP16+500	Potential incised channel (buried valley) associated with River Dane	4	4	16 (Substantial)		3	3	9 (Minor)
		Trenchless Crossing - Trent and Mersey Canal	S-KP16+500	Potential incised channel (buried valley) associated with River Dane	4	4	16 (Substantial)		3	3	9 (Minor)
		Trenchless Crossing - River Bollin	E-KP17+000	Potential incised channel (buried valley) associated with River Bollin, Agden Brook and floodplain	4	4	16 (Substantial)		3	3	9 (Minor)
		Trenchless Crossing - Bridgewater Canal	N1-KP08+500	Shallow irrigation / drainage channel.	4	4	16 (Substantial)		3	3	9 (Minor)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+500	Potential for significant incised channel (buried valley) associated with River Mersey.	4	4	16 (Substantial)		3	3	9 (Minor)
		Trenchless Crossing - River Mersey, Sanky Canal + Skelton Junction to Ditton Junction Line	N1-KP12+500	Potential for significant incised channel (buried valley) associated with River Mersey.	4	4	16 (Substantial)		3	3	9 (Minor)
		Trenchless Crossing - Weaver Navigation Canal	W-KP10+500	Potential incised channel (buried valley) associated with River Weaver	4	4	16 (Substantial)		3	3	9 (Minor)
		Trenchless Crossing - West Coast Mainline Railway	N1-KP09+500	Potential for significant incised channel (buried valley) associated with River Mersey.	4	4	16 (Substantial)		3	3	9 (Minor)
		Trenchless Crossing - Eastford Road and Canal	N1-02-KP02+000	Potential gully / incised channel	4	4	16 (Substantial)		3	3	9 (Minor)
		HAGI - Rocksavage HAGI	W-01-KP00	Potential incised channel (buried valley) associated with River Weaver	4	4	16 (Substantial)		3	3	9 (Minor)
		HAGI - Rocksavage HAGI	W-01-KP00	Potential incised channel (buried valley) associated with River Weaver	4	4	16 (Substantial)		3	3	9 (Minor)
		Trenchless Crossing - Weaver Navigation Canal	W-KP10+500	Potential incised channel (buried valley) associated with River Weaver	4	4	16 (Substantial)		3	3	9 (Minor)
		Trenchless Crossing - Weaver Navigation Canal	W-KP10+500	Potential incised channel (buried valley) associated with River Weaver	4	4	16 (Substantial)		3	3	9 (Minor)

APPENDIX C
RISK ASSESSMENT TABLE – GEOMORPHOLOGY - RIDGES

Hynet Geohazards Desk Study

Hazard Title: Ridges

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
A raised area of the land that is generally narrow and long.	Potential constructability difficulties. - Insufficient design, delay, excessive displacement, failure. - Potential to add cost, time, risk to the project	Preferred Route Centreline - W	W-KP18+374	W-KP18+382	Potential embankment / raised ground associated with Northwich Road construction.	4	4	12 (Moderate)	Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment of temporary and permanent slopes. - Topographic survey to determine existing slope gradients and geomorphology - Engineering geological assessment of existing slope / failed slope - Assessment of existing and proposed slope stability to current British and Eurocode standards and CoP documents. - Adoption of conservative parameters in assessment and design. Designer to consider application of engineering mitigation for temporary / permanent works	3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP10+973	W-KP11+039	Steep slopes associated with railway embankment	4	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP03+195	W-KP03+220	Potential embankment associated with railway.	4	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP00+051	W-KP00+075	Potential small embankment adjacent A5117.	4	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP05+902	S-KP05+938	Small embankment associated with A49.	4	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP07+148	S-KP07+180	Railway embankment, steep slopes/.	4	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP07+923	S-KP07+936	Potentially small area of raised ground / narrow ridge seen in DTM hillshade	4	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP11+607	S-KP12+418	Pipeline alignment at top of gentle ridge line, side sloping ground either side	4	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP17+538	N1-KP17+565	Possible low height embankment	4	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP14+895	N1-KP14+946	Embankment ~4m to 6m high associated with railway.	4	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP08+486	N1-KP08+505	Potential small ridge / embankment associated with canal workings	4	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP04+917	N1-KP04+937	Possible small embankment associated with M56	4	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP05+957	N2-KP06+124	Possible ridge associated with former quarry works and subsequent landfill	4	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP02+345	N2-KP02+380	Possible small embankments associated with railway	4	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP01+330	N2-KP01+400	Possible small embankment or cutting associated with St Helens Link Road.	4	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP00+118	N2-KP00+209	Possible small embankment associated with M62	4	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-04	N2-04-KP00+113	N2-04-KP00+204	Possible small embankment associated with M62	4	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - E-04	E-04-KP00+423	E-04-KP00+437	Potential bund or stockpile of soil seen in topographic contours and DTM	4	4	12 (Moderate)		3	2	6 (Minor)

Hynet Geohazards Desk Study

Hazard Title: Ridges

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	Closest KP	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
A raised area of the land that is generally narrow and long.	Potential constructability difficulties. - Insufficient design, delay, excessive displacement, failure. - Potential to add cost, time, risk to the project	Trenchless Crossing - Stanlow	W-KP00	Potential small embankment adjacent A5117.	4	4	12 (Moderate)	Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment of temporary and permanent slopes. - Topographic survey to determine existing slope gradients and geomorphology - Engineering geological assessment of existing slope / failed slope - Assessment of existing and proposed slope stability to current British and Eurocode standards and CoP documents. - Adoption of conservative parameters in assessment and design. - Designer to consider application of engineering mitigation for temporary / permanent works	3	2	6 (Minor)
		Trenchless Crossing - Ellesmere Port to Warrington Line Railway	W-KP03+000	Potential embankment associated with railway.	4	4	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - Chester to Manchester Line Railway	W-KP11+000	Steep slopes associated with railway embankment	4	4	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - A533 Northwich Road	W-KP18+500	Potential embankment / raised ground associated with Northwich Road construction.	4	4	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - A49 Warrington Road	S-KP06+000	Small embankment associated with A49.	4	4	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - Mid Cheshire Line Railway	S-KP07+000	Railway embankment, steep slopes/.	4	4	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+500	Pipeline alignment at top of gentle ridge line, side sloping ground either side	4	4	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - M56 Motorway	N1-KP05+000	Possible small embankment associated with M56	4	4	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - Bridgewater Canal	N1-KP08+500	Potential small ridge / embankment associated with canal workings	4	4	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - Manchester and Allerton Junction Line Railway	N1-KP15+000	Embankment ~4m to 6m high associated with railway.	4	4	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - M62 Motorway	N2-04-KP00	Possible small embankment associated with M62	4	4	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - A570 St Helens Linkway Road	N2-KP01+500	Possible small embankment or cutting associated with St Helens Link Road.	4	4	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - Liverpool to Manchester Line Railway	N2-KP02+500	Possible small embankments associated with railway	4	4	12 (Moderate)		3	2	6 (Minor)
		HAGI - Stanlow HPP HAGI	W-KP00	Potential small embankment adjacent A5117.	4	4	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - Stanlow	W-KP00	Potential small embankment adjacent A5117.	4	4	12 (Moderate)		3	2	6 (Minor)

APPENDIX C
RISK ASSESSMENT TABLE – GEOMORPHOLOGY – LARGE HILL AND / OR STEEP TERRAIN

Hynet Geohazards Desk Study

Hazard Title: Large Hill and / or Steep Terrain

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
A significant change in elevation over a relatively short lateral distance	Potential constructability difficulties. - Insufficient design, delay, excessive displacement, failure. - Potential to add cost, time, risk to the project	Preferred Route Centreline - W	W-KP17+762	W-KP17+916	Relatively steep slope down to SW/W.	4	3	12 (Moderate)	Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment of temporary and permanent slopes. - Topographic survey to determine existing slope gradients and geomorphology - Engineering geological assessment of existing slope / failed slope - Assessment of existing and proposed slope stability to current British and Eurocode standards and CoP documents. - Adoption of conservative parameters in assessment and design. - Designer to consider application of engineering mitigation for temporary / permanent works	3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP16+116	W-KP16+139	Steep slopes associated with gully.	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP13+114	W-KP13+362	Side sloping terrain	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP11+712	W-KP11+984	Side sloping terrain	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP10+086	W-KP010+92	Steep slopes in numerous locations associated with historical refuse landfill.	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP16+192	W-KP16+786	Moderately sloping / side sloping ground	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP17+938	W-KP18+108	Moderately sloping ground	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP04+007	E-KP04+292	Pipeline rises and falls over crest of small hill	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP017+66	E-KP17+711	Steep slopes associated with historic cutting	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP14+607	E-KP15+099	large hill with relatively steep terrain, sloping down to NE.	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP01+666	S-KP01+762	Relatively steep slope down from canal	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP01+907	S-KP01+954	Relatively steep slope down to tributary to River Weaver	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP03+490	S-KP03+673	Steep slope	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP04+488	S-KP04+748	Steep slope down to Grange Brook valley / gorge	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP04+959	S-KP05+473	Gently side sloping ground	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP08+245	S-KP08+309	Potentially sloping ground across BVS2 location and side slope along pipeline	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP09+253	S-KP09+337	Pipeline alignment at base of hill, side sloping ground.	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP10+968	S-KP11+458	Steep slopes associated with woodland, railway embankment and River Weaver Valley	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP13+473	S-KP14+146	Potentially shallow side sloping ground	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP12+719	S-KP13+293	Potentially shallow side sloping ground	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP15+739	S-KP16+086	Steep sloping ground to valley floor	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP07+259	N1-KP07+777	Steep slopes associated with gulley	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP05+777	N1-KP06+469	Potentially steeply sloping ground.	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP03+251	N1-KP03+631	Side long sloping ground east and west of pipeline	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP05+957	N2-KP06+123	Steep sloping ground to the west, associated with form quarry and landfill.	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP07+084	C-01-KP07+102	Possible steep slope of a few metres elevation gain	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP07+132	C-01-KP07+142	Possible steep slope of a few metres elevation gain	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP06+721	C-01-KP06+789	Steep slope down to River Weaver	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-03	W-03-KP00+047	W-03-KP00+057	Steep sloping ground	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-03	W-03-KP00+403	W-03-KP00+458	Embankments and steep slopes associated with Western Point expressway	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-03	W-03-KP01+254	W-03-KP01+282	Steep slope down to main road	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+523	N1-02-KP00+737	Side sloping ground down to former pit and now lake	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+911	N1-02-KP01+929	Steep sloping ground	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP05+072	N1-02-KP05+117	Steep slope / bank down to Manchester Ship Canal	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+240	N1-05-KP00+440	Steep slopes / embankment associated with railway	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP00+000	W-01-KP00+098	Steep slopes in numerous locations associated with historical refuse landfill.	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP00+468	W-01-KP00+785	Pipeline adjacent to or encroaches onto steep slope / side wall to former pit	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+230	W-01-KP01+438	Steep sloping ground	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+455	W-01-KP01+465	Steep sloping ground	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-02	W-02-KP00+067	W-02-KP00+082	Steep sloping ground	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-02	W-02-KP00+000	W-02-KP00+008	Steep sloping ground	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-02	W-02-KP00+029	W-02-KP00+050	Steep sloping ground	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-02	W-02-KP00+157	W-02-KP00+171	Potentially steep slope	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP16+476	W-KP16+494	Steep slope / embankment up to railway.	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP16+476	W-KP16+494	Moderately sloping / side sloping ground	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP16+442	W-KP16+452	Steep slope / embankment up to railway.	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP16+442	W-KP16+452	Moderately sloping / side sloping ground	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-03	W-03-KP00+000	W-03-KP00+047	Steep sloping ground	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-03	W-03-KP00+000	W-03-KP00+047	Steep sloping ground	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+415	W-01-KP01+436	Steep sloping ground	4	3	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+415	W-01-KP01+436	Steep sloping ground	4	3	12 (Moderate)		3	2	6 (Minor)

Hynet Geohazards Desk Study

Hazard Title: Large Hill and / or Steep Terrain

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	Closest KP	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
A significant change in elevation over a relatively short lateral distance	Potential constructability difficulties. - Insufficient design, delay, excessive displacement, failure. - Potential to add cost, time, risk to the project	HAGI - Rocksavage HAGI	W-01-KP00	Steep slopes in numerous locations associated with historical refuse landfill.	4	3	12 (Moderate)	Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment of temporary and permanent slopes. - Topographic survey to determine existing slope gradients and geomorphology - Engineering geological assessment of existing slope / failed slope - Assessment of existing and proposed slope stability to current British and Eurocode standards and CoP documents. - Adoption of conservative parameters in assessment and design. Designer to consider application of engineering mitigation for temporary / permanent works	3	2	6 (Minor)
		HAGI - Higher Walton HAGI	N1-05-KP00	Potential steep slopes associated with unspecified heap and unspecified ground workings.	4	3	12 (Moderate)		3	2	6 (Minor)
		HAGI - Runcorn HAGI	W-02-KP00	Steep sloping ground	4	3	12 (Moderate)		3	2	6 (Minor)
		HAGI - Runcorn HAGI	W-02-KP00	Steep sloping ground	4	3	12 (Moderate)		3	2	6 (Minor)
		HAGI - Runcorn HAGI	W-02-KP00	Steep sloping ground	4	3	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - United Utilities Water	W-KP10+500	Steep slopes in numerous locations associated with historical refuse landfill.	4	3	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - A56 Chester Road	W-KP12+000	Side sloping terrain	4	3	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - West Coast Main Line Railway	W-KP16+500	Steep slope / embankment up to railway.	4	3	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - West Coast Main Line Railway	W-KP16+500	Steep slope / embankment up to railway.	4	3	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - West Coast Main Line Railway	W-KP16+500	Moderately sloping / side sloping ground	4	3	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - Trent and Mersey Canal	W-KP18+000	Relatively steep slope down to SW/W.	4	3	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - Trent and Mersey Canal	W-KP18+000	Moderately sloping ground	4	3	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - Trent and Mersey Canal	S-KP01+500	Relatively steep slope down from canal	4	3	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - A556 Chester Road	S-KP08+500	Embankment / bund immediately to E/NE of pipeline alignment	4	3	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+000	Steep slopes associated with woodland, railway embankment and River Weaver Valley	4	3	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - A559 Northwich Road	E-KP04+000	Pipeline rises and falls over crest of small hill	4	3	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - A562 Widnes Road	N1-KP13+500	Steep slope close to W/SW of pipeline	4	3	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - Weaver Navigation Canal	W-KP10+500	Steep slopes in numerous locations associated with historical refuse landfill.	4	3	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - A557 Weston Point Expressway - Rocksavage Way	W-03-KP0+500	Embankments and steep slopes associated with Western Point expressway	4	3	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - West Coast Mainline Railway	N1-05-KP0+500	Steep slopes / embankment associated with railway	4	3	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - NULL	N1-02-KP02+000	Steep sloping ground	4	3	12 (Moderate)		3	2	6 (Minor)
		Block Valve - NULL	S-KP08+500	Potentially sloping ground across BVS2 location and side slope along pipeline	4	3	12 (Moderate)		3	2	6 (Minor)
		HAGI - Runcorn HAGI	W-02-KP00	Steep sloping ground	4	3	12 (Moderate)		3	2	6 (Minor)
		HAGI - Runcorn HAGI	W-02-KP00	Steep sloping ground	4	3	12 (Moderate)		3	2	6 (Minor)
		HAGI - Runcorn HAGI	W-03-KP00	Steep sloping ground	4	3	12 (Moderate)		3	2	6 (Minor)
		HAGI - Runcorn HAGI	W-03-KP00	Steep sloping ground	4	3	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - West Coast Main Line Railway	W-KP16+500	Steep slope / embankment up to railway.	4	3	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - West Coast Main Line Railway	W-KP16+500	Moderately sloping / side sloping ground	4	3	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - West Coast Main Line Railway	W-KP16+500	Steep slope / embankment up to railway.	4	3	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - West Coast Main Line Railway	W-KP16+500	Moderately sloping / side sloping ground	4	3	12 (Moderate)		3	2	6 (Minor)

APPENDIX C
RISK ASSESSMENT TABLE – GEOMORPHOLOGY - EXCAVATIONS

Hynet Geohazards Desk Study

Hazard Title: Excavations

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
A hole, opening or cavity formed by the removal of materials. Possibly related to mining and subsequent landfill practices.	Potential constructability difficulties. - Insufficient design, delay, excessive displacement, failure. Potential slope stability issues and for contamination from any backfilled / landfilled materials. - Potential to add cost, time, risk to the project	Preferred Route Centreline - W	W-KP09+999	W-KP010+03	Historic pond crossing the pipeline.	5	5	25 (Severe)	Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment of temporary and permanent slopes and assessment of infilled materials for contamination. - Topographic survey to determine existing slope gradients and geomorphology - Engineering geological assessment of existing slope / failed slope - Assessment of existing and proposed slope stability to current British and Eurocode standards and CoP documents. - Adoption of conservative parameters in assessment and design. - Contamination assessment of any fill materials. - Consider reroute - Designer to consider application of engineering mitigation for temporary / permanent works - Consider remediation of voids by grouting etc	4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP07+923	W-KP08+040	Disused brick field crossing the pipeline.	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP00+926	W-KP00+963	Historic pond crossing the pipeline.	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP08+574	E-KP08+584	Surface depression linked to pond.	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP011+95	E-KP11+969	Unknown surface depression seen on Lidar	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP19+239	E-KP19+251	<Null>	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP08+953	E-KP08+993	Historical pond crossing the pipeline.	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP09+383	E-KP09+395	Historic pond that crosses the pipeline.	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP13+297	E-KP13+443	Brick works, brick field and ponds crossing the pipeline.	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP14+391	E-KP14+416	Historic ponds crossing the pipeline.	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP17+671	E-KP17+694	Historical industrial use cuttings crossing the pipeline.	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP04+650	E-KP04+692	Pipeline crosses existing pond / excavation	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP12+689	E-KP12+714	Unknown surface depression seen in DTM, possibly historic excavation	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP18+765	E-KP18+792	Surface depression, possibly from historic excavation seen in DTM.	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP020+61	E-KP20+681	Undulating uneven ground, possible unregistered surface ground workings.	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP21+072	E-KP21+161	Cutting associated with historical railway	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP07+017	E-KP07+037	Shallow surface depression seen in DTM possibly indicative of historic excavation	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP09+653	S-KP09+677	Shallow depression situation within a pond aslisted by Groundsure.	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP10+749	S-KP010+79	Historic pond crossing the pipeline	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP14+900	S-KP14+909	Shallow surface depression seen in DTM possibly indicative of historic excavation	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP14+952	S-KP14+976	Shallow surface depression seen in DTM possibly indicative of historic excavation	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP15+512	S-KP15+536	Shallow surface depression seen in DTM possibly indicative of historic excavation	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP13+842	N1-KP13+871	Former pond crossing pipeline	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP10+375	N1-KP10+443	Disused canal - possible historic excavation	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP09+166	N1-KP09+220	Historical unspecified ground workings - potential for remaining excavation	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP02+329	N1-KP02+350	Potential shallow surface depression seen in DTM, possible unregistered excavation	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP01+282	N1-KP01+287	Two ponds, in very close proximity, possible crossing pipeline	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP09+369	N1-KP09+470	Cutting associated with canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP07+352	C-01-KP07+484	Surface depression seen on DTM, associated with local brick works and surface ground workings.	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP06+734	C-01-KP06+741	Historic pond crossing the pipeline.	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP07+225	C-01-KP07+244	Historic pond crossing the pipeline.	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP02+308	C-01-KP02+339	Shallow surface depression seen in DTM, possbly related to unregistered excavation / pond, potentially with some backfilling.	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+990	N1-02-KP03+921	Unspecified pit crossing the pipeline	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+261	N1-02-KP03+293	Historic surface ground workings associated with canal construction	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-04	N2-04-KP00+599	N2-04-KP00+605	Former pond crossing pipeline	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - E-02	E-02-KP00+139	E-02-KP00+155	Possible shallow cutting for existing pipeline infrastructure / AGI.	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - W-01	W-01-KP00+604	W-01-KP00+633	Former sand pit - excavation	5	5	25 (Severe)		4	3	12 (Moderate)

Hynet Geohazards Desk Study

Hazard Title: Excavations

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	Closest KP	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
A hole, opening or cavity formed by the removal of materials. Possibly related to mining and subsequent landfill practices.	Potential constructability difficulties. - Insufficient design, delay, excessive displacement, failure. Potential slope stability issues and for contamination from any backfilled / landfilled materials. - Potential to add cost, time, risk to the project	Trenchless Crossing - River Weaver	W-KP10+000	Historic pond crossing the pipeline.	5	5	25 (Severe)	Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment of temporary and permanent slopes and assessment of infilled materials for contamination. - Topographic survey to determine existing slope gradients and geomorphology - Engineering geological assessment of existing slope / failed slope - Assessment of existing and proposed slope stability to current British and Eurocode standards and CoP documents. - Adoption of conservative parameters in assessment and design. - Contamination assessment of any fill materials. - Consider reroute - Designer to consider application of engineering mitigation for temporary / permanent works - Consider remediation of voids by grouting etc	4	3	12 (Moderate)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+000	Historic pond crossing the pipeline	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - M6 Motorway	E-KP09+500	Historic pond that crosses the pipeline.	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+500	Cutting associated with canal	5	5	25 (Severe)		4	3	12 (Moderate)

APPENDIX C
RISK ASSESSMENT TABLE – GEOMORPHOLOGY – POTENTIAL DISSOLUTION FEATURES

Hynet Geohazards Desk Study

Hazard Title: Potential Dissolution Feature

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Depression or cavity in the ground caused by the dissolution of minerals within the parent rock. Features noted in topographic data and / or DTM within 25m either side of pipeline.	Ground instability can result from movement of loose material contained within these cavities, and / or void migration towards the surface, often triggered by water.- Insufficient design, delay, excessive displacement, differential displacement, failure of foundations, slopes and excavation instability. Hole instability if HDD or pile bore penetrates deep filled hollow.- Potential to add cost, time, risk to the project	Preferred Route Centreline - S	S-KP14+905	S-KP015+03	Series of surface depressions in greenfield, in area with known risk of deep buried Halite karsts and surface expression of karts features, often unrecorded. Potential surface subsidence, potentially ongoing.	3	3	9 (Minor)	Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment. - Designer to consider rerouting to avoid unstable geology.	2	3	6 (Minor)
		Preferred Route Centreline - S	S-KP15+511	S-KP015+55	Surface depressions in greenfield, in area with known risk of deep buried Halite karsts and surface expression of karts features, often unrecorded. Potential surface subsidence, potentially ongoing.	3	3	9 (Minor)		2	3	6 (Minor)
		Preferred Route Centreline - S	S-KP15+773	S-KP15+785	Surface depressions in greenfield, in area with known risk of deep buried Halite karsts and surface expression of karts features, often unrecorded. Potential surface subsidence, potentially ongoing.	3	3	9 (Minor)		2	3	6 (Minor)

APPENDIX C
RISK ASSESSMENT TABLE – GEOMORPHOLOGY – SURFACE GROUND WORKINGS

Hynet Geohazards Desk Study

Hazard Title: Surface Ground Workings (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Historical Land uses identified from OS Mapping indicate ground excavation at surface may have occurred. (ponds, cuttings, pits, canals, heaps, mounds, reservoir, refuse heap, water bodies, colliery, brick works etc). Possibly subsequent landfilling (recorded or unrecorded).	Insufficient design, delay, excessive displacement, differential displacement, failure of foundations, slopes and excavation instability. - Potential injury or exposure of construction workers. Pollution of controlled waters and environment. - Potential to add cost, time, risk to the project	Preferred Route Centreline - W	W-KP00+958	W-KP00+963	Pond	5	5	25 (Severe)	Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment of temporary and permanent slopes and assessment of infilled materials for contamination. - Topographic survey to determine existing slope gradients and geomorphology - Engineering geological assessment of existing slope / failed slope- Assessment of existing and proposed slope stability to current British and Eurocode standards and CoP documents.- Adoption of conservative parameters in assessment and design.- Contamination assessment of any fill materials. - Consider reroute - Designer to consider application of engineering mitigation for temporary / permanent works	4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP00+934	W-KP00+936	Pond	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP17+935	W-KP17+939	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP03+232	W-KP03+232	Ponds	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP03+217	W-KP03+218	Pond	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP00+929	W-KP00+933	Pond	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP09+997	W-KP010+02	Ponds	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP11+302	W-KP11+303	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP08+573	E-KP08+573	Pond	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP09+393	E-KP09+399	Ponds	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP08+991	E-KP08+992	Ponds	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP17+697	E-KP17+698	Cuttings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP14+386	E-KP014+39	Ponds	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP13+297	E-KP13+301	Brick Field	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP15+632	E-KP15+634	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP01+965	S-KP02+144	Dredging Disposal Site	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP10+789	S-KP10+792	Pond	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP01+664	S-KP01+666	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP13+583	S-KP13+588	Unspecified Ground Workings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP09+658	S-KP09+668	Pond	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP17+622	S-KP17+622	Cuttings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP17+648	S-KP17+651	Cuttings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP08+076	S-KP07+905	Gravel Pit	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP10+394	N1-KP10+396	Disused Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP10+437	N1-KP10+439	Disused Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP08+468	N1-KP08+468	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP09+398	N1-KP09+400	Ship Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP08+485	N1-KP08+487	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP09+819	N1-KP09+837	Unspecified Ground Workings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP13+869	N1-KP13+874	Ponds	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP09+458	N1-KP09+462	Ship Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP09+211	N1-KP09+213	Cuttings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP03+462	N2-KP03+562	Collieries	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+599	N2-KP05+608	Old Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP04+016	N2-KP04+016	Unspecified Ground Workings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP03+820	N2-KP03+835	Collieries	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+472	N2-KP05+484	Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+671	N2-KP05+739	Disused Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+760	N2-KP05+806	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+989	N2-KP06+033	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP07+160	C-01-KP07+199	Unspecified Heap	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP06+262	C-01-KP06+139	Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP06+736	C-01-KP06+738	Pond	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP07+540	C-01-KP07+564	Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP06+792	C-01-KP06+819	Ponds	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP07+226	C-01-KP07+247	Ponds	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - W-03	W-03-KP01+256	W-03-KP01+459	Cuttings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+616	N1-02-KP01+436	Disused Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+113	N1-02-KP00+270	Unspecified Heap	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+310	N1-02-KP02+381	Unspecified Heap	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+549	N1-02-KP02+573	Unspecified Heap	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+118	N1-02-KP01+127	Disused Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-04	N2-04-KP00+599	N2-04-KP00+606	Ponds	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+141	N1-05-KP00+264	Unspecified Heap	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+016	N2-06-KP00+016	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+026	N2-06-KP00+042	Collieries	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+860	N2-06-KP00+901	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+073	N2-07-KP00+093	Collieries	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - W-01	W-01-KP00+604	W-01-KP00+630	Sand Pit	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - W-01	W-01-KP00+185	W-01-KP00+423	Refuse Heap	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - W-01	W-01-KP00+170	W-01-KP00+171	Canal	5	5	25 (Severe)		4	3	12 (Moderate)

Hynet Geohazards Desk Study

Hazard Title: Surface Ground Workings (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Historical Land uses identified from OS Mapping indicate ground excavation at surface may have occurred. (ponds, cuttings, pits, canals, heaps, mounds, reservoir, refuse heap, water bodies, colliery, brick works etc). Possibly subsequent landfilling (recorded *or unrecorded*).	Insufficient design, delay, excessive displacement, differential displacement, failure of foundations, slopes and excavation instability. - Potential injury or exposure of construction workers. Pollution of controlled waters and environment. - Potential to add cost, time, risk to the project	Preferred Route Centreline - W	W-KP17+918	W-KP17+922	Canal	5	5	25 (Severe)	Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment of temporary and permanent slopes and assessment of infilled materials for contamination. - Topographic survey to determine existing slope gradients and geomorphology - Engineering geological assessment of existing slope / failed slope- Assessment of existing and proposed slope stability to current British and Eurocode standards and CoP documents.- Adoption of conservative parameters in assessment and design.- Contamination assessment of any fill materials. - Consider reroute - Designer to consider application of engineering mitigation for temporary / permanent works	4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP11+259	W-KP11+274	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP00+933	W-KP00+934	Pond	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP11+296	W-KP11+302	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP03+218	W-KP03+232	Ponds	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP03+218	W-KP03+232	Pond	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP07+918	W-KP07+919	Disused Brick Field	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP07+918	W-KP07+919	Brick Field	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP08+040	W-KP08+041	Disused Brick Field	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP21+137	E-KP21+138	Cuttings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP08+573	E-KP08+575	Pond	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP09+382	E-KP09+392	Ponds	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP17+697	E-KP17+697	Cuttings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP17+668	E-KP17+673	Cuttings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP13+444	E-KP13+445	Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP14+418	E-KP14+419	Pond	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP08+955	E-KP08+971	Ponds	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP014+39	E-KP14+391	Ponds	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP19+243	E-KP19+254	Ponds	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP21+098	E-KP21+102	Cuttings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP13+301	E-KP13+302	Brick Field	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP13+301	E-KP13+302	Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP16+551	S-KP16+554	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP01+643	S-KP01+647	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP10+768	S-KP10+774	Pond	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP10+774	S-KP10+752	Pond	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP07+905	S-KP08+076	Unspecified Disused Workings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP07+905	S-KP08+076	Gravel Pit	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP09+659	S-KP09+659	Pond	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP09+667	S-KP09+668	Pond	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP17+622	S-KP17+626	Cuttings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP17+647	S-KP17+648	Cuttings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP10+396	N1-KP10+398	Disused Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP10+396	N1-KP10+398	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP08+484	N1-KP08+485	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP10+437	N1-KP10+437	Disused Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP09+569	N1-KP09+600	Unspecified Heap	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP09+400	N1-KP09+401	Ship Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP09+400	N1-KP09+401	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP09+170	N1-KP09+173	Cuttings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP09+208	N1-KP09+211	Cuttings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP13+845	N1-KP13+851	Ponds	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP013+86	N1-KP13+869	Ponds	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP03+562	N2-KP03+563	Collieries	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+484	N2-KP05+599	Old Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+484	N2-KP05+599	Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP03+816	N2-KP03+820	Collieries	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+613	N2-KP05+614	Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+739	N2-KP05+760	Disused Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+739	N2-KP05+760	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+806	N2-KP05+823	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+806	N2-KP05+823	Unspecified Disused Pit	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+853	N2-KP05+857	Refuse Heap	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP06+068	C-01-KP06+069	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP06+158	C-01-KP06+154	Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP06+158	C-01-KP06+154	Unspecified Heap	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP06+261	C-01-KP06+259	Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP06+261	C-01-KP06+259	Unspecified Pits	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP06+056	C-01-KP06+056	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP07+282	C-01-KP07+313	Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - W-03	W-03-KP01+257	W-03-KP01+459	Cuttings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+620	N1-02-KP01+620	Disused Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+127	N1-02-KP01+148	Disused Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+000	N1-02-KP00+013	Unspecified Heap	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+284	N1-02-KP03+284	Canal	5	5	25 (Severe)		4	3	12 (Moderate)

Hynet Geohazards Desk Study

Hazard Title: Surface Ground Workings (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Historical Land uses identified from OS Mapping indicate ground excavation at surface may have occurred. (ponds, cuttings, pits, canals, heaps, mounds, reservoir, refuse heap, water bodies, colliery, brick works etc). Possibly subsequent landfilling (recorded or unrecorded).	Insufficient design, delay, excessive displacement, differential displacement, failure of foundations, slopes and excavation instability. - Potential injury or exposure of construction workers. Pollution of controlled waters and environment. - Potential to add cost, time, risk to the project	Preferred Spurs Centreline - N1-02	N1-02-KP02+096	N1-02-KP02+124	Refuse Heap	5	5	25 (Severe)	Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment of temporary and permanent slopes and assessment of infilled materials for contamination. - Topographic survey to determine existing slope gradients and geomorphology - Engineering geological assessment of existing slope / failed slope- Assessment of existing and proposed slope stability to current British and Eurocode standards and CoP documents.- Adoption of conservative parameters in assessment and design.- Contamination assessment of any fill materials. - Consider reroute - Designer to consider application of engineering mitigation for temporary / permanent works	4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+555	N1-02-KP02+567	Unspecified Heap	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+264	N1-02-KP03+264	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP06+022	N1-02-KP06+053	Refuse Heap	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP06+022	N1-02-KP06+053	Unspecified Disused Tip	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+661	N1-02-KP01+403	Disused Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+013	N1-05-KP00+049	Unspecified Heap	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+042	N2-06-KP00+045	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+042	N2-06-KP00+045	Collieries	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+826	N2-06-KP00+852	Collieries	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+826	N2-06-KP00+852	Sanitary Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+858	N2-06-KP00+860	Sanitary Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+858	N2-06-KP00+860	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+810	N2-06-KP00+858	Sanitary Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+810	N2-06-KP00+858	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP01+153	N2-06-KP01+098	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - W-01	W-01-KP00+127	W-01-KP00+139	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - W-01	W-01-KP00+166	W-01-KP00+170	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP00+956	W-KP00+958	Pond	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP00+936	W-KP00+937	Pond	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP17+934	W-KP17+935	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP11+274	W-KP11+275	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP07+919	W-KP07+920	Disused Brick Field	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP07+919	W-KP07+920	Brick Field	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP21+137	E-KP21+137	Cuttings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP08+575	E-KP08+575	Pond	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP09+387	E-KP09+390	Ponds	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP13+443	E-KP13+444	Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP08+583	E-KP08+583	Pond	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP08+971	E-KP08+973	Ponds	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP14+416	E-KP14+418	Pond	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP14+416	E-KP14+418	Ponds	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP015+65	E-KP15+651	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP15+634	E-KP15+634	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP16+554	S-KP16+555	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP01+647	S-KP01+650	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP10+786	S-KP10+774	Pond	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP01+661	S-KP01+664	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP09+659	S-KP09+667	Pond	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP17+626	S-KP17+647	Cuttings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP10+398	N1-KP10+400	Disused Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP10+398	N1-KP10+400	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP08+484	N1-KP08+484	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP09+401	N1-KP09+405	Ship Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP09+401	N1-KP09+405	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP09+454	N1-KP09+458	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP09+454	N1-KP09+458	Ship Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP09+206	N1-KP09+208	Cuttings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP13+851	N1-KP13+851	Ponds	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+608	N2-KP05+613	Old Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+608	N2-KP05+613	Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+965	N2-KP05+989	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+965	N2-KP05+989	Clay Pit	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+845	N2-KP05+853	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+845	N2-KP05+853	Refuse Heap	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+833	N2-KP05+845	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+833	N2-KP05+845	Refuse Heap	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+833	N2-KP05+845	Unspecified Ground Workings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+823	N2-KP05+833	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+823	N2-KP05+833	Unspecified Disused Pit	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+823	N2-KP05+833	Unspecified Ground Workings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP06+208	C-01-KP06+218	Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP06+208	C-01-KP06+218	Unspecified Pit	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP07+313	C-01-KP07+316	Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP07+496	C-01-KP07+540	Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+045	N2-06-KP00+047	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)

Hynet Geohazards Desk Study

Hazard Title: Surface Ground Workings (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Historical Land uses identified from OS Mapping indicate ground excavation at surface may have occurred. (ponds, cuttings, pits, canals, heaps, mounds, reservoir, refuse heap, water bodies, colliery, brick works etc). Possibly subsequent landfilling (recorded or unrecorded).	Insufficient design, delay, excessive displacement, differential displacement, failure of foundations, slopes and excavation instability. - Potential injury or exposure of construction workers. Pollution of controlled waters and environment. - Potential to add cost, time, risk to the project	Preferred Spurs Centreline - N2-06	N2-06-KP00+045	N2-06-KP00+047	Collieries	5	5	25 (Severe)	Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment of temporary and permanent slopes and assessment of infilled materials for contamination. - Topographic survey to determine existing slope gradients and geomorphology - Engineering geological assessment of existing slope / failed slope- Assessment of existing and proposed slope stability to current British and Eurocode standards and CoP documents.- Adoption of conservative parameters in assessment and design.- Contamination assessment of any fill materials. - Consider reroute - Designer to consider application of engineering mitigation for temporary / permanent works	4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+804	N2-06-KP00+810	Sanitary Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+804	N2-06-KP00+810	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+804	N2-06-KP00+810	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+557	N2-06-KP00+752	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+557	N2-06-KP00+752	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+519	N2-06-KP00+523	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+519	N2-06-KP00+523	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP01+098	N2-06-KP01+153	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - W-01	W-01-KP00+139	W-01-KP00+141	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP00+952	W-KP00+956	Pond	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP00+937	W-KP00+941	Pond	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP17+922	W-KP17+925	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP08+039	W-KP08+040	Disused Brick Field	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP11+275	W-KP11+296	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP17+694	E-KP17+697	Cuttings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP17+673	E-KP17+674	Cuttings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP13+442	E-KP13+443	Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP13+442	E-KP13+443	Brick Field	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP08+989	E-KP08+991	Ponds	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP08+581	E-KP08+583	Pond	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP13+302	E-KP13+303	Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP13+302	E-KP13+303	Brick Field	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP14+391	E-KP14+392	Pond	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP14+391	E-KP14+392	Ponds	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP21+102	E-KP21+103	Cuttings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP010+78	S-KP10+774	Pond	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP10+768	S-KP10+768	Pond	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP10+768	S-KP10+768	Ponds	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP16+566	S-KP16+567	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP01+660	S-KP01+661	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP10+752	S-KP10+754	Pond	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP10+752	S-KP10+754	Ponds	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP10+400	N1-KP10+400	Disused Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP10+400	N1-KP10+400	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP08+468	N1-KP08+470	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP09+405	N1-KP09+407	Ship Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP09+405	N1-KP09+407	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP09+173	N1-KP09+174	Cuttings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP09+205	N1-KP09+206	Cuttings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP13+851	N1-KP013+86	Ponds	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP03+563	N2-KP03+639	Collieries	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+958	N2-KP05+965	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+958	N2-KP05+965	Clay Pit	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP03+712	N2-KP03+816	Collieries	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+857	N2-KP05+867	Clay Pit	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+857	N2-KP05+867	Refuse Heap	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+857	N2-KP05+867	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP06+067	C-01-KP06+058	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP06+259	C-01-KP06+261	Unspecified Pit	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP06+259	C-01-KP06+261	Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP06+259	C-01-KP06+261	Unspecified Pits	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP06+154	C-01-KP06+158	Unspecified Ground Workings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP06+154	C-01-KP06+158	Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP06+154	C-01-KP06+158	Unspecified Heap	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP07+389	C-01-KP07+366	Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+620	N1-02-KP01+634	Disused Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+282	N1-02-KP03+284	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+097	N1-02-KP02+120	Refuse Heap	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+989	N1-02-KP03+931	Unspecified Pit	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+646	N1-02-KP01+661	Disused Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+118	N2-06-KP00+120	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+118	N2-06-KP00+120	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+047	N2-06-KP00+056	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)

Hynet Geohazards Desk Study

Hazard Title: Surface Ground Workings (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Historical Land uses identified from OS Mapping indicate ground excavation at surface may have occurred. (ponds, cuttings, pits, canals, heaps, mounds, reservoir, refuse heap, water bodies, colliery, brick works etc). Possibly subsequent landfilling (recorded or unrecorded).	Insufficient design, delay, excessive displacement, differential displacement, failure of foundations, slopes and excavation instability. - Potential injury or exposure of construction workers. Pollution of controlled waters and environment. - Potential to add cost, time, risk to the project	Preferred Spurs Centreline - N2-06	N2-06-KP00+047	N2-06-KP00+056	Colliery	5	5	25 (Severe)	Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment of temporary and permanent slopes and assessment of infilled materials for contamination. - Topographic survey to determine existing slope gradients and geomorphology - Engineering geological assessment of existing slope / failed slope- Assessment of existing and proposed slope stability to current British and Eurocode standards and CoP documents.- Adoption of conservative parameters in assessment and design.- Contamination assessment of any fill materials. - Consider reroute - Designer to consider application of engineering mitigation for temporary / permanent works	4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+047	N2-06-KP00+056	Collieries	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+439	N2-06-KP00+444	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+439	N2-06-KP00+444	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+439	N2-06-KP00+444	Brick and Pipe Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+564	N2-06-KP00+730	Unspecified Ground Workings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+564	N2-06-KP00+730	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+564	N2-06-KP00+730	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+752	N2-06-KP00+793	Sanitary Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+752	N2-06-KP00+793	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+752	N2-06-KP00+793	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+793	N2-06-KP00+804	Sanitary Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+793	N2-06-KP00+804	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+793	N2-06-KP00+804	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+505	N2-06-KP00+519	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+505	N2-06-KP00+519	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+505	N2-06-KP00+519	Brick and Pipe Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - W-01	W-01-KP00+141	W-01-KP00+166	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP00+941	W-KP00+952	Pond	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP17+925	W-KP17+934	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP07+920	W-KP07+922	Disused Brick Field	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP07+920	W-KP07+922	Brick Field	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP08+039	W-KP08+039	Disused Brick Field	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP21+134	E-KP21+137	Cuttings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP08+580	E-KP08+581	Pond	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP17+674	E-KP17+674	Cuttings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP14+414	E-KP14+416	Pond	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP14+414	E-KP14+416	Ponds	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP08+980	E-KP08+989	Ponds	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP21+103	E-KP21+112	Cuttings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP015+65	E-KP015+65	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP01+650	S-KP01+651	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP16+563	S-KP16+566	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP10+754	S-KP10+755	Pond	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP10+754	S-KP10+755	Ponds	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP10+400	N1-KP10+401	Disused Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP10+400	N1-KP10+401	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP08+470	N1-KP08+472	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP09+407	N1-KP09+410	Ship Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP09+407	N1-KP09+410	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP09+453	N1-KP09+454	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP09+453	N1-KP09+454	Ship Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP09+179	N1-KP09+182	Cuttings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP09+203	N1-KP09+205	Cuttings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP03+639	N2-KP03+663	Collieries	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP03+639	N2-KP03+663	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP03+692	N2-KP03+712	Collieries	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP07+386	C-01-KP07+389	Unspecified Ground Workings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP07+386	C-01-KP07+389	Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP06+058	C-01-KP06+067	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP07+366	C-01-KP07+376	Unspecified Heap	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP07+366	C-01-KP07+376	Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+635	N1-02-KP01+639	Disused Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+644	N1-02-KP01+646	Disused Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+156	N2-06-KP00+121	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+156	N2-06-KP00+121	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+117	N2-06-KP00+118	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+117	N2-06-KP00+118	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+056	N2-06-KP00+059	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+056	N2-06-KP00+059	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+056	N2-06-KP00+059	Collieries	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+566	N2-06-KP00+567	Refuse Heap	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+566	N2-06-KP00+567	Unspecified Ground Workings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+566	N2-06-KP00+567	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)

Hynet Geohazards Desk Study

Hazard Title: Surface Ground Workings (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Historical Land uses identified from OS Mapping indicate ground excavation at surface may have occurred. (ponds, cuttings, pits, canals, heaps, mounds, reservoir, refuse heap, water bodies, colliery, brick works etc). Possibly subsequent landfilling (recorded or unrecorded).	Insufficient design, delay, excessive displacement, differential displacement, failure of foundations, slopes and excavation instability. - Potential injury or exposure of construction workers. Pollution of *controlled waters and environment*. - Potential to add cost, time, risk to the project	Preferred Spurs Centreline - N2-06	N2-06-KP00+566	N2-06-KP00+567	Colliery	5	5	25 (Severe)	Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment of temporary and permanent slopes and assessment of infilled materials for contamination. - Topographic survey to determine existing slope gradients and geomorphology - Engineering geological assessment of existing slope / failed slope- Assessment of existing and proposed slope stability to current British and Eurocode standards and CoP documents.- Adoption of conservative parameters in assessment and design.- Contamination assessment of any fill materials. - Consider reroute - Designer to consider application of engineering mitigation for temporary / permanent works	4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+229	N2-06-KP00+233	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+435	N2-06-KP00+419	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+435	N2-06-KP00+419	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+435	N2-06-KP00+419	Brick and Pipe Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+444	N2-06-KP00+456	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+444	N2-06-KP00+456	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+444	N2-06-KP00+456	Brick and Pipe Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+530	N2-06-KP00+557	Unspecified Heap	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+530	N2-06-KP00+557	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+530	N2-06-KP00+557	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+658	N2-06-KP00+714	Unspecified Ground Workings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+658	N2-06-KP00+714	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+658	N2-06-KP00+714	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+502	N2-06-KP00+505	Water Body	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+502	N2-06-KP00+505	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+502	N2-06-KP00+505	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+502	N2-06-KP00+505	Brick and Pipe Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+483	N2-06-KP00+488	Water Bodies	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+483	N2-06-KP00+488	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+483	N2-06-KP00+488	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+483	N2-06-KP00+488	Brick and Pipe Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+482	N2-06-KP00+483	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+482	N2-06-KP00+483	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+482	N2-06-KP00+483	Brick and Pipe Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP07+922	W-KP07+922	Disused Brick Field	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP07+922	W-KP07+922	Brick Field	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP07+922	W-KP07+922	Ponds	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP08+038	W-KP08+039	Disused Brick Field	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP08+038	W-KP08+039	Ponds	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP21+125	E-KP21+134	Cuttings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP08+575	E-KP08+580	Pond	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP17+674	E-KP17+694	Cuttings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP14+392	E-KP14+414	Pond	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP14+392	E-KP14+414	Ponds	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP13+353	E-KP13+351	Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP13+353	E-KP13+351	Brick Field	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP08+973	E-KP08+976	Ponds	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP15+634	E-KP15+637	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP01+651	S-KP01+660	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP10+755	S-KP10+768	Pond	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP10+755	S-KP10+768	Ponds	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP08+472	N1-KP08+473	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP08+483	N1-KP08+484	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP10+436	N1-KP10+437	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP10+436	N1-KP10+437	Disused Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP09+451	N1-KP09+453	Ship Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP09+451	N1-KP09+453	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP09+174	N1-KP09+175	Cuttings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP09+182	N1-KP09+184	Cuttings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP03+663	N2-KP03+692	Collieries	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP03+663	N2-KP03+692	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+956	N2-KP05+958	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+956	N2-KP05+958	Clay Pit	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+867	N2-KP05+891	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+867	N2-KP05+891	Clay Pit	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+867	N2-KP05+891	Refuse Heap	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP07+376	C-01-KP07+386	Unspecified Ground Workings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP07+376	C-01-KP07+386	Unspecified Heap	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP07+376	C-01-KP07+386	Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+634	N1-02-KP01+635	Disused Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+642	N1-02-KP01+644	Disused Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+282	N1-02-KP03+282	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+264	N1-02-KP03+265	Canal	5	5	25 (Severe)		4	3	12 (Moderate)

Hynet Geohazards Desk Study

Hazard Title: Surface Ground Workings (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Historical Land uses identified from OS Mapping indicate ground excavation at surface may have occurred. (ponds, cuttings, pits, canals, heaps, mounds, reservoir, refuse heap, water bodies, colliery, brick works etc). Possibly subsequent landfilling (recorded or unrecorded).	Insufficient design, delay, excessive displacement, differential displacement, failure of foundations, slopes and excavation instability. - Potential injury or exposure of construction workers. Pollution of *controlled waters and environment*. - Potential to add cost, time, risk to the project	Preferred Spurs Centreline - N2-06	N2-06-KP00+205	N2-06-KP00+229	Pipe and Brick Works	5	5	25 (Severe)	Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment of temporary and permanent slopes and assessment of infilled materials for contamination. - Topographic survey to determine existing slope gradients and geomorphology - Engineering geological assessment of existing slope / failed slope- Assessment of existing and proposed slope stability to current British and Eurocode standards and CoP documents.- Adoption of conservative parameters in assessment and design.- Contamination assessment of any fill materials. - Consider reroute - Designer to consider application of engineering mitigation for temporary / permanent works	4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+205	N2-06-KP00+229	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+121	N2-06-KP00+143	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+121	N2-06-KP00+143	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+121	N2-06-KP00+143	Collieries	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+150	N2-06-KP00+156	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+150	N2-06-KP00+156	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+150	N2-06-KP00+156	Brick and Pipe Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+199	N2-06-KP00+204	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+199	N2-06-KP00+204	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+112	N2-06-KP00+117	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+112	N2-06-KP00+117	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+112	N2-06-KP00+117	Brick and Pipe Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+059	N2-06-KP00+105	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+059	N2-06-KP00+105	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+059	N2-06-KP00+105	Collieries	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+059	N2-06-KP00+105	Brick and Pipe Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+567	N2-06-KP00+575	Refuse Heap	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+567	N2-06-KP00+575	Unspecified Ground Workings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+567	N2-06-KP00+575	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+567	N2-06-KP00+575	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+499	N2-06-KP00+502	Water Bodies	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+499	N2-06-KP00+502	Water Body	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+499	N2-06-KP00+502	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+499	N2-06-KP00+502	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+499	N2-06-KP00+502	Brick and Pipe Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+233	N2-06-KP00+251	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+263	N2-06-KP00+267	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+263	N2-06-KP00+267	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+263	N2-06-KP00+267	Brick and Pipe Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+408	N2-06-KP00+418	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+408	N2-06-KP00+418	Refuse Heap	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+408	N2-06-KP00+418	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+408	N2-06-KP00+418	Brick and Pipe Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+456	N2-06-KP00+435	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+456	N2-06-KP00+435	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+456	N2-06-KP00+435	Brick and Pipe Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+653	N2-06-KP00+658	Unspecified Ground Workings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+653	N2-06-KP00+658	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+653	N2-06-KP00+658	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+488	N2-06-KP00+489	Water Body	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+488	N2-06-KP00+489	Water Bodies	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+488	N2-06-KP00+489	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+488	N2-06-KP00+489	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+488	N2-06-KP00+489	Brick and Pipe Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP08+038	W-KP08+038	Ponds	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP08+038	W-KP08+038	Disused Brick Field	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP21+125	E-KP21+125	Cuttings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP21+112	E-KP21+113	Cuttings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP13+351	E-KP13+353	Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP13+351	E-KP13+353	Pond	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP13+351	E-KP13+353	Brick Field	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP08+976	E-KP08+980	Ponds	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP16+555	S-KP16+563	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP10+401	N1-KP10+403	Disused Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP10+401	N1-KP10+403	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP08+473	N1-KP08+473	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP08+481	N1-KP08+483	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP09+451	N1-KP09+451	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP09+451	N1-KP09+451	Ship Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP09+175	N1-KP09+177	Cuttings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP09+179	N1-KP09+179	Cuttings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP09+184	N1-KP09+203	Cuttings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+954	N2-KP05+956	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)

Hynet Geohazards Desk Study

Hazard Title: Surface Ground Workings (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Historical Land uses identified from OS Mapping indicate ground excavation at surface may have occurred. (ponds, cuttings, pits, canals, heaps, mounds, reservoir, refuse heap, water bodies, colliery, brick works etc). Possibly subsequent landfilling (recorded or unrecorded).	Insufficient design, delay, excessive displacement, differential displacement, failure of foundations, slopes and excavation instability. - Potential injury or exposure of construction workers. Pollution of *controlled waters and environment*. - Potential to add cost, time, risk to the project	Preferred Route Centreline - N2	N2-KP05+954	N2-KP05+956	Clay Pit	5	5	25 (Severe)	Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment of temporary and permanent slopes and assessment of infilled materials for contamination. - Topographic survey to determine existing slope gradients and geomorphology - Engineering geological assessment of existing slope / failed slope- Assessment of existing and proposed slope stability to current British and Eurocode standards and CoP documents.- Adoption of conservative parameters in assessment and design.- Contamination assessment of any fill materials. - Consider reroute - Designer to consider application of engineering mitigation for temporary / permanent works	4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+954	N2-KP05+956	Refuse Heap	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+912	N2-KP05+915	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+912	N2-KP05+915	Clay Pit	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+912	N2-KP05+915	Refuse Heap	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+639	N1-02-KP01+642	Disused Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+204	N2-06-KP00+205	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+204	N2-06-KP00+205	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+143	N2-06-KP00+150	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+143	N2-06-KP00+150	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+143	N2-06-KP00+150	Collieries	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+143	N2-06-KP00+150	Brick and Pipe Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+105	N2-06-KP00+112	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+105	N2-06-KP00+112	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+105	N2-06-KP00+112	Collieries	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+105	N2-06-KP00+112	Brick and Pipe Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+649	N2-06-KP00+653	Refuse Heap	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+649	N2-06-KP00+653	Unspecified Ground Workings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+649	N2-06-KP00+653	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+649	N2-06-KP00+653	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+497	N2-06-KP00+499	Water Bodies	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+497	N2-06-KP00+499	Water Body	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+497	N2-06-KP00+499	Pond	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+497	N2-06-KP00+499	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+497	N2-06-KP00+499	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+497	N2-06-KP00+499	Brick and Pipe Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+377	N2-06-KP00+408	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+377	N2-06-KP00+408	Refuse Heap	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+377	N2-06-KP00+408	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+377	N2-06-KP00+408	Brick and Pipe Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+251	N2-06-KP00+263	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+251	N2-06-KP00+263	Brick and Pipe Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+267	N2-06-KP00+307	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+267	N2-06-KP00+307	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+267	N2-06-KP00+307	Brick and Pipe Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+489	N2-06-KP00+489	Water Body	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+489	N2-06-KP00+489	Pond	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+489	N2-06-KP00+489	Water Bodies	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+489	N2-06-KP00+489	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+489	N2-06-KP00+489	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+489	N2-06-KP00+489	Brick and Pipe Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP07+922	W-KP07+924	Disused Brick Field	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP07+922	W-KP07+924	Brick Field	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP07+922	W-KP07+924	Ponds	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP21+113	E-KP21+114	Cuttings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP15+647	E-KP015+65	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP10+436	N1-KP10+436	Disused Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP10+436	N1-KP10+436	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP08+481	N1-KP08+481	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP09+177	N1-KP09+178	Cuttings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+915	N2-KP05+954	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+915	N2-KP05+954	Clay Pit	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+915	N2-KP05+954	Refuse Heap	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+891	N2-KP05+912	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+891	N2-KP05+912	Clay Pit	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+891	N2-KP05+912	Refuse Heap	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+281	N1-02-KP03+282	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+265	N1-02-KP03+266	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+575	N2-06-KP00+575	Refuse Heap	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+575	N2-06-KP00+575	Unspecified Ground Workings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+575	N2-06-KP00+575	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+575	N2-06-KP00+575	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+647	N2-06-KP00+649	Refuse Heap	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+647	N2-06-KP00+649	Unspecified Ground Workings	5	5	25 (Severe)		4	3	12 (Moderate)

Hynet Geohazards Desk Study

Hazard Title: Surface Ground Workings (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Historical Land uses identified from OS Mapping indicate ground excavation at surface may have occurred. (ponds, cuttings, pits, canals, heaps, mounds, reservoir, refuse heap, water bodies, colliery, brick works etc). Possibly subsequent landfilling (recorded or unrecorded).	Insufficient design, delay, excessive displacement, differential displacement, failure of foundations, slopes and excavation instability. - Potential injury or exposure of construction workers. Pollution of controlled waters and environment. - Potential to add cost, time, risk to the project	Preferred Spurs Centreline - N2-06	N2-06-KP00+647	N2-06-KP00+649	Pipe and Brick Works	5	5	25 (Severe)	Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment of temporary and permanent slopes and assessment of infilled materials for contamination. - Topographic survey to determine existing slope gradients and geomorphology - Engineering geological assessment of existing slope / failed slope- Assessment of existing and proposed slope stability to current British and Eurocode standards and CoP documents.- Adoption of conservative parameters in assessment and design.- Contamination assessment of any fill materials. - Consider reroute - Designer to consider application of engineering mitigation for temporary / permanent works	4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+647	N2-06-KP00+649	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+495	N2-06-KP00+497	Water Bodies	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+495	N2-06-KP00+497	Water Body	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+495	N2-06-KP00+497	Pond	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+495	N2-06-KP00+497	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+495	N2-06-KP00+497	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+495	N2-06-KP00+497	Brick and Pipe Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+307	N2-06-KP00+377	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+307	N2-06-KP00+377	Refuse Heap	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+307	N2-06-KP00+377	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+307	N2-06-KP00+377	Brick and Pipe Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP08+037	W-KP08+038	Ponds	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP08+037	W-KP08+038	Disused Brick Field	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP08+037	W-KP08+038	Brick Field	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP21+122	E-KP21+125	Cuttings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP21+114	E-KP21+114	Cuttings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP15+637	E-KP15+647	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP10+403	N1-KP10+406	Disused Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP10+403	N1-KP10+406	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP09+410	N1-KP09+411	Ship Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP09+410	N1-KP09+411	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP09+178	N1-KP09+179	Cuttings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+575	N2-06-KP00+578	Refuse Heap	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+575	N2-06-KP00+578	Unspecified Ground Workings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+575	N2-06-KP00+578	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+575	N2-06-KP00+578	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+494	N2-06-KP00+495	Water Bodies	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+494	N2-06-KP00+495	Pond	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+494	N2-06-KP00+495	Water Body	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+494	N2-06-KP00+495	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+494	N2-06-KP00+495	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+494	N2-06-KP00+495	Brick and Pipe Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+489	N2-06-KP00+491	Water Bodies	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+489	N2-06-KP00+491	Pond	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+489	N2-06-KP00+491	Water Body	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+489	N2-06-KP00+491	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+489	N2-06-KP00+491	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+489	N2-06-KP00+491	Brick and Pipe Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP07+924	W-KP07+924	Disused Brick Field	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP07+924	W-KP07+924	Ponds	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP07+924	W-KP07+924	Brick Field	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP10+435	N1-KP10+436	Disused Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP10+435	N1-KP10+436	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP08+478	N1-KP08+481	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP08+473	N1-KP08+474	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP09+411	N1-KP09+411	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP09+411	N1-KP09+411	Ship Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+266	N1-02-KP03+266	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+633	N2-06-KP00+647	Refuse Heap	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+633	N2-06-KP00+647	Unspecified Ground Workings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+633	N2-06-KP00+647	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+633	N2-06-KP00+647	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+578	N2-06-KP00+609	Refuse Heap	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+578	N2-06-KP00+609	Unspecified Ground Workings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+578	N2-06-KP00+609	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+578	N2-06-KP00+609	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+578	N2-06-KP00+609	Unspecified Heap	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+491	N2-06-KP00+494	Water Bodies	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+491	N2-06-KP00+494	Pond	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+491	N2-06-KP00+494	Water Body	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+491	N2-06-KP00+494	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+491	N2-06-KP00+494	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+491	N2-06-KP00+494	Brick and Pipe Works	5	5	25 (Severe)		4	3	12 (Moderate)

Hynet Geohazards Desk Study

Hazard Title: Surface Ground Workings (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Historical Land uses identified from OS Mapping indicate ground excavation at surface may have occurred. (ponds, cuttings, pits, canals, heaps, mounds, reservoir, refuse heap, water bodies, colliery, brick works etc). Possibly subsequent landfilling (recorded or unrecorded).	Insufficient design, delay, excessive displacement, differential displacement, failure of foundations, slopes and excavation instability. - Potential injury or exposure of construction workers. Pollution of controlled waters and environment. - Potential to add cost, time, risk to the project	Preferred Route Centreline - W	W-KP08+035	W-KP08+037	Ponds	5	5	25 (Severe)	Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment of temporary and permanent slopes and assessment of infilled materials for contamination. - Topographic survey to determine existing slope gradients and geomorphology - Engineering geological assessment of existing slope / failed slope- Assessment of existing and proposed slope stability to current British and Eurocode standards and CoP documents.- Adoption of conservative parameters in assessment and design.- Contamination assessment of any fill materials. - Consider reroute - Designer to consider application of engineering mitigation for temporary / permanent works	4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP08+035	W-KP08+037	Disused Brick Field	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP08+035	W-KP08+037	Brick Field	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP21+114	E-KP21+122	Cuttings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP10+434	N1-KP10+435	Disused Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP10+434	N1-KP10+435	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP08+474	N1-KP08+476	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP09+411	N1-KP09+412	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP09+411	N1-KP09+412	Ship Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+631	N2-06-KP00+633	Refuse Heap	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+631	N2-06-KP00+633	Unspecified Ground Workings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+631	N2-06-KP00+633	Unspecified Heap	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+631	N2-06-KP00+633	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+631	N2-06-KP00+633	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+609	N2-06-KP00+628	Refuse Heap	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+609	N2-06-KP00+628	Unspecified Ground Workings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+609	N2-06-KP00+628	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+609	N2-06-KP00+628	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+609	N2-06-KP00+628	Unspecified Heap	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP07+924	W-KP08+035	Ponds	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP07+924	W-KP08+035	Disused Brick Field	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP07+924	W-KP08+035	Brick Field	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP10+433	N1-KP10+434	Disused Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP10+433	N1-KP10+434	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP08+476	N1-KP08+478	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+266	N1-02-KP03+281	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+628	N2-06-KP00+631	Refuse Heap	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+628	N2-06-KP00+631	Unspecified Ground Workings	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+628	N2-06-KP00+631	Unspecified Heap	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+628	N2-06-KP00+631	Pipe and Brick Works	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+628	N2-06-KP00+631	Colliery	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP10+406	N1-KP10+408	Disused Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP10+406	N1-KP10+408	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP10+433	N1-KP10+433	Disused Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP10+433	N1-KP10+433	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP09+412	N1-KP09+413	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP09+412	N1-KP09+413	Ship Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP09+449	N1-KP09+451	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP09+449	N1-KP09+451	Ship Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP10+408	N1-KP10+409	Disused Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP10+408	N1-KP10+409	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP10+432	N1-KP10+433	Disused Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP10+432	N1-KP10+433	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP09+447	N1-KP09+449	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP09+447	N1-KP09+449	Ship Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP10+409	N1-KP10+432	Disused Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP10+409	N1-KP10+432	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP09+413	N1-KP09+447	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP09+413	N1-KP09+447	Ship Canal	5	5	25 (Severe)		4	3	12 (Moderate)

RSK GEOSCIENCES

Hynet Geohazards Desk Study

Hazard Title: Surface Ground Workings (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	Closest KP	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Historical Land uses identified from OS Mapping indicate ground excavation at surface may have occurred. (ponds, cuttings, pits, canals, heaps, mounds, reservoir, refuse heap, water bodies, colliery, brick works etc). Possibly subsequent landfilling (recorded or unrecorded).	Insufficient design, delay, excessive displacement, differential displacement, failure of foundations, slopes and excavation instability. - Potential injury or exposure of construction workers. Pollution of controlled waters and environment. - Potential to add cost, time, risk to the project	Trenchless Crossing - Sutton Weaver Canal	W-KP11+302	Canal	5	5	25 (Severe)	Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment of temporary and permanent slopes and assessment of infilled materials for contamination. - Topographic survey to determine existing slope gradients and geomorphology - Engineering geological assessment of existing slope / failed slope- Assessment of existing and proposed slope stability to current British and Eurocode standards and CoP documents.- Adoption of conservative parameters in assessment and design.- Contamination assessment of any fill materials. - Consider reroute - Designer to consider application of engineering mitigation for temporary / permanent works	4	3	12 (Moderate)
		Trenchless Crossing - Trent and Mersey Canal	W-KP17+935	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Trent and Mersey Canal	S-KP01+665	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Bridgewater Canal + road	E-KP15+632	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Bridgewater Canal	N1-KP08+468	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Bridgewater Canal	N1-KP08+486	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+404	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Weaver Navigation Canal	W-01-KP00+170	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Sutton Weaver Canal	W-KP11+259	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Sutton Weaver Canal	W-KP11+296	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Trent and Mersey Canal	W-KP17+919	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Trent and Mersey Canal	S-KP01+644	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Trent and Mersey Canal	S-KP01+646	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Trent and Mersey Canal	S-KP01+657	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Trent and Mersey Canal	S-KP16+551	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Bridgewater Canal + road	E-KP15+649	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Bridgewater Canal	N1-KP08+485	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+400	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+468	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Weaver Navigation Canal	W-01-KP00+127	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Weaver Navigation Canal	W-01-KP00+167	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Sutton Weaver Canal	W-KP11+274	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Trent and Mersey Canal	W-KP17+934	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Trent and Mersey Canal	W-KP17+917	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Trent and Mersey Canal	S-KP01+647	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Trent and Mersey Canal	S-KP01+662	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Trent and Mersey Canal	S-KP01+655	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Trent and Mersey Canal	S-KP16+555	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Bridgewater Canal + road	E-KP015+65	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Bridgewater Canal + road	E-KP15+651	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Bridgewater Canal + road	E-KP15+634	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Bridgewater Canal	N1-KP08+484	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+401	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+417	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+455	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Weaver Navigation Canal	W-01-KP00+139	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Sutton Weaver Canal	W-KP11+275	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Trent and Mersey Canal	W-KP17+922	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Trent and Mersey Canal	S-KP01+660	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Trent and Mersey Canal	S-KP16+566	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Bridgewater Canal	N1-KP08+483	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Bridgewater Canal	N1-KP08+469	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+421	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+415	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+405	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+449	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Weaver Navigation Canal	W-01-KP00+141	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Trent and Mersey Canal	W-KP17+926	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Trent and Mersey Canal	S-KP01+650	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Trent and Mersey Canal	S-KP16+564	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Bridgewater Canal	N1-KP08+470	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+408	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+454	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Trent and Mersey Canal	S-KP01+652	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Trent and Mersey Canal	S-KP01+653	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Bridgewater Canal + road	E-KP15+635	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Bridgewater Canal	N1-KP08+472	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+418	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+452	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Trent and Mersey Canal	S-KP16+556	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Bridgewater Canal	N1-KP08+473	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Bridgewater Canal	N1-KP08+482	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+419	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+451	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Bridgewater Canal + road	E-KP15+647	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Bridgewater Canal	N1-KP08+474	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Bridgewater Canal	N1-KP08+481	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Bridgewater Canal + road	E-KP15+637	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+450	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+410	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+458	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Bridgewater Canal	N1-KP08+479	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+411	Canal	5	5	25 (Severe)		4	3	12 (Moderate)

RSK GEOSCIENCES

Hynet Geohazards Desk Study

Hazard Title: Surface Ground Workings (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	Closest KP	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Historical Land uses identified from OS Mapping indicate ground excavation at surface may have occurred. (ponds, cuttings, pits, canals, heaps, mounds, reservoir, refuse heap, water bodies, colliery, brick works etc). Possibly subsequent landfilling (recorded or unrecorded).	Insufficient design, delay, excessive displacement, differential displacement, failure of foundations, slopes and excavation instability. - Potential injury or exposure of construction workers. Pollution of controlled waters and environment. - Potential to add cost, time, risk to the project	Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+420	Canal	5	5	25 (Severe)	Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment of temporary and permanent slopes and assessment of infilled materials for contamination. - Topographic survey to determine existing slope gradients and geomorphology - Engineering geological assessment of existing slope / failed slope- Assessment of existing and proposed slope stability to current British and Eurocode standards and CoP documents.- Adoption of conservative parameters in assessment and design.- Contamination assessment of any fill materials. - Consider reroute - Designer to consider application of engineering mitigation for temporary / permanent works	4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+406	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Bridgewater Canal	N1-KP08+475	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+424	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+463	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Bridgewater Canal	N1-KP08+477	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+462	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+413	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+416	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+448	Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Middlewich Branch Line Railway	S-KP17+622	Cuttings	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Middlewich Branch Line Railway	S-KP17+649	Cuttings	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Middlewich Branch Line Railway	S-KP17+623	Cuttings	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Middlewich Branch Line Railway	S-KP17+648	Cuttings	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Middlewich Branch Line Railway	S-KP17+627	Cuttings	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Eastford Road and Canal	N1-02-KP01+617	Disused Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Eastford Road and Canal	N1-02-KP01+620	Disused Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Eastford Road and Canal	N1-02-KP01+616	Disused Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Eastford Road and Canal	N1-02-KP01+661	Disused Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Eastford Road and Canal	N1-02-KP01+621	Disused Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Eastford Road and Canal	N1-02-KP01+615	Disused Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Eastford Road and Canal	N1-02-KP01+646	Disused Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Eastford Road and Canal	N1-02-KP01+627	Disused Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Eastford Road and Canal	N1-02-KP01+647	Disused Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Eastford Road and Canal	N1-02-KP01+636	Disused Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Eastford Road and Canal	N1-02-KP01+644	Disused Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Eastford Road and Canal	N1-02-KP01+649	Disused Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Eastford Road and Canal	N1-02-KP01+635	Disused Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Eastford Road and Canal	N1-02-KP01+642	Disused Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Eastford Road and Canal	N1-02-KP01+633	Disused Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Eastford Road and Canal	N1-02-KP01+640	Disused Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Weaver Navigation Canal	S-KP02+119	Dredging Disposal Site	5	5	25 (Severe)		4	3	12 (Moderate)
		Block Valve - NULL	S-KP08+269	Gravel Pit	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Ellesmere Port to Warrington Line Railway	W-KP03+217	Pond	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP10+789	Pond	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP10+792	Pond	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Ellesmere Port to Warrington Line Railway	W-KP03+218	Pond	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP10+772	Pond	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP10+774	Pond	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP10+786	Pond	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP10+776	Pond	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP10+797	Pond	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP010+78	Pond	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP10+779	Pond	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP10+777	Pond	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Ellesmere Port to Warrington Line Railway	W-KP03+232	Ponds	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - River Weaver	W-KP09+998	Ponds	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - M6 Motorway	E-KP09+394	Ponds	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - A557 Weston Point Expressway - Rocksavage Way	W-03-KP00+373	Ponds	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Ellesmere Port to Warrington Line Railway	W-KP03+218	Ponds	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP10+804	Ponds	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - M6 Motorway	E-KP09+391	Ponds	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - A557 Weston Point Expressway - Rocksavage Way	W-03-KP00+366	Ponds	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - A557 Weston Point Expressway - Rocksavage Way	W-03-KP00+369	Ponds	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP10+797	Ponds	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - A557 Weston Point Expressway - Rocksavage Way	W-03-KP00+368	Ponds	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP10+789	Ponds	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP10+779	Ponds	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP010+78	Ponds	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP10+777	Ponds	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - Weaver Navigation Canal	W-01-KP00+185	Refuse Heap	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+399	Ship Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+458	Ship Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+400	Ship Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+468	Ship Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+401	Ship Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+417	Ship Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+455	Ship Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+421	Ship Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+415	Ship Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+405	Ship Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+449	Ship Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+408	Ship Canal	5	5	25 (Severe)		4	3	12 (Moderate)

Hynet Geohazards Desk Study

Hazard Title: Surface Ground Workings (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	Closest KP	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Historical Land uses identified from OS Mapping indicate ground excavation at surface may have occurred. (ponds, cuttings, pits, canals, heaps, mounds, reservoir, refuse heap, water bodies, colliery, brick works etc). Possibly subsequent landfilling (recorded or unrecorded).	Insufficient design, delay, excessive displacement, differential displacement, failure of foundations, slopes and excavation instability. - Potential injury or exposure of *construction workers*. Pollution of controlled waters and environment. - Potential to add cost, time, risk to the project	Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+454	Ship Canal	5	5	25 (Severe)	Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment of temporary and permanent slopes and assessment of infilled materials for contamination. - Topographic survey to determine existing slope gradients and geomorphology - Engineering geological assessment of existing slope / failed slope- Assessment of existing and proposed slope stability to current British and Eurocode standards and CoP documents.- Adoption of conservative parameters in assessment and design.- Contamination assessment of any fill materials. - Consider reroute - Designer to consider application of engineering mitigation for temporary / permanent works	4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+418	Ship Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+452	Ship Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+419	Ship Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+451	Ship Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+450	Ship Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+410	Ship Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+411	Ship Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+420	Ship Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+406	Ship Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+424	Ship Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+463	Ship Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+462	Ship Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+413	Ship Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+416	Ship Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+448	Ship Canal	5	5	25 (Severe)		4	3	12 (Moderate)
		Trenchless Crossing - West Coast Mainline Railway	N1-05-KP00+229	Unspecified Heap	5	5	25 (Severe)		4	3	12 (Moderate)
		HAGI - Higher Walton HAGI	N1-KP09+569	Unspecified Heap	5	5	25 (Severe)		4	3	12 (Moderate)
		HAGI - Stanlow HPP HAGI	W-KP00+000	Unspecified Pit	5	5	25 (Severe)		4	3	12 (Moderate)

APPENDIX C
RISK ASSESSMENT TABLE – GEOMORPHOLOGY – BRITISH PITS

Hynet Geohazards Desk Study

Hazard Title: British Pits (Mapped spatial extents of hazard are taken directly from Groundsure dataset - data within 250m of centreline or facility)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	Closest KP	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Surface mineral workings. Possibly subsequent landfilling (recorded or unrecorded).	Insufficient design, delay, excessive displacement, differential displacement, failure of foundations, slopes and excavation instability. - Potential injury or exposure of construction workers. Pollution of controlled waters and environment.- Potential to add cost, time, risk to the project	Preferred Spurs Centreline - N1-02	N1-02-KP00+256	Acton Grange - Sand	5	5	25 (Severe)	Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment of temporary and permanent slopes and assessment of infilled materials for contamination. - Topographic survey to determine existing slope gradients and geomorphology - Engineering geological assessment of existing slope / failed slope - Assessment of existing and proposed slope stability to current British and Eurocode standards and CoP documents. - Adoption of conservative parameters in assessment and design. - Contamination assessment of any fill materials. - Consider reroute - Designer to consider application of engineering mitigation for temporary / permanent works	4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP016+36	Bold Heath Quarry - Sandstone	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP13+347	High Legh Brick Field - Clay & Shale	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP013+58	Hillside Farm Pit - Sand	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+014	Birchwood Lane Sand Pit - Sand	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - W-03	W-03-KP01+948	Runcorn Heath Marl Pit - Clay & Shale	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP03+959	Sutton Heath Pottery - Fireclay	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP18+497	Dutton Hall Gravel Pit - Sand & Gravel	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP01+349	Bartington Farm Pit - Clay & Shale	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP07+455	Abattoir Cottages Brick Works - Clay & Shale	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+171	Ravenhead Brick Works - Clay & Shale	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP13+392	Moultonbank Farm Pit - Sand	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP08+007	Moore Sand Pit - Sand	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+316	Ravenhead Colliery - Coal, Deep	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP15+002	Agdenlane Farm - Sandstone	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP03+705	Sutton Heath Collieries - Coal, Deep	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP06+156	Common House Pit - Clay & Shale	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP14+157	Chester Road Sand Pit - Sand	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+932	Ravenhead Park OCCS - Coal, Surface Mined	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP05+999	Grangelane Farm Marl Pit - Clay & Shale	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP05+262	Hough Lane Pit - Sand	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+627	Old Teapot Brick Works - Clay & Shale	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP06+494	Bridge Farm Shaft - Salt	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP13+576	Hillside Farm Pit - Sand	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP07+997	Moore Sand Pit - Sand	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP03+200	Sutton Heath Gravel Pit - Sand & Gravel	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+603	Sherdley Road Brick Pit - Clay & Shale	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP16+904	Mill Lane - Sandstone	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP04+033	Sutton Heath Pottery - Fireclay	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP03+554	Sutton Heath Extension OCCS - Coal, Surface Mined	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP08+950	Vale Farm Pit - Sand	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP10+169	Moore Nature Reserve Sand Pit - Sand	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP07+377	Forest Hill Quarry - Sand & Gravel	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP016+36	Bold Heath Quarry - Sand	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP07+935	Dalefords Quarry - Sand	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP10+017	Brickhill Pits - Sand & Gravel	5	5	25 (Severe)		4	3	12 (Moderate)

APPENDIX C
RISK ASSESSMENT TABLE – GEOMORPHOLOGY – UNDERGROUND WORKINGS

Hynet Geohazards Desk Study

Hazard Title: Underground workings (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Potential for underground mine workings including shafts, unspecified mine workings depths, Tunnels etc, potentially at shallow depth	Insufficient design, delay, excessive displacement, subsidence, differential displacement, failure of foundations, slopes and excavation instability. Old shafts, tunnels, mine workings within depth of proposed alignment, foundations, HDD bores. - Potential injury or exposure of construction workers. Pollution of controlled waters and environment. - Potential to add cost, time, risk to the project	Preferred Route Centreline - S	S-KP18+001	S-KP18+097	Non Coal Mining - Winsford or Meadowbank - Salt - rock salt - Small scale underground mining may have occurred; mine adits, shafts and tunnels may be present. Potential for localised difficult ground conditions are at a level where they should be considered	3	3	9 (Minor)	Obtain Coal Mining Report from Coal Authority - Designer to complete detailed Coal Mining Risk Assessment for the route alignment. - Obtain necessary permits from Coal Authority to undertake any investigation of construction works that interact with or disturb any coal assets. - Suitable ground investigation in areas with identified potential for shallow workings, to inform design. - Designer to consider engineer mitigation to deal with relict coal mine workings (Shafts etc).	3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP18+365	S-KP18+401	Non Coal Mining - Holford Brinefield - Salt - brine - Small scale underground mining may have occurred; mine adits, shafts and tunnels may be present. Potential for localised difficult ground conditions are at a level where they should be considered	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP18+401	S-KP18+365	Non Coal Mining - Holford Brinefield - Salt - brine - Small scale underground mining may have occurred; mine adits, shafts and tunnels may be present. Potential for localised difficult ground conditions are at a level where they should be considered	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP13+174	S-KP18+001	Non Coal Mining - Winsford or Meadowbank - Salt - rock salt - Small scale underground mining may have occurred; mine adits, shafts and tunnels may be present. Potential for localised difficult ground conditions are at a level where they should be considered	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP11+765	N1-KP19+023	Coal Mining - Minable Coal	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP00+000	N2-KP06+129	Coal Mining - Minable Coal	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP06+454	C-01-KP06+867	Non Coal Mining - Witton Flashes - Salt - Underground mining is known to have occurred within or very close to the area. Potential for difficult ground conditions should be investigated. Potential for localised subsidence is at a level where it should be considered	4	4	16 (Substantial)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-04	N2-04-KP00+000	N2-04-KP02+035	Coal Mining - Minable Coal	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-06	N2-KP06+129	N2-06-KP00+026	Coal Mining - Minable Coal	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-07	N2-KP06+129	N2-07-KP00+157	Coal Mining - Minable Coal	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP00+033	N2-KP00+710	Coal Mining - Minable Coal	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP00+033	N2-KP00+710	Non Coal Mining - Not available - Vein Mineral - Sporadic underground mining of restricted extent may have occurred. Potential for difficult ground conditions are unlikely and localised and are at a level where they need not be considered	2	2	4 (Minor)		2	2	4 (None / Negligible)

Hynet Geohazards Desk Study

Hazard Title: Underground workings (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Potential for underground mine workings including shafts, unspecified mine workings depths, Tunnels etc, potentially at shallow depth	Insufficient design, delay, excessive displacement, subsidence, differential displacement, failure of foundations, slopes and excavation instability. Old shafts, tunnels, mine workings within depth of proposed alignment, foundations, HDD bores. - Potential injury or exposure of construction workers. Pollution of controlled waters and environment.- Potential to add cost, time, risk to the project	Preferred Route Centreline - N2	N2-KP00+017	N2-KP00+033	Coal Mining - Minable Coal	3	3	9 (Minor)	Obtain Coal Mining Report from Coal Authority - Designer to complete detailed Coal Mining Risk Assessment for the route alignment. - Obtain necessary permits from Coal Authority to undertake any investigation of construction works that interact with or disturb any coal assets. - Suitable ground investigation in areas with identified potential for shallow workings, to inform design. - Designer to consider engineer mitigation to deal with relict coal mine workings (Shafts etc).	3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP00+017	N2-KP00+033	Non Coal Mining - Not available - Vein Mineral - Sporadic underground mining of restricted extent may have occurred. Potential for difficult ground conditions are unlikely and localised and are at a level where they need not be considered	2	2	4 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP03+816	N2-KP03+835	Coal Mining - Minable Coal	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP03+816	N2-KP03+835	Underground Workings - Collieries	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP05+857	N2-KP06+033	Coal Mining - Minable Coal	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP05+857	N2-KP06+033	Underground Workings - Colliery	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP03+462	N2-KP03+563	Coal Mining - Minable Coal	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP03+462	N2-KP03+563	Underground Workings - Collieries	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP05+671	N2-KP05+739	Coal Mining - Minable Coal	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP05+671	N2-KP05+739	Underground Workings - Disused Colliery	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP05+760	N2-KP05+853	Coal Mining - Minable Coal	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP05+760	N2-KP05+853	Underground Workings - Colliery	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-04	N2-04-KP00+024	N2-04-KP00+713	Coal Mining - Minable Coal	3	3	9 (Minor)		3	2	6 (Minor)

Hynet Geohazards Desk Study

Hazard Title: Underground workings (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Potential for underground mine workings including shafts, unspecified mine workings depths, Tunnels etc, potentially at shallow depth	Potential for underground mine workings including shafts, unspecified mine workings depths, Tunnels etc, potentially at shallow depth	Preferred Spurs Centreline - N2-04	N2-04-KP00+024	N2-04-KP00+713	Non Coal Mining - Not available - Vein Mineral - Sporadic underground mining of restricted extent may have occurred. Potential for difficult ground conditions are urlikely and localised and are at a level where they need not be considered	2	2	4 (Minor)	Obtain Coal Mining Report from Coal Authority - Designer to complete detailed Coal Mining Risk Assessment for the route alignment. - Obtain necessary permits from Coal Authority to undertake any investigation of construction works that interact with or disturb any coal assets. - Suitable ground investigation in areas with identified potential for shallow workings, to inform design. - Designer to consider engineer mitigation to deal with relict coal mine workings (Shafts etc).	2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-04	N2-04-KP00+017	N2-04-KP00+024	Coal Mining - Minable Coal	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-04	N2-04-KP00+017	N2-04-KP00+024	Non Coal Mining - Not available - Vein Mineral - Sporadic underground mining of restricted extent may have occurred. Potential for difficult ground conditions are urlikely and localised and are at a level where they need not be considered	2	2	4 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+523	N2-06-KP00+901	Coal Mining - Minable Coal	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+523	N2-06-KP00+901	Underground Workings - Colliery	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+482	N2-06-KP00+858	Coal Mining - Minable Coal	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+482	N2-06-KP00+858	Underground Workings - Colliery	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+439	N2-06-KP00+120	Coal Mining - Minable Coal	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+439	N2-06-KP00+120	Underground Workings - Colliery	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+826	N2-06-KP00+047	Coal Mining - Minable Coal	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+826	N2-06-KP00+047	Underground Workings - Collieries	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+073	N2-07-KP00+093	Coal Mining - Minable Coal	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+073	N2-07-KP00+093	Underground Workings - Collieries	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP05+867	N2-KP05+989	Coal Mining - Minable Coal	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP05+867	N2-KP05+989	Underground Workings - Colliery	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP05+867	N2-KP05+989	Underground Workings - Colliery	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP05+739	N2-KP05+760	Coal Mining - Minable Coal	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP05+739	N2-KP05+760	Underground Workings - Disused Colliery	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP05+739	N2-KP05+760	Underground Workings - Colliery	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+643	N2-06-KP00+692	Coal Mining - Minable Coal	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+643	N2-06-KP00+692	Underground Workings - Colliery	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+643	N2-06-KP00+692	Underground Workings - Unspecified Mine	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+901	N2-06-KP01+199	Coal Mining - Minable Coal	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+901	N2-06-KP01+199	Underground Workings - Colliery	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+901	N2-06-KP01+199	Underground Workings - Colliery	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+456	N2-06-KP00+121	Coal Mining - Minable Coal	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+456	N2-06-KP00+121	Underground Workings - Colliery	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+456	N2-06-KP00+121	Underground Workings - Colliery	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+047	N2-06-KP00+112	Coal Mining - Minable Coal	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+047	N2-06-KP00+112	Underground Workings - Colliery	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+047	N2-06-KP00+112	Underground Workings - Collieries	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP03+712	N2-KP03+816	Coal Mining - Minable Coal	3	3	9 (Minor)		3	2	6 (Minor)

Hynet Geohazards Desk Study

Hazard Title: Underground workings (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Potential for underground mine workings including shafts, unspecified mine workings depths, Tunnels etc, potentially at shallow depth	Insufficient design, delay, excessive displacement, subsidence, differential displacement, failure of foundations, slopes and excavation instability. Old shafts, tunnels, mine workings within depth of proposed alignment, foundations, HDD bores. - Potential injury or exposure of construction workers. Pollution of controlled waters and environment.- Potential to add cost, time, risk to the project	Preferred Route Centreline - N2	N2-KP03+712	N2-KP03+816	Underground Workings - Collieries	3	3	9 (Minor)	Obtain Coal Mining Report from Coal Authority - Designer to complete detailed Coal Mining Risk Assessment for the route alignment. - Obtain necessary permits from Coal Authority to undertake any investigation of construction works that interact with or disturb any coal assets. - Suitable ground investigation in areas with identified potential for shallow workings, to inform design. - Designer to consider engineer mitigation to deal with relict coal mine workings (Shafts etc).	3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP03+712	N2-KP03+816	Underground Workings - Collieries	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP03+712	N2-KP03+816	Underground Workings - Collieries	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP03+563	N2-KP03+639	Coal Mining - Minable Coal	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP03+563	N2-KP03+639	Underground Workings - Collieries	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP03+563	N2-KP03+639	Underground Workings - Collieries	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP03+563	N2-KP03+639	Underground Workings - Collieries	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+121	N2-06-KP00+150	Coal Mining - Minable Coal	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+121	N2-06-KP00+150	Underground Workings - Colliery	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+121	N2-06-KP00+150	Underground Workings - Colliery	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+121	N2-06-KP00+150	Underground Workings - Collieries	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP03+692	N2-KP03+712	Coal Mining - Minable Coal	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP03+692	N2-KP03+712	Underground Workings - Collieries	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP03+692	N2-KP03+712	Underground Workings - Collieries	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP03+692	N2-KP03+712	Underground Workings - Collieries	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP03+692	N2-KP03+712	Underground Workings - Collieries	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP03+639	N2-KP03+663	Coal Mining - Minable Coal	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP03+639	N2-KP03+663	Underground Workings - Colliery	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP03+639	N2-KP03+663	Underground Workings - Collieries	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP03+639	N2-KP03+663	Underground Workings - Collieries	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP03+639	N2-KP03+663	Underground Workings - Collieries	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP03+663	N2-KP03+692	Coal Mining - Minable Coal	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP03+663	N2-KP03+692	Underground Workings - Collieries	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP03+663	N2-KP03+692	Underground Workings - Colliery	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP03+663	N2-KP03+692	Underground Workings - Collieries	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP03+663	N2-KP03+692	Underground Workings - Collieries	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP03+663	N2-KP03+692	Underground Workings - Collieries	3	3	9 (Minor)		3	2	6 (Minor)

Hynet Geohazards Desk Study

Hazard Title: Underground workings (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	Closest KP	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Potential for underground mine workings including shafts, unspecified mine workings depths, Tunnels etc, potentially at shallow depth	Insufficient design, defay, excessive displacement, subsidence, differential displacement, failure of foundations, sopes and excavation instability. Old shafts, tunnels, mine workings within depth of proposed alignment, foundations, HDD bores. - Potential injury or exposure of construction workers. Pollution of controlled waters and environment.- Potential to add cost, time, risk to the project	HAGI - Clockface HAGI	N1-KP18+971	Coal Mining - Minable Coal	3	3	9 (Minor)	Obtain Coal Mining Report from Coal Authority - Designer to complete detailed Coal Mining Risk Assessment for the route alignment. - Obtain necessary permits from Coal Authority to undertake any investigation of construction works that interact with or disturb any coal assets. - Suitable ground investigation in areas with identified potential for shallow workings, to inform design. - Designer to consider engineer mitigation to deal with relict coal mine workings (Shafts etc).	3	2	6 (Minor)
		HAGI - Inoyvn Gas Storage HAGI	S-KP18+388	Non Coal Mining - Holford Brinefield - Salt - brine - Small scale underground mining may have occurred; mine adits, shafts and tunnels may be present. Potential for localised difficult ground conditions are at a level where they should be considered	3	3	9 (Minor)		3	2	6 (Minor)
		HAGI - Inoyvn Gas Storage HAGI	S-KP18+401	Non Coal Mining - Holford Brinefield - Salt - brine - Small scale underground mining may have occurred; mine adits, shafts and tunnels may be present. Potential for localised difficult ground conditions are at a level where they should be considered	3	3	9 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - A533 Road	S-KP14+834	Non Coal Mining - Winsford or Meadowbank - Salt - rock salt - Small scale underground mining may have occurred; mine adits, shafts and tunnels may be present. Potential for localised difficult ground conditions are at a level where they should be considered	3	3	9 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - River Dane	S-KP16+248	Non Coal Mining - Winsford or Meadowbank - Salt - rock salt - Small scale underground mining may have occurred; mine adits, shafts and tunnels may be present. Potential for localised difficult ground conditions are at a level where they should be considered	3	3	9 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - Trent and Mersey Canal	S-KP16+542	Non Coal Mining - Winsford or Meadowbank - Salt - rock salt - Small scale underground mining may have occurred; mine adits, shafts and tunnels may be present. Potential for localised difficult ground conditions are at a level where they should be considered	3	3	9 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - Middlewich Branch Line Railway	S-KP17+621	Non Coal Mining - Winsford or Meadowbank - Salt - rock salt - Small scale underground mining may have occurred; mine adits, shafts and tunnels may be present. Potential for localised difficult ground conditions are at a level where they should be considered	3	3	9 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - A530 King Street Road	S-KP18+087	Non Coal Mining - Winsford or Meadowbank - Salt - rock salt - Small scale underground mining may have occurred; mine adits, shafts and tunnels may be present. Potential for localised difficult ground conditions are at a level where they should be considered	3	3	9 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - A530 King Street Road	S-KP18+095	Non Coal Mining - Holford Brinefield - Salt - brine - Small scale underground mining may have occurred; mine adits, shafts and tunnels may be present. Potential for localised difficult ground conditions are at a level where they should be considered	3	3	9 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - A530 King Street Road	S-KP18+097	Non Coal Mining - Holford Brinefield - Salt - brine - Small scale underground mining may have occurred; mine adits, shafts and tunnels may be present. Potential for localised difficult ground conditions are at a level where they should be considered	3	3	9 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - A530 King Street Road	S-KP18+085	Non Coal Mining - Winsford or Meadowbank - Salt - rock salt - Small scale underground mining may have occurred; mine adits, shafts and tunnels may be present. Potential for localised difficult ground conditions are at a level where they should be considered	3	3	9 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - River Mersey, Sanky Canal + Skelton Junction to Ditton Junction Line	N1-KP12+334	Coal Mining - Minable Coal	3	3	9 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - A562 Widnes Road	N1-KP13+713	Coal Mining - Minable Coal	3	3	9 (Minor)		3	2	6 (Minor)

Hynet Geohazards Desk Study

Hazard Title: Underground workings (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	Closest KP	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Potential for underground mine workings including shafts, unspecified mine workings depths, Tunnels etc, potentially at shallow depth	Insufficient design, delay, excessive displacement, subsidence, differential displacement, failure of foundations, slopes and excavation instability. Old shafts, tunnels, mine workings within depth of proposed alignment, foundations, HDD bores. - Potential injury or exposure of construction workers. Pollution of controlled waters and environment.- Potential to add cost, time, risk to the project	Trenchless Crossing - A5080 South Lane Road	N1-KP14+643	Coal Mining - Minable Coal	3	3	9 (Minor)	Obtain Coal Mining Report from Coal Authority - Designer to complete detailed Coal Mining Risk Assessment for the route alignment. - Obtain necessary permits from Coal Authority to undertake any investigation of construction works that interact with or disturb any coal assets. - Suitable ground investigation in areas with identified potential for shallow workings, to inform design. - Designer to consider engineer mitigation to deal with relict coal mine workings (Shafts etc).	3	2	6 (Minor)
		Trenchless Crossing - Manchester and Allerton Junction Line Railway	N1-KP014+89	Coal Mining - Minable Coal	3	3	9 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - A57 Warrington Road	N1-KP18+206	Coal Mining - Minable Coal	3	3	9 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - A570 St Helens Linkway Road	N2-KP01+335	Coal Mining - Minable Coal	3	3	9 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - Liverpool to Manchester Line Railway	N2-KP02+339	Coal Mining - Minable Coal	3	3	9 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - London Road	S-KP15+618	Non Coal Mining - Winsford or Meadowbank - Salt - rock salt - Small scale underground mining may have occurred; mine adits, shafts and tunnels may be present. Potential for localised difficult ground conditions are at a level where they should be considered	3	3	9 (Minor)		3	2	6 (Minor)
		HAGI - Clockface HAGI	N2-KP00+033	Coal Mining - Minable Coal	3	3	9 (Minor)		3	2	6 (Minor)
		HAGI - Clockface HAGI	N2-KP00+033	Non Coal Mining - Not available - Vein Mineral - Sporadic underground mining of restricted extent may have occurred. Potential for difficult ground conditions are unlikely and localised and are at a level where they need not be considered	2	2	4 (Minor)		2	2	4 (None / Negligible)
		HAGI - Clockface HAGI	N2-KP00+017	Coal Mining - Minable Coal	3	3	9 (Minor)		3	2	6 (Minor)
		HAGI - Clockface HAGI	N2-KP00+017	Non Coal Mining - Not available - Vein Mineral - Sporadic underground mining of restricted extent may have occurred. Potential for difficult ground conditions are unlikely and localised and are at a level where they need not be considered	2	2	4 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - M62 Motorway	N2-KP00+135	Coal Mining - Minable Coal	3	3	9 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - M62 Motorway	N2-KP00+135	Non Coal Mining - Not available - Vein Mineral - Sporadic underground mining of restricted extent may have occurred. Potential for difficult ground conditions are unlikely and localised and are at a level where they need not be considered	2	2	4 (Minor)		2	2	4 (None / Negligible)

APPENDIX C
RISK ASSESSMENT TABLE – GEOMORPHOLOGY – BRINE AREA

Hynet Geohazards Desk Study

Hazard Title: Brine Area (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Cheshire Brine Compensation District indicates areas that may be affected by salt and brine extraction in Cheshire. The extraction of brine over many years has caused some properties within the Cheshire area to be at risk of subsidence. This subsidence can occur a considerable distance from the location of the extraction and further assessment is recommended.	Insufficient design, delay, excessive displacement, subsidence, differential displacement, failure of foundations, slopes and excavation instability. Potential to add cost, time, risk to the project	Preferred Route Centreline - E	E-KP00+857	E-KP21+662	Brine Area	3	3	9 (Minor)	Obtain Cheshire Salt Search report and complete detailed Brine extraction risk assessment for route alignment.	3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP02+165	S-KP18+444	Brine Area	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP01+128	C-01-KP07+966	Brine Area	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - E-01	E-01-KP00+000	E-01-KP00+454	Brine Area	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - E-02	E-02-KP00+000	E-02-KP00+155	Brine Area	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - E-04	E-04-KP00+000	E-04-KP00+588	Brine Area	3	3	9 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - E-05	E-05-KP00+000	E-05-KP00+124	Brine Area	3	3	9 (Minor)		3	2	6 (Minor)

Hynet Geohazards Desk Study

Hazard Title: Brine Area (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	Closest KP	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Cheshire Brine Compensation District indicates areas that may be affected by salt and brine extraction in Cheshire. The extraction of brine over many years has caused some properties within the Cheshire area to be at risk of subsidence. This subsidence can occur a considerable distance from the location of the extraction and further assessment is recommended.	Insufficient design, delay, excessive displacement, subsidence, differential displacement, failure of foundations, slopes and excavation instability. Potential to add cost, time, risk to the project	HAGI - Warburton HAGI	E-02-KP00	Brine Area	3	3	9 (Minor)	Obtain Cheshire Salt Search report and complete detailed Brine extraction risk assessment for route alignment.	3	2	6 (Minor)
		HAGI - Partington HAGI	E-01-KP00	Brine Area	3	3	9 (Minor)		3	2	6 (Minor)
		HAGI - Inoyvn Gas Storage HAGI	S-KP18+000	Brine Area	3	3	9 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - Weaver Navigation Canal	S-KP02+000	Brine Area	3	3	9 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - West Coast Main Line Railway	S-KP04+500	Brine Area	3	3	9 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - A49 Warrington Road	S-KP06+000	Brine Area	3	3	9 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - Mid Cheshire Line Railway	S-KP07+000	Brine Area	3	3	9 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - A556 Chester Road	S-KP08+500	Brine Area	3	3	9 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+000	Brine Area	3	3	9 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - A533 Road	S-KP15+000	Brine Area	3	3	9 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - River Dane	S-KP16+500	Brine Area	3	3	9 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - Trent and Mersey Canal	S-KP16+500	Brine Area	3	3	9 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - Middlewich Branch Line Railway	S-KP17+500	Brine Area	3	3	9 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - A530 King Street Road	S-KP18+000	Brine Area	3	3	9 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - A49 Tarporley Road	E-KP01+000	Brine Area	3	3	9 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - A559 Northwich Road	E-KP04+000	Brine Area	3	3	9 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - M6 Motorway	E-KP09+500	Brine Area	3	3	9 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - A50 Road	E-KP11+500	Brine Area	3	3	9 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - M56 Motorway	E-KP14+000	Brine Area	3	3	9 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - A56 Lymm Road	E-KP15+500	Brine Area	3	3	9 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - Bridgewater Canal + road	E-KP15+500	Brine Area	3	3	9 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - River Bolin	E-KP17+000	Brine Area	3	3	9 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - A6144 Manchester Road	E-05-KP00	Brine Area	3	3	9 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - London Road	S-KP15+500	Brine Area	3	3	9 (Minor)		3	2	6 (Minor)
		Block Valve - NULL	E-KP12+000	Brine Area	3	3	9 (Minor)		3	2	6 (Minor)
		Block Valve - NULL	S-KP08+500	Brine Area	3	3	9 (Minor)		3	2	6 (Minor)

APPENDIX C
RISK ASSESSMENT TABLE – HYDROLOGY – FLOODING – RISK OF FLOODING FROM RIVERS AND THE SEA

Hynet Geohazards Desk Study

Hazard Title: Flooding - Risk of Flooding from rivers and the sea (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Risk of Flooding from Rivers and Sea (RoFRaS)/FloBased on rd Risk Assessment Wales (FRAW) models. - The risk categories for RoFRaS for rivers and the sea and FRAW for rivers are; Very low (less than 1 in 1000 chance in any given year), Low (less than 1 in 100 but greater than or equal to 1 in 1000 chance), Medium (less than 1 in 30 but greater than or equal to 1 in 100 chance) or High (greater than or equal to 1 in 30 chance). - The risk categories for FRAW for the sea are; Very low (less than 1 in 1000 chance in any given year), Low (less than 1 in 200 but greater than or equal to 1 in 1000 chance), Medium (less than 1 in 30 but greater than or equal to 1 in 200 chance) or High (greater than or equal to 1 in 30 chance)	Insufficient design, delay, excessive displacement, buoyancy, failure, instability of excavations, environmental impacts / pollution, maintenance / repair access issues.	Preferred Route Centreline - W	W-KP02+404	W-KP02+411	High	4	4	16 (Substantial)	Flood Risk Assessment to determine flood risk. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; raising ground levels, re-routing, anchoring to prevent buoyancy issues. - Designer to consider appropriate temporary and permanent drainage & flood defences	4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP17+035	W-KP17+191	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP16+956	W-KP16+962	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP11+328	W-KP11+357	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP04+391	W-KP04+432	Low	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP04+470	W-KP04+514	Low	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP16+938	W-KP16+956	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP17+446	W-KP17+498	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP11+031	W-KP11+046	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP10+567	W-KP10+622	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP06+645	W-KP06+749	Very Low	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - W	W-KP06+757	W-KP07+383	Very Low	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - E	E-KP00+853	E-KP00+860	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP06+713	E-KP06+721	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP19+905	E-KP19+912	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP20+177	E-KP20+182	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP16+923	E-KP016+95	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP16+842	E-KP16+919	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP20+164	E-KP20+177	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP00+590	E-KP00+853	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP09+574	E-KP09+968	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP00+860	E-KP00+870	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP06+696	E-KP06+713	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP06+721	E-KP06+751	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP16+824	E-KP16+842	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP16+962	E-KP017+11	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP19+912	E-KP19+925	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP19+881	E-KP19+905	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP020+14	E-KP20+164	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP20+182	E-KP20+206	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP16+269	S-KP16+288	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP17+459	S-KP17+465	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP11+261	S-KP11+312	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP02+145	S-KP02+772	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP17+433	S-KP17+459	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP11+252	S-KP11+261	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP11+312	S-KP11+328	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP04+628	S-KP04+643	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP02+134	S-KP02+145	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP16+288	S-KP16+397	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP16+204	S-KP16+269	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP17+465	S-KP17+494	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP11+429	N1-KP11+479	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP09+996	N1-KP10+096	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP10+204	N1-KP10+258	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP12+647	N1-KP12+662	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP09+447	N1-KP09+452	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP12+604	N1-KP12+625	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP09+940	N1-KP09+992	Low	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP12+645	N1-KP12+647	Low	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP10+096	N1-KP10+149	Low	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP10+258	N1-KP10+283	Low	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP09+818	N1-KP09+940	Low	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP07+650	N1-KP07+676	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP010+16	N1-KP10+204	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP09+469	N1-KP09+512	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP10+283	N1-KP10+364	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP09+402	N1-KP09+403	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP11+583	N1-KP11+641	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP01+856	N2-KP01+860	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N2	N2-KP01+860	N2-KP01+884	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N2	N2-KP01+386	N2-KP01+398	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP01+855	N2-KP01+856	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP01+273	N2-KP01+340	Very Low	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP06+926	C-01-KP06+964	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+187	N1-02-KP00+262	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+316	N1-02-KP00+386	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+920	N1-02-KP01+925	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+334	N1-02-KP01+378	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+105	N1-02-KP00+139	Low	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+306	N1-02-KP00+316	Low	2	4	8 (Minor)		2	2	4 (None / Negligible)

Hynet Geohazards Desk Study

Hazard Title: Flooding - Risk of Flooding from rivers and the sea (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Risk of Flooding from Rivers and Sea (RoFRaS)/FloBased on rd Risk Assessment Wales (FRAW) models. - The risk categories for RoFRaS for rivers and the sea and FRAW for rivers are; Very low (less than 1 in 1000 chance in any given year), Low (less than 1 in 100 but greater than or equal to 1 in 1000 chance), Medium (less than 1 in 30 but greater than or equal to 1 in 100 chance) or High (greater than or equal to 1 in 30 chance). - The risk categories for FRAW for the sea are; Very low (less than 1 in 1000 chance in any given year), Low (less than 1 in 200 but greater than or equal to 1 in 1000 chance), Medium (less than 1 in 30 but greater than or equal to 1 in 200 chance) or High (greater than or equal to 1 in 30 chance)	Insufficient design, delay, excessive displacement, buoyancy, failure, instability of excavations, environmental impacts / pollution, maintenance / repair access issues.	Preferred Spurs Centreline - N1-02	N1-02-KP05+602	N1-02-KP05+645	Medium	3	4	12 (Moderate)	Flood Risk Assessment to determine flood risk. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; raising ground levels, re-routing, anchoring to prevent buoyancy issues. - Designer to consider appropriate temporary and permanent drainage & flood defences	3	2	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP05+683	N1-02-KP05+782	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP06+028	N1-02-KP06+060	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-04	N2-04-KP01+357	N2-04-KP01+362	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N2-04	N2-04-KP01+319	N2-04-KP01+357	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N2-04	N2-04-KP01+291	N2-04-KP01+319	Low	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-04	N2-04-KP01+362	N2-04-KP01+373	Low	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-04	N2-04-KP01+227	N2-04-KP01+291	Very Low	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - N2-04	N2-04-KP01+373	N2-04-KP01+422	Very Low	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+142	N1-05-KP00+159	Low	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+159	N1-05-KP00+677	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP00+153	W-01-KP00+177	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP06+060	N1-02-KP06+110	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP05+782	N1-02-KP06+028	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+320	N1-02-KP01+334	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+378	N1-02-KP01+412	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+655	N1-02-KP01+920	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+454	N1-02-KP01+486	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP10+203	W-KP10+225	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP09+802	W-KP010+11	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP10+201	W-KP10+201	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP09+021	W-KP09+664	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP11+261	W-KP11+307	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP11+046	W-KP11+234	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP08+077	W-KP08+083	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP07+383	W-KP07+389	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP06+639	W-KP06+645	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP06+749	W-KP06+757	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP17+242	W-KP17+272	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP17+293	W-KP17+446	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP17+498	W-KP17+772	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP05+551	W-KP05+557	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP04+043	W-KP04+054	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP03+656	W-KP03+662	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP03+069	W-KP03+077	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP02+954	W-KP03+007	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP02+900	W-KP02+901	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP02+471	W-KP02+793	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP03+874	W-KP04+006	Low	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP03+707	W-KP03+731	Low	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP03+077	W-KP03+656	Low	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP03+007	W-KP03+069	Low	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP02+901	W-KP02+954	Low	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP02+793	W-KP02+900	Low	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP02+411	W-KP02+471	Low	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP02+254	W-KP02+404	Low	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP16+962	W-KP17+035	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP17+191	W-KP17+242	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP17+272	W-KP17+293	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP04+006	W-KP04+043	Very Low	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - W	W-KP03+731	W-KP03+874	Very Low	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - W	W-KP03+662	W-KP03+707	Very Low	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - W	W-KP04+514	W-KP05+551	Very Low	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - W	W-KP04+432	W-KP04+470	Very Low	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - W	W-KP04+054	W-KP04+391	Very Low	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - W	W-KP08+083	W-KP09+021	Very Low	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - W	W-KP05+557	W-KP06+639	Very Low	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - W	W-KP09+788	W-KP09+802	Very Low	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - W	W-KP09+664	W-KP09+779	Very Low	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - W	W-KP07+389	W-KP08+077	Very Low	1	4	4 (None / Negligible)		1	2	2 (None / Negligible)
		Preferred Route Centreline - E	E-KP016+95	E-KP16+962	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP16+919	E-KP16+923	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP19+282	E-KP19+287	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP19+257	E-KP19+262	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP04+618	S-KP04+620	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP04+622	S-KP04+628	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP04+618	S-KP04+618	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP04+620	S-KP04+622	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP12+313	N1-KP12+604	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP12+172	N1-KP12+242	High	4	4	16 (Substantial)		4	2	8 (Minor)

Hynet Geohazards Desk Study

Hazard Title: Flooding - Risk of Flooding from rivers and the sea (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Risk of Flooding from Rivers and Sea (RoFRaS)/FloBased on rd Risk Assessment Wales (FRAW) models. - The risk categories for RoFRaS for rivers and the sea and FRAW for rivers are; Very low (less than 1 in 1000 chance in any given year), Low (less than 1 in 100 but greater than or equal to 1 in 1000 chance), Medium (less than 1 in 30 but greater than or equal to 1 in 100 chance) or High (greater than or equal to 1 in 30 chance). - The risk categories for FRAW for the sea are; Very low (less than 1 in 1000 chance in any given year), Low (less than 1 in 200 but greater than or equal to 1 in 1000 chance), Medium (less than 1 in 30 but greater than or equal to 1 in 200 chance) or High (greater than or equal to 1 in 30 chance)	Insufficient design, delay, excessive displacement, buoyancy, failure, instability of excavations, environmental impacts / pollution, maintenance / repair access issues.	Preferred Route Centreline - N1	N1-KP11+641	N1-KP12+058	High	4	4	16 (Substantial)	Flood Risk Assessment to determine flood risk. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; raising ground levels, re-routing, anchoring to prevent buoyancy issues. - Designer to consider appropriate temporary and permanent drainage & flood defences	4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP11+549	N1-KP11+583	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP09+403	N1-KP09+447	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP11+479	N1-KP11+549	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP11+379	N1-KP11+429	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP11+129	N1-KP11+179	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP11+279	N1-KP11+329	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP12+242	N1-KP12+313	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP12+058	N1-KP12+172	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP09+736	N1-KP09+818	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP09+674	N1-KP09+690	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP10+364	N1-KP11+129	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP10+149	N1-KP010+16	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP11+329	N1-KP11+379	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP11+179	N1-KP11+279	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP09+992	N1-KP09+996	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP06+869	C-01-KP06+876	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP06+876	C-01-KP06+926	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+785	N1-02-KP01+090	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+771	N1-02-KP00+774	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+523	N1-02-KP00+527	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+488	N1-02-KP00+520	Low	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+481	N1-02-KP00+485	Low	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+453	N1-02-KP00+474	Low	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+823	N1-02-KP03+155	Low	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+252	N1-02-KP03+287	Low	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP05+522	N1-02-KP05+602	Low	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP05+515	N1-02-KP05+517	Low	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP05+502	N1-02-KP05+509	Low	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+090	N1-02-KP01+320	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+412	N1-02-KP01+454	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+486	N1-02-KP01+655	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+386	N1-02-KP00+453	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+262	N1-02-KP00+306	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+139	N1-02-KP00+187	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP00+193	W-01-KP00+195	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP00+177	W-01-KP00+192	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP00+128	W-01-KP00+153	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP00+096	W-01-KP00+114	Medium	3	4	12 (Moderate)		3	2	6 (Minor)

Hynet Geohazards Desk Study

Hazard Title: Flooding - Risk of Flooding from rivers and the sea (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	Closest KP	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Risk of Flooding from Rivers and Sea (RoFRaS)/FloBased on rd Risk Assessment Wales (FRAW) models. - The risk categories for RoFRaS for rivers and the sea and FRAW for rivers are; Very low (less than 1 in 1000 chance in any given year), Low (less than 1 in 100 but greater than or equal to 1 in 1000 chance), Medium (less than 1 in 30 but greater than or equal to 1 in 100 chance) or High (greater than or equal to 1 in 30 chance). - The risk categories for FRAW for the sea are; Very low (less than 1 in 1000 chance in any given year), Low (less than 1 in 200 but greater than or equal to 1 in 1000 chance), Medium (less than 1 in 30 but greater than or equal to 1 in 200 chance) or High (greater than or equal to 1 in 30 chance)	Insufficient design, delay, excessive displacement, buoyancy, failure, instability of excavations, environmental impacts / pollution, maintenance / repair access issues.	HAGI - Stanlow HPP HAGI	W-KP00	Medium	3	4	12 (Moderate)	Flood Risk Assessment to determine flood risk. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; raising ground levels, re-routing, anchoring to prevent buoyancy issues. - Designer to consider appropriate temporary and permanent drainage & flood defences	3	2	6 (Minor)
		HAGI - Higher Walton HAGI	N1-05-KP00	Low	2	4	8 (Minor)		2	2	4 (None / Negligible)
		HAGI - Higher Walton HAGI	N1-KP09+500	Low	2	4	8 (Minor)		2	2	4 (None / Negligible)
		HAGI - Higher Walton HAGI	N1-05-KP00	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		HAGI - Inoyvn Gas Storage HAGI	S-KP18+000	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - Ellesmere Port to Warrington Line Railway	W-KP03+000	Low	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - River Weaver	W-KP10+000	Low	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - River Weaver	W-KP10+000	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - United Utilities Water	W-KP10+500	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - United Utilities Water	W-KP10+500	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - Chester to Manchester Line Railway	W-KP11+000	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - Sutton Weaver Canal	W-KP11+500	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - Weaver Navigation Canal	S-KP02+000	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+500	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+500	Low	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+500	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+500	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - River Dane	S-KP16+500	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - River Dane	S-KP16+500	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - River Dane	S-KP16+000	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - River Bolin	E-KP17+000	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - River Bolin	E-KP17+000	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - River Bolin	E-KP17+000	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+500	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+500	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+500	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+500	Low	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+500	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+500	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - River Mersey, Sanky Canal + Skelton Junction to Ditton Junction Line	N1-KP12+500	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - River Mersey, Sanky Canal + Skelton Junction to Ditton Junction Line	N1-KP12+500	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - River Mersey, Sanky Canal + Skelton Junction to Ditton Junction Line	N1-KP12+500	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - River Mersey, Sanky Canal + Skelton Junction to Ditton Junction Line	N1-KP12+500	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - River Mersey, Sanky Canal + Skelton Junction to Ditton Junction Line	N1-KP12+500	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - River Mersey, Sanky Canal + Skelton Junction to Ditton Junction Line	N1-KP12+500	Low	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - River Mersey, Sanky Canal + Skelton Junction to Ditton Junction Line	N1-KP12+500	Low	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A570 St Helens Linkway Road	N2-KP01+500	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - A570 St Helens Linkway Road	N2-KP01+500	Very Low	1	4	4 (None / Negligible		1	2	2 (None / Negligible)
		Trenchless Crossing - Weaver Navigation Canal	W-KP10+500	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Weaver Navigation Canal	W-KP10+500	Low	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Weaver Navigation Canal	W-KP10+500	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - West Coast Mainline Railway	N1-KP09+500	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - West Coast Mainline Railway	N1-05-KP0+500	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - Eastford Road and Canal	N1-02-KP01+500	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Eastford Road and Canal	N1-02-KP01+500	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - NULL	N1-02-KP02+000	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - NULL	N1-02-KP02+000	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - River Weaver	W-KP10+000	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - River Weaver	W-KP09+500	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - River Weaver	W-KP09+500	Very Low	1	4	4 (None / Negligible		1	2	2 (None / Negligible)
		Trenchless Crossing - Chester to Manchester Line Railway	W-KP11+000	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Chester to Manchester Line Railway	W-KP11+000	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Sutton Weaver Canal	W-KP11+500	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Sutton Weaver Canal	W-KP11+500	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Sutton Weaver Canal	W-KP11+000	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Sutton Weaver Canal	W-KP11+000	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Sutton Weaver Canal	W-KP11+000	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Sutton Weaver Canal	W-KP11+000	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Sutton Weaver Canal	W-KP11+000	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Sutton Weaver Canal	W-KP11+000	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Sutton Weaver Canal	W-KP11+000	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Sutton Weaver Canal	W-KP11+000	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Sutton Weaver Canal	W-KP11+000	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Sutton Weaver Canal	W-KP11+000	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Sutton Weaver Canal	W-KP11+000	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Sutton Weaver Canal	W-KP11+000	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Sutton Weaver Canal	W-KP11+000	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Sutton Weaver Canal	W-KP11+000	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Sutton Weaver Canal	W-KP11+000	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Sutton Weaver Canal	W-KP11+000	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Sutton Weaver Canal	W-KP11+000	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Sutton Weaver Canal	W-KP11+000	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Sutton Weaver Canal	W-KP11+000	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Weaver Navigation Canal	S-KP02+000	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - River Bolin	E-KP17+000	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - River Bolin	E-KP17+000	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+500	Medium	3	4	12 (Moderate)		3	2	6 (Minor)

Hynet Geohazards Desk Study

Hazard Title: Flooding - Risk of Flooding from rivers and the sea (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	Closest KP	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Risk of Flooding from Rivers and Sea (RoFRaS)/FloBased on rd Risk Assessment Wales (FRAW) models. - The risk categories for RoFRaS for rivers and the sea and FRAW for rivers are; Very low (less than 1 in 1000 chance in any given year), Low (less than 1 in 100 but greater than or equal to 1 in 1000 chance), Medium (less than 1 in 30 but greater than or equal to 1 in 100 chance) or High (greater than or equal to 1 in 30 chance). - The risk categories for FRAW for the sea are; Very low (less than 1 in 1000 chance in any given year), Low (less than 1 in 200 but greater than or equal to 1 in 1000 chance), Medium (less than 1 in 30 but greater than or equal to 1 in 200 chance) or High (greater than or equal to 1 in 30 chance)	Insufficient design, delay, excessive displacement, buoyancy, failure, instability of excavations, environmental impacts / pollution, maintenance / repair access issues.	Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+500	Medium	3	4	12 (Moderate)	Flood Risk Assessment to determine flood risk. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; raising ground levels, re-routing, anchoring to prevent buoyancy issues. - Designer to consider appropriate temporary and permanent drainage & flood defences	3	2	6 (Minor)
		Trenchless Crossing - Weaver Navigation Canal	W-KP10+500	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - Weaver Navigation Canal	W-KP10+500	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - Weaver Navigation Canal	W-KP10+500	Medium	3	4	12 (Moderate)		3	2	6 (Minor)
		Trenchless Crossing - Eastford Road and Canal	N1-02-KP01+500	High	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Eastford Road and Canal	N1-02-KP01+500	High	4	4	16 (Substantial)		4	2	8 (Minor)

APPENDIX C
RISK ASSESSMENT TABLE - HYDROLOGY – SURFACE WATER FLOODING

Hynet Geohazards Desk Study

Hazard Title: Surface Water Flooding (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Ambiental Risk Analytics surface water (pluvial) Flood Map identifies areas likely to flood as a result of extreme rainfall events, i.e. land naturally vulnerable to surface water ponding or flooding. This data set was produced by simulating 1 in 30 year, 1 in 100 year, 1 in 250 year and 1 in 1,000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though some older ones may flood in a 1 in 5 year rainfall event.	Insufficient design, delay, excessive displacement, buoyancy, failure, instability of excavations, environmental impacts / pollution, maintenance / repair access issues.	Preferred Route Centreline - W	W-KP02+604	W-KP02+607	1 in 30	4	4	16 (Substantial)	Flood Risk Assessment to determine flood risk. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; raising ground levels, re-routing, anchoring to prevent buoyancy issues. - Designer to consider appropriate temporary and permanent drainage & flood defences	4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP02+598	W-KP02+600	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP02+600	W-KP02+604	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP01+872	W-KP01+876	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP017+62	W-KP17+622	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP16+954	W-KP16+956	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP16+958	W-KP16+961	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP16+956	W-KP16+958	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP16+972	W-KP16+977	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP16+961	W-KP16+972	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP016+78	W-KP16+785	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP16+787	W-KP16+791	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP16+791	W-KP016+78	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP16+125	W-KP16+127	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP16+124	W-KP16+125	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP17+092	W-KP17+088	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP17+099	W-KP017+08	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP07+832	W-KP07+834	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP07+834	W-KP07+834	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP17+613	W-KP17+594	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP11+328	W-KP11+328	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP11+348	W-KP11+354	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP11+328	W-KP11+348	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP15+888	W-KP15+892	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP07+383	W-KP07+386	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP01+488	E-KP01+490	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP00+807	E-KP00+826	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP00+799	E-KP00+835	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP01+484	E-KP01+494	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP12+014	E-KP12+021	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP10+935	E-KP10+937	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP10+927	E-KP010+93	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP010+93	E-KP10+935	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP10+584	E-KP10+584	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP10+581	E-KP10+582	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP10+582	E-KP10+584	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP10+267	E-KP10+300	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP10+157	E-KP010+16	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP09+759	E-KP09+761	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP09+747	E-KP09+750	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP09+718	E-KP09+720	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP09+534	E-KP09+536	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP09+536	E-KP09+537	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP09+537	E-KP09+540	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP07+196	E-KP07+198	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP06+789	E-KP06+798	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP06+718	E-KP06+720	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP06+715	E-KP06+718	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP06+718	E-KP06+718	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP04+774	E-KP04+779	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP04+773	E-KP04+782	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP04+675	E-KP04+678	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP04+671	E-KP04+671	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP04+666	E-KP04+675	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP10+938	E-KP10+942	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP010+28	E-KP010+31	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP010+18	E-KP10+267	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP10+152	E-KP10+155	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP10+157	E-KP010+18	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP010+13	E-KP10+132	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP10+117	E-KP10+126	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)

Hynet Geohazards Desk Study

Hazard Title: Surface Water Flooding (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Ambiental Risk Analytics surface water (pluvial) Flood Map identifies areas likely to flood as a result of extreme rainfall events, i.e. land naturally vulnerable to surface water ponding or flooding. This data set was produced by simulating 1 in 30 year, 1 in 100 year, 1 in 250 year and 1 in 1,000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though some older ones may flood in a 1 in 5 year rainfall event.	Insufficient design, delay, excessive displacement, buoyancy, failure instability of excavations, environmental impacts / pollution, maintenance / repair access issues.	Preferred Route Centreline - E	E-KP09+670	E-KP09+792	1 in 30	4	4	16 (Substantial)	Flood Risk Assessment to determine flood risk. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; raising ground levels, re-routing, anchoring to prevent buoyancy issues. - Designer to consider appropriate temporary and permanent drainage & flood defences	4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP19+253	E-KP19+255	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP19+247	E-KP19+251	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP19+243	E-KP19+245	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP19+251	E-KP19+253	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP17+888	E-KP17+889	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP17+886	E-KP17+888	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP17+685	E-KP17+687	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP17+347	E-KP17+348	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP17+348	E-KP017+35	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP016+92	E-KP16+924	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP15+591	E-KP15+594	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP15+418	E-KP15+424	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP13+573	E-KP13+583	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP18+093	E-KP18+103	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP17+683	E-KP17+693	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP20+884	E-KP20+886	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP020+88	E-KP20+884	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP20+874	E-KP20+876	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP20+876	E-KP020+88	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP20+872	E-KP20+874	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP020+86	E-KP20+872	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP20+178	E-KP20+182	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP19+911	E-KP19+913	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP19+909	E-KP19+911	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP19+907	E-KP19+909	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - E	E-KP19+905	E-KP19+905	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP01+641	S-KP01+644	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP01+646	S-KP01+649	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP01+946	S-KP01+954	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP17+474	S-KP17+476	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP17+457	S-KP17+457	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP17+449	S-KP17+452	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP17+468	S-KP17+474	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP17+461	S-KP17+468	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP17+452	S-KP17+461	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP17+444	S-KP17+449	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP16+341	S-KP16+353	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP15+325	S-KP15+327	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP15+327	S-KP15+328	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP15+328	S-KP15+329	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP15+329	S-KP15+331	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP15+526	S-KP15+536	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP12+538	S-KP12+544	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP01+625	S-KP01+627	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP03+029	S-KP03+028	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP03+031	S-KP03+023	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP04+617	S-KP04+618	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP04+618	S-KP04+620	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP04+626	S-KP04+628	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP04+628	S-KP04+630	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP05+511	S-KP05+513	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP05+531	S-KP05+533	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP05+535	S-KP05+537	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP05+792	S-KP05+794	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP06+225	S-KP06+228	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP06+228	S-KP06+225	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP06+317	S-KP06+321	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP06+315	S-KP06+317	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP06+602	S-KP06+606	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP11+074	S-KP11+076	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)

Hynet Geohazards Desk Study

Hazard Title: Surface Water Flooding (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Ambiental Risk Analytics surface water (pluvial) Flood Map identifies areas likely to flood as a result of extreme rainfall events, i.e. land naturally vulnerable to surface water ponding or flooding. This data set was produced by simulating 1 in 30 year, 1 in 100 year, 1 in 250 year and 1 in 1,000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though some older ones may flood in a 1 in 5 year rainfall event.	Insufficient design, delay, excessive displacement, buoyancy, failure, instability of excavations, environmental impacts / pollution, maintenance / repair access issues.	Preferred Route Centreline - S	S-KP11+076	S-KP11+082	1 in 30	4	4	16 (Substantial)	Flood Risk Assessment to determine flood risk. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; raising ground levels, re-routing, anchoring to prevent buoyancy issues. - Designer to consider appropriate temporary and permanent drainage & flood defences	4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP011+09	S-KP11+092	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP11+082	S-KP11+086	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP11+092	S-KP011+09	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP11+094	S-KP11+096	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP11+096	S-KP11+098	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP11+086	S-KP11+088	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP11+292	S-KP11+284	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP11+808	S-KP11+806	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP11+816	S-KP11+818	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP04+620	S-KP04+626	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP05+533	S-KP05+531	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP05+794	S-KP05+792	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP08+380	S-KP08+385	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP11+818	S-KP11+803	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP18+098	N1-KP18+099	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP018+09	N1-KP18+106	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP17+563	N1-KP17+563	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP17+561	N1-KP17+563	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP17+563	N1-KP17+584	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP17+584	N1-KP17+593	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP17+593	N1-KP17+599	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP17+599	N1-KP17+605	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP17+605	N1-KP017+61	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP17+103	N1-KP17+107	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP14+522	N1-KP14+523	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP14+521	N1-KP14+522	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP13+137	N1-KP13+141	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP13+141	N1-KP13+141	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP13+049	N1-KP13+051	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP13+045	N1-KP13+047	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP13+047	N1-KP13+049	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP12+897	N1-KP12+898	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP12+894	N1-KP12+896	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP12+892	N1-KP12+894	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP012+89	N1-KP12+892	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP012+89	N1-KP012+89	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP12+888	N1-KP012+89	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP12+886	N1-KP12+888	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP12+883	N1-KP12+886	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP12+882	N1-KP12+883	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP12+878	N1-KP12+882	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP12+875	N1-KP12+876	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP12+871	N1-KP12+875	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP012+87	N1-KP12+871	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP12+867	N1-KP012+87	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP12+865	N1-KP12+867	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP12+863	N1-KP12+865	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP12+861	N1-KP12+863	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP12+859	N1-KP12+861	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP12+863	N1-KP12+863	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP12+855	N1-KP12+856	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP09+540	N1-KP09+541	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP09+553	N1-KP09+548	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP09+554	N1-KP09+553	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP09+415	N1-KP09+415	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP07+694	N1-KP07+695	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP07+692	N1-KP07+694	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP07+690	N1-KP07+692	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP07+667	N1-KP07+690	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP06+317	N1-KP06+325	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)

Hynet Geohazards Desk Study

Hazard Title: Surface Water Flooding (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Ambiental Risk Analytics surface water (pluvial) Flood Map identifies areas likely to flood as a result of extreme rainfall events, i.e. land naturally vulnerable to surface water ponding or flooding. This data set was produced by simulating 1 in 30 year, 1 in 100 year, 1 in 250 year and 1 in 1,000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though some older ones may flood in a 1 in 5 year rainfall event.	Insufficient design, delay, excessive displacement, buoyancy, failure instability of excavations, environmental impacts / pollution, maintenance / repair access issues.	Preferred Route Centreline - N1	N1-KP06+043	N1-KP06+047	1 in 30	4	4	16 (Substantial)	Flood Risk Assessment to determine flood risk. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; raising ground levels, re-routing, anchoring to prevent buoyancy issues. - Designer to consider appropriate temporary and permanent drainage & flood defences	4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP04+914	N1-KP04+918	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N1	N1-KP06+037	N1-KP06+050	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N2	N2-KP05+162	N2-KP05+177	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N2	N2-KP05+125	N2-KP05+162	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N2	N2-KP05+122	N2-KP05+125	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N2	N2-KP02+163	N2-KP02+183	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N2	N2-KP01+859	N2-KP01+861	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N2	N2-KP01+858	N2-KP01+859	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N2	N2-KP01+857	N2-KP01+858	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N2	N2-KP01+855	N2-KP01+857	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N2	N2-KP00+121	N2-KP00+122	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - N2	N2-KP00+095	N2-KP00+145	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP00+744	C-01-KP00+746	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP00+746	C-01-KP00+757	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP01+250	C-01-KP01+260	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP05+160	C-01-KP05+161	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP05+163	C-01-KP05+164	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP05+161	C-01-KP05+163	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP06+056	C-01-KP06+058	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP06+058	C-01-KP06+059	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP06+059	C-01-KP06+061	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP06+061	C-01-KP06+069	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP06+399	C-01-KP06+401	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP07+364	C-01-KP07+366	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP07+366	C-01-KP07+368	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP07+390	C-01-KP07+394	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP07+409	C-01-KP07+411	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP07+399	C-01-KP07+403	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP07+362	C-01-KP07+364	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP07+419	C-01-KP07+421	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP07+386	C-01-KP07+384	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP07+359	C-01-KP07+362	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP07+421	C-01-KP07+427	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP07+411	C-01-KP07+399	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP07+427	C-01-KP07+433	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP07+469	C-01-KP07+475	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP07+451	C-01-KP07+461	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP07+463	C-01-KP07+467	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP07+476	C-01-KP07+469	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP06+401	C-01-KP06+399	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - W-03	W-03-KP00+363	W-03-KP00+364	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+140	N1-02-KP00+142	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+137	N1-02-KP00+137	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+123	N1-02-KP00+126	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+023	N1-02-KP00+023	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+126	N1-02-KP00+139	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+811	N1-02-KP03+779	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+926	N1-02-KP02+933	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - E-01	E-01-KP00+447	E-01-KP00+451	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - E-01	E-01-KP00+451	E-01-KP00+447	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - E-01	E-01-KP00+225	E-01-KP00+228	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - E-01	E-01-KP00+131	E-01-KP00+135	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - E-01	E-01-KP00+228	E-01-KP00+320	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - E-01	E-01-KP00+113	E-01-KP00+225	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N2-04	N2-04-KP01+360	N2-04-KP01+361	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N2-04	N2-04-KP01+355	N2-04-KP01+360	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N2-04	N2-04-KP01+309	N2-04-KP01+311	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N2-04	N2-04-KP00+098	N2-04-KP00+113	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N2-04	N2-04-KP01+339	N2-04-KP01+355	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N2-04	N2-04-KP01+324	N2-04-KP01+342	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)

Hynet Geohazards Desk Study

Hazard Title: Surface Water Flooding (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Ambiental Risk Analytics surface water (pluvial) Flood Map identifies areas likely to flood as a result of extreme rainfall events, i.e. land naturally vulnerable to surface water ponding or flooding. This data set was produced by simulating 1 in 30 year, 1 in 100 year, 1 in 250 year and 1 in 1,000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though some older ones may flood in a 1 in 5 year rainfall event.	Insufficient design, delay, excessive displacement, buoyancy, failure instability of excavations, environmental impacts / pollution, maintenance / repair access issues.	Preferred Spurs Centreline - N2-04	N2-04-KP01+297	N2-04-KP01+324	1 in 30	4	4	16 (Substantial)	Flood Risk Assessment to determine flood risk. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; raising ground levels, re-routing, anchoring to prevent buoyancy issues. - Designer to consider appropriate temporary and permanent drainage & flood defences	4	2	8 (Minor)
		Preferred Spurs Centreline - N2-04	N2-04-KP00+076	N2-04-KP00+134	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+244	N1-05-KP00+246	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+240	N1-05-KP00+244	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+056	N1-05-KP00+079	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+058	N1-05-KP00+062	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+162	N2-06-KP00+162	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+165	N2-06-KP00+188	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+190	N2-06-KP00+191	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+482	N2-06-KP00+482	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+482	N2-06-KP00+485	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+485	N2-06-KP00+490	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+501	N2-06-KP00+503	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+503	N2-06-KP00+506	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+497	N2-06-KP00+496	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+506	N2-06-KP00+506	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP01+071	N2-06-KP01+075	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - E-04	E-04-KP00+442	E-04-KP00+444	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+141	N2-07-KP00+144	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+137	N2-07-KP00+140	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+135	N2-07-KP00+137	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+128	N2-07-KP00+129	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+123	N2-07-KP00+125	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+118	N2-07-KP00+121	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+111	N2-07-KP00+114	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+110	N2-07-KP00+135	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+144	N2-07-KP00+157	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+095	N2-07-KP00+109	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP00+853	W-01-KP00+855	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP00+847	W-01-KP00+853	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP00+845	W-01-KP00+847	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP00+829	W-01-KP00+831	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP00+831	W-01-KP00+845	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+185	W-01-KP01+193	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+189	W-01-KP01+191	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+106	W-01-KP01+108	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+104	W-01-KP01+106	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+098	W-01-KP01+104	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+097	W-01-KP01+098	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+088	W-01-KP01+097	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+086	W-01-KP01+088	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+085	W-01-KP01+086	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+082	W-01-KP01+085	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+077	W-01-KP01+082	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+074	W-01-KP01+075	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+069	W-01-KP01+071	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+065	W-01-KP01+069	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+063	W-01-KP01+065	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+059	W-01-KP01+063	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+057	W-01-KP01+059	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+055	W-01-KP01+057	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+053	W-01-KP01+055	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+047	W-01-KP01+053	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+039	W-01-KP01+041	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+049	W-01-KP01+051	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+029	W-01-KP01+035	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+028	W-01-KP01+029	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+025	W-01-KP01+027	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+021	W-01-KP01+025	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+019	W-01-KP01+021	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+027	W-01-KP01+028	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)

Hynet Geohazards Desk Study

Hazard Title: Surface Water Flooding (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Ambiental Risk Analytics surface water (pluvial) Flood Map identifies areas likely to flood as a result of extreme rainfall events, i.e. land naturally vulnerable to surface water ponding or flooding. This data set was produced by simulating 1 in 30 year, 1 in 100 year, 1 in 250 year and 1 in 1,000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though some older ones may flood in a 1 in 5 year rainfall event.	Insufficient design, delay, excessive displacement, buoyancy, failure, instability of excavations, environmental impacts / pollution, maintenance / repair access issues.	Preferred Spurs Centreline - W-01	W-01-KP01+012	W-01-KP01+016	1 in 30	4	4	16 (Substantial)	Flood Risk Assessment to determine flood risk. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; raising ground levels, re-routing, anchoring to prevent buoyancy issues. - Designer to consider appropriate temporary and permanent drainage & flood defences	4	2	8 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+108	W-01-KP01+110	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+071	W-01-KP01+077	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+035	W-01-KP01+047	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP00+436	W-01-KP00+440	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP00+410	W-01-KP00+411	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP00+403	W-01-KP00+404	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP00+167	W-01-KP00+168	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP00+161	W-01-KP00+170	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP00+136	W-01-KP00+142	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP00+142	W-01-KP00+164	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+438	W-01-KP01+448	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - W-02	W-02-KP00+028	W-02-KP00+036	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Spurs Centreline - W-02	W-02-KP00+036	W-02-KP00+028	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP02+724	S-KP02+722	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP02+724	S-KP02+722	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP02+725	S-KP02+724	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP02+725	S-KP02+724	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP01+635	S-KP01+641	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP01+635	S-KP01+641	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP01+644	S-KP01+646	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP01+644	S-KP01+646	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP01+633	S-KP01+635	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP01+633	S-KP01+635	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP01+627	S-KP01+633	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - S	S-KP01+627	S-KP01+633	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Preferred Route Centreline - W	W-KP04+554	W-KP04+557	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP02+709	W-KP02+718	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP02+622	W-KP02+624	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP02+612	W-KP02+613	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP02+604	W-KP02+607	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP02+598	W-KP02+600	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP02+615	W-KP02+619	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP02+600	W-KP02+604	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP02+407	W-KP02+409	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP01+876	W-KP01+877	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP01+870	W-KP01+872	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP00+080	W-KP00+082	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP00+935	W-KP00+938	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP01+872	W-KP01+876	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP00+082	W-KP00+088	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP09+653	W-KP09+659	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP09+646	W-KP09+649	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP09+644	W-KP09+646	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP09+642	W-KP09+642	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP11+326	W-KP11+328	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP13+297	W-KP13+300	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP19+065	W-KP19+074	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP07+381	W-KP07+387	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP07+384	W-KP07+386	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP07+832	W-KP07+834	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP07+834	W-KP07+834	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP06+916	W-KP06+918	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP06+918	W-KP06+919	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP16+127	W-KP16+129	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP16+124	W-KP16+127	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP16+772	W-KP16+775	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP016+78	W-KP16+794	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP016+83	W-KP016+83	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP16+954	W-KP16+956	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP16+956	W-KP16+958	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)

Hynet Geohazards Desk Study

Hazard Title: Surface Water Flooding (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Ambiental Risk Analytics surface water (pluvial) Flood Map identifies areas likely to flood as a result of extreme rainfall events, i.e. land naturally vulnerable to surface water ponding or flooding. This data set was produced by simulating 1 in 30 year, 1 in 100 year, 1 in 250 year and 1 in 1,000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though some older ones may flood in a 1 in 5 year rainfall event.	Insufficient design, delay, excessive displacement, buoyancy, failure, instability of excavations, environmental impacts / pollution, maintenance / repair access issues.	Preferred Route Centreline - W	W-KP16+954	W-KP16+951	1 in 100	3	4	12 (Minor)	Flood Risk Assessment to determine flood risk. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; raising ground levels, re-routing, anchoring to prevent buoyancy issues. - Designer to consider appropriate temporary and permanent drainage & flood defences	3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP16+958	W-KP16+961	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP16+958	W-KP16+958	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP16+977	W-KP16+978	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP16+974	W-KP16+977	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP16+978	W-KP16+979	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP17+639	W-KP17+641	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP17+641	W-KP17+645	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP17+635	W-KP17+637	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP11+356	W-KP11+361	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP11+328	W-KP011+35	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP11+328	W-KP11+356	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP15+717	W-KP15+725	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP15+888	W-KP15+892	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP16+794	W-KP016+78	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP17+123	W-KP17+035	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP16+961	W-KP16+974	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP17+708	W-KP17+624	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP17+035	W-KP17+123	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP17+571	W-KP17+594	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP17+624	W-KP17+622	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP02+859	E-KP02+872	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP01+484	E-KP01+491	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP00+801	E-KP00+835	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP00+567	E-KP00+572	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP00+332	E-KP00+336	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP02+820	E-KP02+832	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP01+482	E-KP01+497	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP00+794	E-KP00+841	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP012+01	E-KP12+027	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP10+925	E-KP10+927	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP10+935	E-KP10+949	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP10+584	E-KP10+584	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP10+581	E-KP10+582	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP10+582	E-KP10+584	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP10+317	E-KP010+32	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP09+874	E-KP09+886	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP09+833	E-KP09+834	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP09+825	E-KP09+825	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP09+773	E-KP09+775	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP09+534	E-KP09+536	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP09+536	E-KP09+537	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP09+537	E-KP09+540	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP09+629	E-KP09+851	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP07+196	E-KP07+198	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP06+789	E-KP06+798	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP06+721	E-KP06+723	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP06+718	E-KP06+720	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP06+715	E-KP06+718	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP06+718	E-KP06+718	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP06+713	E-KP06+714	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP04+774	E-KP04+779	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP04+773	E-KP04+785	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP04+675	E-KP04+678	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP04+671	E-KP04+671	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP04+671	E-KP04+675	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP04+666	E-KP04+666	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP04+666	E-KP04+669	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP10+927	E-KP10+942	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP10+311	E-KP10+339	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP10+217	E-KP10+311	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)

Hynet Geohazards Desk Study

Hazard Title: Surface Water Flooding (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Ambiental Risk Analytics surface water (pluvial) Flood Map identifies areas likely to flood as a result of extreme rainfall events, i.e. land naturally vulnerable to surface water ponding or flooding. This data set was produced by simulating 1 in 30 year, 1 in 100 year, 1 in 250 year and 1 in 1,000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though some older ones may flood in a 1 in 5 year rainfall event.	Insufficient design, delay, excessive displacement, buoyancy, failure, instability of excavations, environmental impacts / pollution, maintenance / repair access issues.	Preferred Route Centreline - E	E-KP10+157	E-KP10+184	1 in 100	3	4	12 (Minor)	Flood Risk Assessment to determine flood risk. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; raising ground levels, re-routing, anchoring to prevent buoyancy issues. - Designer to consider appropriate temporary and permanent drainage & flood defences	3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP10+044	E-KP10+265	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP09+764	E-KP09+778	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP09+675	E-KP09+744	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP07+026	E-KP07+032	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP19+243	E-KP19+251	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP19+251	E-KP19+255	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP17+888	E-KP17+889	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP17+889	E-KP17+891	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP17+883	E-KP17+885	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP17+885	E-KP17+888	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP17+693	E-KP17+695	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP17+683	E-KP17+693	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP17+347	E-KP17+348	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP17+348	E-KP017+35	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP17+102	E-KP17+103	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP016+95	E-KP16+952	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP16+957	E-KP16+961	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP16+919	E-KP016+92	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP16+917	E-KP16+919	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP016+92	E-KP16+924	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP15+612	E-KP15+623	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP15+598	E-KP15+600	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP15+426	E-KP15+428	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP15+418	E-KP15+426	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP15+412	E-KP15+418	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP18+084	E-KP18+114	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP16+952	E-KP16+957	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP015+58	E-KP015+59	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP015+59	E-KP15+598	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP13+567	E-KP13+587	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP21+076	E-KP021+08	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP20+882	E-KP20+886	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP20+872	E-KP20+882	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP20+852	E-KP20+854	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP020+86	E-KP20+872	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP20+831	E-KP020+85	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP20+829	E-KP20+831	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP20+827	E-KP20+829	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP20+825	E-KP20+827	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP20+821	E-KP20+825	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP20+819	E-KP20+821	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP20+817	E-KP20+819	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP20+813	E-KP20+817	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP20+803	E-KP20+805	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP20+799	E-KP20+803	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP20+795	E-KP20+799	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP020+18	E-KP20+182	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP20+178	E-KP020+18	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP20+176	E-KP20+178	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP19+911	E-KP19+913	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP19+909	E-KP19+911	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP19+905	E-KP19+907	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP19+907	E-KP19+909	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - E	E-KP19+905	E-KP19+905	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP01+644	S-KP01+646	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP01+943	S-KP01+946	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP01+957	S-KP01+957	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP02+173	S-KP02+181	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP02+247	S-KP02+251	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP02+251	S-KP02+259	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)

Hynet Geohazards Desk Study

Hazard Title: Surface Water Flooding (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Ambiental Risk Analytics surface water (pluvial) Flood Map identifies areas likely to flood as a result of extreme rainfall events, i.e. land naturally vulnerable to surface water ponding or flooding. This data set was produced by simulating 1 in 30 year, 1 in 100 year, 1 in 250 year and 1 in 1,000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though some older ones may flood in a 1 in 5 year rainfall event.	Insufficient design, delay, excessive displacement, buoyancy, failure instability of excavations, environmental impacts / pollution, maintenance / repair access issues.	Preferred Route Centreline - S	S-KP02+686	S-KP02+688	1 in 100	3	4	12 (Minor)	Flood Risk Assessment to determine flood risk. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; raising ground levels, re-routing, anchoring to prevent buoyancy issues. - Designer to consider appropriate temporary and permanent drainage & flood defences	3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP02+713	S-KP02+722	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP02+755	S-KP02+757	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP01+946	S-KP01+957	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP02+372	S-KP02+371	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP17+478	S-KP17+481	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP17+471	S-KP17+478	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP17+464	S-KP17+471	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP17+449	S-KP17+454	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP17+461	S-KP17+464	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP17+447	S-KP17+449	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP17+442	S-KP17+444	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP016+56	S-KP16+562	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP16+556	S-KP16+558	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP16+558	S-KP016+56	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP16+353	S-KP16+355	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP16+272	S-KP16+275	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP16+276	S-KP016+28	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP15+145	S-KP15+149	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP15+325	S-KP15+327	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP15+327	S-KP15+328	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP15+328	S-KP15+331	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP015+53	S-KP15+532	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP15+532	S-KP015+53	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP12+536	S-KP12+533	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP17+454	S-KP17+461	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP17+444	S-KP17+447	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP16+275	S-KP16+276	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP16+339	S-KP16+353	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP01+624	S-KP01+627	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP03+016	S-KP03+021	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP03+021	S-KP03+033	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP03+039	S-KP03+038	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP03+807	S-KP03+806	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP04+617	S-KP04+620	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP04+620	S-KP04+626	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP04+626	S-KP04+628	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP04+630	S-KP04+634	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP04+628	S-KP04+630	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP05+493	S-KP05+495	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP05+495	S-KP05+493	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP05+483	S-KP05+489	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP05+509	S-KP05+511	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP05+511	S-KP05+527	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP05+527	S-KP05+533	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP05+547	S-KP05+541	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP05+533	S-KP05+539	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP05+783	S-KP05+783	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP05+805	S-KP05+799	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP05+810	S-KP05+789	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP05+921	S-KP05+924	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP06+225	S-KP06+228	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP06+228	S-KP06+225	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP06+313	S-KP06+314	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP06+321	S-KP06+323	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP06+602	S-KP06+604	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP06+604	S-KP06+608	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP08+028	S-KP08+029	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP08+380	S-KP08+385	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP08+789	S-KP08+789	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP08+792	S-KP08+794	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)

Hynet Geohazards Desk Study

Hazard Title: Surface Water Flooding (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Ambiental Risk Analytics surface water (pluvial) Flood Map identifies areas likely to flood as a result of extreme rainfall events, i.e. land naturally vulnerable to surface water ponding or flooding. This data set was produced by simulating 1 in 30 year, 1 in 100 year, 1 in 250 year and 1 in 1,000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though some older ones may flood in a 1 in 5 year rainfall event.	Insufficient design, delay, excessive displacement, buoyancy, failure instability of excavations, environmental impacts / pollution, maintenance / repair access issues.	Preferred Route Centreline - S	S-KP11+072	S-KP11+074	1 in 100	3	4	12 (Minor)	Flood Risk Assessment to determine flood risk. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; raising ground levels, re-routing, anchoring to prevent buoyancy issues. - Designer to consider appropriate temporary and permanent drainage & flood defences	3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP11+082	S-KP11+084	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP11+088	S-KP011+09	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP11+092	S-KP11+094	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP11+084	S-KP11+086	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP11+100	S-KP11+104	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP11+106	S-KP011+11	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP11+302	S-KP11+304	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP11+262	S-KP11+302	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP11+799	S-KP11+800	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP11+823	S-KP011+82	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP11+829	S-KP11+823	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP06+314	S-KP06+321	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP07+751	S-KP07+719	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP11+074	S-KP11+082	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP11+095	S-KP11+088	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP11+104	S-KP11+095	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP18+215	N1-KP18+217	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP18+098	N1-KP18+100	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP018+09	N1-KP18+106	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP17+607	N1-KP17+611	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP17+561	N1-KP17+563	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP17+563	N1-KP17+587	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP17+587	N1-KP17+595	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP17+595	N1-KP17+601	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP17+601	N1-KP17+607	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP17+218	N1-KP17+218	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP17+213	N1-KP17+218	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP17+212	N1-KP17+213	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP17+206	N1-KP17+209	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP17+097	N1-KP17+109	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP16+868	N1-KP016+87	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP15+781	N1-KP15+785	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP15+419	N1-KP015+42	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP15+415	N1-KP15+416	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP15+411	N1-KP15+413	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP15+407	N1-KP15+409	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP15+406	N1-KP15+411	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP14+937	N1-KP014+94	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP14+665	N1-KP14+667	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP14+521	N1-KP14+523	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP14+321	N1-KP14+323	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP013+73	N1-KP13+733	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP013+73	N1-KP013+73	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP13+178	N1-KP13+179	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP13+172	N1-KP13+173	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP13+153	N1-KP13+158	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP13+134	N1-KP13+137	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP13+132	N1-KP13+134	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP13+129	N1-KP13+131	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP13+123	N1-KP13+125	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP13+121	N1-KP13+123	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP13+137	N1-KP13+143	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP13+125	N1-KP13+127	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP13+118	N1-KP13+121	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP13+049	N1-KP13+051	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP13+045	N1-KP13+047	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP13+041	N1-KP13+045	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP13+047	N1-KP13+049	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP12+903	N1-KP12+905	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP12+897	N1-KP12+898	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)

Hynet Geohazards Desk Study

Hazard Title: Surface Water Flooding (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Ambiental Risk Analytics surface water (pluvial) Flood Map identifies areas likely to flood as a result of extreme rainfall events, i.e. land naturally vulnerable to surface water ponding or flooding. This data set was produced by simulating 1 in 30 year, 1 in 100 year, 1 in 250 year and 1 in 1,000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though some older ones may flood in a 1 in 5 year rainfall event.	Insufficient design, delay, excessive displacement, buoyancy, failure, instability of excavations, environmental impacts / pollution, maintenance / repair access issues.	Preferred Route Centreline - N1	N1-KP12+894	N1-KP12+896	1 in 100	3	4	12 (Minor)	Flood Risk Assessment to determine flood risk. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; raising ground levels, re-routing, anchoring to prevent buoyancy issues. - Designer to consider appropriate temporary and permanent drainage & flood defences	3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP012+89	N1-KP12+894	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP012+89	N1-KP012+89	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP12+886	N1-KP012+89	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP12+882	N1-KP12+886	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP012+88	N1-KP12+882	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP12+878	N1-KP012+88	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP012+87	N1-KP12+871	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP12+863	N1-KP12+865	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP12+869	N1-KP12+876	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP12+867	N1-KP12+869	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP12+865	N1-KP12+867	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP12+861	N1-KP12+863	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP12+859	N1-KP12+861	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP12+863	N1-KP12+863	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP12+855	N1-KP12+856	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP12+802	N1-KP12+807	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP12+786	N1-KP12+788	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP11+911	N1-KP11+912	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP11+909	N1-KP11+911	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP11+469	N1-KP11+473	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP09+963	N1-KP09+968	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP09+544	N1-KP09+542	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP09+560	N1-KP09+561	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP09+548	N1-KP09+544	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP09+415	N1-KP09+417	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP09+415	N1-KP09+415	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP09+377	N1-KP09+381	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP07+694	N1-KP07+695	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP07+692	N1-KP07+694	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP07+690	N1-KP07+692	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP07+680	N1-KP07+682	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP07+667	N1-KP07+676	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP07+668	N1-KP07+690	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP06+345	N1-KP06+345	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP06+337	N1-KP06+341	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP06+329	N1-KP06+333	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP06+306	N1-KP06+309	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP06+035	N1-KP06+037	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP06+050	N1-KP06+052	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP06+037	N1-KP06+050	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP05+597	N1-KP05+599	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP05+581	N1-KP05+595	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP04+480	N1-KP04+481	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP04+450	N1-KP04+452	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP04+452	N1-KP04+454	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP04+450	N1-KP04+450	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP04+236	N1-KP04+237	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP04+233	N1-KP04+236	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP04+233	N1-KP04+233	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP02+567	N1-KP02+569	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP12+793	N1-KP12+802	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP09+969	N1-KP09+981	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP07+466	N1-KP07+507	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP06+319	N1-KP06+337	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP06+264	N1-KP06+325	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP04+912	N1-KP04+918	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP04+441	N1-KP04+476	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N1	N1-KP02+564	N1-KP02+569	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP05+903	N2-KP05+904	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP05+899	N2-KP05+899	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)

Hynet Geohazards Desk Study

Hazard Title: Surface Water Flooding (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Ambiental Risk Analytics surface water (pluvial) Flood Map identifies areas likely to flood as a result of extreme rainfall events, i.e. land naturally vulnerable to surface water ponding or flooding. This data set was produced by simulating 1 in 30 year, 1 in 100 year, 1 in 250 year and 1 in 1,000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though some older ones may flood in a 1 in 5 year rainfall event.	Insufficient design, delay, excessive displacement, buoyancy, failure, instability of excavations, environmental impacts / pollution, maintenance / repair access issues.	Preferred Route Centreline - N2	N2-KP05+166	N2-KP05+179	1 in 100	3	4	12 (Minor)	Flood Risk Assessment to determine flood risk. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; raising ground levels, re-routing, anchoring to prevent buoyancy issues. - Designer to consider appropriate temporary and permanent drainage & flood defences	3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP05+125	N2-KP05+166	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP05+120	N2-KP05+125	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP05+061	N2-KP05+080	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP05+042	N2-KP05+046	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP04+110	N2-KP04+119	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP04+103	N2-KP04+105	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP02+161	N2-KP02+187	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP01+859	N2-KP01+861	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP01+861	N2-KP01+866	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP01+857	N2-KP01+858	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP01+858	N2-KP01+859	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP01+855	N2-KP01+857	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP01+377	N2-KP01+379	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP00+142	N2-KP00+145	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP02+170	N2-KP02+174	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP00+133	N2-KP00+142	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP00+099	N2-KP00+118	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - N2	N2-KP00+071	N2-KP00+133	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP00+741	C-01-KP00+742	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP00+759	C-01-KP00+761	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP00+742	C-01-KP00+759	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP01+267	C-01-KP01+267	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP01+246	C-01-KP01+267	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP01+617	C-01-KP01+615	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP04+189	C-01-KP04+191	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP04+184	C-01-KP04+186	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP04+174	C-01-KP04+179	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP05+160	C-01-KP05+161	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP05+163	C-01-KP05+164	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP05+161	C-01-KP05+163	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP06+056	C-01-KP06+061	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP06+061	C-01-KP06+069	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP06+396	C-01-KP06+402	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP06+402	C-01-KP06+408	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP06+954	C-01-KP06+958	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP06+960	C-01-KP06+961	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP06+961	C-01-KP06+960	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP07+057	C-01-KP07+061	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP07+382	C-01-KP07+386	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP07+399	C-01-KP07+403	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP07+368	C-01-KP07+373	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP07+433	C-01-KP07+435	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP07+359	C-01-KP07+368	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP07+461	C-01-KP07+463	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP07+439	C-01-KP07+443	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP07+475	C-01-KP07+476	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP07+469	C-01-KP07+475	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP07+443	C-01-KP07+459	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP07+463	C-01-KP07+461	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP07+482	C-01-KP07+484	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP07+480	C-01-KP07+482	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP07+476	C-01-KP07+469	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP04+166	C-01-KP04+189	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - C-01	C-01-KP07+403	C-01-KP07+382	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-03	W-03-KP01+884	W-03-KP01+886	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-03	W-03-KP01+878	W-03-KP01+880	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-03	W-03-KP01+873	W-03-KP01+884	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-03	W-03-KP01+020	W-03-KP01+025	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-03	W-03-KP00+363	W-03-KP00+368	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+140	N1-02-KP00+142	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)

Hynet Geohazards Desk Study

Hazard Title: Surface Water Flooding (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Ambiental Risk Analytics surface water (pluvial) Flood Map identifies areas likely to flood as a result of extreme rainfall events, i.e. land naturally vulnerable to surface water ponding or flooding. This data set was produced by simulating 1 in 30 year, 1 in 100 year, 1 in 250 year and 1 in 1,000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though some older ones may flood in a 1 in 5 year rainfall event.	Insufficient design, delay, excessive displacement, buoyancy, failure, instability of excavations, environmental impacts / pollution, maintenance / repair access issues.	Preferred Spurs Centreline - N1-02	N1-02-KP00+128	N1-02-KP00+129	1 in 100	3	4	12 (Minor)	Flood Risk Assessment to determine flood risk. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; raising ground levels, re-routing, anchoring to prevent buoyancy issues. - Designer to consider appropriate temporary and permanent drainage & flood defences	3	2	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+115	N1-02-KP00+123	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+123	N1-02-KP00+139	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+108	N1-02-KP00+114	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+106	N1-02-KP00+108	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+023	N1-02-KP00+052	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP06+062	N1-02-KP06+062	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+789	N1-02-KP03+795	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+795	N1-02-KP03+789	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+802	N1-02-KP03+799	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+829	N1-02-KP03+831	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+803	N1-02-KP03+802	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+262	N1-02-KP03+262	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+262	N1-02-KP03+262	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+926	N1-02-KP02+931	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+921	N1-02-KP02+922	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+919	N1-02-KP02+921	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+864	N1-02-KP02+868	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+861	N1-02-KP02+863	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+863	N1-02-KP02+864	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+857	N1-02-KP02+859	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+848	N1-02-KP02+854	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+799	N1-02-KP02+800	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+802	N1-02-KP02+804	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+781	N1-02-KP02+782	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+946	N1-02-KP01+964	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP06+060	N1-02-KP06+062	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+922	N1-02-KP02+934	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+773	N1-02-KP02+818	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - E-01	E-01-KP00+400	E-01-KP00+404	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - E-01	E-01-KP00+400	E-01-KP00+400	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - E-01	E-01-KP00+406	E-01-KP00+415	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - E-01	E-01-KP00+275	E-01-KP00+277	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - E-01	E-01-KP00+268	E-01-KP00+275	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - E-01	E-01-KP00+261	E-01-KP00+266	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - E-01	E-01-KP00+250	E-01-KP00+252	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - E-01	E-01-KP00+126	E-01-KP00+144	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - E-01	E-01-KP00+441	E-01-KP00+436	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - E-01	E-01-KP00+404	E-01-KP00+441	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - E-01	E-01-KP00+256	E-01-KP00+332	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - E-01	E-01-KP00+184	E-01-KP00+256	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - E-01	E-01-KP00+113	E-01-KP00+184	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-04	N2-04-KP01+910	N2-04-KP01+919	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-04	N2-04-KP01+360	N2-04-KP01+361	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-04	N2-04-KP01+357	N2-04-KP01+360	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-04	N2-04-KP01+344	N2-04-KP01+357	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-04	N2-04-KP01+289	N2-04-KP01+294	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-04	N2-04-KP01+325	N2-04-KP01+347	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-04	N2-04-KP01+285	N2-04-KP01+325	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-04	N2-04-KP01+278	N2-04-KP01+285	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-04	N2-04-KP00+087	N2-04-KP00+134	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-04	N2-04-KP00+060	N2-04-KP00+140	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+244	N1-05-KP00+246	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+240	N1-05-KP00+244	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+075	N1-05-KP00+081	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+056	N1-05-KP00+075	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP01+086	N2-06-KP01+086	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP01+075	N2-06-KP01+078	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+195	N2-06-KP00+197	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+477	N2-06-KP00+479	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+479	N2-06-KP00+480	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)

Hynet Geohazards Desk Study

Hazard Title: Surface Water Flooding (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Ambiental Risk Analytics surface water (pluvial) Flood Map identifies areas likely to flood as a result of extreme rainfall events, i.e. land naturally vulnerable to surface water ponding or flooding. This data set was produced by simulating 1 in 30 year, 1 in 100 year, 1 in 250 year and 1 in 1,000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though some older ones may flood in a 1 in 5 year rainfall event.	Insufficient design, delay, excessive displacement, buoyancy, failure instability of excavations, environmental impacts / pollution, maintenance / repair access issues.	Preferred Spurs Centreline - N2-06	N2-06-KP01+067	N2-06-KP01+075	1 in 100	3	4	12 (Minor)	Flood Risk Assessment to determine flood risk. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; raising ground levels, re-routing, anchoring to prevent buoyancy issues. - Designer to consider appropriate temporary and permanent drainage & flood defences	3	2	6 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+193	N2-06-KP00+191	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+480	N2-06-KP00+506	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - E-04	E-04-KP00+315	E-04-KP00+317	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - E-04	E-04-KP00+439	E-04-KP00+446	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+140	N2-07-KP00+141	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+135	N2-07-KP00+137	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+133	N2-07-KP00+133	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+128	N2-07-KP00+129	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+123	N2-07-KP00+125	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+121	N2-07-KP00+122	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+116	N2-07-KP00+118	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+111	N2-07-KP00+114	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+107	N2-07-KP00+109	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+106	N2-07-KP00+149	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+091	N2-07-KP00+104	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+149	N2-07-KP00+157	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+189	W-01-KP01+191	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+177	W-01-KP01+179	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+163	W-01-KP01+165	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+149	W-01-KP01+151	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+147	W-01-KP01+149	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+143	W-01-KP01+147	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+140	W-01-KP01+142	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+136	W-01-KP01+138	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+131	W-01-KP01+132	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+132	W-01-KP01+136	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+128	W-01-KP01+131	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+120	W-01-KP01+120	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+116	W-01-KP01+118	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+106	W-01-KP01+108	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+100	W-01-KP01+104	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+097	W-01-KP01+106	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+088	W-01-KP01+097	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+086	W-01-KP01+088	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+085	W-01-KP01+086	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+082	W-01-KP01+085	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+077	W-01-KP01+082	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+071	W-01-KP01+077	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+065	W-01-KP01+067	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+051	W-01-KP01+053	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+047	W-01-KP01+049	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+039	W-01-KP01+041	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+049	W-01-KP01+065	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+029	W-01-KP01+035	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+028	W-01-KP01+029	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+025	W-01-KP01+028	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+021	W-01-KP01+025	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+019	W-01-KP01+021	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+017	W-01-KP01+019	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+035	W-01-KP01+047	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+012	W-01-KP01+016	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+010	W-01-KP01+012	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+006	W-01-KP01+008	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+004	W-01-KP01+005	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP00+998	W-01-KP01+000	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP00+849	W-01-KP00+851	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP00+841	W-01-KP00+843	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP00+837	W-01-KP00+839	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP00+835	W-01-KP00+837	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP00+829	W-01-KP00+855	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)

Hynet Geohazards Desk Study

Hazard Title: Surface Water Flooding (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Ambiental Risk Analytics surface water (pluvial) Flood Map identifies areas likely to flood as a result of extreme rainfall events, i.e. land naturally vulnerable to surface water ponding or flooding. This data set was produced by simulating 1 in 30 year, 1 in 100 year, 1 in 250 year and 1 in 1,000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though some older ones may flood in a 1 in 5 year rainfall event.	Insufficient design, delay, excessive displacement, buoyancy, failure, instability of excavations, environmental impacts / pollution, maintenance / repair access issues.	Preferred Spurs Centreline - W-01	W-01-KP00+436	W-01-KP00+440	1 in 100	3	4	12 (Minor)	Flood Risk Assessment to determine flood risk. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; raising ground levels, re-routing, anchoring to prevent buoyancy issues. - Designer to consider appropriate temporary and permanent drainage & flood defences	3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP00+410	W-01-KP00+411	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP00+405	W-01-KP00+410	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP00+403	W-01-KP00+404	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP00+388	W-01-KP00+390	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP00+167	W-01-KP00+171	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP00+147	W-01-KP00+153	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP00+134	W-01-KP00+136	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+165	W-01-KP01+195	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+108	W-01-KP01+116	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+067	W-01-KP01+071	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP00+136	W-01-KP00+170	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+438	W-01-KP01+440	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+440	W-01-KP01+446	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-01	W-01-KP01+446	W-01-KP01+450	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-02	W-02-KP00+024	W-02-KP00+036	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-02	W-02-KP00+036	W-02-KP00+038	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-02	W-02-KP00+016	W-02-KP00+024	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP06+752	W-KP06+754	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - W	W-KP06+752	W-KP06+754	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP01+635	S-KP01+644	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP01+635	S-KP01+644	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP01+630	S-KP01+635	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP01+630	S-KP01+635	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP01+627	S-KP01+630	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP01+627	S-KP01+630	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP01+646	S-KP01+649	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP01+646	S-KP01+649	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP02+757	S-KP02+755	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP02+757	S-KP02+755	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP02+722	S-KP02+713	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Route Centreline - S	S-KP02+722	S-KP02+713	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Preferred Spurs Centreline - W-03	W-03-KP01+873	W-03-KP01+884	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-03	W-03-KP01+812	W-03-KP01+924	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-03	W-03-KP01+764	W-03-KP01+766	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-03	W-03-KP01+754	W-03-KP01+756	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-03	W-03-KP01+756	W-03-KP01+784	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-03	W-03-KP01+280	W-03-KP01+291	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-03	W-03-KP01+019	W-03-KP01+027	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-03	W-03-KP01+018	W-03-KP01+019	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-03	W-03-KP00+363	W-03-KP00+368	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-03	W-03-KP00+361	W-03-KP00+363	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-03	W-03-KP00+368	W-03-KP00+371	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP01+199	W-01-KP01+201	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP01+197	W-01-KP01+199	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP01+177	W-01-KP01+179	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP01+151	W-01-KP01+153	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP01+153	W-01-KP01+159	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP01+159	W-01-KP01+165	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP01+147	W-01-KP01+149	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP01+138	W-01-KP01+143	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP01+120	W-01-KP01+128	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP01+120	W-01-KP01+120	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP01+118	W-01-KP01+120	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP01+116	W-01-KP01+118	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP01+112	W-01-KP01+114	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP01+108	W-01-KP01+108	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP01+016	W-01-KP01+019	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP01+005	W-01-KP01+012	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP01+000	W-01-KP01+004	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP00+996	W-01-KP00+998	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)

Hynet Geohazards Desk Study

Hazard Title: Surface Water Flooding (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Ambiental Risk Analytics surface water (pluvial) Flood Map identifies areas likely to flood as a result of extreme rainfall events, i.e. land naturally vulnerable to surface water ponding or flooding. This data set was produced by simulating 1 in 30 year, 1 in 100 year, 1 in 250 year and 1 in 1,000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though some older ones may flood in a 1 in 5 year rainfall event.	Insufficient design, delay, excessive displacement, buoyancy, failure, instability of excavations, environmental impacts / pollution, maintenance / repair access issues.	Preferred Spurs Centreline - W-01	W-01-KP00+988	W-01-KP00+990	1 in 1000	2	4	8 (Minor)	Flood Risk Assessment to determine flood risk. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; raising ground levels, re-routing, anchoring to prevent buoyancy issues. - Designer to consider appropriate temporary and permanent drainage & flood defences	2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP00+978	W-01-KP00+992	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP00+992	W-01-KP00+996	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP00+998	W-01-KP01+195	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP00+837	W-01-KP00+839	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP00+837	W-01-KP00+837	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP00+855	W-01-KP00+861	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP00+853	W-01-KP00+855	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP00+829	W-01-KP00+831	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP00+831	W-01-KP00+853	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP00+440	W-01-KP00+443	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP00+439	W-01-KP00+440	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP00+436	W-01-KP00+439	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP00+410	W-01-KP00+411	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP00+408	W-01-KP00+410	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP00+403	W-01-KP00+404	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP00+404	W-01-KP00+408	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP00+396	W-01-KP00+403	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP00+381	W-01-KP00+393	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP00+171	W-01-KP00+174	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP00+161	W-01-KP00+171	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP00+133	W-01-KP00+134	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP00+134	W-01-KP00+142	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP00+142	W-01-KP00+161	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP01+195	W-01-KP01+197	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP00+970	W-01-KP00+978	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP01+450	W-01-KP01+452	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP01+436	W-01-KP01+438	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP01+438	W-01-KP01+450	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-02	W-02-KP00+101	W-02-KP00+109	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-02	W-02-KP00+018	W-02-KP00+038	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-02	W-02-KP00+010	W-02-KP00+004	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-02	W-02-KP00+012	W-02-KP00+018	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP00+931	W-01-KP00+933	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - W-01	W-01-KP00+931	W-01-KP00+933	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP01+644	S-KP01+649	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP01+656	S-KP01+659	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP01+653	S-KP01+656	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP01+940	S-KP01+943	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP01+948	S-KP01+948	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP01+957	S-KP01+960	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP02+159	S-KP02+167	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP02+142	S-KP02+153	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP02+153	S-KP02+159	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP02+181	S-KP02+183	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP02+167	S-KP02+181	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP02+380	S-KP02+382	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP02+474	S-KP02+475	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP02+476	S-KP02+478	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP02+480	S-KP02+482	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP02+491	S-KP02+493	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP02+495	S-KP02+497	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP02+497	S-KP02+502	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP02+527	S-KP02+529	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP02+558	S-KP02+559	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP02+686	S-KP02+688	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP01+954	S-KP01+946	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP02+407	S-KP02+230	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP02+529	S-KP02+296	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP02+559	S-KP02+491	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP17+631	S-KP17+632	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)

Hynet Geohazards Desk Study

Hazard Title: Surface Water Flooding (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Ambiental Risk Analytics surface water (pluvial) Flood Map identifies areas likely to flood as a result of extreme rainfall events, i.e. land naturally vulnerable to surface water ponding or flooding. This data set was produced by simulating 1 in 30 year, 1 in 100 year, 1 in 250 year and 1 in 1,000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though some older ones may flood in a 1 in 5 year rainfall event.	Insufficient design, delay, excessive displacement, buoyancy, failure, instability of excavations, environmental impacts / pollution, maintenance / repair access issues.	Preferred Route Centreline - S	S-KP17+632	S-KP17+636	1 in 1000	2	4	8 (Minor)	Flood Risk Assessment to determine flood risk. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; raising ground levels, re-routing, anchoring to prevent buoyancy issues. - Designer to consider appropriate temporary and permanent drainage & flood defences	2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP17+483	S-KP17+493	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP17+493	S-KP17+498	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP17+478	S-KP17+483	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP17+471	S-KP17+478	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP17+415	S-KP17+418	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP17+447	S-KP17+471	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP17+436	S-KP17+444	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP17+418	S-KP17+423	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP16+556	S-KP16+562	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP16+329	S-KP16+337	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP16+347	S-KP16+349	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP16+288	S-KP16+289	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP16+286	S-KP16+288	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP016+27	S-KP16+272	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP16+469	S-KP16+477	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP16+272	S-KP16+286	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP15+149	S-KP15+153	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP15+325	S-KP15+327	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP15+327	S-KP15+328	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP15+328	S-KP15+329	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP15+329	S-KP15+331	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP15+145	S-KP15+149	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP15+331	S-KP15+335	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP015+53	S-KP15+532	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP15+335	S-KP15+339	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP15+532	S-KP015+53	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP14+854	S-KP14+858	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP12+531	S-KP12+547	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP17+423	S-KP17+436	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP17+444	S-KP17+447	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP16+337	S-KP16+355	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP15+133	S-KP15+145	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP00+037	S-KP00+052	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP00+509	S-KP00+512	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP01+624	S-KP01+627	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP03+006	S-KP03+012	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP03+056	S-KP03+055	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP03+807	S-KP03+806	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP04+617	S-KP04+618	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP04+622	S-KP04+624	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP04+628	S-KP04+634	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP05+473	S-KP05+477	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP05+477	S-KP05+479	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP05+479	S-KP05+481	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP05+493	S-KP05+495	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP05+483	S-KP05+489	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP05+569	S-KP05+573	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP05+582	S-KP05+583	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP05+775	S-KP05+777	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP05+783	S-KP05+813	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP05+813	S-KP05+818	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP05+922	S-KP05+924	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP05+929	S-KP05+931	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP05+931	S-KP05+933	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP05+952	S-KP05+976	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP06+020	S-KP06+022	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP06+166	S-KP06+167	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP06+167	S-KP06+166	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP06+216	S-KP06+218	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP06+235	S-KP06+236	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)

Hynet Geohazards Desk Study

Hazard Title: Surface Water Flooding (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Ambiental Risk Analytics surface water (pluvial) Flood Map identifies areas likely to flood as a result of extreme rainfall events, i.e. land naturally vulnerable to surface water ponding or flooding. This data set was produced by simulating 1 in 30 year, 1 in 100 year, 1 in 250 year and 1 in 1,000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though some older ones may flood in a 1 in 5 year rainfall event.	Insufficient design, delay, excessive displacement, buoyancy, failure, instability of excavations, environmental impacts / pollution, maintenance / repair access issues.	Preferred Route Centreline - S	S-KP06+223	S-KP06+232	1 in 1000	2	4	8 (Minor)	Flood Risk Assessment to determine flood risk. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; raising ground levels, re-routing, anchoring to prevent buoyancy issues. - Designer to consider appropriate temporary and permanent drainage & flood defences	2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP06+260	S-KP06+270	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP06+309	S-KP06+311	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP06+321	S-KP06+323	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP06+314	S-KP06+321	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP06+354	S-KP06+353	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP06+311	S-KP06+314	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP06+323	S-KP06+331	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP06+602	S-KP06+602	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP06+579	S-KP06+583	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP06+602	S-KP06+608	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP06+610	S-KP06+616	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP07+705	S-KP07+707	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP07+707	S-KP07+709	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP07+719	S-KP07+719	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP08+020	S-KP08+021	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP08+043	S-KP08+045	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP08+053	S-KP08+052	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP08+067	S-KP08+068	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP08+363	S-KP08+364	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP08+359	S-KP08+362	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP08+382	S-KP08+385	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP08+385	S-KP08+387	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP10+068	S-KP10+076	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP11+058	S-KP011+06	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP011+06	S-KP11+064	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP011+11	S-KP11+112	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP11+114	S-KP11+116	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP11+112	S-KP11+114	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP011+26	S-KP11+262	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP11+256	S-KP11+254	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP11+308	S-KP011+31	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP11+324	S-KP11+326	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP11+302	S-KP11+308	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP11+316	S-KP11+324	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP11+064	S-KP11+074	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP11+798	S-KP11+799	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP11+808	S-KP11+806	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP11+815	S-KP11+803	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP11+833	S-KP011+84	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP00+565	S-KP00+565	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP04+626	S-KP04+628	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP04+624	S-KP04+622	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP05+511	S-KP05+539	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP05+778	S-KP05+483	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP05+933	S-KP05+952	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP05+987	S-KP05+985	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP06+022	S-KP06+020	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP05+917	S-KP05+922	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP06+232	S-KP06+223	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP06+428	S-KP06+432	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP07+020	S-KP07+027	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP07+719	S-KP07+719	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP07+761	S-KP07+765	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP08+061	S-KP08+043	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP08+385	S-KP08+382	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP011+31	S-KP11+316	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP08+782	S-KP08+850	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP11+262	S-KP11+302	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP08+871	S-KP08+871	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP11+074	S-KP011+11	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)

Hynet Geohazards Desk Study

Hazard Title: Surface Water Flooding (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Ambiental Risk Analytics surface water (pluvial) Flood Map identifies areas likely to flood as a result of extreme rainfall events, i.e. land naturally vulnerable to surface water ponding or flooding. This data set was produced by simulating 1 in 30 year, 1 in 100 year, 1 in 250 year and 1 in 1,000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though some older ones may flood in a 1 in 5 year rainfall event.	Insufficient design, delay, excessive displacement, buoyancy, failure, instability of excavations, environmental impacts / pollution, maintenance / repair access issues.	Preferred Spurs Centreline - C-01	C-01-KP00+621	C-01-KP00+623	1 in 1000	2	4	8 (Minor)	Flood Risk Assessment to determine flood risk. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; raising ground levels, re-routing, anchoring to prevent buoyancy issues. - Designer to consider appropriate temporary and permanent drainage & flood defences	2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP00+713	C-01-KP00+709	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP00+797	C-01-KP00+799	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP00+790	C-01-KP00+790	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP00+729	C-01-KP00+770	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP01+240	C-01-KP01+242	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP01+279	C-01-KP01+281	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP01+242	C-01-KP01+279	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP01+891	C-01-KP01+892	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP01+903	C-01-KP01+903	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP01+920	C-01-KP01+920	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP01+927	C-01-KP01+932	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP01+941	C-01-KP01+942	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP01+978	C-01-KP01+979	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP01+991	C-01-KP01+998	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP01+998	C-01-KP02+003	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP02+008	C-01-KP02+010	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP02+014	C-01-KP02+018	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP02+020	C-01-KP02+007	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP02+030	C-01-KP02+020	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP02+035	C-01-KP02+037	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP02+049	C-01-KP02+052	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP02+052	C-01-KP02+042	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP02+399	C-01-KP02+406	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP03+388	C-01-KP03+396	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP04+209	C-01-KP04+211	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP04+184	C-01-KP04+186	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP04+169	C-01-KP04+171	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP04+172	C-01-KP04+182	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP04+151	C-01-KP04+152	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP05+146	C-01-KP05+148	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP05+160	C-01-KP05+161	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP05+163	C-01-KP05+164	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP05+161	C-01-KP05+163	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP06+054	C-01-KP06+055	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP06+069	C-01-KP06+071	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP06+056	C-01-KP06+069	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP06+395	C-01-KP06+396	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP06+396	C-01-KP06+405	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP06+431	C-01-KP06+432	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP06+405	C-01-KP06+415	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP06+927	C-01-KP06+929	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP06+926	C-01-KP06+927	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP06+929	C-01-KP06+935	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP06+963	C-01-KP06+964	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP06+984	C-01-KP06+990	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP06+980	C-01-KP06+984	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP07+078	C-01-KP07+080	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP07+082	C-01-KP07+083	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP07+083	C-01-KP07+062	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP07+131	C-01-KP07+139	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP07+161	C-01-KP07+163	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP07+289	C-01-KP07+303	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP07+303	C-01-KP07+305	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP07+354	C-01-KP07+359	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP07+359	C-01-KP07+362	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP07+390	C-01-KP07+394	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP07+409	C-01-KP07+411	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP07+419	C-01-KP07+421	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP07+437	C-01-KP07+438	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP07+433	C-01-KP07+435	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)

Hynet Geohazards Desk Study

Hazard Title: Surface Water Flooding (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Ambiental Risk Analytics surface water (pluvial) Flood Map identifies areas likely to flood as a result of extreme rainfall events, i.e. land naturally vulnerable to surface water ponding or flooding. This data set was produced by simulating 1 in 30 year, 1 in 100 year, 1 in 250 year and 1 in 1,000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though some older ones may flood in a 1 in 5 year rainfall event.	Insufficient design, delay, excessive displacement, buoyancy, failure, instability of excavations, environmental impacts / pollution, maintenance / repair access issues.	Preferred Spurs Centreline - C-01	C-01-KP07+431	C-01-KP07+433	1 in 1000	2	4	8 (Minor)	Flood Risk Assessment to determine flood risk. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; raising ground levels, re-routing, anchoring to prevent buoyancy issues. - Designer to consider appropriate temporary and permanent drainage & flood defences	2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP07+461	C-01-KP07+463	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP07+475	C-01-KP07+475	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP07+473	C-01-KP07+475	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP07+438	C-01-KP07+439	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP07+439	C-01-KP07+459	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP07+463	C-01-KP07+461	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP07+476	C-01-KP07+473	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP07+514	C-01-KP07+518	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP00+623	C-01-KP00+548	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP01+592	C-01-KP01+581	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP01+728	C-01-KP01+573	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP01+966	C-01-KP01+857	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP01+988	C-01-KP01+990	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP04+575	C-01-KP04+597	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP04+152	C-01-KP04+209	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP05+180	C-01-KP05+181	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP06+935	C-01-KP06+963	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - C-01	C-01-KP07+421	C-01-KP07+390	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP01+633	S-KP01+644	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP01+633	S-KP01+644	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP01+630	S-KP01+633	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP01+630	S-KP01+633	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP01+627	S-KP01+630	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP01+627	S-KP01+630	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP02+724	S-KP02+722	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP02+724	S-KP02+722	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP02+759	S-KP02+757	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP02+759	S-KP02+757	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP02+757	S-KP02+724	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP02+757	S-KP02+724	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP03+012	S-KP03+053	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - S	S-KP03+012	S-KP03+053	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP03+346	N2-KP03+348	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP03+325	N2-KP03+327	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP03+309	N2-KP03+311	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP02+628	N2-KP02+632	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP02+618	N2-KP02+624	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP02+616	N2-KP02+618	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP02+612	N2-KP02+614	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP02+610	N2-KP02+616	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP05+981	N2-KP05+983	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP05+963	N2-KP05+965	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP05+972	N2-KP05+980	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP05+959	N2-KP05+961	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP05+954	N2-KP05+956	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP05+945	N2-KP05+947	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP05+945	N2-KP05+963	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP05+938	N2-KP05+940	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP05+936	N2-KP05+943	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP05+927	N2-KP05+930	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP05+916	N2-KP05+918	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP05+918	N2-KP05+936	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP05+915	N2-KP05+916	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP05+904	N2-KP05+906	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP05+907	N2-KP05+914	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP05+899	N2-KP05+902	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP05+892	N2-KP05+892	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP05+899	N2-KP05+904	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP05+884	N2-KP05+888	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP05+873	N2-KP05+876	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)

Hynet Geohazards Desk Study

Hazard Title: Surface Water Flooding (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Ambiental Risk Analytics surface water (pluvial) Flood Map identifies areas likely to flood as a result of extreme rainfall events, i.e. land naturally vulnerable to surface water ponding or flooding. This data set was produced by simulating 1 in 30 year, 1 in 100 year, 1 in 250 year and 1 in 1,000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though some older ones may flood in a 1 in 5 year rainfall event.	Insufficient design, delay, excessive displacement, buoyancy, failure, instability of excavations, environmental impacts / pollution, maintenance / repair access issues.	Preferred Route Centreline - N2	N2-KP05+857	N2-KP05+857	1 in 1000	2	4	8 (Minor)	Flood Risk Assessment to determine flood risk. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; raising ground levels, re-routing, anchoring to prevent buoyancy issues. - Designer to consider appropriate temporary and permanent drainage & flood defences	2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP05+842	N2-KP05+843	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP05+346	N2-KP05+364	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP05+332	N2-KP05+345	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP05+325	N2-KP05+331	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP05+312	N2-KP05+324	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP05+258	N2-KP05+266	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP05+253	N2-KP05+257	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP05+252	N2-KP05+253	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP05+242	N2-KP05+252	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP05+240	N2-KP05+242	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP05+233	N2-KP05+236	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP05+236	N2-KP05+240	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP05+215	N2-KP05+233	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP05+181	N2-KP05+183	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP05+171	N2-KP05+181	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP05+124	N2-KP05+175	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP05+121	N2-KP05+122	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP05+117	N2-KP05+124	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP05+033	N2-KP05+120	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP05+023	N2-KP05+028	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP04+972	N2-KP04+982	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP04+921	N2-KP04+964	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP04+908	N2-KP04+921	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP04+905	N2-KP04+906	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP04+892	N2-KP04+898	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP04+110	N2-KP04+124	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP04+095	N2-KP04+119	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP04+089	N2-KP04+095	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP04+087	N2-KP04+089	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP04+021	N2-KP04+087	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP03+582	N2-KP03+584	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP03+666	N2-KP03+680	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP03+660	N2-KP03+665	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP03+682	N2-KP03+761	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP03+363	N2-KP03+364	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP02+167	N2-KP02+178	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP02+160	N2-KP02+187	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP01+872	N2-KP01+888	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP01+863	N2-KP01+864	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP01+859	N2-KP01+861	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP01+857	N2-KP01+859	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP01+855	N2-KP01+857	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP01+848	N2-KP01+855	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP01+837	N2-KP01+842	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP01+485	N2-KP01+487	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP01+479	N2-KP01+480	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP01+387	N2-KP01+389	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP01+378	N2-KP01+379	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP01+395	N2-KP01+397	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP01+389	N2-KP01+395	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP01+373	N2-KP01+378	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP00+706	N2-KP00+709	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP01+861	N2-KP01+881	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP01+480	N2-KP01+490	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP01+315	N2-KP01+332	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP00+692	N2-KP00+706	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP00+074	N2-KP00+145	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP00+048	N2-KP00+083	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-04	N2-04-KP01+908	N2-04-KP01+910	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-04	N2-04-KP01+919	N2-04-KP01+919	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)

Hynet Geohazards Desk Study

Hazard Title: Surface Water Flooding (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Ambiental Risk Analytics surface water (pluvial) Flood Map identifies areas likely to flood as a result of extreme rainfall events, i.e. land naturally vulnerable to surface water ponding or flooding. This data set was produced by simulating 1 in 30 year, 1 in 100 year, 1 in 250 year and 1 in 1,000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though some older ones may flood in a 1 in 5 year rainfall event.	Insufficient design, delay, excessive displacement, buoyancy, failure, instability of excavations, environmental impacts / pollution, maintenance / repair access issues.	Preferred Spurs Centreline - N2-04	N2-04-KP01+910	N2-04-KP01+919	1 in 1000	2	4	8 (Minor)	Flood Risk Assessment to determine flood risk. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; raising ground levels, re-routing, anchoring to prevent buoyancy issues. - Designer to consider appropriate temporary and permanent drainage & flood defences	2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-04	N2-04-KP01+394	N2-04-KP01+395	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-04	N2-04-KP01+399	N2-04-KP01+402	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-04	N2-04-KP01+362	N2-04-KP01+364	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-04	N2-04-KP01+360	N2-04-KP01+361	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-04	N2-04-KP01+361	N2-04-KP01+362	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-04	N2-04-KP01+364	N2-04-KP01+389	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-04	N2-04-KP01+309	N2-04-KP01+311	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-04	N2-04-KP01+262	N2-04-KP01+264	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-04	N2-04-KP00+696	N2-04-KP00+701	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-04	N2-04-KP01+395	N2-04-KP01+399	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-04	N2-04-KP01+324	N2-04-KP01+360	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-04	N2-04-KP01+281	N2-04-KP01+324	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-04	N2-04-KP01+257	N2-04-KP01+281	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-04	N2-04-KP01+244	N2-04-KP01+248	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-04	N2-04-KP01+248	N2-04-KP01+257	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-04	N2-04-KP00+693	N2-04-KP00+707	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-04	N2-04-KP00+691	N2-04-KP00+696	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-04	N2-04-KP00+066	N2-04-KP00+140	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-04	N2-04-KP00+048	N2-04-KP00+066	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-06	N2-06-KP01+088	N2-06-KP01+090	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-06	N2-06-KP01+080	N2-06-KP01+081	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-06	N2-06-KP01+096	N2-06-KP01+100	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-06	N2-06-KP01+078	N2-06-KP01+080	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-06	N2-06-KP01+065	N2-06-KP01+067	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-06	N2-06-KP01+067	N2-06-KP01+086	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-06	N2-06-KP01+144	N2-06-KP01+146	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+866	N2-06-KP00+868	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+864	N2-06-KP00+866	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+154	N2-06-KP00+156	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+157	N2-06-KP00+197	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+197	N2-06-KP00+201	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+325	N2-06-KP00+336	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+434	N2-06-KP00+435	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+438	N2-06-KP00+438	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+469	N2-06-KP00+470	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+509	N2-06-KP00+509	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-06	N2-06-KP01+090	N2-06-KP01+088	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-06	N2-06-KP01+146	N2-06-KP01+151	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+438	N2-06-KP00+455	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+512	N2-06-KP00+469	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+530	N2-06-KP00+530	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+151	N2-07-KP00+152	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+147	N2-07-KP00+148	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+144	N2-07-KP00+144	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+121	N2-07-KP00+122	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+114	N2-07-KP00+114	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+104	N2-07-KP00+110	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+100	N2-07-KP00+103	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+097	N2-07-KP00+099	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+093	N2-07-KP00+095	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+091	N2-07-KP00+157	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+088	N2-07-KP00+090	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+086	N2-07-KP00+087	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+072	N2-07-KP00+088	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+030	N2-07-KP00+031	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+027	N2-07-KP00+027	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N2-07	N2-07-KP00+019	N2-07-KP00+069	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP03+096	N2-KP03+106	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP03+096	N2-KP03+106	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP03+297	N2-KP03+352	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)

Hynet Geohazards Desk Study

Hazard Title: Surface Water Flooding (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Ambiental Risk Analytics surface water (pluvial) Flood Map identifies areas likely to flood as a result of extreme rainfall events, i.e. land naturally vulnerable to surface water ponding or flooding. This data set was produced by simulating 1 in 30 year, 1 in 100 year, 1 in 250 year and 1 in 1,000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though some older ones may flood in a 1 in 5 year rainfall event.	Insufficient design, delay, excessive displacement, buoyancy, failure, instability of excavations, environmental impacts / pollution, maintenance / repair access issues.	Preferred Route Centreline - N2	N2-KP03+297	N2-KP03+352	1 in 1000	2	4	8 (Minor)	Flood Risk Assessment to determine flood risk. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; raising ground levels, re-routing, anchoring to prevent buoyancy issues. - Designer to consider appropriate temporary and permanent drainage & flood defences	2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP02+391	N2-KP02+392	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP02+391	N2-KP02+392	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP03+352	N2-KP03+582	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP03+352	N2-KP03+582	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP02+384	N2-KP02+391	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N2	N2-KP02+384	N2-KP02+391	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - E-01	E-01-KP00+426	E-01-KP00+427	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - E-01	E-01-KP00+447	E-01-KP00+449	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - E-01	E-01-KP00+449	E-01-KP00+447	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - E-01	E-01-KP00+400	E-01-KP00+400	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - E-01	E-01-KP00+395	E-01-KP00+400	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - E-01	E-01-KP00+293	E-01-KP00+304	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - E-01	E-01-KP00+290	E-01-KP00+291	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - E-01	E-01-KP00+179	E-01-KP00+182	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - E-01	E-01-KP00+160	E-01-KP00+163	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - E-01	E-01-KP00+153	E-01-KP00+155	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - E-01	E-01-KP00+146	E-01-KP00+151	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - E-01	E-01-KP00+137	E-01-KP00+143	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - E-01	E-01-KP00+126	E-01-KP00+280	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - E-01	E-01-KP00+053	E-01-KP00+054	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - E-01	E-01-KP00+051	E-01-KP00+053	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - E-01	E-01-KP00+000	E-01-KP00+051	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - E-01	E-01-KP00+280	E-01-KP00+333	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - E-01	E-01-KP00+108	E-01-KP00+126	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - E-04	E-04-KP00+317	E-04-KP00+317	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - E-04	E-04-KP00+317	E-04-KP00+317	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - E-04	E-04-KP00+030	E-04-KP00+032	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - E-04	E-04-KP00+000	E-04-KP00+030	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - E-04	E-04-KP00+438	E-04-KP00+485	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - E-04	E-04-KP00+439	E-04-KP00+446	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - E-05	E-05-KP00+031	E-05-KP00+033	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - E-05	E-05-KP00+029	E-05-KP00+031	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - E-05	E-05-KP00+026	E-05-KP00+026	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - E-05	E-05-KP00+000	E-05-KP00+029	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP06+640	W-KP06+642	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP06+642	W-KP06+644	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP06+642	W-KP06+642	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP06+043	W-KP06+047	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP05+552	W-KP05+554	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP05+554	W-KP05+556	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP05+429	W-KP05+429	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP05+427	W-KP05+429	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP05+349	W-KP05+350	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP05+348	W-KP05+349	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP04+554	W-KP04+555	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP04+555	W-KP04+557	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP04+046	W-KP04+048	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP04+044	W-KP04+046	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP03+656	W-KP03+657	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP03+659	W-KP03+661	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP03+657	W-KP03+656	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP03+271	W-KP03+272	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP03+268	W-KP03+270	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP03+187	W-KP03+189	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP03+067	W-KP03+070	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP02+723	W-KP02+724	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP02+718	W-KP02+720	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP02+718	W-KP02+716	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP02+716	W-KP02+718	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP02+709	W-KP02+712	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)

Hynet Geohazards Desk Study

Hazard Title: Surface Water Flooding (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Ambiental Risk Analytics surface water (pluvial) Flood Map identifies areas likely to flood as a result of extreme rainfall events, i.e. land naturally vulnerable to surface water ponding or flooding. This data set was produced by simulating 1 in 30 year, 1 in 100 year, 1 in 250 year and 1 in 1,000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though some older ones may flood in a 1 in 5 year rainfall event.	Insufficient design, delay, excessive displacement, buoyancy, failure, instability of excavations, environmental impacts / pollution, maintenance / repair access issues.	Preferred Route Centreline - W	W-KP02+712	W-KP02+707	1 in 1000	2	4	8 (Minor)	Flood Risk Assessment to determine flood risk. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; raising ground levels, re-routing, anchoring to prevent buoyancy issues. - Designer to consider appropriate temporary and permanent drainage & flood defences	2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP02+617	W-KP02+618	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP02+607	W-KP02+609	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP02+407	W-KP02+407	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP02+407	W-KP02+409	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP02+405	W-KP02+407	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP02+326	W-KP02+328	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP01+872	W-KP01+872	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP01+872	W-KP01+872	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP00+078	W-KP00+080	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP00+080	W-KP00+088	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP00+088	W-KP00+090	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP00+096	W-KP00+098	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP00+098	W-KP00+102	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP00+935	W-KP00+940	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP00+814	W-KP00+804	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP00+565	W-KP00+567	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP00+563	W-KP00+567	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP02+657	W-KP02+617	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP02+581	W-KP02+579	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP02+598	W-KP02+607	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP00+084	W-KP00+086	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP09+892	W-KP09+891	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP09+891	W-KP09+892	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP09+867	W-KP09+869	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP09+859	W-KP09+862	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP09+946	W-KP09+952	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP09+874	W-KP09+874	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP09+660	W-KP09+661	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP09+656	W-KP09+656	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP09+642	W-KP09+644	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP09+642	W-KP09+642	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP09+656	W-KP09+656	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP09+644	W-KP09+646	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP11+328	W-KP11+328	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP11+326	W-KP11+328	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP11+289	W-KP11+287	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP11+321	W-KP11+321	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP11+328	W-KP11+351	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP11+276	W-KP11+282	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP09+532	W-KP09+533	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP11+295	W-KP11+289	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP09+528	W-KP09+532	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP13+295	W-KP13+297	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP13+297	W-KP13+300	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP13+297	W-KP13+297	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP11+295	W-KP11+295	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP11+064	W-KP11+104	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP08+731	W-KP08+733	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP08+733	W-KP08+734	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP08+412	W-KP08+415	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP08+082	W-KP08+084	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP08+084	W-KP08+085	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP08+077	W-KP08+082	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP08+075	W-KP08+077	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP07+919	W-KP07+923	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP07+381	W-KP07+387	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP07+832	W-KP07+834	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP07+834	W-KP07+834	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP07+379	W-KP07+381	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP07+753	W-KP07+755	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)

Hynet Geohazards Desk Study

Hazard Title: Surface Water Flooding (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Ambiental Risk Analytics surface water (pluvial) Flood Map identifies areas likely to flood as a result of extreme rainfall events, i.e. land naturally vulnerable to surface water ponding or flooding. This data set was produced by simulating 1 in 30 year, 1 in 100 year, 1 in 250 year and 1 in 1,000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though some older ones may flood in a 1 in 5 year rainfall event.	Insufficient design, delay, excessive displacement, buoyancy, failure, instability of excavations, environmental impacts / pollution, maintenance / repair access issues.	Preferred Route Centreline - W	W-KP07+750	W-KP07+752	1 in 1000	2	4	8 (Minor)	Flood Risk Assessment to determine flood risk. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; raising ground levels, re-routing, anchoring to prevent buoyancy issues. - Designer to consider appropriate temporary and permanent drainage & flood defences	2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP07+752	W-KP07+753	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP07+288	W-KP07+288	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP07+252	W-KP07+254	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP15+723	W-KP15+723	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP07+257	W-KP07+266	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP07+244	W-KP07+247	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP07+247	W-KP07+252	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP07+576	W-KP07+578	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP07+576	W-KP07+583	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP07+583	W-KP07+583	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP07+231	W-KP07+234	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP07+583	W-KP07+586	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP07+213	W-KP07+216	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP07+619	W-KP07+621	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP07+715	W-KP07+651	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP07+374	W-KP07+257	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP07+153	W-KP07+154	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP07+105	W-KP07+107	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP07+123	W-KP07+121	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP15+854	W-KP15+856	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP15+858	W-KP015+86	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP15+858	W-KP15+858	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP15+884	W-KP15+888	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP15+894	W-KP15+897	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP06+916	W-KP06+919	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP06+895	W-KP06+900	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP06+754	W-KP06+756	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP16+123	W-KP16+124	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP16+127	W-KP16+129	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP16+124	W-KP16+127	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP16+751	W-KP16+753	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP16+768	W-KP16+772	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP16+772	W-KP16+776	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP16+812	W-KP16+813	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP16+813	W-KP16+821	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP16+821	W-KP16+825	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP16+825	W-KP16+834	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP16+834	W-KP16+839	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP16+776	W-KP16+798	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP16+945	W-KP16+945	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP16+945	W-KP16+949	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP16+977	W-KP16+979	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP16+979	W-KP16+981	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP16+981	W-KP16+983	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP16+967	W-KP016+97	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP17+007	W-KP17+013	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP17+215	W-KP17+219	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP17+561	W-KP17+563	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP17+483	W-KP17+487	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP17+689	W-KP017+69	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP17+538	W-KP017+54	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP09+997	W-KP10+007	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP11+823	W-KP011+83	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP09+869	W-KP09+867	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP09+893	W-KP09+946	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP11+435	W-KP11+438	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP13+114	W-KP13+122	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP011+37	W-KP11+376	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP11+359	W-KP011+37	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP11+351	W-KP11+359	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)

Hynet Geohazards Desk Study

Hazard Title: Surface Water Flooding (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Ambiental Risk Analytics surface water (pluvial) Flood Map identifies areas likely to flood as a result of extreme rainfall events, i.e. land naturally vulnerable to surface water ponding or flooding. This data set was produced by simulating 1 in 30 year, 1 in 100 year, 1 in 250 year and 1 in 1,000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though some older ones may flood in a 1 in 5 year rainfall event.	Insufficient design, delay, excessive displacement, buoyancy, failure, instability of excavations, environmental impacts / pollution, maintenance / repair access issues.	Preferred Route Centreline - W	W-KP15+715	W-KP15+725	1 in 1000	2	4	8 (Minor)	Flood Risk Assessment to determine flood risk. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; raising ground levels, re-routing, anchoring to prevent buoyancy issues. - Designer to consider appropriate temporary and permanent drainage & flood defences	2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP07+288	W-KP07+288	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP07+718	W-KP07+649	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP07+195	W-KP07+211	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP015+85	W-KP15+858	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP15+888	W-KP15+894	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP07+234	W-KP07+120	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP16+798	W-KP16+812	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP16+949	W-KP16+954	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP16+954	W-KP16+956	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP017+33	W-KP17+397	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP17+013	W-KP17+215	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP17+037	W-KP17+123	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP17+021	W-KP17+178	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP17+571	W-KP17+708	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP16+956	W-KP16+977	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP017+54	W-KP17+743	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP03+477	N1-KP03+481	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP02+589	N1-KP02+593	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP06+752	W-KP06+754	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP06+752	W-KP06+754	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP06+910	W-KP06+864	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP06+910	W-KP06+864	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP019+07	W-KP19+071	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP17+745	W-KP17+746	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP19+071	W-KP019+07	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - W	W-KP17+743	W-KP17+751	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP02+855	E-KP02+865	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP01+497	E-KP01+497	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP01+482	E-KP01+494	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP00+803	E-KP00+830	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP00+848	E-KP00+855	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP00+332	E-KP00+336	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP00+319	E-KP00+318	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP00+830	E-KP00+704	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP02+814	E-KP02+847	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP01+497	E-KP01+482	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP00+772	E-KP00+521	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP07+200	E-KP07+202	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP07+193	E-KP07+196	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP07+196	E-KP07+198	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP07+202	E-KP07+200	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP07+188	E-KP07+189	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP07+191	E-KP07+193	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP07+169	E-KP07+174	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP07+025	E-KP07+032	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP07+032	E-KP07+035	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP07+024	E-KP07+025	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP06+806	E-KP06+812	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP06+789	E-KP06+798	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP06+721	E-KP06+723	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP06+718	E-KP06+720	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP06+715	E-KP06+718	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP06+718	E-KP06+718	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP06+713	E-KP06+714	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP06+714	E-KP06+715	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP06+299	E-KP06+313	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP05+359	E-KP05+362	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP04+779	E-KP04+785	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP04+773	E-KP04+774	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP04+774	E-KP04+779	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)

Hynet Geohazards Desk Study

Hazard Title: Surface Water Flooding (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Ambiental Risk Analytics surface water (pluvial) Flood Map identifies areas likely to flood as a result of extreme rainfall events, i.e. land naturally vulnerable to surface water ponding or flooding. This data set was produced by simulating 1 in 30 year, 1 in 100 year, 1 in 250 year and 1 in 1,000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though some older ones may flood in a 1 in 5 year rainfall event.	Insufficient design, delay, excessive displacement, buoyancy, failure, instability of excavations, environmental impacts / pollution, maintenance / repair access issues.	Preferred Route Centreline - E	E-KP04+675	E-KP04+678	1 in 1000	2	4	8 (Minor)	Flood Risk Assessment to determine flood risk. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; raising ground levels, re-routing, anchoring to prevent buoyancy issues. - Designer to consider appropriate temporary and permanent drainage & flood defences	2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP04+678	E-KP04+680	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP04+675	E-KP04+666	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP04+671	E-KP04+669	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP03+865	E-KP03+869	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP07+189	E-KP07+188	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP06+779	E-KP06+784	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP06+798	E-KP06+789	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP05+494	E-KP05+374	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP05+305	E-KP05+325	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP01+594	N1-KP01+580	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP01+596	N1-KP01+569	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP00+976	N1-KP00+984	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP00+453	N1-KP00+455	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP00+396	N1-KP00+394	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP00+429	N1-KP00+392	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP00+255	N1-KP00+299	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP04+499	N1-KP04+502	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP04+445	N1-KP04+445	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP04+238	N1-KP04+241	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP04+231	N1-KP04+233	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP02+562	N1-KP02+564	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP02+564	N1-KP02+569	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP04+577	N1-KP04+513	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP04+502	N1-KP04+445	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP04+233	N1-KP04+238	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP02+865	E-KP02+725	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP02+865	E-KP02+725	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP18+233	N1-KP18+235	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP18+227	N1-KP18+229	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP18+229	N1-KP18+233	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP18+215	N1-KP18+217	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP18+096	N1-KP18+102	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP18+102	N1-KP18+096	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP17+611	N1-KP17+614	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP17+561	N1-KP17+563	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP17+563	N1-KP17+588	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP17+588	N1-KP17+597	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP17+597	N1-KP17+603	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP17+369	N1-KP17+372	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP17+603	N1-KP17+611	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP17+366	N1-KP17+368	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP17+254	N1-KP17+258	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP17+258	N1-KP017+26	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP17+251	N1-KP17+254	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP17+249	N1-KP17+251	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP17+248	N1-KP17+249	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP17+245	N1-KP17+247	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP17+243	N1-KP17+245	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP17+218	N1-KP17+222	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP17+222	N1-KP17+224	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP17+218	N1-KP17+218	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP17+212	N1-KP17+218	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP17+209	N1-KP17+212	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP17+206	N1-KP17+209	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP17+201	N1-KP17+203	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP17+177	N1-KP17+179	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP17+176	N1-KP17+177	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP17+156	N1-KP17+158	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP17+148	N1-KP17+152	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP17+145	N1-KP17+148	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)

Hynet Geohazards Desk Study

Hazard Title: Surface Water Flooding (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Ambiental Risk Analytics surface water (pluvial) Flood Map identifies areas likely to flood as a result of extreme rainfall events, i.e. land naturally vulnerable to surface water ponding or flooding. This data set was produced by simulating 1 in 30 year, 1 in 100 year, 1 in 250 year and 1 in 1,000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though some older ones may flood in a 1 in 5 year rainfall event.	Insufficient design, delay, excessive displacement, buoyancy, failure, instability of excavations, environmental impacts / pollution, maintenance / repair access issues.	Preferred Route Centreline - N1	N1-KP17+143	N1-KP17+145	1 in 1000	2	4	8 (Minor)	Flood Risk Assessment to determine flood risk. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; raising ground levels, re-routing, anchoring to prevent buoyancy issues. - Designer to consider appropriate temporary and permanent drainage & flood defences	2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP17+141	N1-KP17+143	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP17+139	N1-KP17+141	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP17+114	N1-KP17+115	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP17+107	N1-KP17+109	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP17+097	N1-KP17+101	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP17+101	N1-KP17+107	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP16+976	N1-KP16+978	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP16+976	N1-KP16+976	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP16+978	N1-KP16+982	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP016+87	N1-KP16+872	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP16+868	N1-KP016+87	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP15+781	N1-KP15+783	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP15+751	N1-KP15+753	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP15+751	N1-KP15+751	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP15+783	N1-KP15+787	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP15+423	N1-KP15+425	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP15+419	N1-KP015+42	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP15+415	N1-KP15+416	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP15+411	N1-KP15+413	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP15+406	N1-KP15+407	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP14+944	N1-KP14+946	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP014+94	N1-KP14+944	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP14+933	N1-KP14+937	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP14+937	N1-KP014+94	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP14+931	N1-KP14+933	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP14+897	N1-KP14+898	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP14+889	N1-KP14+893	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP14+665	N1-KP14+667	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP14+646	N1-KP014+65	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP14+523	N1-KP14+525	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP14+521	N1-KP14+523	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP14+519	N1-KP14+521	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP14+485	N1-KP14+481	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP14+472	N1-KP14+472	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP014+32	N1-KP14+325	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP13+748	N1-KP013+75	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP13+745	N1-KP13+748	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP13+733	N1-KP13+737	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP013+73	N1-KP13+733	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP13+392	N1-KP13+394	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP13+389	N1-KP13+389	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP13+377	N1-KP13+379	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP13+362	N1-KP13+366	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP13+382	N1-KP13+374	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP13+359	N1-KP13+359	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP13+339	N1-KP13+341	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP13+334	N1-KP13+337	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP13+329	N1-KP13+334	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP13+242	N1-KP13+242	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP13+225	N1-KP13+227	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP013+22	N1-KP13+222	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP13+188	N1-KP13+188	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP013+16	N1-KP13+166	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP13+153	N1-KP13+158	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP13+112	N1-KP13+112	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP13+092	N1-KP13+093	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP13+072	N1-KP13+072	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP13+051	N1-KP13+051	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP13+049	N1-KP13+051	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP13+047	N1-KP13+049	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)

Hynet Geohazards Desk Study

Hazard Title: Surface Water Flooding (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Ambiental Risk Analytics surface water (pluvial) Flood Map identifies areas likely to flood as a result of extreme rainfall events, i.e. land naturally vulnerable to surface water ponding or flooding. This data set was produced by simulating 1 in 30 year, 1 in 100 year, 1 in 250 year and 1 in 1,000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though some older ones may flood in a 1 in 5 year rainfall event.	Insufficient design, delay, excessive displacement, buoyancy, failure, instability of excavations, environmental impacts / pollution, maintenance / repair access issues.	Preferred Route Centreline - N1	N1-KP13+045	N1-KP13+047	1 in 1000	2	4	8 (Minor)	Flood Risk Assessment to determine flood risk. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; raising ground levels, re-routing, anchoring to prevent buoyancy issues. - Designer to consider appropriate temporary and permanent drainage & flood defences	2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP13+045	N1-KP13+041	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP13+041	N1-KP13+045	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP12+903	N1-KP12+905	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP12+897	N1-KP12+898	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP12+896	N1-KP12+897	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP12+894	N1-KP12+896	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP012+89	N1-KP12+894	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP012+89	N1-KP012+89	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP12+886	N1-KP012+89	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP12+882	N1-KP12+886	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP012+88	N1-KP12+882	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP12+878	N1-KP012+88	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP12+876	N1-KP12+878	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP12+875	N1-KP12+876	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP12+873	N1-KP12+875	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP012+87	N1-KP12+871	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP12+871	N1-KP12+873	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP12+867	N1-KP012+87	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP12+865	N1-KP12+867	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP12+863	N1-KP12+865	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP12+863	N1-KP12+863	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP12+861	N1-KP12+863	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP12+855	N1-KP12+856	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP012+85	N1-KP12+852	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP12+848	N1-KP12+849	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP12+786	N1-KP12+788	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP12+757	N1-KP12+758	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP11+912	N1-KP11+915	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP11+909	N1-KP11+912	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP11+908	N1-KP11+909	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP11+906	N1-KP11+908	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP10+488	N1-KP010+49	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP10+486	N1-KP10+488	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP10+671	N1-KP10+673	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP10+669	N1-KP10+671	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP10+444	N1-KP10+447	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP010+77	N1-KP10+771	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP10+768	N1-KP010+77	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP010+76	N1-KP10+761	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP10+772	N1-KP10+774	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP10+766	N1-KP10+768	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP10+455	N1-KP10+457	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP10+777	N1-KP10+785	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP10+800	N1-KP10+802	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP010+93	N1-KP10+931	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP10+932	N1-KP10+936	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP010+94	N1-KP10+947	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP10+947	N1-KP10+947	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP10+941	N1-KP10+945	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP10+988	N1-KP010+99	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP11+042	N1-KP11+043	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP11+018	N1-KP011+02	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP11+008	N1-KP11+012	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP10+984	N1-KP10+988	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP10+947	N1-KP10+962	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP11+044	N1-KP11+046	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP11+043	N1-KP11+044	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP011+02	N1-KP11+034	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP11+413	N1-KP11+415	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP11+403	N1-KP11+405	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)

Hynet Geohazards Desk Study

Hazard Title: Surface Water Flooding (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Ambiental Risk Analytics surface water (pluvial) Flood Map identifies areas likely to flood as a result of extreme rainfall events, i.e. land naturally vulnerable to surface water ponding or flooding. This data set was produced by simulating 1 in 30 year, 1 in 100 year, 1 in 250 year and 1 in 1,000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though some older ones may flood in a 1 in 5 year rainfall event.	Insufficient design, delay, excessive displacement, buoyancy, failure, instability of excavations, environmental impacts / pollution, maintenance / repair access issues.	Preferred Route Centreline - N1	N1-KP11+046	N1-KP11+055	1 in 1000	2	4	8 (Minor)	Flood Risk Assessment to determine flood risk. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; raising ground levels, re-routing, anchoring to prevent buoyancy issues. - Designer to consider appropriate temporary and permanent drainage & flood defences	2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP11+038	N1-KP11+042	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP11+409	N1-KP11+411	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP11+014	N1-KP11+018	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP09+965	N1-KP09+967	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP09+538	N1-KP09+540	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP09+540	N1-KP09+561	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP09+429	N1-KP09+430	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP09+422	N1-KP09+427	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP09+410	N1-KP09+413	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP09+408	N1-KP09+409	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP09+383	N1-KP09+388	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP09+381	N1-KP09+381	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP09+195	N1-KP09+201	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP09+183	N1-KP09+185	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP09+179	N1-KP09+183	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP08+482	N1-KP08+484	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP08+478	N1-KP08+482	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP18+637	N1-KP18+651	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP18+217	N1-KP18+223	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP16+866	N1-KP16+868	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP15+407	N1-KP15+411	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP14+893	N1-KP14+897	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP13+389	N1-KP13+377	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP13+366	N1-KP13+359	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP13+341	N1-KP13+316	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP13+324	N1-KP13+307	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP13+249	N1-KP13+253	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP13+288	N1-KP13+231	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP13+227	N1-KP13+183	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP13+194	N1-KP13+168	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP13+158	N1-KP13+153	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP13+118	N1-KP13+145	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP13+112	N1-KP13+098	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP13+098	N1-KP13+072	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP013+06	N1-KP13+066	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP12+856	N1-KP12+848	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP12+793	N1-KP12+802	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP12+788	N1-KP12+786	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP11+809	N1-KP11+858	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP10+447	N1-KP10+444	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP10+731	N1-KP10+813	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP10+994	N1-KP10+996	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP11+034	N1-KP11+038	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP11+495	N1-KP11+409	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP09+967	N1-KP09+965	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP09+381	N1-KP09+381	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP09+437	N1-KP09+422	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+139	N1-02-KP00+140	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+142	N1-02-KP00+149	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+140	N1-02-KP00+139	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+117	N1-02-KP00+117	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+105	N1-02-KP00+106	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+117	N1-02-KP00+117	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+023	N1-02-KP00+052	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+020	N1-02-KP00+023	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+023	N1-02-KP00+023	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+081	N1-05-KP00+083	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+081	N1-05-KP00+081	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+079	N1-05-KP00+081	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+056	N1-05-KP00+056	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)

Hynet Geohazards Desk Study

Hazard Title: Surface Water Flooding (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Ambiental Risk Analytics surface water (pluvial) Flood Map identifies areas likely to flood as a result of extreme rainfall events, i.e. land naturally vulnerable to surface water ponding or flooding. This data set was produced by simulating 1 in 30 year, 1 in 100 year, 1 in 250 year and 1 in 1,000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though some older ones may flood in a 1 in 5 year rainfall event.	Insufficient design, delay, excessive displacement, buoyancy, failure, instability of excavations, environmental impacts / pollution, maintenance / repair access issues.	Preferred Spurs Centreline - N1-05	N1-05-KP00+056	N1-05-KP00+079	1 in 1000	2	4	8 (Minor)	Flood Risk Assessment to determine flood risk. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; raising ground levels, re-routing, anchoring to prevent buoyancy issues. - Designer to consider appropriate temporary and permanent drainage & flood defences	2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP12+377	E-KP012+38	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP12+368	E-KP12+377	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP12+364	E-KP12+368	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP12+006	E-KP12+028	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP11+306	E-KP11+308	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP11+302	E-KP11+303	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP11+291	E-KP11+291	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP10+927	E-KP10+927	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP10+927	E-KP010+93	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP10+923	E-KP10+923	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP010+93	E-KP10+935	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP10+935	E-KP10+956	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP10+925	E-KP10+927	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP10+584	E-KP10+584	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP10+584	E-KP10+587	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP10+581	E-KP10+582	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP010+58	E-KP10+581	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP10+582	E-KP10+584	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP10+313	E-KP10+315	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP10+204	E-KP10+205	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP10+161	E-KP010+18	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP10+143	E-KP10+146	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP10+094	E-KP10+096	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP09+864	E-KP09+866	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP09+866	E-KP09+867	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP09+714	E-KP09+720	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP09+620	E-KP09+620	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP09+611	E-KP09+612	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP09+534	E-KP09+536	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP09+536	E-KP09+540	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP09+531	E-KP09+534	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP09+404	E-KP09+405	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP09+405	E-KP09+407	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP09+321	E-KP09+329	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP12+028	E-KP12+006	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP11+192	E-KP011+19	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP11+287	E-KP11+289	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP10+956	E-KP10+961	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP10+394	E-KP10+385	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP10+325	E-KP10+313	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP10+091	E-KP10+091	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP10+004	E-KP09+993	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP09+889	E-KP09+886	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP09+720	E-KP09+620	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP10+326	E-KP09+611	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP19+255	E-KP19+257	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP19+243	E-KP19+249	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP19+075	E-KP19+079	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP18+093	E-KP18+103	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP17+893	E-KP17+893	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP17+888	E-KP17+889	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP17+889	E-KP17+893	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP17+693	E-KP17+695	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP17+683	E-KP17+685	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP17+685	E-KP17+693	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP17+681	E-KP17+683	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP017+35	E-KP017+35	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP17+347	E-KP17+348	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP17+348	E-KP017+35	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP17+102	E-KP17+106	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)

Hynet Geohazards Desk Study

Hazard Title: Surface Water Flooding (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Ambiental Risk Analytics surface water (pluvial) Flood Map identifies areas likely to flood as a result of extreme rainfall events, i.e. land naturally vulnerable to surface water ponding or flooding. This data set was produced by simulating 1 in 30 year, 1 in 100 year, 1 in 250 year and 1 in 1,000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though some older ones may flood in a 1 in 5 year rainfall event.	Insufficient design, delay, excessive displacement, buoyancy, failure, instability of excavations, environmental impacts / pollution, maintenance / repair access issues.	Preferred Route Centreline - E	E-KP017+09	E-KP017+09	1 in 1000	2	4	8 (Minor)	Flood Risk Assessment to determine flood risk. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; raising ground levels, re-routing, anchoring to prevent buoyancy issues. - Designer to consider appropriate temporary and permanent drainage & flood defences	2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP16+961	E-KP16+963	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP16+948	E-KP016+95	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP16+924	E-KP16+924	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP16+924	E-KP16+926	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP16+917	E-KP016+92	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP16+915	E-KP16+917	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP16+885	E-KP16+915	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP16+864	E-KP16+866	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP16+866	E-KP16+885	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP016+92	E-KP16+924	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP16+692	E-KP16+692	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP16+667	E-KP16+671	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP16+665	E-KP16+667	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP16+663	E-KP16+665	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP16+209	E-KP16+211	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP15+600	E-KP15+602	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP15+619	E-KP15+619	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP15+626	E-KP15+619	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP15+408	E-KP015+41	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP015+41	E-KP15+428	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP15+202	E-KP15+203	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP15+003	E-KP15+003	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP14+606	E-KP14+609	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP013+92	E-KP013+93	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP13+609	E-KP13+613	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP13+537	E-KP13+597	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP19+249	E-KP19+255	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP18+762	E-KP18+801	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP18+103	E-KP18+093	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP17+883	E-KP17+888	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP17+106	E-KP017+09	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP016+95	E-KP16+961	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP15+203	E-KP15+207	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP15+586	E-KP15+600	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP15+558	E-KP15+564	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP15+564	E-KP15+586	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP14+932	E-KP14+855	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP13+567	E-KP13+589	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP21+655	E-KP21+658	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP21+654	E-KP21+655	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP21+658	E-KP21+662	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP021+08	E-KP21+082	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP021+07	E-KP21+072	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP21+072	E-KP021+08	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP20+916	E-KP20+918	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP20+915	E-KP20+916	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP20+918	E-KP020+92	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP20+906	E-KP020+91	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP20+888	E-KP020+89	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP20+884	E-KP20+888	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP20+872	E-KP20+884	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP20+854	E-KP20+856	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP20+858	E-KP20+854	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP20+848	E-KP20+852	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP20+846	E-KP20+848	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP20+835	E-KP20+841	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP20+831	E-KP20+835	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP20+827	E-KP20+829	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP20+829	E-KP20+827	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP20+821	E-KP20+825	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)

Hynet Geohazards Desk Study

Hazard Title: Surface Water Flooding (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Ambiental Risk Analytics surface water (pluvial) Flood Map identifies areas likely to flood as a result of extreme rainfall events, i.e. land naturally vulnerable to surface water ponding or flooding. This data set was produced by simulating 1 in 30 year, 1 in 100 year, 1 in 250 year and 1 in 1,000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though some older ones may flood in a 1 in 5 year rainfall event.	Insufficient design, delay, excessive displacement, buoyancy, failure, instability of excavations, environmental impacts / pollution, maintenance / repair access issues.	Preferred Route Centreline - E	E-KP20+819	E-KP20+821	1 in 1000	2	4	8 (Minor)	Flood Risk Assessment to determine flood risk. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; raising ground levels, re-routing, anchoring to prevent buoyancy issues. - Designer to consider appropriate temporary and permanent drainage & flood defences	2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP20+817	E-KP20+819	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP20+813	E-KP20+817	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP20+807	E-KP20+809	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP20+803	E-KP20+805	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP20+797	E-KP20+803	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP20+795	E-KP20+797	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP20+601	E-KP20+615	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP20+193	E-KP20+197	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP20+182	E-KP20+184	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP20+178	E-KP20+182	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP20+176	E-KP20+178	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP20+061	E-KP20+065	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP19+964	E-KP019+97	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP19+915	E-KP19+917	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP19+913	E-KP19+915	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP19+911	E-KP19+913	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP19+909	E-KP19+911	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP19+905	E-KP19+907	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP19+907	E-KP19+909	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP19+903	E-KP19+905	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP19+905	E-KP19+905	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - E	E-KP21+413	E-KP21+422	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP07+694	N1-KP07+695	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP07+690	N1-KP07+694	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP07+688	N1-KP07+690	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP07+663	N1-KP07+665	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP07+684	N1-KP07+688	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP07+676	N1-KP07+684	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP07+665	N1-KP07+676	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP07+466	N1-KP07+464	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP07+052	N1-KP07+064	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP07+032	N1-KP07+030	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP06+355	N1-KP06+355	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP06+355	N1-KP06+353	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP06+298	N1-KP06+296	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP06+286	N1-KP06+266	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP06+284	N1-KP06+256	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP06+030	N1-KP06+033	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP06+057	N1-KP06+062	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP06+037	N1-KP06+050	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP05+922	N1-KP05+921	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP05+578	N1-KP05+579	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP05+560	N1-KP05+562	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP05+551	N1-KP05+551	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP04+916	N1-KP04+918	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP04+867	N1-KP04+873	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP04+603	N1-KP04+603	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP04+603	N1-KP04+603	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP04+616	N1-KP04+618	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP07+468	N1-KP06+896	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP06+317	N1-KP06+268	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP06+050	N1-KP06+037	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP05+579	N1-KP05+578	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP05+567	N1-KP05+486	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP05+438	N1-KP05+446	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Route Centreline - N1	N1-KP04+918	N1-KP04+898	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+466	N1-02-KP01+468	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+470	N1-02-KP01+472	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+474	N1-02-KP01+474	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+498	N1-02-KP01+500	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)

Hynet Geohazards Desk Study

Hazard Title: Surface Water Flooding (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Ambiental Risk Analytics surface water (pluvial) Flood Map identifies areas likely to flood as a result of extreme rainfall events, i.e. land naturally vulnerable to surface water ponding or flooding. This data set was produced by simulating 1 in 30 year, 1 in 100 year, 1 in 250 year and 1 in 1,000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though some older ones may flood in a 1 in 5 year rainfall event.	Insufficient design, delay, excessive displacement, buoyancy, failure, instability of excavations, environmental impacts / pollution, maintenance / repair access issues.	Preferred Spurs Centreline - N1-02	N1-02-KP01+500	N1-02-KP01+502	1 in 1000	2	4	8 (Minor)	Flood Risk Assessment to determine flood risk. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; raising ground levels, re-routing, anchoring to prevent buoyancy issues. - Designer to consider appropriate temporary and permanent drainage & flood defences	2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+502	N1-02-KP01+504	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+965	N1-02-KP00+968	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+962	N1-02-KP00+965	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+962	N1-02-KP00+962	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+957	N1-02-KP00+948	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+472	N1-02-KP01+494	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP06+100	N1-02-KP06+105	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP06+105	N1-02-KP06+109	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP06+066	N1-02-KP06+068	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP06+109	N1-02-KP06+110	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP06+055	N1-02-KP06+056	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP05+807	N1-02-KP05+807	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP05+795	N1-02-KP05+795	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+103	N1-02-KP03+105	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+751	N1-02-KP03+762	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+046	N1-02-KP03+047	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+038	N1-02-KP03+040	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+845	N1-02-KP03+847	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+030	N1-02-KP03+034	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+019	N1-02-KP03+021	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+027	N1-02-KP03+029	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+021	N1-02-KP03+018	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+829	N1-02-KP03+845	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+513	N1-02-KP03+515	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+001	N1-02-KP03+002	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+255	N1-02-KP03+257	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+023	N1-02-KP03+024	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+264	N1-02-KP03+266	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+260	N1-02-KP03+264	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+257	N1-02-KP03+260	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+457	N1-02-KP03+459	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+443	N1-02-KP03+445	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+422	N1-02-KP03+425	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+429	N1-02-KP03+431	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+002	N1-02-KP02+985	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+387	N1-02-KP03+378	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+937	N1-02-KP02+939	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+340	N1-02-KP03+353	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+913	N1-02-KP02+924	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+548	N1-02-KP03+422	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+881	N1-02-KP02+881	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+872	N1-02-KP02+875	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+868	N1-02-KP02+868	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+863	N1-02-KP02+864	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+857	N1-02-KP02+859	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+849	N1-02-KP02+848	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+834	N1-02-KP02+835	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+829	N1-02-KP02+824	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+835	N1-02-KP02+829	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+818	N1-02-KP02+820	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+799	N1-02-KP02+800	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+852	N1-02-KP02+844	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+781	N1-02-KP02+782	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+766	N1-02-KP02+768	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+924	N1-02-KP02+934	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+751	N1-02-KP02+756	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+734	N1-02-KP02+735	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+730	N1-02-KP02+730	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+717	N1-02-KP02+722	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+709	N1-02-KP02+710	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)

Hynet Geohazards Desk Study

Hazard Title: Surface Water Flooding (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Ambiental Risk Analytics surface water (pluvial) Flood Map identifies areas likely to flood as a result of extreme rainfall events, i.e. land naturally vulnerable to surface water ponding or flooding. This data set was produced by simulating 1 in 30 year, 1 in 100 year, 1 in 250 year and 1 in 1,000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though some older ones may flood in a 1 in 5 year rainfall event.	Insufficient design, delay, excessive displacement, buoyancy, failure, instability of excavations, environmental impacts / pollution, maintenance / repair access issues.	Preferred Spurs Centreline - N1-02	N1-02-KP02+698	N1-02-KP02+700	1 in 1000	2	4	8 (Minor)	Flood Risk Assessment to determine flood risk. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; raising ground levels, re-routing, anchoring to prevent buoyancy issues. - Designer to consider appropriate temporary and permanent drainage & flood defences	2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+700	N1-02-KP02+707	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+722	N1-02-KP02+709	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+692	N1-02-KP02+692	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+692	N1-02-KP02+692	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+685	N1-02-KP02+687	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+666	N1-02-KP02+673	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+662	N1-02-KP02+664	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+658	N1-02-KP02+660	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+664	N1-02-KP02+662	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+687	N1-02-KP02+685	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+646	N1-02-KP02+648	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+610	N1-02-KP02+610	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+592	N1-02-KP02+595	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+595	N1-02-KP02+597	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+584	N1-02-KP02+586	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+590	N1-02-KP02+588	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+575	N1-02-KP02+583	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+570	N1-02-KP02+574	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+563	N1-02-KP02+565	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+565	N1-02-KP02+570	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+559	N1-02-KP02+561	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+553	N1-02-KP02+554	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+548	N1-02-KP02+550	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+545	N1-02-KP02+548	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+554	N1-02-KP02+553	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+523	N1-02-KP02+525	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+541	N1-02-KP02+517	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+475	N1-02-KP02+477	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+460	N1-02-KP02+461	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+461	N1-02-KP02+463	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+464	N1-02-KP02+468	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+456	N1-02-KP02+456	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+468	N1-02-KP02+472	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+452	N1-02-KP02+454	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+444	N1-02-KP02+445	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+456	N1-02-KP02+452	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+440	N1-02-KP02+443	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+438	N1-02-KP02+440	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+436	N1-02-KP02+438	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+445	N1-02-KP02+444	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+429	N1-02-KP02+436	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+427	N1-02-KP02+427	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+228	N1-02-KP02+230	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+215	N1-02-KP02+215	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+173	N1-02-KP02+175	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+175	N1-02-KP02+179	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+154	N1-02-KP02+159	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+159	N1-02-KP02+163	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+168	N1-02-KP02+165	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+145	N1-02-KP02+149	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+119	N1-02-KP02+121	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+115	N1-02-KP02+107	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+072	N1-02-KP02+078	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+078	N1-02-KP02+080	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+048	N1-02-KP02+050	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+056	N1-02-KP02+054	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+028	N1-02-KP02+034	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+036	N1-02-KP02+037	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+002	N1-02-KP02+004	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+966	N1-02-KP01+968	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)

Hynet Geohazards Desk Study

Hazard Title: Surface Water Flooding (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	KP From	KP To	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Ambiental Risk Analytics surface water (pluvial) Flood Map identifies areas likely to flood as a result of extreme rainfall events, i.e. land naturally vulnerable to surface water ponding or flooding. This data set was produced by simulating 1 in 30 year, 1 in 100 year, 1 in 250 year and 1 in 1,000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though some older ones may flood in a 1 in 5 year rainfall event.	Insufficient design, delay, excessive displacement, buoyancy, failure, instability of excavations, environmental impacts / pollution, maintenance / repair access issues.	Preferred Spurs Centreline - N1-02	N1-02-KP02+037	N1-02-KP02+002	1 in 1000	2	4	8 (Minor)	Flood Risk Assessment to determine flood risk. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; raising ground levels, re-routing, anchoring to prevent buoyancy issues. - Designer to consider appropriate temporary and permanent drainage & flood defences	2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+643	N1-02-KP01+644	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+622	N1-02-KP01+624	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+629	N1-02-KP01+628	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+632	N1-02-KP01+629	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP06+056	N1-02-KP06+055	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP05+809	N1-02-KP05+795	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+762	N1-02-KP03+829	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+388	N1-02-KP03+376	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+353	N1-02-KP03+374	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+934	N1-02-KP02+937	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+881	N1-02-KP02+857	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+800	N1-02-KP02+781	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+768	N1-02-KP02+751	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+735	N1-02-KP02+730	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+653	N1-02-KP02+651	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+968	N1-02-KP01+966	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+238	N1-05-KP00+240	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+240	N1-05-KP00+244	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Preferred Spurs Centreline - N1-05	N1-05-KP00+244	N1-05-KP00+248	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)

RSK GEOSCIENCES

Hynet Geohazards Desk Study

Hazard Title: Surface Water Flooding (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	Closest KP	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Ambiental Risk Analytics surface water (pluvial) FloodMap identifies areas likely to flood as a result of extreme rainfall events, i.e. land naturally vulnerable to surface water ponding or flooding. This data set was produced by simulating 1 in 30 year, 1 in 100 year, 1 in 250 year and 1 in 1,000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though some older ones may flood in a 1 in 5 year rainfall event.	Insufficient design, delay, excessive displacement, buoyancy, failure, instability of excavations, environmental impacts / pollution, maintenance / repair access issues.	HAGI - Stanlow HPP HAGI	W-KP00	1 in 30	4	4	16 (Substantial)	Flood Risk Assessment to determine flood risk. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; raising ground levels, re-routing, anchoring to prevent buoyancy issues. - Designer to consider appropriate temporary and permanent drainage & flood defences	4	2	8 (Minor)
		HAGI - Higher Walton HAGI	N1-02-KP00	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		HAGI - Higher Walton HAGI	N1-05-KP00	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		HAGI - Warbuton HAGI	E-02-KP00	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		HAGI - Partington HAGI	E-05-KP00	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		HAGI - Runcorn HAGI	W-03-KP00	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		HAGI - Runcorn HAGI	W-02-KP00	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Stanlow	W-KP00	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - A5117 Road	W-KP02+000	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Sutton Weaver Canal	W-KP11+500	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Trent and Mersey Canal	S-KP01+500	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Weaver Navigation Canal	S-KP02+000	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - A556 Chester Road	S-KP08+500	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+000	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	S-KP11+500	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - River Dane	S-KP16+500	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - River Dane	S-KP16+000	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Trent and Mersey Canal	S-KP16+500	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - M56 Motorway	E-KP14+000	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - A56 Lymm Road	E-KP15+500	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Bridgewater Canal + road	E-KP15+500	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - River Bolin	E-KP17+000	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - M56 Motorway	N1-KP05+000	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+500	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - River Mersey, Sanky Canal + Skelton Junction to Ditton Junction Line	N1-KP13+000	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - A562 Widnes Road	N1-KP14+000	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - A562 Widnes Road	N1-KP13+500	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - A5080 South Lane Road	N1-KP14+500	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - A57 Warrington Road	N1-KP18+000	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - M62 Motorway	N2-04-KP00	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - M62 Motorway	N2-KP00	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - Weaver Navigation Canal	W-KP10+500	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - A557 Weston Point Expressway - Rocksavage Way	W-03-KP0+500	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - A6144 Manchester Road	E-05-KP00	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - West Coast Mainline Railway	N1-KP09+500	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		Trenchless Crossing - NULL	N1-02-KP02+000	1 in 30	4	4	16 (Substantial)		4	2	8 (Minor)
		HAGI - Stanlow HPP HAGI	<Null>	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		HAGI - Clockface HAGI	<Null>	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		HAGI - Higher Walton HAGI	<Null>	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		HAGI - Warbuton HAGI	<Null>	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		HAGI - Partington HAGI	<Null>	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		HAGI - Runcorn HAGI	<Null>	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - Stanlow	<Null>	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - A5117 Road	<Null>	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - River Weaver	<Null>	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - Sutton Weaver Canal	<Null>	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - Trent and Mersey Canal	<Null>	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - Weaver Navigation Canal	<Null>	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - A49 Warrington Road	<Null>	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - A556 Chester Road	<Null>	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	<Null>	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - River Dane	<Null>	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - M56 Motorway	<Null>	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - A56 Lymm Road	<Null>	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - Bridgewater Canal + road	<Null>	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - River Bolin	<Null>	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	<Null>	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - River Mersey, Sanky Canal + Skelton Junction to Ditton Junction Line	<Null>	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - A562 Widnes Road	<Null>	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - A5080 South Lane Road	<Null>	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - Manchester and Allerton Junction Line Railway	<Null>	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - A57 Warrington Road	<Null>	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - M62 Motorway	<Null>	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - A570 St Helens Linkway Road	<Null>	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)

Hynet Geohazards Desk Study

Hazard Title: Surface Water Flooding (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	Closest KP	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Ambiental Risk Analytics surface water (pluvial) FloodMap identifies areas likely to flood as a result of extreme rainfall events, i.e. land naturally vulnerable to surface water ponding or flooding. This data set was produced by simulating 1 in 30 year, 1 in 100 year, 1 in 250 year and 1 in 1,000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though some older ones may flood in a 1 in 5 year rainfall event.	Insufficient design, delay, excessive displacement, buoyancy, failure, instability of excavations, environmental impacts / pollution, maintenance / repair access issues.	Trenchless Crossing - Liverpool to Manchester Line Railway	<Null>	1 in 100	3	4	12 (Minor)	Flood Risk Assessment to determine flood risk. - Designer to consider appropriate engineering mitigation to facilitate temporary and permanent works; raising ground levels, re-routing, anchoring to prevent buoyancy issues. - Designer to consider appropriate temporary and permanent drainage & flood defences	3	2	6 (Minor)
		Trenchless Crossing - A557 Weston Point Expressway - Rocksavage Way	<Null>	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - A6144 Manchester Road	<Null>	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - West Coast Mainline Railway	<Null>	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		Trenchless Crossing - NULL	<Null>	1 in 100	3	4	12 (Minor)		3	2	6 (Minor)
		HAGI - Stanlow HPP HAGI	<Null>	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		HAGI - Runcorn HAGI	<Null>	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Stanlow	<Null>	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A5117 Road	<Null>	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Ellesmere Port to Warrington Line Railway	<Null>	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - River Weaver	<Null>	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - United Utilities Water	<Null>	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Sutton Weaver Canal	<Null>	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A56 Chester Road	<Null>	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - West Coast Main Line Railway	<Null>	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Weaver Navigation Canal	<Null>	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A557 Weston Point Expressway - Rocksavage Way	<Null>	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		HAGI - Central Hub HAGI	<Null>	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Trent and Mersey Canal	<Null>	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A49 Warrington Road	<Null>	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A556 Chester Road	<Null>	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Weaver River/West Coast Main Line Railway	<Null>	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A533 Road	<Null>	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - River Dane	<Null>	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Middlewich Branch Line Railway	<Null>	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A49 Tarporley Road	<Null>	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		HAGI - Clockface HAGI	<Null>	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - River Mersey, Sanky Canal + Skelton Junction to Ditton Junction Line	<Null>	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A562 Widnes Road	<Null>	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A5080 South Lane Road	<Null>	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Manchester and Allerton Junction Line Railway	<Null>	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A57 Warrington Road	<Null>	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - M62 Motorway	<Null>	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A570 St Helens Linkway Road	<Null>	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Liverpool to Manchester Line Railway	<Null>	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		HAGI - Higher Walton HAGI	<Null>	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		HAGI - Warbuton HAGI	<Null>	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		HAGI - Partington HAGI	<Null>	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - M6 Motorway	<Null>	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - M56 Motorway	<Null>	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A56 Lymm Road	<Null>	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Bridgewater Canal + road	<Null>	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - River Bolin	<Null>	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Bridgewater Canal	<Null>	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - West Coast Main Line and Manchester Ship Canal	<Null>	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - A6144 Manchester Road	<Null>	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - West Coast Mainline Railway	<Null>	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - Eastford Road and Canal	<Null>	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)
		Trenchless Crossing - NULL	<Null>	1 in 1000	2	4	8 (Minor)		2	2	4 (None / Negligible)

APPENDIX C
RISK ASSESSMENT TABLE – SUPERFICIAL GEOLOGY

RSK GEOSCIENCES

Hynet Geohazards Desk Study

Hazard Title: Superficial Geology (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Geological Unit / Formation	Nearest Project Infrastructure	KP From	KP To	Constraint Category
ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	Preferred Route Centreline - E	E-KP00+784	E-KP00+864	ALLUVIUM
ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	Preferred Route Centreline - S	S-KP15+309	S-KP15+366	ALLUVIUM
ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	Preferred Route Centreline - S	S-KP16+222	S-KP16+377	ALLUVIUM
ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	Preferred Route Centreline - S	S-KP17+489	S-KP17+532	ALLUVIUM
ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	Preferred Route Centreline - S	S-KP04+608	S-KP04+649	ALLUVIUM
ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	Preferred Route Centreline - S	S-KP01+977	S-KP02+800	ALLUVIUM
ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	Preferred Route Centreline - N1	N1-KP14+494	N1-KP14+502	ALLUVIUM
ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	Preferred Spurs Centreline - C-01	C-01-KP06+837	C-01-KP06+997	ALLUVIUM
ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	Preferred Spurs Centreline - N2-06	N2-06-KP00+445	N2-06-KP00+504	ALLUVIUM
ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	Preferred Route Centreline - W	W-KP16+864	W-KP17+143	ALLUVIUM
ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	Preferred Route Centreline - W	W-KP17+318	W-KP17+648	ALLUVIUM
ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	Preferred Route Centreline - E	E-KP07+161	E-KP07+222	ALLUVIUM
ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	Preferred Route Centreline - E	E-KP06+748	E-KP07+020	ALLUVIUM
ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	Preferred Route Centreline - E	E-KP06+052	E-KP06+329	ALLUVIUM
ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	Preferred Route Centreline - E	E-KP20+125	E-KP20+177	ALLUVIUM
ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	Preferred Route Centreline - E	E-KP19+897	E-KP19+961	ALLUVIUM
ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	Preferred Route Centreline - E	E-KP16+882	E-KP17+107	ALLUVIUM
ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	Preferred Route Centreline - S	S-KP11+071	S-KP11+103	ALLUVIUM
ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	Preferred Route Centreline - S	S-KP11+234	S-KP11+333	ALLUVIUM
ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	Preferred Route Centreline - S	S-KP16+081	S-KP16+125	ALLUVIUM
ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	Preferred Spurs Centreline - E-01	E-01-KP00+363	E-01-KP00+430	ALLUVIUM
ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	Preferred Spurs Centreline - E-01	E-01-KP00+438	E-01-KP00+454	ALLUVIUM
ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	Preferred Spurs Centreline - N2-06	N2-06-KP00+881	N2-06-KP00+962	ALLUVIUM
ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	Preferred Spurs Centreline - N2-06	N2-06-KP00+774	N2-06-KP00+873	ALLUVIUM
GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Preferred Route Centreline - W	W-KP17+648	W-KP18+339	GLACIOFLUVIAL DEPOSITS, DEVENSIAN
GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Preferred Route Centreline - W	W-KP11+351	W-KP15+131	GLACIOFLUVIAL DEPOSITS, DEVENSIAN
GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Preferred Route Centreline - E	E-KP02+202	E-KP02+498	GLACIOFLUVIAL DEPOSITS, DEVENSIAN
GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Preferred Route Centreline - E	E-KP06+446	E-KP06+671	GLACIOFLUVIAL DEPOSITS, DEVENSIAN
GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Preferred Route Centreline - E	E-KP03+653	E-KP04+519	GLACIOFLUVIAL DEPOSITS, DEVENSIAN
GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Preferred Route Centreline - S	S-KP04+649	S-KP04+765	GLACIOFLUVIAL DEPOSITS, DEVENSIAN
GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Preferred Route Centreline - S	S-KP00+978	S-KP01+196	GLACIOFLUVIAL DEPOSITS, DEVENSIAN
GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Preferred Spurs Centreline - C-01	C-01-KP05+347	C-01-KP05+510	GLACIOFLUVIAL DEPOSITS, DEVENSIAN
GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Preferred Spurs Centreline - C-01	C-01-KP03+757	C-01-KP04+007	GLACIOFLUVIAL DEPOSITS, DEVENSIAN
GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Preferred Spurs Centreline - C-01	C-01-KP00+487	C-01-KP00+761	GLACIOFLUVIAL DEPOSITS, DEVENSIAN
GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Preferred Spurs Centreline - W-01	W-01-KP00+458	W-01-KP00+866	GLACIOFLUVIAL DEPOSITS, DEVENSIAN
GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Preferred Route Centreline - S	S-KP15+997	S-KP16+049	GLACIOFLUVIAL DEPOSITS, DEVENSIAN
GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Preferred Route Centreline - S	S-KP15+463	S-KP15+947	GLACIOFLUVIAL DEPOSITS, DEVENSIAN
GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Preferred Route Centreline - S	S-KP11+407	S-KP12+531	GLACIOFLUVIAL DEPOSITS, DEVENSIAN
GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Preferred Route Centreline - S	S-KP12+945	S-KP14+063	GLACIOFLUVIAL DEPOSITS, DEVENSIAN
GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Preferred Route Centreline - S	S-KP00+495	S-KP00+779	GLACIOFLUVIAL DEPOSITS, DEVENSIAN
GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Preferred Route Centreline - S	S-KP01+461	S-KP01+822	GLACIOFLUVIAL DEPOSITS, DEVENSIAN
GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Preferred Route Centreline - S	S-KP06+555	S-KP06+977	GLACIOFLUVIAL DEPOSITS, DEVENSIAN
GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Preferred Route Centreline - S	S-KP06+998	S-KP07+192	GLACIOFLUVIAL DEPOSITS, DEVENSIAN
GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Preferred Route Centreline - S	S-KP07+236	S-KP07+265	GLACIOFLUVIAL DEPOSITS, DEVENSIAN
GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Preferred Route Centreline - S	S-KP07+521	S-KP08+786	GLACIOFLUVIAL DEPOSITS, DEVENSIAN
GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Preferred Route Centreline - S	S-KP08+940	S-KP09+769	GLACIOFLUVIAL DEPOSITS, DEVENSIAN
GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Preferred Route Centreline - W	W-KP17+143	W-KP17+318	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN
GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Preferred Route Centreline - E	E-KP015+96	E-KP16+692	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN
GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Preferred Route Centreline - S	S-KP02+800	S-KP03+505	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN
GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Preferred Route Centreline - S	S-KP01+822	S-KP01+977	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN
GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Preferred Spurs Centreline - C-01	C-01-KP07+487	C-01-KP07+966	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN
GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Preferred Spurs Centreline - C-01	C-01-KP07+059	C-01-KP07+199	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN
GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Preferred Spurs Centreline - E-04	E-04-KP00+000	E-04-KP00+261	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN
GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Preferred Spurs Centreline - E-05	E-05-KP00+000	E-05-KP00+124	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN
GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Preferred Route Centreline - E	E-KP21+500	E-KP21+662	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN
GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Preferred Route Centreline - E	E-KP21+058	E-KP21+123	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN
GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Preferred Route Centreline - E	E-KP20+177	E-KP20+728	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN
GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Preferred Route Centreline - E	E-KP19+961	E-KP20+125	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN
GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Preferred Route Centreline - E	E-KP19+741	E-KP19+897	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN
GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Preferred Route Centreline - E	E-KP18+998	E-KP19+614	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN
GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Preferred Route Centreline - E	E-KP17+107	E-KP17+571	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN
GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Preferred Route Centreline - S	S-KP11+013	S-KP11+071	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN

RSK GEOSCIENCES

Hynet Geohazards Desk Study

Hazard Title: Superficial Geology (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Geological Unit / Formation	Nearest Project Infrastructure	KP From	KP To	Constraint Category
GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Preferred Route Centreline - S	S-KP11+103	S-KP11+234	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN
GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Preferred Spurs Centreline - N1-02	N1-02-KP05+716	N1-02-KP05+813	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN
GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Preferred Spurs Centreline - N1-02	N1-02-KP04+888	N1-02-KP05+664	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN
GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Preferred Spurs Centreline - N1-02	N1-02-KP03+275	N1-02-KP04+682	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN
GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Preferred Spurs Centreline - E-01	E-01-KP00+430	E-01-KP00+438	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN
GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Preferred Spurs Centreline - E-01	E-01-KP00+000	E-01-KP00+363	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN
PEAT - PEAT	Preferred Route Centreline - E	E-KP09+541	E-KP09+728	PEAT
PEAT - PEAT	Preferred Route Centreline - E	E-KP09+728	E-KP10+524	PEAT
PEAT - PEAT	Preferred Route Centreline - E	E-KP21+123	E-KP21+500	PEAT
PEAT - PEAT	Preferred Route Centreline - E	E-KP20+728	E-KP21+058	PEAT
PEAT - PEAT	Preferred Route Centreline - S	S-KP08+786	S-KP08+940	PEAT
PEAT - PEAT	Preferred Spurs Centreline - E-04	E-04-KP00+261	E-04-KP00+588	PEAT
RIVER TERRACE DEPOSITS (UNDIFFERENTIATED) - SAND AND GRAVEL	Preferred Route Centreline - E	E-KP16+692	E-KP16+882	RIVER TERRACE DEPOSITS (UNDIFFERENTIATED)
RIVER TERRACE DEPOSITS (UNDIFFERENTIATED) - SAND AND GRAVEL	Preferred Route Centreline - S	S-KP16+173	S-KP16+222	RIVER TERRACE DEPOSITS (UNDIFFERENTIATED)
RIVER TERRACE DEPOSITS (UNDIFFERENTIATED) - SAND AND GRAVEL	Preferred Route Centreline - S	S-KP16+377	S-KP16+544	RIVER TERRACE DEPOSITS (UNDIFFERENTIATED)
RIVER TERRACE DEPOSITS, 1 - SAND AND GRAVEL	Preferred Route Centreline - S	S-KP16+125	S-KP16+173	RIVER TERRACE DEPOSITS, 1
SHIRDLEY HILL SAND FORMATION - SAND	Preferred Route Centreline - E	E-KP15+123	E-KP015+96	SHIRDLEY HILL SAND FORMATION
SHIRDLEY HILL SAND FORMATION - SAND	Preferred Route Centreline - N1	N1-KP12+963	N1-KP13+645	SHIRDLEY HILL SAND FORMATION
SHIRDLEY HILL SAND FORMATION - SAND	Preferred Route Centreline - N1	N1-KP14+972	N1-KP15+136	SHIRDLEY HILL SAND FORMATION
SHIRDLEY HILL SAND FORMATION - SAND	Preferred Spurs Centreline - N1-02	N1-02-KP04+682	N1-02-KP04+888	SHIRDLEY HILL SAND FORMATION
SHIRDLEY HILL SAND FORMATION - SAND	Preferred Spurs Centreline - E-02	E-02-KP00+000	E-02-KP00+155	SHIRDLEY HILL SAND FORMATION
SHIRDLEY HILL SAND FORMATION - SAND	Preferred Route Centreline - E	E-KP19+614	E-KP19+741	SHIRDLEY HILL SAND FORMATION
SHIRDLEY HILL SAND FORMATION - SAND	Preferred Route Centreline - E	E-KP17+571	E-KP18+998	SHIRDLEY HILL SAND FORMATION
SHIRDLEY HILL SAND FORMATION - SAND	Preferred Route Centreline - N1	N1-KP10+338	N1-KP011+48	SHIRDLEY HILL SAND FORMATION
SHIRDLEY HILL SAND FORMATION - SAND	Preferred Route Centreline - N1	N1-KP09+147	N1-KP09+305	SHIRDLEY HILL SAND FORMATION
SHIRDLEY HILL SAND FORMATION - SAND	Preferred Route Centreline - N1	N1-KP08+078	N1-KP09+094	SHIRDLEY HILL SAND FORMATION
TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	Preferred Route Centreline - W	W-KP02+292	W-KP11+305	TIDAL FLAT DEPOSITS
TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	Preferred Spurs Centreline - N1-05	N1-05-KP00+000	N1-05-KP00+677	TIDAL FLAT DEPOSITS
TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	Preferred Route Centreline - N1	N1-KP011+48	N1-KP12+526	TIDAL FLAT DEPOSITS
TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	Preferred Route Centreline - N1	N1-KP09+305	N1-KP10+338	TIDAL FLAT DEPOSITS
TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	Preferred Spurs Centreline - N1-02	N1-02-KP05+813	N1-02-KP06+110	TIDAL FLAT DEPOSITS
TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	Preferred Spurs Centreline - N1-02	N1-02-KP05+664	N1-02-KP05+716	TIDAL FLAT DEPOSITS
TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	Preferred Spurs Centreline - N1-02	N1-02-KP00+000	N1-02-KP03+275	TIDAL FLAT DEPOSITS
TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	Preferred Spurs Centreline - W-01	W-01-KP01+073	W-01-KP01+201	TIDAL FLAT DEPOSITS
TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	Preferred Spurs Centreline - W-01	W-01-KP00+000	W-01-KP00+458	TIDAL FLAT DEPOSITS
TILL, DEVENSIAN - DIAMICTON	Preferred Route Centreline - W	W-KP01+748	W-KP02+292	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Route Centreline - W	W-KP15+209	W-KP15+366	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Route Centreline - E	E-KP10+524	E-KP11+249	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Route Centreline - S	S-KP03+616	S-KP03+662	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Spurs Centreline - C-01	C-01-KP07+215	C-01-KP07+487	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Spurs Centreline - W-03	W-03-KP01+834	W-03-KP01+948	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Spurs Centreline - N2-04	N2-04-KP00+000	N2-04-KP02+035	TILL, DEVENSIAN
TILL, DEVENSIAN - CLAY, SANDY, GRAVELLY, COBBLY	Preferred Spurs Centreline - N2-06	N2-KP06+129	N2-06-KP00+436	TILL, DEVENSIAN
TILL, DEVENSIAN - CLAY, SANDY, GRAVELLY, COBBLY	Preferred Spurs Centreline - N2-07	N2-KP06+129	N2-07-KP00+157	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Spurs Centreline - W-02	W-02-KP00+044	W-02-KP00+112	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Route Centreline - W	W-KP00+093	W-KP01+748	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Route Centreline - W	W-KP00+000	W-KP00+059	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Route Centreline - E	E-KP08+810	E-KP09+541	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Route Centreline - E	E-KP07+222	E-KP08+731	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Route Centreline - E	E-KP07+020	E-KP07+161	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Route Centreline - E	E-KP06+671	E-KP06+748	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Route Centreline - E	E-KP05+051	E-KP06+052	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Route Centreline - E	E-KP06+329	E-KP06+446	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Route Centreline - E	E-KP03+495	E-KP03+653	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Route Centreline - E	E-KP02+498	E-KP03+168	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Route Centreline - E	E-KP01+584	E-KP02+202	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Route Centreline - E	E-KP14+722	E-KP15+123	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Route Centreline - E	E-KP12+929	E-KP14+681	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Route Centreline - S	S-KP06+977	S-KP06+998	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Route Centreline - S	S-KP07+192	S-KP07+236	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Route Centreline - S	S-KP07+265	S-KP07+521	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Route Centreline - S	S-KP011+36	S-KP11+407	TILL, DEVENSIAN

Hynet Geohazards Desk Study

Hazard Title: Superficial Geology (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Geological Unit / Formation	Nearest Project Infrastructure	KP From	KP To	Constraint Category
TILL, DEVENSIAN - DIAMICTON	Preferred Route Centreline - S	S-KP12+531	S-KP12+945	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Route Centreline - S	S-KP16+049	S-KP16+081	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Route Centreline - S	S-KP15+947	S-KP15+997	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Route Centreline - S	S-KP14+063	S-KP15+309	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Route Centreline - S	S-KP15+366	S-KP15+463	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Route Centreline - S	S-KP17+532	S-KP18+444	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Route Centreline - S	S-KP16+544	S-KP17+489	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Route Centreline - S	S-KP03+662	S-KP04+608	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Route Centreline - S	S-KP04+765	S-KP06+555	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Route Centreline - S	S-KP09+769	S-KP11+013	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Route Centreline - S	S-KP00+779	S-KP00+978	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Route Centreline - S	S-KP01+196	S-KP01+461	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Route Centreline - N1	N1-KP07+682	N1-KP07+930	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Route Centreline - N1	N1-KP07+168	N1-KP07+652	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Route Centreline - N1	N1-KP06+159	N1-KP06+986	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Route Centreline - N1	N1-KP05+685	N1-KP06+115	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Route Centreline - N1	N1-KP02+659	N1-KP05+004	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Route Centreline - N1	N1-KP01+579	N1-KP02+301	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Route Centreline - N1	N1-KP15+136	N1-KP19+023	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Route Centreline - N1	N1-KP14+502	N1-KP14+972	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Route Centreline - N1	N1-KP13+645	N1-KP14+494	TILL, DEVENSIAN
TILL, DEVENSIAN - CLAY, SANDY, GRAVELLY, COBBLY	Preferred Route Centreline - N2	N2-KP05+948	N2-KP06+129	TILL, DEVENSIAN
TILL, DEVENSIAN - CLAY, SANDY, GRAVELLY, COBBLY	Preferred Route Centreline - N2	N2-KP05+848	N2-KP05+864	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Route Centreline - N2	N2-KP05+841	N2-KP05+848	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Route Centreline - N2	N2-KP03+316	N2-KP05+066	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Route Centreline - N2	N2-KP00+000	N2-KP03+135	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Spurs Centreline - C-01	C-01-KP06+997	C-01-KP07+059	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Spurs Centreline - C-01	C-01-KP07+199	C-01-KP07+215	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Spurs Centreline - C-01	C-01-KP00+846	C-01-KP03+757	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Spurs Centreline - C-01	C-01-KP04+007	C-01-KP05+347	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Spurs Centreline - C-01	C-01-KP05+510	C-01-KP06+837	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Spurs Centreline - N2-06	N2-06-KP00+962	N2-06-KP01+199	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Spurs Centreline - N2-06	N2-06-KP00+873	N2-06-KP00+881	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Spurs Centreline - N2-06	N2-06-KP00+633	N2-06-KP00+774	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Spurs Centreline - N2-06	N2-06-KP00+436	N2-06-KP00+445	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Spurs Centreline - N2-06	N2-06-KP00+504	N2-06-KP00+633	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Spurs Centreline - W-01	W-01-KP01+201	W-01-KP01+464	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Preferred Spurs Centreline - W-01	W-01-KP00+866	W-01-KP01+073	TILL, DEVENSIAN

Hynet Geohazards Desk Study

Hazard Title: Superficial Geology (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Geological Unit / Formation	Nearest Project Infrastructure	Closest KP	Constraint Category
GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Block Vlave - NULL	S-KP08+500	GLACIOFLUVIAL DEPOSITS, DEVENSIAN
ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	HAGI - Stanlow HPP HAGI	W-KP00	ALLUVIUM
TILL, DEVENSIAN - DIAMICTON	HAGI - Stanlow HPP HAGI	W-KP00	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	HAGI - Stanlow HPP HAGI	W-KP00	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	HAGI - Clockface HAGI	N2-KP00	TILL, DEVENSIAN
TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	HAGI - Rocksavage HAGI	W-01-KP00	TIDAL FLAT DEPOSITS
TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	HAGI - Higher Walton HAGI	N1-05-KP00	TIDAL FLAT DEPOSITS
SHIRDLEY HILL SAND FORMATION - SAND	HAGI - Warbuton HAGI	E-02-KP00	SHIRDLEY HILL SAND FORMATION
GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	HAGI - Partington HAGI	E-01-KP00	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	HAGI - Runcorn HAGI	W-03-KP00	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	HAGI - Inoyvn Gas Storage HAGI	S-KP18+000	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	HAGI - Stanlow HPP HAGI	W-KP00	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Trench Crossing - A5117 Road	W-KP01+500	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Trench Crossing - A5117 Road	W-KP02+000	TILL, DEVENSIAN
TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	Trench Crossing - Ellesmere Port to Warrington Line Railway	W-KP03+000	TIDAL FLAT DEPOSITS
TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	Trench Crossing - River Weaver	W-KP10+000	TIDAL FLAT DEPOSITS
TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	Trench Crossing - United Utilities Water	W-KP10+500	TIDAL FLAT DEPOSITS
TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	Trench Crossing - Chester to Manchester Line Railway	W-KP11+000	TIDAL FLAT DEPOSITS
TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	Trench Crossing - Sutton Weaver Canal	W-KP11+000	TIDAL FLAT DEPOSITS
GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Trench Crossing - United Utilities Sewer	W-KP11+500	GLACIOFLUVIAL DEPOSITS, DEVENSIAN
GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Trench Crossing - A56 Chester Road	W-KP12+000	GLACIOFLUVIAL DEPOSITS, DEVENSIAN
GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Trench Crossing - Trent and Mersey Canal	W-KP18+000	GLACIOFLUVIAL DEPOSITS, DEVENSIAN
GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Trench Crossing - A533 Northwich Road	C-01-KP0+500	GLACIOFLUVIAL DEPOSITS, DEVENSIAN
GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Trench Crossing - Trent and Mersey Canal	S-KP01+500	GLACIOFLUVIAL DEPOSITS, DEVENSIAN
ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	Trench Crossing - Weaver Navigation Canal	S-KP02+000	ALLUVIUM
TILL, DEVENSIAN - DIAMICTON	Trench Crossing - West Coast Main Line Railway	S-KP04+500	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Trench Crossing - A49 Warrington Road	S-KP06+000	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Trench Crossing - Mid Cheshire Line Railway	S-KP07+000	TILL, DEVENSIAN
GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Trench Crossing - Mid Cheshire Line Railway	S-KP07+000	GLACIOFLUVIAL DEPOSITS, DEVENSIAN
GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Trench Crossing - A556 Chester Road	S-KP08+500	GLACIOFLUVIAL DEPOSITS, DEVENSIAN
GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Trench Crossing - Weaver River/West Coast Main Line Railway	S-KP11+500	GLACIOFLUVIAL DEPOSITS, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Trench Crossing - Weaver River/West Coast Main Line Railway	S-KP11+500	TILL, DEVENSIAN
ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	Trench Crossing - Weaver River/West Coast Main Line Railway	S-KP11+000	ALLUVIUM
TILL, DEVENSIAN - DIAMICTON	Trench Crossing - A533 Road	S-KP15+000	TILL, DEVENSIAN
ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	Trench Crossing - River Dane	S-KP16+500	ALLUVIUM
RIVER TERRACE DEPOSITS (UNDIFFERENTIATED) - SAND AND GRAVEL	Trench Crossing - Trent and Mersey Canal	S-KP16+500	RIVER TERRACE DEPOSITS (UNDIFFERENTIATED)
TILL, DEVENSIAN - DIAMICTON	Trench Crossing - Trent and Mersey Canal	S-KP16+500	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Trench Crossing - Middlewich Branch Line Railway	S-KP17+500	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Trench Crossing - A530 King Street Road	S-KP18+000	TILL, DEVENSIAN
GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Trench Crossing - A559 Northwich Road	E-KP04+000	GLACIOFLUVIAL DEPOSITS, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Trench Crossing - M6 Motorway	E-KP09+500	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Trench Crossing - M56 Motorway	E-KP14+000	TILL, DEVENSIAN
SHIRDLEY HILL SAND FORMATION - SAND	Trench Crossing - A56 Lymm Road	E-KP15+500	SHIRDLEY HILL SAND FORMATION
SHIRDLEY HILL SAND FORMATION - SAND	Trench Crossing - Bridgewater Canal + road	E-KP15+500	SHIRDLEY HILL SAND FORMATION
ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	Trench Crossing - River Bolin	E-KP17+000	ALLUVIUM
TILL, DEVENSIAN - DIAMICTON	Trench Crossing - M56 Motorway	N1-KP05+000	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Trench Crossing - A56 Chester Road	N1-KP08+000	TILL, DEVENSIAN
SHIRDLEY HILL SAND FORMATION - SAND	Trench Crossing - Bridgewater Canal	N1-KP08+500	SHIRDLEY HILL SAND FORMATION
TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	Trench Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+500	TIDAL FLAT DEPOSITS
SHIRDLEY HILL SAND FORMATION - SAND	Trench Crossing - River Mersey, Sanky Canal + Skelton Junction to Ditton Junction Line	N1-KP12+500	SHIRDLEY HILL SAND FORMATION
TILL, DEVENSIAN - DIAMICTON	Trench Crossing - A562 Widnes Road	N1-KP13+500	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Trench Crossing - A5080 South Lane Road	N1-KP14+500	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Trench Crossing - Manchester and Allerton Junction Line Railway	N1-KP15+000	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Trench Crossing - A57 Warrington Road	N1-KP18+000	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Trench Crossing - M62 Motorway	N2-04-KP00	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Trench Crossing - A570 St Helens Linkway Road	N2-KP01+500	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Trench Crossing - Liverpool to Manchester Line Railway	N2-KP02+500	TILL, DEVENSIAN
TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	Trench Crossing - Weaver Navigation Canal	W-KP10+500	TIDAL FLAT DEPOSITS
GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Trench Crossing - A6144 Manchester Road	E-05-KP00	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN
ALLUVIUM - CLAY, SILT, SAND AND GRAVEL	Trench Crossing - A6144 Manchester Road	E-05-KP00	ALLUVIUM
TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	Trench Crossing - West Coast Mainline Railway	N1-05-KP0+500	TIDAL FLAT DEPOSITS
TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	Trench Crossing - Eastford Road and Canal	N1-02-KP01+500	TIDAL FLAT DEPOSITS

Hynet Geohazards Desk Study

Hazard Title: Superficial Geology (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Geological Unit / Formation	Nearest Project Infrastructure	Closest KP	Constraint Category
GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Trench Crossing - London Road	S-KP15+500	GLACIOFLUVIAL DEPOSITS, DEVENSIAN
TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	Trench Crossing - NULL	N1-02-KP02+000	TIDAL FLAT DEPOSITS
TILL, DEVENSIAN - DIAMICTON	Trench Crossing - Stanlow	W-KP00	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Trench Crossing - Stanlow	W-KP00	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Trench Crossing - Stanlow	W-KP00	TILL, DEVENSIAN
GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Trench Crossing - Weaver River/West Coast Main Line Railway	S-KP11+000	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN
GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL	Trench Crossing - Weaver River/West Coast Main Line Railway	S-KP11+000	GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Trench Crossing - Weaver River/West Coast Main Line Railway	S-KP11+000	TILL, DEVENSIAN
TILL, DEVENSIAN - DIAMICTON	Trench Crossing - Weaver River/West Coast Main Line Railway	S-KP11+000	TILL, DEVENSIAN
TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	Trench Crossing - River Mersey, Sanky Canal + Skelton Junction to Ditton Junction Line	N1-KP12+500	TIDAL FLAT DEPOSITS
TIDAL FLAT DEPOSITS - CLAY, SILT AND SAND	Trench Crossing - River Mersey, Sanky Canal + Skelton Junction to Ditton Junction Line	N1-KP12+500	TIDAL FLAT DEPOSITS

APPENDIX C
RISK ASSESSMENT TABLE – BEDROCK GEOLOGY

RSK GEOSCIENCES

Hynet Geohazards Desk Study

Hazard Title: Bedrock Geology (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Geological Unit / Formation	Nearest Project Infrastructure	KP From	KP To	Constraint Category
KINNERTON SANDSTONE FORMATION - SANDSTONE	Preferred Route Centreline - W	W-KP01+669	W-KP01+748	KINNERTON SANDSTONE FORMATION - SANDSTONE
CHESTER FORMATION - SANDSTONE, PEBBLY (GRAVELLY)	Preferred Route Centreline - W	W-KP00+000	W-KP01+669	CHESTER FORMATION - SANDSTONE, PEBBLY (GRAVELLY)
CHESTER FORMATION - SANDSTONE, PEBBLY (GRAVELLY)	Preferred Route Centreline - W	W-KP03+551	W-KP04+909	CHESTER FORMATION - SANDSTONE, PEBBLY (GRAVELLY)
TARPORLEY SILTSTONE FORMATION - SILTSTONE, MUDSTONE AND SANDSTONE	Preferred Route Centreline - W	W-KP09+573	W-KP10+156	TARPORLEY SILTSTONE FORMATION - SILTSTONE, MUDSTONE AND SANDSTONE
HELSBY SANDSTONE FORMATION - SANDSTONE, PEBBLY (GRAVELLY)	Preferred Route Centreline - W	W-KP09+181	W-KP09+573	HELSBY SANDSTONE FORMATION - SANDSTONE, PEBBLY (GRAVELLY)
HELSBY SANDSTONE FORMATION - SANDSTONE, PEBBLY (GRAVELLY)	Preferred Route Centreline - W	W-KP08+439	W-KP09+181	HELSBY SANDSTONE FORMATION - SANDSTONE, PEBBLY (GRAVELLY)
KINNERTON SANDSTONE FORMATION - SANDSTONE	Preferred Route Centreline - W	W-KP01+748	W-KP03+551	KINNERTON SANDSTONE FORMATION - SANDSTONE
CHESTER FORMATION - SANDSTONE, PEBBLY (GRAVELLY)	Preferred Route Centreline - W	W-KP06+530	W-KP06+608	CHESTER FORMATION - SANDSTONE, PEBBLY (GRAVELLY)
WILMSLOW SANDSTONE FORMATION - SANDSTONE	Preferred Route Centreline - W	W-KP08+371	W-KP08+439	WILMSLOW SANDSTONE FORMATION - SANDSTONE
BOLLIN MUDSTONE MEMBER - MUDSTONE	Preferred Route Centreline - W	W-KP10+156	W-KP19+303	BOLLIN MUDSTONE MEMBER - MUDSTONE
BOLLIN MUDSTONE MEMBER - MUDSTONE	Preferred Route Centreline - E	E-KP04+158	E-KP09+728	BOLLIN MUDSTONE MEMBER - MUDSTONE
BOLLIN MUDSTONE MEMBER - MUDSTONE	Preferred Route Centreline - E	E-KP09+728	E-KP013+77	BOLLIN MUDSTONE MEMBER - MUDSTONE
WILMSLOW SANDSTONE FORMATION - SANDSTONE	Preferred Route Centreline - E	E-KP17+571	E-KP18+128	WILMSLOW SANDSTONE FORMATION - SANDSTONE
NORTHWICH HALITE MEMBER - HALITE-STONE AND MUDSTONE	Preferred Route Centreline - E	E-KP15+295	E-KP16+991	NORTHWICH HALITE MEMBER - HALITE-STONE AND MUDSTONE
HELSBY SANDSTONE FORMATION - SANDSTONE, PEBBLY (GRAVELLY)	Preferred Route Centreline - E	E-KP17+315	E-KP17+571	HELSBY SANDSTONE FORMATION - SANDSTONE, PEBBLY (GRAVELLY)
HELSBY SANDSTONE FORMATION - SANDSTONE, PEBBLY (GRAVELLY)	Preferred Route Centreline - E	E-KP14+722	E-KP15+295	HELSBY SANDSTONE FORMATION - SANDSTONE, PEBBLY (GRAVELLY)
TARPORLEY SILTSTONE FORMATION - SILTSTONE, MUDSTONE AND SANDSTONE	Preferred Route Centreline - E	E-KP013+77	E-KP14+722	TARPORLEY SILTSTONE FORMATION - SILTSTONE, MUDSTONE AND SANDSTONE
BOLLIN MUDSTONE MEMBER - MUDSTONE	Preferred Route Centreline - E	E-KP18+128	E-KP18+698	BOLLIN MUDSTONE MEMBER - MUDSTONE
TARPORLEY SILTSTONE FORMATION - SILTSTONE, MUDSTONE AND SANDSTONE	Preferred Route Centreline - E	E-KP18+698	E-KP19+991	TARPORLEY SILTSTONE FORMATION - SILTSTONE, MUDSTONE AND SANDSTONE
HELSBY SANDSTONE FORMATION - SANDSTONE, PEBBLY (GRAVELLY)	Preferred Route Centreline - E	E-KP19+991	E-KP21+062	HELSBY SANDSTONE FORMATION - SANDSTONE, PEBBLY (GRAVELLY)
BOLLIN MUDSTONE MEMBER - MUDSTONE	Preferred Route Centreline - E	E-KP16+991	E-KP17+315	BOLLIN MUDSTONE MEMBER - MUDSTONE
BOLLIN MUDSTONE MEMBER - MUDSTONE	Preferred Route Centreline - E	E-KP00+000	E-KP04+158	BOLLIN MUDSTONE MEMBER - MUDSTONE
WILMSLOW SANDSTONE FORMATION - SANDSTONE	Preferred Route Centreline - E	E-KP21+062	E-KP21+662	WILMSLOW SANDSTONE FORMATION - SANDSTONE
SIDMOUTH MUDSTONE FORMATION - MUDSTONE	Preferred Route Centreline - S	S-KP017+65	S-KP18+444	SIDMOUTH MUDSTONE FORMATION - MUDSTONE
NORTHWICH HALITE MEMBER - HALITE-STONE AND MUDSTONE	Preferred Route Centreline - S	S-KP13+274	S-KP16+173	NORTHWICH HALITE MEMBER - HALITE-STONE AND MUDSTONE
NORTHWICH HALITE MEMBER - HALITE-STONE AND MUDSTONE	Preferred Route Centreline - S	S-KP16+173	S-KP017+65	NORTHWICH HALITE MEMBER - HALITE-STONE AND MUDSTONE
BOLLIN MUDSTONE MEMBER - MUDSTONE	Preferred Route Centreline - S	S-KP03+662	S-KP13+274	BOLLIN MUDSTONE MEMBER - MUDSTONE
BOLLIN MUDSTONE MEMBER - MUDSTONE	Preferred Route Centreline - S	S-KP00+000	S-KP03+662	BOLLIN MUDSTONE MEMBER - MUDSTONE
KINNERTON SANDSTONE FORMATION - SANDSTONE	Preferred Route Centreline - N1	N1-KP17+545	N1-KP18+297	KINNERTON SANDSTONE FORMATION - SANDSTONE
KINNERTON SANDSTONE FORMATION - SANDSTONE	Preferred Route Centreline - N1	N1-KP17+109	N1-KP17+545	KINNERTON SANDSTONE FORMATION - SANDSTONE
KINNERTON SANDSTONE FORMATION - SANDSTONE	Preferred Route Centreline - N1	N1-KP18+681	N1-KP19+023	KINNERTON SANDSTONE FORMATION - SANDSTONE
KINNERTON SANDSTONE FORMATION - SANDSTONE	Preferred Route Centreline - N1	N1-KP18+297	N1-KP18+681	KINNERTON SANDSTONE FORMATION - SANDSTONE
TARPORLEY SILTSTONE FORMATION - SILTSTONE, MUDSTONE AND SANDSTONE	Preferred Route Centreline - N1	N1-KP07+512	N1-KP07+865	TARPORLEY SILTSTONE FORMATION - SILTSTONE, MUDSTONE AND SANDSTONE
HELSBY SANDSTONE FORMATION - SANDSTONE, PEBBLY (GRAVELLY)	Preferred Route Centreline - N1	N1-KP08+708	N1-KP09+747	HELSBY SANDSTONE FORMATION - SANDSTONE, PEBBLY (GRAVELLY)
WILMSLOW SANDSTONE FORMATION - SANDSTONE	Preferred Route Centreline - N1	N1-KP12+526	N1-KP12+569	WILMSLOW SANDSTONE FORMATION - SANDSTONE
WILMSLOW SANDSTONE FORMATION - SANDSTONE	Preferred Route Centreline - N1	N1-KP13+308	N1-KP14+037	WILMSLOW SANDSTONE FORMATION - SANDSTONE
WILMSLOW SANDSTONE FORMATION - SANDSTONE	Preferred Route Centreline - N1	N1-KP14+037	N1-KP14+142	WILMSLOW SANDSTONE FORMATION - SANDSTONE
CHESTER FORMATION - SANDSTONE, PEBBLY (GRAVELLY)	Preferred Route Centreline - N1	N1-KP14+142	N1-KP14+601	CHESTER FORMATION - SANDSTONE, PEBBLY (GRAVELLY)
WILMSLOW SANDSTONE FORMATION - SANDSTONE	Preferred Route Centreline - N1	N1-KP14+601	N1-KP15+791	WILMSLOW SANDSTONE FORMATION - SANDSTONE
CHESTER FORMATION - SANDSTONE, PEBBLY (GRAVELLY)	Preferred Route Centreline - N1	N1-KP15+791	N1-KP17+109	CHESTER FORMATION - SANDSTONE, PEBBLY (GRAVELLY)
KINNERTON SANDSTONE FORMATION - SANDSTONE	Preferred Route Centreline - N2	N2-KP00+000	N2-KP00+017	KINNERTON SANDSTONE FORMATION - SANDSTONE
PENNINE MIDDLE COAL MEASURES FORMATION - SANDSTONE	Preferred Route Centreline - N2	N2-KP01+205	N2-KP01+466	PENNINE MIDDLE COAL MEASURES FORMATION - SANDSTONE
PENNINE MIDDLE COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE	Preferred Route Centreline - N2	N2-KP01+466	N2-KP01+557	PENNINE MIDDLE COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE
PENNINE MIDDLE COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE	Preferred Route Centreline - N2	N2-KP00+941	N2-KP01+205	PENNINE MIDDLE COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE
PENNINE MIDDLE COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE	Preferred Route Centreline - N2	N2-KP01+557	N2-KP01+604	PENNINE MIDDLE COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE
PENNINE MIDDLE COAL MEASURES FORMATION - SANDSTONE	Preferred Route Centreline - N2	N2-KP00+827	N2-KP00+941	PENNINE MIDDLE COAL MEASURES FORMATION - SANDSTONE
NOB END ROCK - SANDSTONE	Preferred Route Centreline - N2	N2-KP01+604	N2-KP01+674	NOB END ROCK - SANDSTONE
PENNINE MIDDLE COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE	Preferred Route Centreline - N2	N2-KP00+710	N2-KP00+827	PENNINE MIDDLE COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE
ETRURIA FORMATION - MUDSTONE, SANDSTONE AND CONGLOMERATE	Preferred Route Centreline - N2	N2-KP00+017	N2-KP00+710	ETRURIA FORMATION - MUDSTONE, SANDSTONE AND CONGLOMERATE
PENNINE MIDDLE COAL MEASURES FORMATION - SANDSTONE	Preferred Route Centreline - N2	N2-KP03+814	N2-KP03+861	PENNINE MIDDLE COAL MEASURES FORMATION - SANDSTONE
PENNINE MIDDLE COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE	Preferred Route Centreline - N2	N2-KP03+609	N2-KP03+814	PENNINE MIDDLE COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE
PEMBERTON ROCK - SANDSTONE	Preferred Route Centreline - N2	N2-KP03+589	N2-KP03+609	PEMBERTON ROCK - SANDSTONE
PENNINE MIDDLE COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE	Preferred Route Centreline - N2	N2-KP03+566	N2-KP03+589	PENNINE MIDDLE COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE
PENNINE MIDDLE COAL MEASURES FORMATION - SANDSTONE	Preferred Route Centreline - N2	N2-KP03+504	N2-KP03+566	PENNINE MIDDLE COAL MEASURES FORMATION - SANDSTONE
KINNERTON SANDSTONE FORMATION - SANDSTONE	Preferred Route Centreline - N2	N2-KP01+674	N2-KP03+316	KINNERTON SANDSTONE FORMATION - SANDSTONE
PENNINE MIDDLE COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE	Preferred Route Centreline - N2	N2-KP03+316	N2-KP03+504	PENNINE MIDDLE COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE
PEMBERTON ROCK - SANDSTONE	Preferred Route Centreline - N2	N2-KP03+316	N2-KP03+316	PEMBERTON ROCK - SANDSTONE
PENNINE MIDDLE COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE	Preferred Route Centreline - N2	N2-KP03+861	N2-KP05+848	PENNINE MIDDLE COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE
PENNINE MIDDLE COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE	Preferred Route Centreline - N2	N2-KP05+848	N2-KP06+129	PENNINE MIDDLE COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE
NORTHWICH HALITE MEMBER - HALITE-STONE AND MUDSTONE	Preferred Spurs Centreline - C-01	C-01-KP05+773	C-01-KP07+215	NORTHWICH HALITE MEMBER - HALITE-STONE AND MUDSTONE
NORTHWICH HALITE MEMBER - HALITE-STONE AND MUDSTONE	Preferred Spurs Centreline - C-01	C-01-KP07+215	C-01-KP07+467	NORTHWICH HALITE MEMBER - HALITE-STONE AND MUDSTONE
BOLLIN MUDSTONE MEMBER - MUDSTONE	Preferred Spurs Centreline - C-01	C-01-KP07+467	C-01-KP07+966	BOLLIN MUDSTONE MEMBER - MUDSTONE

Hynet Geohazards Desk Study

Hazard Title: Bedrock Geology (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Geological Unit / Formation	Nearest Project Infrastructure	KP From	KP To	Constraint Category
BOLLIN MUDSTONE MEMBER - MUDSTONE	Preferred Spurs Centreline - C-01	C-01-KP00+000	C-01-KP05+773	BOLLIN MUDSTONE MEMBER - MUDSTONE
TARPORLEY SILTSTONE FORMATION - SILTSTONE, MUDSTONE AND SANDSTONE	Preferred Spurs Centreline - W-03	W-03-KP00+404	W-03-KP01+315	TARPORLEY SILTSTONE FORMATION - SILTSTONE, MUDSTONE AND SANDSTONE
BOLLIN MUDSTONE MEMBER - MUDSTONE	Preferred Spurs Centreline - W-03	W-03-KP01+315	W-03-KP01+948	BOLLIN MUDSTONE MEMBER - MUDSTONE
BOLLIN MUDSTONE MEMBER - MUDSTONE	Preferred Spurs Centreline - W-03	W-03-KP00+000	W-03-KP00+404	BOLLIN MUDSTONE MEMBER - MUDSTONE
HELSBY SANDSTONE FORMATION - SANDSTONE, PEBBLY (GRAVELLY)	Preferred Spurs Centreline - N1-02	N1-02-KP00+000	N1-02-KP01+637	HELSBY SANDSTONE FORMATION - SANDSTONE, PEBBLY (GRAVELLY)
WILMSLOW SANDSTONE FORMATION - SANDSTONE	Preferred Spurs Centreline - N1-02	N1-02-KP01+637	N1-02-KP06+110	WILMSLOW SANDSTONE FORMATION - SANDSTONE
WILMSLOW SANDSTONE FORMATION - SANDSTONE	Preferred Spurs Centreline - E-01	E-01-KP00+000	E-01-KP00+454	WILMSLOW SANDSTONE FORMATION - SANDSTONE
KINNERTON SANDSTONE FORMATION - SANDSTONE	Preferred Spurs Centreline - N2-04	N2-04-KP00+000	N2-04-KP00+017	KINNERTON SANDSTONE FORMATION - SANDSTONE
PENNINE MIDDLE COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE	Preferred Spurs Centreline - N2-04	N2-04-KP00+957	N2-04-KP01+301	PENNINE MIDDLE COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE
ETRURIA FORMATION - MUDSTONE, SANDSTONE AND CONGLOMERATE	Preferred Spurs Centreline - N2-04	N2-04-KP00+017	N2-04-KP00+713	ETRURIA FORMATION - MUDSTONE, SANDSTONE AND CONGLOMERATE
PENNINE MIDDLE COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE	Preferred Spurs Centreline - N2-04	N2-04-KP01+685	N2-04-KP02+035	PENNINE MIDDLE COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE
HELSBY SANDSTONE FORMATION - SANDSTONE, PEBBLY (GRAVELLY)	Preferred Spurs Centreline - N1-05	N1-05-KP00+000	N1-05-KP00+677	HELSBY SANDSTONE FORMATION - SANDSTONE, PEBBLY (GRAVELLY)
PENNINE MIDDLE COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE	Preferred Spurs Centreline - N2-06	N2-06-KP00+436	N2-06-KP00+633	PENNINE MIDDLE COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE
WILMSLOW SANDSTONE FORMATION - SANDSTONE	Preferred Spurs Centreline - E-02	E-02-KP00+000	E-02-KP00+155	WILMSLOW SANDSTONE FORMATION - SANDSTONE
WILMSLOW SANDSTONE FORMATION - SANDSTONE	Preferred Spurs Centreline - E-04	E-04-KP00+000	E-04-KP00+588	WILMSLOW SANDSTONE FORMATION - SANDSTONE
PENNINE MIDDLE COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE	Preferred Spurs Centreline - N2-07	N2-KP06+129	N2-07-KP00+157	PENNINE MIDDLE COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE
BOLLIN MUDSTONE MEMBER - MUDSTONE	Preferred Spurs Centreline - W-01	W-01-KP00+000	W-01-KP01+465	BOLLIN MUDSTONE MEMBER - MUDSTONE
BOLLIN MUDSTONE MEMBER - MUDSTONE	Preferred Spurs Centreline - W-02	W-02-KP00+000	W-02-KP00+171	BOLLIN MUDSTONE MEMBER - MUDSTONE
WILMSLOW SANDSTONE FORMATION - SANDSTONE	Preferred Spurs Centreline - E-05	E-05-KP00+000	E-05-KP00+124	WILMSLOW SANDSTONE FORMATION - SANDSTONE
WILMSLOW SANDSTONE FORMATION - SANDSTONE	Preferred Route Centreline - W	W-KP06+608	W-KP08+371	WILMSLOW SANDSTONE FORMATION - SANDSTONE
WILMSLOW SANDSTONE FORMATION - SANDSTONE	Preferred Route Centreline - W	W-KP04+909	W-KP06+530	WILMSLOW SANDSTONE FORMATION - SANDSTONE
WILMSLOW SANDSTONE FORMATION - SANDSTONE	Preferred Route Centreline - N1	N1-KP12+963	N1-KP13+308	WILMSLOW SANDSTONE FORMATION - SANDSTONE
WILMSLOW SANDSTONE FORMATION - SANDSTONE	Preferred Route Centreline - N1	N1-KP09+747	N1-KP12+526	WILMSLOW SANDSTONE FORMATION - SANDSTONE
WILMSLOW SANDSTONE FORMATION - SANDSTONE	Preferred Route Centreline - N1	N1-KP07+865	N1-KP08+708	WILMSLOW SANDSTONE FORMATION - SANDSTONE
BOLLIN MUDSTONE MEMBER - MUDSTONE	Preferred Route Centreline - N1	N1-KP07+168	N1-KP07+512	BOLLIN MUDSTONE MEMBER - MUDSTONE
BOLLIN MUDSTONE MEMBER - MUDSTONE	Preferred Route Centreline - N1	N1-KP06+159	N1-KP06+986	BOLLIN MUDSTONE MEMBER - MUDSTONE
BOLLIN MUDSTONE MEMBER - MUDSTONE	Preferred Route Centreline - N1	N1-KP05+685	N1-KP06+115	BOLLIN MUDSTONE MEMBER - MUDSTONE
BOLLIN MUDSTONE MEMBER - MUDSTONE	Preferred Route Centreline - N1	N1-KP00+000	N1-KP05+190	BOLLIN MUDSTONE MEMBER - MUDSTONE
PENNINE MIDDLE COAL MEASURES FORMATION - SANDSTONE	Preferred Spurs Centreline - N2-04	N2-04-KP01+301	N2-04-KP01+458	PENNINE MIDDLE COAL MEASURES FORMATION - SANDSTONE
PENNINE MIDDLE COAL MEASURES FORMATION - SANDSTONE	Preferred Spurs Centreline - N2-04	N2-04-KP00+831	N2-04-KP00+957	PENNINE MIDDLE COAL MEASURES FORMATION - SANDSTONE
PENNINE MIDDLE COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE	Preferred Spurs Centreline - N2-04	N2-04-KP01+458	N2-04-KP01+685	PENNINE MIDDLE COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE
PENNINE MIDDLE COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE	Preferred Spurs Centreline - N2-04	N2-04-KP00+713	N2-04-KP00+831	PENNINE MIDDLE COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE
PENNINE MIDDLE COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE	Preferred Spurs Centreline - N2-06	N2-06-KP00+633	N2-06-KP01+199	PENNINE MIDDLE COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE
PENNINE MIDDLE COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE	Preferred Spurs Centreline - N2-06	N2-KP06+129	N2-06-KP00+436	PENNINE MIDDLE COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE

RSK GEOSCIENCES

Hynet Geohazards Desk Study

Hazard Title: Bedrock Geology (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Geological Unit / Formation	Nearest Project Infrastructure	Closest KP	Constraint Category
BOLLIN MUDSTONE MEMBER - MUDSTONE	Block Valve - NULL	E-KP12+000	BOLLIN MUDSTONE MEMBER - MUDSTONE
BOLLIN MUDSTONE MEMBER - MUDSTONE	Block Valve - NULL	S-KP08+500	BOLLIN MUDSTONE MEMBER - MUDSTONE
CHESTER FORMATION - SANDSTONE, PEBBLY (GRAVELLY)	HAGI - Stanlow HPP HAGI	W-KP00	CHESTER FORMATION - SANDSTONE, PEBBLY (GRAVELLY)
CHESTER FORMATION - SANDSTONE, PEBBLY (GRAVELLY)	HAGI - Stanlow HPP HAGI	W-KP00	CHESTER FORMATION - SANDSTONE, PEBBLY (GRAVELLY)
BOLLIN MUDSTONE MEMBER - MUDSTONE	HAGI - Central Hub HAGI	S-KP00	BOLLIN MUDSTONE MEMBER - MUDSTONE
KINNERTON SANDSTONE FORMATION - SANDSTONE	HAGI - Clockface HAGI	N2-KP00	KINNERTON SANDSTONE FORMATION - SANDSTONE
ETRURIA FORMATION - MUDSTONE, SANDSTONE AND CONGLOMERATE	HAGI - Clockface HAGI	N2-KP00	ETRURIA FORMATION - MUDSTONE, SANDSTONE AND CONGLOMERATE
BOLLIN MUDSTONE MEMBER - MUDSTONE	HAGI - Rocksavage HAGI	W-01-KP00	BOLLIN MUDSTONE MEMBER - MUDSTONE
HELSBY SANDSTONE FORMATION - SANDSTONE, PEBBLY (GRAVELLY)	HAGI - Higher Walton HAGI	N1-05-KP00	HELSBY SANDSTONE FORMATION - SANDSTONE, PEBBLY (GRAVELLY)
WILMSLOW SANDSTONE FORMATION - SANDSTONE	HAGI - Warburton HAGI	E-02-KP00	WILMSLOW SANDSTONE FORMATION - SANDSTONE
WILMSLOW SANDSTONE FORMATION - SANDSTONE	HAGI - Partington HAGI	E-01-KP00	WILMSLOW SANDSTONE FORMATION - SANDSTONE
BOLLIN MUDSTONE MEMBER - MUDSTONE	HAGI - Runcorn HAGI	W-02-KP00	BOLLIN MUDSTONE MEMBER - MUDSTONE
SIDMOUTH MUDSTONE FORMATION - MUDSTONE	HAGI - Inoyvn Gas Storage HAGI	S-KP18+000	SIDMOUTH MUDSTONE FORMATION - MUDSTONE
CHESTER FORMATION - SANDSTONE, PEBBLY (GRAVELLY)	HAGI - Stanlow HPP HAGI	W-KP00	CHESTER FORMATION - SANDSTONE, PEBBLY (GRAVELLY)
CHESTER FORMATION - SANDSTONE, PEBBLY (GRAVELLY)	Trench Crossing - Stanlow	W-KP00	CHESTER FORMATION - SANDSTONE, PEBBLY (GRAVELLY)
KINNERTON SANDSTONE FORMATION - SANDSTONE	Trench Crossing - A5117 Road	W-KP01+500	KINNERTON SANDSTONE FORMATION - SANDSTONE
CHESTER FORMATION - SANDSTONE, PEBBLY (GRAVELLY)	Trench Crossing - A5117 Road	W-KP01+500	CHESTER FORMATION - SANDSTONE, PEBBLY (GRAVELLY)
KINNERTON SANDSTONE FORMATION - SANDSTONE	Trench Crossing - A5117 Road	W-KP02+000	KINNERTON SANDSTONE FORMATION - SANDSTONE
CHESTER FORMATION - SANDSTONE, PEBBLY (GRAVELLY)	Trench Crossing - A5117 Road	W-KP01+500	CHESTER FORMATION - SANDSTONE, PEBBLY (GRAVELLY)
KINNERTON SANDSTONE FORMATION - SANDSTONE	Trench Crossing - Ellesmere Port to Warrington Line Railway	W-KP03+000	KINNERTON SANDSTONE FORMATION - SANDSTONE
TARPORLEY SILTSTONE FORMATION - SILTSTONE, MUDSTONE AND SANDSTONE	Trench Crossing - River Weaver	W-KP10+000	TARPORLEY SILTSTONE FORMATION - SILTSTONE, MUDSTONE AND SANDSTONE
HELSBY SANDSTONE FORMATION - SANDSTONE, PEBBLY (GRAVELLY)	Trench Crossing - River Weaver	W-KP09+500	HELSBY SANDSTONE FORMATION - SANDSTONE, PEBBLY (GRAVELLY)
BOLLIN MUDSTONE MEMBER - MUDSTONE	Trench Crossing - United Utilities Water	W-KP10+500	BOLLIN MUDSTONE MEMBER - MUDSTONE
BOLLIN MUDSTONE MEMBER - MUDSTONE	Trench Crossing - Chester to Manchester Line Railway	W-KP11+000	BOLLIN MUDSTONE MEMBER - MUDSTONE
BOLLIN MUDSTONE MEMBER - MUDSTONE	Trench Crossing - Sutton Weaver Canal	W-KP11+000	BOLLIN MUDSTONE MEMBER - MUDSTONE
BOLLIN MUDSTONE MEMBER - MUDSTONE	Trench Crossing - United Utilities Sewer	W-KP11+500	BOLLIN MUDSTONE MEMBER - MUDSTONE
BOLLIN MUDSTONE MEMBER - MUDSTONE	Trench Crossing - A56 Chester Road	W-KP12+000	BOLLIN MUDSTONE MEMBER - MUDSTONE
BOLLIN MUDSTONE MEMBER - MUDSTONE	Trench Crossing - West Coast Main Line Railway	W-KP16+500	BOLLIN MUDSTONE MEMBER - MUDSTONE
BOLLIN MUDSTONE MEMBER - MUDSTONE	Trench Crossing - Trent and Mersey Canal	W-KP18+000	BOLLIN MUDSTONE MEMBER - MUDSTONE
BOLLIN MUDSTONE MEMBER - MUDSTONE	Trench Crossing - A533 Northwich Road	W-KP18+500	BOLLIN MUDSTONE MEMBER - MUDSTONE
BOLLIN MUDSTONE MEMBER - MUDSTONE	Trench Crossing - A533 Northwich Road	C-01-KP0+500	BOLLIN MUDSTONE MEMBER - MUDSTONE
BOLLIN MUDSTONE MEMBER - MUDSTONE	Trench Crossing - Trent and Mersey Canal	S-KP01+500	BOLLIN MUDSTONE MEMBER - MUDSTONE
BOLLIN MUDSTONE MEMBER - MUDSTONE	Trench Crossing - Weaver Navigation Canal	S-KP02+000	BOLLIN MUDSTONE MEMBER - MUDSTONE
BOLLIN MUDSTONE MEMBER - MUDSTONE	Trench Crossing - West Coast Main Line Railway	S-KP04+500	BOLLIN MUDSTONE MEMBER - MUDSTONE
BOLLIN MUDSTONE MEMBER - MUDSTONE	Trench Crossing - A49 Warrington Road	S-KP06+000	BOLLIN MUDSTONE MEMBER - MUDSTONE
BOLLIN MUDSTONE MEMBER - MUDSTONE	Trench Crossing - Mid Cheshire Line Railway	S-KP07+000	BOLLIN MUDSTONE MEMBER - MUDSTONE
BOLLIN MUDSTONE MEMBER - MUDSTONE	Trench Crossing - A556 Chester Road	S-KP08+500	BOLLIN MUDSTONE MEMBER - MUDSTONE
BOLLIN MUDSTONE MEMBER - MUDSTONE	Trench Crossing - Weaver River/West Coast Main Line Railway	S-KP11+000	BOLLIN MUDSTONE MEMBER - MUDSTONE
NORTHWICH HALITE MEMBER - HALITE-STONE AND MUDSTONE	Trench Crossing - A533 Road	S-KP15+000	NORTHWICH HALITE MEMBER - HALITE-STONE AND MUDSTONE
NORTHWICH HALITE MEMBER - HALITE-STONE AND MUDSTONE	Trench Crossing - River Dane	S-KP16+500	NORTHWICH HALITE MEMBER - HALITE-STONE AND MUDSTONE
NORTHWICH HALITE MEMBER - HALITE-STONE AND MUDSTONE	Trench Crossing - Trent and Mersey Canal	S-KP16+500	NORTHWICH HALITE MEMBER - HALITE-STONE AND MUDSTONE
SIDMOUTH MUDSTONE FORMATION - MUDSTONE	Trench Crossing - Middlewich Branch Line Railway	S-KP17+500	SIDMOUTH MUDSTONE FORMATION - MUDSTONE
NORTHWICH HALITE MEMBER - HALITE-STONE AND MUDSTONE	Trench Crossing - Middlewich Branch Line Railway	S-KP17+500	NORTHWICH HALITE MEMBER - HALITE-STONE AND MUDSTONE
SIDMOUTH MUDSTONE FORMATION - MUDSTONE	Trench Crossing - A530 King Street Road	S-KP18+000	SIDMOUTH MUDSTONE FORMATION - MUDSTONE
BOLLIN MUDSTONE MEMBER - MUDSTONE	Trench Crossing - A49 Tarporley Road	E-KP01+000	BOLLIN MUDSTONE MEMBER - MUDSTONE
BOLLIN MUDSTONE MEMBER - MUDSTONE	Trench Crossing - A559 Northwich Road	E-KP04+000	BOLLIN MUDSTONE MEMBER - MUDSTONE
BOLLIN MUDSTONE MEMBER - MUDSTONE	Trench Crossing - M6 Motorway	E-KP09+500	BOLLIN MUDSTONE MEMBER - MUDSTONE
BOLLIN MUDSTONE MEMBER - MUDSTONE	Trench Crossing - A50 Road	E-KP11+500	BOLLIN MUDSTONE MEMBER - MUDSTONE
TARPORLEY SILTSTONE FORMATION - SILTSTONE, MUDSTONE AND SANDSTONE	Trench Crossing - M56 Motorway	E-KP14+000	TARPORLEY SILTSTONE FORMATION - SILTSTONE, MUDSTONE AND SANDSTONE
NORTHWICH HALITE MEMBER - HALITE-STONE AND MUDSTONE	Trench Crossing - A56 Lymm Road	E-KP15+500	NORTHWICH HALITE MEMBER - HALITE-STONE AND MUDSTONE
NORTHWICH HALITE MEMBER - HALITE-STONE AND MUDSTONE	Trench Crossing - Bridgewater Canal + road	E-KP15+500	NORTHWICH HALITE MEMBER - HALITE-STONE AND MUDSTONE
NORTHWICH HALITE MEMBER - HALITE-STONE AND MUDSTONE	Trench Crossing - River Bolin	E-KP17+000	NORTHWICH HALITE MEMBER - HALITE-STONE AND MUDSTONE
BOLLIN MUDSTONE MEMBER - MUDSTONE	Trench Crossing - M56 Motorway	N1-KP05+000	BOLLIN MUDSTONE MEMBER - MUDSTONE
WILMSLOW SANDSTONE FORMATION - SANDSTONE	Trench Crossing - A56 Chester Road	N1-KP08+000	WILMSLOW SANDSTONE FORMATION - SANDSTONE
WILMSLOW SANDSTONE FORMATION - SANDSTONE	Trench Crossing - Bridgewater Canal	N1-KP08+500	WILMSLOW SANDSTONE FORMATION - SANDSTONE
HELSBY SANDSTONE FORMATION - SANDSTONE, PEBBLY (GRAVELLY)	Trench Crossing - West Coast Main Line and Manchester Ship Canal	N1-KP09+500	HELSBY SANDSTONE FORMATION - SANDSTONE, PEBBLY (GRAVELLY)
WILMSLOW SANDSTONE FORMATION - SANDSTONE	Trench Crossing - River Mersey, Sanky Canal + Skelton Junction to Ditton Junction Line	N1-KP12+500	WILMSLOW SANDSTONE FORMATION - SANDSTONE
WILMSLOW SANDSTONE FORMATION - SANDSTONE	Trench Crossing - A562 Widnes Road	N1-KP13+500	WILMSLOW SANDSTONE FORMATION - SANDSTONE
WILMSLOW SANDSTONE FORMATION - SANDSTONE	Trench Crossing - A5080 South Lane Road	N1-KP14+500	WILMSLOW SANDSTONE FORMATION - SANDSTONE
WILMSLOW SANDSTONE FORMATION - SANDSTONE	Trench Crossing - Manchester and Allerton Junction Line Railway	N1-KP15+000	WILMSLOW SANDSTONE FORMATION - SANDSTONE
KINNERTON SANDSTONE FORMATION - SANDSTONE	Trench Crossing - A57 Warrington Road	N1-KP18+000	KINNERTON SANDSTONE FORMATION - SANDSTONE
ETRURIA FORMATION - MUDSTONE, SANDSTONE AND CONGLOMERATE	Trench Crossing - M62 Motorway	N2-04-KP00	ETRURIA FORMATION - MUDSTONE, SANDSTONE AND CONGLOMERATE

Hynet Geohazards Desk Study

Hazard Title: Bedrock Geology (Mapped spatial extents of hazard are taken directly from Groundsure dataset)

Project Number: 322968

Geological Unit / Formation	Nearest Project Infrastructure	Closest KP	Constraint Category
PENNINE MIDDLE COAL MEASURES FORMATION - SANDSTONE	Trench Crossing - A570 St Helens Linkway Road	N2-KP01+500	PENNINE MIDDLE COAL MEASURES FORMATION - SANDSTONE
KINNERTON SANDSTONE FORMATION - SANDSTONE	Trench Crossing - Liverpool to Manchester Line Railway	N2-KP02+500	KINNERTON SANDSTONE FORMATION - SANDSTONE
BOLLIN MUDSTONE MEMBER - MUDSTONE	Trench Crossing - Weaver Navigation Canal	W-KP10+500	BOLLIN MUDSTONE MEMBER - MUDSTONE
TARPORLEY SILTSTONE FORMATION - SILTSTONE, MUDSTONE AND SANDSTONE	Trench Crossing - A557 Weston Point Expressway - Rocksavage Way	W-03-KP0+500	TARPORLEY SILTSTONE FORMATION - SILTSTONE, MUDSTONE AND SANDSTONE
BOLLIN MUDSTONE MEMBER - MUDSTONE	Trench Crossing - A557 Weston Point Expressway - Rocksavage Way	W-03-KP0+500	BOLLIN MUDSTONE MEMBER - MUDSTONE
WILMSLOW SANDSTONE FORMATION - SANDSTONE	Trench Crossing - A6144 Manchester Road	E-05-KP00	WILMSLOW SANDSTONE FORMATION - SANDSTONE
HELSBY SANDSTONE FORMATION - SANDSTONE, PEBBLY (GRAVELLY)	Trench Crossing - West Coast Mainline Railway	N1-05-KP0+500	HELSBY SANDSTONE FORMATION - SANDSTONE, PEBBLY (GRAVELLY)
HELSBY SANDSTONE FORMATION - SANDSTONE, PEBBLY (GRAVELLY)	Trench Crossing - Eastford Road and Canal	N1-02-KP01+500	HELSBY SANDSTONE FORMATION - SANDSTONE, PEBBLY (GRAVELLY)
WILMSLOW SANDSTONE FORMATION - SANDSTONE	Trench Crossing - Eastford Road and Canal	N1-02-KP01+500	WILMSLOW SANDSTONE FORMATION - SANDSTONE
NORTHWICH HALITE MEMBER - HALITE-STONE AND MUDSTONE	Trench Crossing - London Road	S-KP15+500	NORTHWICH HALITE MEMBER - HALITE-STONE AND MUDSTONE
WILMSLOW SANDSTONE FORMATION - SANDSTONE	Trench Crossing - NULL	N1-02-KP02+000	WILMSLOW SANDSTONE FORMATION - SANDSTONE
CHESTER FORMATION - SANDSTONE, PEBBLY (GRAVELLY)	Trench Crossing - Stanlow	W-KP00	CHESTER FORMATION - SANDSTONE, PEBBLY (GRAVELLY)
WILMSLOW SANDSTONE FORMATION - SANDSTONE	Trench Crossing - River Mersey, Sanky Canal + Skelton Junction to Ditton Junction Line	N1-KP12+500	WILMSLOW SANDSTONE FORMATION - SANDSTONE
WILMSLOW SANDSTONE FORMATION - SANDSTONE	Trench Crossing - River Mersey, Sanky Canal + Skelton Junction to Ditton Junction Line	N1-KP12+500	WILMSLOW SANDSTONE FORMATION - SANDSTONE

APPENDIX C
RISK ASSESSMENT TABLE – GOEMORPHOLOGY - LANDFILL

Hynet Geohazards Desk Study

Hazard Title: Landfill (Mapped spatial extents of hazard are taken directly from Groundsure dataset - Point / Polygon data within 250m of centreline or facility)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	Closest KP	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Landfill sites identified from Local Authority Records, historical mapping, Active or recently close landfill sites under EA regualation, Historical Landfill sites identified on DoE survey 1973, Historical Waste Sites from records held by Local Authority, Licensed waste sites. All presented data from Groundsure Reports.	Insufficient design, delay, excessive displacement, differential displacement, failure of foundations, slopes and excavation instability. Potential injury or exposure of construction workers. Pollution of controlled waters and environment.	Preferred Route Centreline - N1	N1-KP11+147	Active or Recent Landfill - Arpley Land Fill Site, Forrest Way, Sankey Bridges, Cheshire, WA4 6YZ - WASTE LANDFILLING; >10 T/D WITH CAPACITY >25,000T E	5	5	25 (Severe)	Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment of temporary and permanent slopes and assessment of infilled materials for contamination. Contamination assessment of any fill marterials. - Consider reroute - Designer to Consider application of engineering mitigation fror temporary / permanent works	4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP06+093	Active or Recent Landfill - Reynolds Street, Latchford, Warrington, Cheshir - A05: Landfill taking Non-Biodegradeable Wastes	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-04	N2-04-KP02+035	Active or Recent Landfill - LEA GREEN ROAD, ST HELENS, MERSEYSIDE, WA9 4QQ - WASTE LANDFILLING; >10 T/D WITH CAPACITY >25,000T EXCLUDING INE	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP14+621	Active or Recent Landfill - JACK LANE, BOSTOCK, MIDDLEWICH, CHESHIRE, CW10 9JQ - UNDERGROUND STORAGE OF HAZARDOUS WASTE WITH A TOTAL CA	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP06+110	Active or Recent Landfill - Land/premises At, Site At Woolston Deposit Grounds, Woolston, Warrington, Cheshire, WA4 2JA - A04: Household, Commercial &	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP017+08	Active or Recent Landfill - JACK LANE, BOSTOCK, MIDDLEWICH, CHESHIRE, CW10 9JQ - UNDERGROUND STORAGE OF HAZARDOUS WASTE WITH A TOTAL CA	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP06+567	Active or Recent Landfill - Deposit Ground, Off Brook Furlong, Frodsham, Cheshire, WA6 7SN - A04: Household, Commercial & Industrial Waste Landfill	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP14+577	Active or Recent Landfill - JACK LANE, BOSTOCK, MIDDLEWICH, CHESHIRE, CW10 9JQ - UNDERGROUND STORAGE OF HAZARDOUS WASTE WITH A TOTAL CA	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+431	Historical Landfill Local Authority - Refuse Tip	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP06+051	Historical Landfill Local Authority - Refuse Tip	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP03+989	Historical Landfill Local Authority - Hallem Hall Farm, Summer Lane, Runcorn	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP03+363	Historical Landfill Local Authority - Refuse Tip	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP03+640	Historical Landfill Local Authority - Disused Refuse Tip	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP06+003	Historical Landfill Local Authority - Refuse Tip	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP10+317	Historical Landfill Local Authority - Landfill Site	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - W-03	W-03-KP00+580	Historical Landfill Local Authority - Cartmel Close, Cavendish Farm, Runcorn	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+825	Historical Landfill Local Authority - Refuse Tip	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+822	Historical Landfill Local Authority - Refuse Tip	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP06+051	Historical Landfill Local Authority - Refuse Tip	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - W-01	W-01-KP00+183	Historical Landfill Local Authority - Refuse Tip	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - W-03	W-03-KP01+948	Historical Landfill Local Authority - Heath Road South, Runcorn	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - W-01	W-01-KP00+334	Historical Landfill Local Authority - Flood Brook, Under M56, Beechwood, Runcorn	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP10+514	Historical Landfill Local Authority - Landfill Site	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP10+959	Historical Landfill Local Authority - Refuse Tip	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP10+624	Historical Landfill Local Authority - Refuse Tip	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP20+911	Historical Landfill Local Authority - Refuse Tip	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - E	E-KP20+904	Historical Landfill Local Authority - Refuse Tip	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP10+317	Historical Landfill Local Authority - No 3 Lagoon, Sutton, Runcorn	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP10+787	Historical Landfill Local Authority - Refuse Tip	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - W-01	W-01-KP01+043	Historical Landfill Local Authority - Sutton, Rocksavage, Runcorn	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+608	Historical Landfill Local Authority - Refuse Tip	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP06+003	Historical Landfill Local Authority - Refuse Tip	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - W-02	W-02-KP00+171	Historical Landfill Local Authority - Refuse Tip	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP03+363	Historical Landfill Local Authority - Refuse Tip	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+828	Historical Landfill Local Authority - Refuse Tip	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP10+818	Historical Landfill Local Authority - Refuse Tip	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP06+051	Historical Landfill Local Authority - Refuse Tip	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+893	Historical Landfill Local Authority - Refuse Tip	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP02+876	Historical Landfill Local Authority - Refuse Tip	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP00+000	Historic Water Site - Ground Workings and Refuse Heap	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP01+965	Historic Water Site - Dredging Disposal Site	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP07+557	Historic Water Site - Waste Transfer Station	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+166	Historic Water Site - Waste Reception Centre	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+137	Historic Water Site - Car Breakers Yard	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP07+407	Historic Water Site - Waste Transfer Station	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+260	Historic Water Site - Car Breakers Yard	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP02+097	Historic Water Site - Scrap Metal Yard	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+258	Historic Water Site - Car Breaker's Yard	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+137	Historic Water Site - Car Breakers Yard	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+166	Historic Water Site - Waste Reception Centre	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP17+334	Historic Water Site - Dredging Disposal Site	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+166	Historic Water Site - Waste Reception Centre	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP01+958	Historic Water Site - Dredging Disposal Site	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+194	Historic Water Site - Recycling/Haulage Yard (C/U)	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+258	Historic Water Site - Car Breaker's Yard	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP01+970	Historic Water Site - Disposal Site	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+166	Historic Water Site - Waste Reception Centre	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+195	Historic Water Site - Waste Transfer Station (C/U)	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+199	Historic Water Site - Household Waste Recycling Centre	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+137	Historic Water Site - Car Breakers Yard	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP05+547	Historic Water Site - Waste Transfer Station (Extension)	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP17+362	Historic Water Site - Disused Disposal Site	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+254	Historic Water Site - Car Breakers Yard	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP017+34	Historic Water Site - Dredging Disposal Site	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+258	Historic Water Site - Car Breaker's Yard	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP01+846	Historic Water Site - Scrap Metal Yard	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+445	Historic Landfill - Teapot Brick Pit, St. Helens, Merseyside	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+422	Historic Landfill - Ravenhead Quarry (NWDA-Waste Manage, Burtonhead Road, St. Helens, Merseyside	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP06+051	Historic Landfill - Pier Point And Bryant, Factory Site, Nook Lane, Latchford	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+212	Historic Landfill - Ravenhead Quarry NWDA - Waste Management, Burtonhead Road, St. Helens, Merseyside	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP03+409	Historic Landfill - Clay Colliery, Elton Head Road, St. Helens, Merseyside	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+286	Historic Landfill - Runcorn and Latchford - Blackbear Canal, Reclamation Scheme, Off Loushers Lane, Warrington, Cheshire	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP10+956	Historic Landfill - East Clifton Marsh, Runcorn, Cheshire	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+295	Historic Landfill - Ravenhead Quarry Extension Waste Management, Burtonhead Road, St. Helens, Merseyside	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+293	Historic Landfill - Runcorn and Latchford - Blackbear Canal, Reclamation Scheme, Off Loushers Lane, Warrington, Cheshire	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP02+654	Historic Landfill - Sutton Heath Quarry, Elton Head Road	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - W	W-KP18+257	Historic Landfill - Dutton Hall, Dutton	5	5	25 (Severe)		4	3	12 (Moderate)

Hynet Geohazards Desk Study

Hazard Title: Landfill (Mapped spatial extents of hazard are taken directly from Groundsure dataset - Point / Polygon data within 250m of centreline or facility)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	Closest KP	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Landfill sites identified from Local Authority Records, historical mapping, Active or recently close landfill sites under EA regualation, Historical Landfill sites identified on DoE survey 1973, Historical Waste Sites from records held by Local Authority, Licensed waste sites. All presented data from Groundsure Reports.	Insufficient design, delay, excessive displacement, differential displacement, failure of foundations, slopes and excavation instability. Potential injury or exposure of construction workers. Pollution of controlled waters and environment.	Preferred Spurs Centreline - N1-02	N1-02-KP06+094	Historic Landfill - Baco Landfill, Latchford	5	5	25 (Severe)	Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment of temporary and permanent slopes and assessment of infilled materials for contamination. - Contamination assessment of any fill marterials. - Consider reroute - Designer to Consider application of engineering mitigation fror temporary / permanent works	4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP06+006	Historic Landfill - Thelwall Lane, Warrington	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP03+726	Historic Landfill - Mere House Farm, Station Road, Weaverham, Northwich, Cheshire	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - W-01	W-01-KP00+919	Historic Landfill - No. 3 Lagoon, Sutton, Runcorn, Cheshire	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+392	Historic Landfill - Roughdales Quarry Landfill Site, Sutton Heath, St. Helens, Merseyside	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP01+347	Historic Landfill - Heath Lane, Little Leigh, Near Northwich, Cheshire	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP04+701	Historic Landfill - Birse Construction M62 Link Road, Sherdley Road, St. Helens, Merseyside	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP04+634	Historic Landfill - Hefferston Grange Farm, Grange Lane, Gorstage, Northwich, Cheshire	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+409	Historic Landfill - Greengate Quarry, Rawes Head Road, St Helens, Merseyside	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+719	Historic Landfill - Lyons Yard, Ravenhead Park, Burtonhead Road, St. Helens, Merseyside	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+187	Historic Landfill - Burtonhead Road/Ravenhead Quarry(Waste Clearance), Burtonhead Road, St. Helens, Merseyside	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP04+548	Historic Landfill - Birse Construction M62 Link Road, Sherdley Park, Eltonhead Road, St. Helens, Merseyside	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP05+375	Historic Landfill - Grange Lane Farm, Grange Lane Farm, Weaverham, Cheshire	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP06+892	Historic Landfill - Anderton Lime Bed, Anderton, Northwich, Cheshire	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+219	Historic Landfill - Ravenhead Quarry, Burtonhead Road, St. Helens, Merseyside	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP03+571	Historic Landfill - Runcorn and Latchford - Blackbear Canal, Reclamation Scheme, Off Loushers Lane, Warrington, Cheshire	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+427	Historic Landfill - Elm Road, St. Helens, Merseyside	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+566	Historic Landfill - Sherdley Road, St. Helens, Merseyside	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP06+110	Historic Landfill - Baco Landfill, Latchford	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP14+149	Historic Landfill - Ravine opposite former Bison Concrete Works Entrance, Shaws Lane, Off Wharton Road (A5018), Smoke Hall Lane, Winsford	5	5	25 (Severe)		4	3	12 (Moderate)

Hynet Geohazards Desk Study

Hazard Title: Landfill (Mapped spatial extents of hazard are taken directly from Groundsure dataset - Point / Polygon data within 250m of centreline or facility)

Project Number: 322968

Hazard Description	Impact Description	Nearest Project Infrastructure	Closest KP	Constraint Description	Probability Score	Impact Score	Risk Score	Mitigation	Probability Score - (Residual Risk)	Impact Score - (Residual Risk)	Risk - (Residual Risk)
Landfill sites identified from Local Authority Records, historical mapping, Active or recently close landfill sites under EA regualation, Historical Landfill sites identified on DoE survey 1973, Historical Waste Sites from records held by Local Authority, Licensed waste sites. All presented data from Groundsure Reports.	Insufficient design, delay, excessive displacement, differential displacement, failure of foundations, slopes and excavation instability. Potential injury or exposure of construction workers. Pollution of controlled waters and environment.	Preferred Spurs Centreline - N1-02	N1-02-KP01+091	Licensed Waste Site - Household, Commercial & Industrial Waste T Stn	5	5	25 (Severe)	Ground investigation to determine exact Geology and groundwater conditions to allow for site-specific assessment of temporary and permanent slopes and assessment of infilled materials for contamination. - Contamination assessment of any fill marterials. - Consider reroute - Designer to Consider application of engineering mitigation fror temporary / permanent works	4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+251	Licensed Waste Site - Household, Commercial & Industrial Waste T Stn	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+091	Licensed Waste Site - Household, Commercial & Industrial Waste T Stn	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+162	Licensed Waste Site - 75kte Non-hazardous & hazardous HWA Site	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP07+373	Licensed Waste Site - Household, Commercial & Industrial Waste T Stn	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP01+976	Licensed Waste Site - Lagoon	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP14+588	Licensed Waste Site - Other Landfill Site taking Special Waste	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - E-01	E-01-KP00+432	Licensed Waste Site - Physical Treatment Facility	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP01+976	Licensed Waste Site - Lagoon	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+091	Licensed Waste Site - Household, Commercial & Industrial Waste T Stn	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP00+055	Licensed Waste Site - Deposit of waste to land as a recovery operation	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+411	Licensed Waste Site - Household, Commercial & Industrial Waste T Stn	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP07+309	Licensed Waste Site - Physico-Chemical Treatment Facility	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+608	Licensed Waste Site - Special Waste Transfer Station	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP01+976	Licensed Waste Site - Lagoon	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+411	Licensed Waste Site - Household, Commercial & Industrial Waste T Stn	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - E-01	E-01-KP00+432	Licensed Waste Site - Physical Treatment Facility	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP14+588	Licensed Waste Site - Landfill taking other wastes	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP05+658	Licensed Waste Site - Use of waste for timber / construction products	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N1	N1-KP14+844	Licensed Waste Site - Mining Waste Operations	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+608	Licensed Waste Site - Special Waste Transfer Station	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N1-02	N1-02-KP01+091	Licensed Waste Site - Household, Commercial & Industrial Waste T Stn	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP01+976	Licensed Waste Site - Lagoon	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP07+373	Licensed Waste Site - Household, Commercial & Industrial Waste T Stn	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP14+588	Licensed Waste Site - Other Landfill Site taking Special Waste	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+259	Licensed Waste Site - Household, Commercial & Industrial Waste T Stn	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - C-01	C-01-KP07+309	Licensed Waste Site - Physico-Chemical Treatment Facility	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - N2-06	N2-06-KP00+162	Licensed Waste Site - 75kte Non-hazardous & hazardous HWA Site	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - S	S-KP05+658	Licensed Waste Site - Use of waste for timber / construction products	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Spurs Centreline - W-01	W-01-KP00+593	Historic Landfill - No 3 Lagoon, Sutton, Runcorn, Cheshire	5	5	25 (Severe)		4	3	12 (Moderate)
		Preferred Route Centreline - N2	N2-KP05+597	Historic Landfill - Old Teaport Quarry, Sutton Heath Rd, St Helens	5	5	25 (Severe)		4	3	12 (Moderate)

HyNet North West Hydrogen Pipeline

Delivering clean growth

Cadent

Your Gas Network