A1 in Northumberland: Morpeth to Ellingham

Scheme Number: TR010041

6.8 Environmental Statement – Appendix 11.1 Preliminary Sources Study Report

Part B

APFP Regulation 5(2)(a)

Planning Act 2008

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

June 2020

Infrastructure Planning

Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

The A1 in Northumberland: Morpeth to Ellingham Development Consent Order 20[xx]

Environmental Statement - Appendix

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Alnwick to Ellingham

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Table of Contents

1 Introduction

1.1 Scheme Description

The A1 Northumberland is the main link road through Northumberland to the North East of Newcastle (see Plate1-1), and forms part of the Department for Transport's (DfT) Roads Investment Strategy (RIS). The purpose of the scheme is to address key issues with the existing arrangements that affect the performance of the A1 north of Newcastle Upon Tyne and its ability to perform as a 'Route of Strategic National Importance'.

In 2016, HE commenced a scheme to develop the upgrade to the A1 to a continuous dual carriageway in Northumberland between Newcastle and Ellingham through the Project Control Framework (PCF) Stage 2 Option development.

As part of the DfT First Roads Investment Strategy (see Plate 1-2), options are being considered and developed for the following programme of improvements:

Plate 1-1 - Northumberland in context of the UK

- **A1 Morpeth to Ellingham** – thirteen miles of upgrade to dual the carriageway linking the Morpeth and Alnwick bypasses with the dual carriageway near Ellingham, to create a continuous, high-quality dual carriageway from Newcastle to Ellingham. This involves:
  - Morpeth to Felton offline and online dualling options
  - Alnwick to Ellingham online dualling option
- **A1 north of Ellingham enhancements** – a set of measures to enhance the performance and safety of the A1 north of Ellingham, including:
  - Three stretches of climbing lanes totalling 2.5 miles
  - Five junctions enhanced with right turning refuges
  - Better crossing facilities for pedestrians and cyclists.

This programme will involve the undertaking of three Preliminary Sources Study Reports (PSSR), as stated in the Statement of Intent (Reference 1) [HAGDMS No. 28835], these reports will be as follows:

- Section A – Morpeth to Felton.
- **Section B – Alnwick to Ellingham.**
- Section C – North of Ellingham.

The route passes through predominantly agricultural land and is a key economic route for the north of England. This project aims to increase capacity, reduce journey times, improve safety, facilitate future economic growth in Northumberland and improve local access junctions and interchanges along the A1.

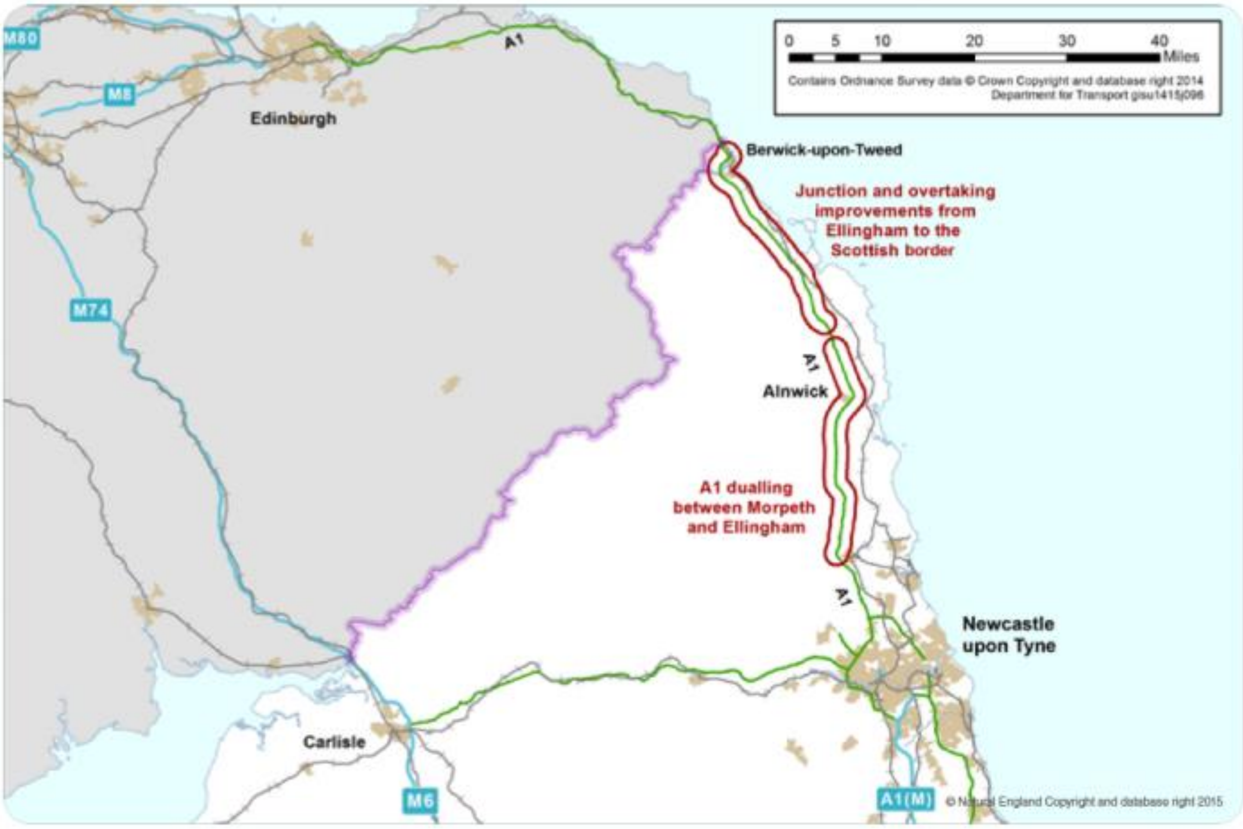

Plate 1-2 Location of improvements From Newcastle to Berwick (DFT)

1.2 Document Purpose and Structure

This report presents the PSSR for **Section B - A1 in Northumberland, Alnwick to Ellingham** improvements, and has been produced for Highways England in accordance with the Design Manual for Roads and Bridges Vol 4 Section 1 Part 2, HD22/08, Managing Geotechnical Risks.

This report contains a description of the site based upon site visits, historical mapping and published information followed by a description of the engineering proposals for the route options culminating in a ground model and risk register based upon published historical information.

Accompanying this report is an Annex A document which includes a preliminary assessment of the requirements for ground investigation (GI) on the site to inform the preliminary design at the next design stage.

2 Sources of Information

The desk study review involved consultations with a number of external companies and a qualitative assessment of desk study sources to inform the geotechnical and contamination risks across the length of the scheme.

2.1 Geological Data Sources

The following British Geological Society (BGS) geological maps and memoirs have been consulted in the study of the site:

- 1:50,000 series geological sheet 6 - Alnwick Solid
- 1:50,000 series geological sheet 6 - Alnwick Drift
- The Geology of the Alnwick District

2.2 Online Consultations

The following Online consultation has been sourced:

- Coal Authority Gazetteer of England and Wales
- Coal Authority Interactive Map Viewer
- Cranfield University Soilscapes map
- Environmental Agency (EA), 'What's in your backyard?'
- Groundwater vulnerability maps
- Google Earth
- Highways Agency Geotechnical Data Management System (HAGDMS)
- Historic England Interactive Web viewer
- Natural England – AONB and SSSI Database [accessed October 2016].
- Onshore Geo Index
- Ordinance Survey (OS) maps
- UK Aerial Photos Interactive Web Viewer
- Zetica Unexploded Ordnance (UXO) Pre-Desk-Study-Assessment (PDSA) (November 2016)

2.3 Existing Geotechnical Information

The following geotechnical information has been sourced:

- Alnwick Bypass, Stage 2 – Technical Report, Geotechnical and Concrete Services Ltd (1970) [HAGDMS 7182]
- Middlemoor Wind Farm and Shipperton Burn Wildlife Crossing Ground Investigation – Final Factual Report, Halcrow Group Ltd (2012) [HAGDMS 26725]
- Alnwick Bypass, Stage 2 – trial pit logs, Northumberland County Council – County Surveyors Department (1979) [Sourced from BGS Online borehole database]
- Heiferlaw Cutting (Alnwick Bypass, Stage 2) – Borehole logs, Norwest Holst Soil Engineering Ltd (1980) [Sourced from BGS Online borehole database]

3 Field Studies

3.1 Site Observations

A site walkover of the A1 Section B Alnwick and Ellingham route was conducted on Thursday 27th October 2016. The aims of the visit were to observe the local topography, geomorphology, ground conditions and the existing structures and site constraints that may impact on the geotechnical risk.

The site was accessed using a car to drive between lay-bys and stopping points on the northbound and southbound sides of the carriageway between Alnwick and North Charlton. Stopping points are highlighted in Plate 3-1.

Land adjacent to the carriageway is arable farmland with undulating topography. The carriageway generally follows the topography, although sections of the route are in cutting with cuttings up to 3m deep and on small embankments up to 2m high. Photographs in Section 3.2 show the variation along the route.

3.2 Photographs

Plate 3-1 shows the location of the eight stops made during the site walkover; these stops are described throughout this section.

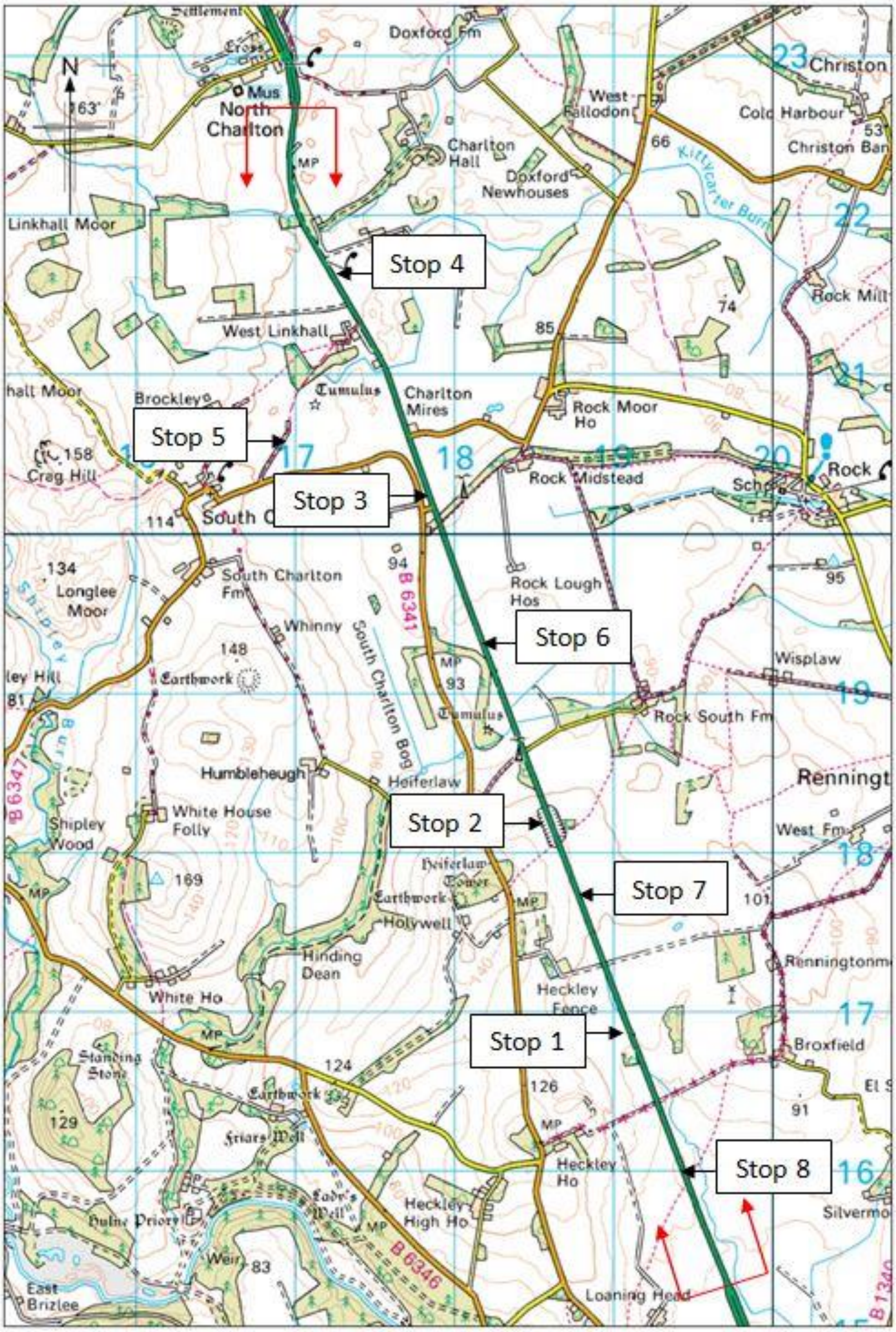

Plate 3-1 - Location of walkover stops

3.2.1 Stop 1

At this location the carriageway requires widening to accommodate the proposed works. The road is approximately at-grade with the surrounding land, Plate 3-2 and Plate 3-3.

Geological mapping and borehole information shows superficial deposits are up to 3m thick and overlie the Oxford Limestone Member and Alston Formation at this point.

Plate 3-2 Stop 1 on the west side of the A1 looking south. The carriageway is at-grade with the surrounding area.

Plate 3-3 Stop 1 on the west side of the A1 looking north.

3.2.2 Stop 2

Stop 2 is the lay-by near Black Plantation on the northbound side of the carriage way. Plate 3-4 looking south and shows the carriageway ascending southwards in cutting. The ground elevation at this point is in the order of 100m AOD.

Plate 3-5 shows cut slopes, approximately 1.5m to 2m deep opposite the lay-by on the east side, on the west side the cutting depth is 1.5m. The depth of cutting increases towards the south and is estimated to be around 3m deep at the top of the hill. Batter slopes are well vegetated with grass and small trees.

Borehole logs and geological mapping (BGS) show the units underneath Stop 2 comprise glacial till up to 3.5m thick above the Scremerston Coal Member. Cut slopes are assumed to be in glacial deposits. Slope angles are 1V:2H to 1V:3H and there are no signs of instability.

The A1 is around 85m AOD at this point (Plate 3-6) and at-grade with the surroundings.

Plate 3-4 Stop 2 in a lay-by on the west side of the A1. This photo is looking south, brow of the hill in distance.

Plate 3-5 Stop 2 showing the shallow cutting on the east side of the carriageway opposite the lay-by.

Plate 3-6 Stop 2 View downhill from the lay-by towards the north.

3.2.3 Stop 3

Stop 3 is in a northbound lay-by near Rock Nab. Approaching this site the carriageway is on a small embankment (around 1m high).

Plate 3.6 shows adjacent land falling gently towards the east. The west side of the carriageway is approximately at-grade and the east side is on a small embankment as the adjacent land falls to the east (Plate 3-8).

The large pond (Plate 3-7) suggests this is a low point along the route OS mapping shows a stream crosses the A1 between Rock Lodge and Charlton Mires (culvert located at Ch. 7700m) and there is a spring east of Rock Lodge, east of the A1. Groundwater is expected to be shallow in this vicinity.

Alluvium and glaciofluvial deposits are identified above glacial till on geological maps and in borehole logs close to Stop 3 (BGS). The Alston Formation is the bedrock unit.

Plate 3-7 Stop 3 View to the north-west of agricultural land and pond west of the carriageway.

Plate 3-8 Stop 3 View north along the carriageway from the lay-by. Carriageway is on a shallow (<2m) embankment.

3.2.4 Stop 4

Stop 4 is located in a lay-by on the southbound side of the carriageway near East Linkhall. The route is on asymmetrical embankment at this point with the east side at-grade (Plate 3-9) and the west side on a small embankment up to 2m high (Plate 3-10).

There is no borehole data for this area. Geological mapping (BGS) shows glaciofluvial and glacial till above undifferentiated bedrock of the Tyne Limestone Formation and Alston Formation.

Plate 3-9 Stop 4 in a lay-by on the southbound side of the carriageway looking south.

Plate 3-10 Stop 4 in the lay-by on the southbound side of the carriageway looking north.

3.2.5 Stop 5

The footpath east of South Charlton shows the view toward the A1. The agricultural land in between is gently undulating and is at the same elevation as the carriageway.

Glaciofluvial and glacial till deposits overlie the Alston Formation in this location.

Plate 3-11 Stop 5 looking towards the A1 in the southeast direction from the footpath.

Plate 3-12 Stop 5 looking north east towards the A1 from the footpath. Topography is gently undulating and the surrounding agricultural land is at-grade with the carriageway.

3.2.6 Stop 6

Stop 6 is in a lay-by on the southbound side of the A1 near Rock Lough House. The road is in a small cutting of up to 2m deep north of Stop 6 (Plate 3-13). The cutting height decreases to the south. Plate 3-14 shows the cutting is approximately 2m high opposite the lay-by and Plate 3-15 shows it to be at-grade with the surrounding fields to the south.

The cutting is expected to be in glacial till which is found to be over 3.5m deep in a nearby exploratory hole (TPA13). The slopes are covered in grass and initial inspection suggests they are stable at the gradient estimated to be 1V:2H. According to the geological map, bedrock below Stop 6 is the Tyne Limestone Formation.

Plate 3-13 Stop 6 looking south west towards agricultural land.

Plate 3-14 Stop 6 Looking north from the lay-by on the southbound side of the carriageway. In shallow cutting 2m deep.

Plate 3-15 Stop 6 looking south from the lay-by on the east side of the carriageway.

3.2.7 Stop 7

Stop 7 is a lay-by on the southbound carriageway near Heckley Fence. Plate 3-16 and Plate 3-17 show the west side of the road is in cutting. The height decreases from an estimated 3.5m north of the lay-by (Plate 3-16) to 2m opposite the lay-by (Plate 3-17). Slope gradients are estimated to be 1V:2H and an initial inspection did not identify any signs of instability.

Plate 3-18 shows agricultural land east of the carriageway is approximately at-grade with the road. The topography is sloping towards the east.

Based on the available borehole and mapping data (BGS) the slopes are cut into glacial till which is in excess of 3.5m thick and overlies the Tyne Limestone Formation.

Plate 3-16 Stop 7 looking north from the lay-by on the southbound side of the carriageway.

Plate 3-17 Stop 7 showing the cutting on the west side of the carriage way opposite the lay-by. Cutting is up to 2m high with a gradient estimated at 1V:2H.

Plate 3-18 Stop 7 looking south-east from the lay-by on the southbound side of the carriageway over agricultural land. The road is on a slight embankment (around 1m) above the adjacent land on the east.

3.2.8 Stop 8

The southern-most stopping point at Heckley House lay-by is on the southbound side of the carriageway near the start of the Alnwick to Ellingham dualling route.

Plate 3-19 shows that the road falls to the south and mature trees line both sides of the road leading up to the lay-by. The road is in a small cutting up to 1m deep on the west side of the road opposite the lay-by (Plate 3-20). North of Stop 8 the ground continues to rise and the carriageway is at-grade (Plate 3-21).

Cuttings are expected to be in glacial till as nearby boreholes show glacial till is more than 6m thick (BH4). Bedrock in this location is the Alston Formation.

Plate 3-19 Stop 8 Looking south towards the dualled section of carriageway from a lay-by on the southbound side.

Plate 3-20 Stop 8 opposite the lay-by the carriageway is in cutting (up to 2m) and the vegetation is predominantly shrubs.

Plate 3-21 Stop 8 looking north from the lay-by on the southbound side of the carriageway

4 Site Description

4.1 Scheme Description

The Alnwick to Ellingham improvement consist of upgrading the existing A1 carriageway, from single to a dual carriageway. The current option being presented consists of a widening of the existing corridor.

The scheme extends approximately 8km, from existing dual carriageway to the North of Alnwick National Grid Reference (NGR) 419681E, 615368N (Ch. 2300m) to the Brownieside dual carriageway to the south of North Charlton NGR 417020E, 622653N (Ch. 10280m).

Accompanying the upgrades to the carriageway the scheme also involves the construction of two overpass structures (the Broxfield Bridge and South Charlton Junction), improvements to the drainage system and an upgrade of culverts that cross the route.

This section includes a description of the route based on information obtained from sources stated in Section 2. The ground conditions, previous land use and potential contaminants are summarised. This section will refer to chainages and features which are highlighted on the following drawings

- HA551459-JAC-GEN-Section B-WD-C-002 to 008 inclusive, enclosed in Section 9.

4.2 Topography

The route traverses the gently undulating coastal plateau of eastern Northumberland, which extends to the North Sea, and to the east is designated an area of Outstanding Natural Beauty (AONB) (Reference 7).

Section B generally rises from an elevation of approximately 60m Above Ordnance Datum (AOD) at the north of the Alnwick Bypass (Ch. 2300m) to a height of 107m AOD (at Ch. 5100 m), before levelling out to around 90m AOD (at Ch. 6250m). Extending northwards, the route gradually rises to about 100m AOD (Ch. 10280m) where it terminates as it joins the Brownieside Dual Carriageway, south of North Charlton.

4.3 Geology

4.3.1 Top Soil and Subsoil

A review of the soil properties within the study area has been undertaken using the Cranfield University Soilscapes map, a summary of which is presented in Table 4.1.

Table 4-1 Soil properties within the study area

Chainage (m)	0-1700	2300-7660	7660-9050	9320-10200	9050-9320
Soil Description	Soilscape 17: Slowly permeable seasonally wet acid loamy and clayey soils		Soilscape 6: Freely draining slightly acid loamy soils		Soilscape 18: Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils
Drainage	Impeded drainage		Freely draining		Impeded drainage
Fertility	Low		Low		Moderate
Habitats	Seasonally wet pastures and woodlands		Neutral and acid pastures and deciduous woodlands; acid communities such as bracken and gorse in the uplands		Seasonally wet pastures and woodlands
Land Cover	Grassland with some arable and forestry		Arable and grassland		Grassland and arable, some woodland
Water Protection	Main risks are associated with overland flow from compacted or poached fields. Organic slurry, dirty water, fertiliser, pathogens and fine sediment can all move in suspension or solution with overland flow or drain water		Groundwater contamination with nitrate; siltation and nutrient enrichment of streams from soil erosion is certain from these soils		Main risks are associated with overland flow from compacted or poached fields. Organic slurry, dirty water, fertiliser, pathogens and fine sediment can all move in suspension or solution with overland flow or drain water

4.3.2 Made Ground

The majority of boreholes available on the BGS geology viewer for the study area were drilled between 1969 and 1981, before the construction of the Alnwick bypass. Therefore, made ground, which may be associated with recent road construction, is not represented in the available borehole data for much of the route.

Exploratory holes undertaken during the 2012 investigation at Middlemoor Farm did encounter made ground and the material encountered is assessed in Section 5.2.1.

A study of early OS maps and data obtained from the Groundsure database shows that there have been quarries and a pond in the study area which are no longer present (see Section 4.6.2 and Figure 8B). This could be due to natural sedimentation and vegetation growth or infilling with soil or waste material.

4.3.3 Recent and Glacial Geology

A review of maps and memoirs published by the British Geological Survey (BGS) (References 3, 4 & 5) indicates that the underlying superficial deposits comprise isolated deposits of peat and alluvium, above glacial deposits of Devensian, glacial till (formerly Boulder clay), glaciofluvial (sands and gravels) and glacio-lacustrine (laminated clays). These deposits are of variable thickness and individual geotechnical units are not continuous along the route.

Northumberland Till is divided into Upper and Lower units characterised, amongst other things, by colour. The Upper Till being light brown and mottled blue/grey and the Lower Till dark grey. This is thought to be a feature of post-depositional weathering of lodgement tills deposited during the Devensian period and not a stratigraphic boundary. The reason for this change in appearance has been researched extensively, and much of the data was uncovered during opencast mining operations to the south east of the route, a very good parametric variation in geotechnical properties is known.

Traces of Peat were identified within trial pits between Ch. 3800m and 4200m. BGS mapping (References 3 & 4) indicate that these are located underneath the footprint of the existing carriageway, within the Charlton Peat Bogs (approximate Ch.6000 to 6700m).

4.3.4 Bedrock Geology

The superficial deposits are shown to be underlain by strata of Lower Carboniferous age marine deposits of the Alston Formation, Tyne Limestone Formation and the Scremerston Coal Member within the Yoredale Group succession. These comprise a succession of mudstones, sandstones, siltstones and limestones, containing thin interbedded coal seams.

Lateral variations in elevation of the units encountered results from regional-scale faulting and bedding. Dip direction is typically to the south-east at approximately 2 degrees, there are exceptions to this, often on account of the faults with local reversal of dip direction in some locations, particularly to the east of the route.

A drawing showing the depth to bedrock (alternatively the total thickness of the glacial deposits) is presented as Figure 10B, enclosed in Section 9. Bedrock appears to rise from the south of the site and is not proven from Ch.2300 to 3750m. This is indicative of thicker superficial deposits overlying the bedrock.

The succession of strata within the wider geological sequence is presented as Table 4-2.

Table 4-2 Geological Succession (Adapted from Reference 3, 4 and 5)

Period	Epoch	Name	Description	Location
Quaternary	**Holocene**	Peat	Peat, Local environment previously dominated by organic accumulations.	Charlton Bog (Ch. 6000 – 6700m)
		Alluvium	Clay, Silt, Sand And Gravel. Local environment previously dominated by rivers.	South Charlton (Ch. 7550m) Alnwick Bypass (Ch. 2000 – 2300m)
	Devensian	Glaciofluvial	Sand And Gravel. Local environment previously dominated by ice age conditions.	Immediate South of Site (North of Alnwick) North of South Charlton (Ch. 7700 – 10200m)
		Glacial Till	Clay, sand, gravel, and boulders. Drift deposited directly by the glacier.	Whole Site (varying thickness)
Lower Carboniferous	**Yoredale Group**	Alston Formation	Limestone, Sandstone, Siltstone And Mudstone 400-415m thick formed approximately 322 to 335 million years ago. Local environment previously dominated by shallow carbonate seas.	Alnwick Bypass (Ch. 2300 – 4200m) continues to the east South of North Charlton (Ch. 8800 – 10200)m
		Tyne Limestone Formation	Limestone, Sandstone, Siltstone And Mudstone up to 550m thick formed approximately 331 to 339 million years ago. Local environment previously dominated by shallow carbonate seas.	West of carriageway (Ch. 3100 – 3300m) East of Humbleheugh (Ch. 6250 – 7100m)
		Oxford Limestone Member	Limestone. Sedimentary Bedrock formed approximately 326 to 331 million years ago in the Carboniferous Period. Local environment previously dominated by shallow carbonate seas.	Marker horizons adjacent to site (Ch. 3700m and 4250m)
		Dun Limestone Member	Limestone. Sedimentary Bedrock formed approximately 331 to 335 million years ago in the Carboniferous Period. Local environment previously dominated by shallow carbonate seas.	Forms horizon West of carriageway at Ch. 4800m
		Scremerston Coal Member	Sandstone, Siltstone And Mudstone formed approximately 331 to 339 million years ago. Local environment previously dominated by swamps, estuaries and deltas.	Outcrops to the SE of Humbleheugh (Ch. 5000 – 6200m) continues west of site.
	Border Group	Fell Sandstone Formation	Sandstone. Sedimentary Bedrock formed approximately 335 to 352 million years ago in the Carboniferous Period. Local environment previously dominated by rivers.	Underlying across site

4.4 Hydrology

A number of watercourses are present within the study area, some of which cross the alignment of the current carriageway and extent of the proposed scheme. These watercourses (from south to north) are described in Table 4-3, while their locations are indicated on Figure 4B in Section 9. It should be noted, however, that existing unmapped watercourses could be present in the study area. Watercourses greater than 100m from the proposed scheme have not been included in Table 4-3.

Table 4-3 Watercourses within the study area

Name	Chainage (m)	Crossing Type	Tributary of
Unnamed Drain	1150	N/A	Unnamed Pond at Rock
Unnamed River	2570	Culvert	Denwick Burn
Unnamed River	2960	Culvert	Denwick Burn
Unnamed River	3180	Culvert	Denwick Burn
Unnamed River	3710	Culvert	Denwick Burn
Denwick Burn	4390	Culvert	River Aln
Unnamed River	5450	Culvert	White House Burn
Unnamed River	6020	Culvert	White House Burn
Unnamed Drain	7700	Culvert	Kittycarter Burn
Unnamed Drain	8380	Culvert	Kittycarter Burn
Shipperton Burn	9475	Culvert	Doxford Lake

There are currently two ponds located within the vicinity of the A1, and these are summarised in Table 4-4 and shown on Figure 7B in Section 9. Historical ponds are summarised in section 4.6.2.

Table 4-4 Ponds within the study area

Chainage (m)	Code	Type	Further Information
90m E of 1050	P2	Pond	At location of former quarry. East of proposed works access track.
370m NW of 1700	P5	Pond	At location of former quarry. Northwest of proposed works access track.
20m W of 8350	P3	Pond	Surface water flooding noted on site walkover. Pond first shown on 2013 aerial imagery.
55m SW of 8550	P4	Pond	Pond created between 1978 and 2002.

No sections of carriageway within the proposed scheme are in flood risk areas. However, an area 10-20m east of chainage 2300 to 2550m is indicated to have a low to medium risk of flooding from Denwick Burn. This is shown on Figure 4B in Section 9. There are no surface water abstractions within the study area.

4.5 Hydrogeology

The classification of superficial and bedrock aquifers beneath the proposed scheme are summarised in Table 4-5 and Table 4-6. The distribution of aquifers within the superficial deposits and bedrock is shown on Figure 5B and 6B respectively.

Table 4-5 Aquifer classification and extents – superficial deposits

Classification	Definition	Chainages (m)	Associated Strata
Secondary A	Permeable layers capable of supporting water at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers	975-1175	Alluvium
		7490-7650	
		7740-9020	Glaciofluvial Deposits
		9540-10200	Glaciofluvial Deposits
Secondary Undifferentiated	Assigned when it has not been possible to attribute either category A or B to a strata	0-975	Glacial Till
		975-1700	
		2300-3690	
		3870-6040	
		6510-7490	
		7650-7740	
		9020-9540	
Unproductive	Deposits with low permeability that have negligible significance for water supply or river base flow	6040-6510	Peat

Table 4-6 Aquifer classification and extents - bedrock

Classification	Definition	Chainages (m)	Associated Strata
Secondary A	Permeable layers capable of supporting water at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers	130-930	Alston Formation
		1150-1370	
		1420-1700	
		2300-3110	
		3370-3710	
		4060-4200	
		7270-8800	
		0-130	Tyne Limestone Formation and Alston Formation (Undifferentiated)
		980-1150	
		3110-3370	
		3750-4060	
		4230-4940	
		6250-7080	
		8800-10200	
		930-980	Oxford Limestone Member
		1370-1420	
		3710-3750	
		4200-4230	
		4940-6250	Scremerston Coal Member
		7080-7270	

There are no groundwater abstractions or Groundwater Source Protection Zones within the study area.

4.5.1 Groundwater Aspects

Groundwater strikes from borehole logs indicate a ground water level between 1.4 and 3.5mbgl (below ground level). These strikes tend to occur in granular lenses within the cohesive glacial till.

A single permeability test, within a piezometer, was conducted in the 2012 Ground Investigation by Halcrow Ltd, which showed a "hydrostatic groundwater table within the glacial till and underlying bedrock strata" (Reference 12). After an initial water strike at 3.5mbgl (94.40mAOD) at the interface of the glacial till and bedrock in BH-01 (January 2012), two further visits measured reduce levels of 95.08mAOD and 94.93mAOD on 14 February 2012 and 21 March 2012 respectively. The relief and geological variability along the route prevent a detailed understanding of groundwater connectivity from area to area. It will be necessary at key locations (bridge sites, deep cuttings etc) to establish the local groundwater characteristics during further ground investigations (as described in Annex A).

4.6 Land Use

4.6.1 Current Land Use

The land use within the study area is largely agricultural, with scattered farms and houses located within the vicinity of the A1. The largest settlements in the vicinity of the study area are North Charlton, South Charlton and Denwick, which are located to the north, west and south of the study area respectively.

The current commercial / industrial land uses within the study area are summarised in Table 4-7, and shown on Figure 7B in Section 8B.

Table 4-7 Current commercial / industrial land uses

Type	Code	Chainage (m)	NGR
Lime Kiln (Disused)	C1	80m E of 1030	418983 620037
Sheep Dip	C2	320m N of 1700	418576 620852
Telephone Mast	C3	30m W of 5800	418437 618597
Telephone Exchange	C4	300m W of 7760	417454 620424
Telephone Mast	C5	310m W of 7760	417441 620431
Disused Quarry	C6	390m E of 8030	418084 620692
Sheep Dip	C7	100m E of 8030	417793 620688
Sheep Dip	C8	210m SW of 8700	417257 621201

4.6.2 Historical Land Use

A summary of historical land use within the study area, based on a review of published historical OS mapping, is provided in Figure 8B in Section 9. Published maps where no significant changes have been noted are not listed. Historical tanks within the study area are detailed separately in Table 4.10. Features that may be considered higher risk are highlighted in bold.

An unexploded ordinance Pre-Desk Study Assessment (PDSA) (Appendix A) was performed by Zetica suggested that no readily available records of bombing or other significant military activity on the site. The PDSA suggests that the completion of a further detailed investigation is likely only going to form as confirmatory of a low risk level for UXO. A **low risk** from UXO hazard indicates that for future ground investigations and construction works a zero tolerance strategy is not required.

Table 4-8 Summary of historical land use and features within the study area

Map	Chainage (m)	Code	Feature
1864 1:2,500	80m E of 1030	L1	Lime Kiln
	90m E of 1050	**Q1**	**Quarry, partially filled with water**
	180m SW of 1700	L2	Smithy
	340m NW of 1700	Q2	Possible old quarry marked
	320m E of 8000	Q3	Old coal pit
	340m E of 8020	Q4	Old quarry
	70m W of 8600	**P1**	**Large pond to S of West Linkhall**
	60m W of 8660	L3	Smithy
	70m NE of 8700	A1	'Camp (Remains of)' shown and large curvilinear earthworks present in field
	40m NE of 9250	A2	'Camp (Remains of)' marked and large curvilinear earthworks present in field
	100m NE of 9350	**Q5**	**Old quarry**
	100m E of 9510	A3	Tumulus
	30m E of 9720	A4	'Stone Coffins found about here AD 1829'
	10m E of 10100	A5	Large curvilinear earthworks present in field, shown as Comby Hills
1897 1:2,500	180m SW of 1700	L2	Smithy no longer present
	320m E of 8000	Q3	Old coal pit no longer present – presumed infilled
	70m W of 8600	**P1**	**Pond no longer present at West Linkhall**
	60m W of 8660	L3	Smithy no longer present
	250m NE of 8900	Q6	Old quarry
	100m NE of 9350	**Q5**	Old quarry no longer present – presumed infilled
1924 1:2,500	80m E of 1030	L1	Lime kiln now shown as 'Old Limekiln'
	90m E of 1050	**Q1**	**Quarry no longer present – presumed infilled**
	340m NW of 1700	Q2	Possible old quarry now shown as 'Old Quarry'
	120m E of 3530	L4	Sheepwash
	70m W of 5370	**L5**	**Small square reservoir**
	180m W of 5980	A6	'Tumulus (Beaker found AD 1921)'
	50m E of 7990	W1	Pump shown at Charlton Mires
1974 1:2,500	**70m W of 5370**	**L5**	**Reservoir no longer present**
	7980-8350	H1	A1 carriageway straightened
	100m E of 8020	**L6**	**Sheep Dip at Charlton Mires**
	8400-8830	H2	A1 carriageway straightened to bypass West Linkhall
	100m W of 8600	L7	Small rectangular reservoir at West Linkhall
	200m SW of 8700	L8	Sheep dip at West Linkhall
	9750-10070	H3	A1 straightened
1988 1:2,500	5200-6300	H4	Existing A1 carriageway and associated embankments shown

Table 4-9 Historical tanks within the study area

Chainage (m)	Code	NGR	Dates
160m SW of 1700	T1	418416 620449	1895
180m SW of 1700	T2	418410 620423	1974
190m SW of 1700	T3	418401 620416	Current*
60m W of 5370	**T4**	**418554 618194**	**Current***
70m W of 5370	**T5**	**418545 618199**	**1987**
140m W of 8680	T6	417313 621287	1924, 1973, 1986
220m N 10200	T7	416970 622910	1973

*Tanks only appear on current mapping and/or aerial imagery so date is unknown

4.7 Archaeological and Historical Investigations

Information from the Archaeology Data Service (ADS) (Reference 9) was reviewed and three archaeological records were found within the study area. Information from historical mapping was also used and these are summarised in Table 4-10 and shown on Figure 8B. The archaeological impacts of the proposed options will be considered as part of the Environmental Impact Assessment, further detailed study of the archaeology is therefore considered to be outside the scope of this report.

Table 4-10 Archaeological remains found within the study area

Chainage	NGR	Code	Details	Date of discovery	Source
180m W of 5980	418223 618765	A6	Beaker found.	1921	Historical Mapping
6910	416998 622307	A7	19th Century Milepost.	Not listed	ADS
70m NE of 8700	417488 621332	A1	Large curvilinear earthworks, likely to be Medieval in origin. Shown as 'Camp (Remains of)' on 1864 map.	Unknown	Historical Mapping
40m NE of 9250	417190 621797	A2	Large curvilinear earthworks, likely to be Medieval in origin. Shown as 'Camp (Remains of)' on 1864 map.	Unknown	Historical Mapping
100m NE of 9450	417144 622011	A3	'Tumulus' shown on 1864 map.	Unknown	Historical Mapping
30m E of 9720	417030 622220	A4	Bronze Age cairn/cist.	1824	ADS
30m E of 9720	417000 622200	A4	Two Bronze Age cists and a dagger.	1824	ADS
30m E of 9720	417033 622219	A4	'Stone Coffins found about here AD 1829' shown on 1864 map.	1829	Historical Mapping
10m E of 10100	417018 622565	A5	Large curvilinear earthworks, likely to be Medieval in origin. Shown as 'Comby Hills' on 1864 map.	Unknown	Historical Mapping

4.8 Aerial Photographs

Aerial imagery from the National Collection of Aerial Photography was reviewed and 15 photographs of the study area were found. These were taken in June 1972 and show that the study area was predominantly arable farmland and woodland.

4.9 Mining and Mineral Deposits

A mining report CON29M has been obtained on behalf of Highways England for the route and is presented in Appendix B. In summary the routes is not influenced by recorded underground or opencast mining, nor are any such mining operations planned at the present time. However the route is underlain by known coal seams which have no records of being mined. The possibility that there are mine workings within these seams cannot be entirely ruled out. Proposed Bridge structures will be treated as areas where possible unrecorded workings would pose an unacceptable risk. Future investigations to cater for this risk are presented in Annex A.

4.10 Contaminated Land

A summary of the potential contaminants within the study area is summarised in Table 4-11. This list is meant to be indicative and is not exhaustive of the contaminants that may be encountered.

Table 4-11 Potential contaminants that may be encountered within the study area

Source	Potential Contaminants
Existing Road Network (A1)	Embankment fill materials (PFA, ash), oils/hydrocarbons, Polycyclic Aromatic Hydrocarbons (PAHs), Benzene, Toluene, Ethyl benzene and Xylenes (BTEX), Methyl Tertiary Butyl Ether (MTBE), heavy metals, antifreeze, brake fluids, road salt.
Agriculture	Slurry (nitrate, ammonium, organics), pesticides, herbicides, fertilisers, pathogens, oils, fuels, PAHs.
Infilled Ponds / Quarries	Various unknown contaminants (including heavy metals, hydrocarbons, PAHs, ash, ground gas, asbestos)
Historical Tanks	Oils, fuels (diesel, red diesel, gasoline), pesticides, herbicides, fertilisers, slurry (nitrate, ammonium, organics),

None of the 151 BGS Exploratory Hole records reviewed recorded any signs of visual / olfactory contamination.

4.11 Waste

There are no active or historical landfills or waste transfer stations within the study area.
There are two active discharge consents within the study area, which are summarised in Table 4-12 below and shown on Figure 8B in Section 9.

Table 4-12 Active discharge consents within the study area

Name	Chainage	Code	NGR	Type	Permit Number	Receiving Water
The Doxford Settlement, Charlton Mires Farm and Cottages	130m E of 8060	D1	417820 620720	Sewage Discharges – Final/Treated Effluent	221/0941	Tributary of Kittycarter Burn
Charlton Mires Farm	130m E of 8040	D2	417820 620700	Sewage Discharges – Final/Treated Effluent	221/0899	Kittycarter Burn

A planning application for a recycling facility (application reference CC/2009/0001) was submitted on 01/10/2009 at Rock Nab (NGR 417570 620139, Code RF1).

4.12 Pollution

There are no records of any pollution incidents within the study area.

4.13 Designated Sites

There are no Sites of Special Scientific Interest (SSSI) or designated ecological sites within the study area. Details of designated cultural heritage sites within the study area are summarised in Table 4-13 and shown on Figure 7B in Section 9.

Table 4-13 Listed cultural heritage sites within the study area

Chainage	Code	NGR	Type	Grade
220m WSW of 4450	CH1	418728 617257	Dovecote and wall	II
30m SW of 8430	CH2	417554 621047	Building	II
100m SW of 8750	CH3	417333 621281	Building	II

4.14 Structures

Table 4-14 Description of known structures on route

Structure	Approximate Chainage (m)	Description	Assumed Ground Conditions
Culvert	3700	Box culvert 2.5m wide 70m long	Glacial till (Depth – 3.2m) Mudstone (Unproven Depth) Ground water at 2.1m
Culvert	6000	Box culvert 2.5m wide 25m long	Glacial till to 1.5m Weathered weak to med. strong Mudstone (Unproven depth) Possible peat deposits (Shown on BGS maps – Reference 3 and 4) (unproven in BH logs)
Culvert	7700	Box culvert 2.5m wide 65m long	Glacial till (Unproven Depth >3.6m) Granular lens (1m) (at depth 3.2m) Ground water at 3.2m
Culvert	8370	Box culvert 2.5m wide 25m long	Possible Alluvial deposits, overlying glaciofluvial sand and gravel and glacial till (unknown depths)
Culvert	9450	Box culvert 2.5m wide 20m long	Made ground (up to 2.5m deep, overlying firm glacial till to unproven depth.

4.15 Services

Locations of services are shown in drawings HA551459-JAC-GEN-Section B-WD-C-002 to 008, enclosed within Section 9.

Known services that are present along the site are described in Table 4.6. There may be other services not yet identified so this table should not be considered complete. Further consultation with relevant providers and authorities will have to be carried out prior to detailed design.

Table 4-15 Description of known services on route

Service	Provider	Approximate Chainage (m)	Location Description	Assumed Ground Conditions
Communications	Vodafone	2300 to 10200	Northbound side of carriageway	Varies (See Section 5)
Electrical	Northern Powergrid	2500	Crosses carriageway	Yellow - Brown, silty, sandy, CLAY (glacial till)
Electrical	Northern Powergrid	4180	Crosses carriageway	Brown, silty, sandy, CLAY (glacial till)
Electrical	Northern Powergrid	4195	Crosses carriageway	Brown, silty, sandy, CLAY (glacial till)
Water	Northumbrian Water Mains	5840	Crosses carriageway	Soft to firm, mottled brown, CLAY (glacial till)
Water	Northumbrian Water Mains	7250 to 7950	Runs NB carriageway then crosses at Ch. 7950m	Varies (See Section 5)
Oil/ Gas	Northern Gas	7250 to 10200	Crosses junction approach and continues along NB carriageway	Varies (See Section 5)
Electrical	Northern Powergrid	7720	Crosses carriageway and proposed bridge approach to the west of carriageway	Brown, silty, sandy, CLAY (glacial till)
Water (Abandoned Pipes)	Northumbrian Water Abandoned Pipes	7950 to 10200	Southbound of carriageway	Glacial sands and gravels
Water	Northumbrian Water Mains	7950 to 10200	Southbound of carriageway	Varies (See Section 5)

5 Ground Conditions

An abstract from the BGS map covering the route, (Figures 1B and 2B, presented in Section 9), indicates that the site is typically underlain by glacial till and glaciofluvial deposits, with occasional localised deposits of more recent peat and alluvium above them. The alluvium/peat is shown to occur between Ch. 6000m and Ch. 6700m and at isolated locations to the immediate south of the site, Ch. 7400m and Ch. 8400m as shown on Figure 2B. Glaciofluvial deposits form a surface exposure from Ch. 7750 to the northern end of the route (Ch.10200).

The extensive glacial cover is underlain by rocks of the Alston Formation, Tyne Limestone Formation, Scremerston Coal Group, Oxford Limestone Member and Fell Sandstone Formation.

Existing ground investigation data by way of boreholes and trial pits are shown on the following drawings, enclosed in Section 9;

- HA551459-JAC-GEN-Section B-WD-C-002 to 008 inclusive,

An assessment of ground conditions underlying the route has been made based on available ground investigation data and in line with the published geological maps. A geological long section has been created based on existing borehole locations, and is presented in drawings, enclosed within Section 9;

- HA551459-JAC-GEN-Section B-WD-C-073A to 73C

5.1 Existing Ground Investigations

Existing investigation has been undertaken extensively over certain areas of the site. The areas with data are to the south of the South Charlton Junction (Ch. 8100m). There is limited information on ground conditions to the north of this point. Figure 3B shows the existing ground investigations and details of the scope covered. Details of earlier ground investigations are presented in Table 5-1.

Table 5-1 Existing Ground Investigations

Title	Company	Year	Scope of GI
Alnwick Bypass, Stage 2 – Technical Report	Geotechnical and Concrete Services Ltd	1970	Exploratory Holes - 37 Cable Percussion (CP) boreholes - 3 CP boreholes with rotary core follow-on In-Situ Testing - Standard Penetration Testing (SPT) Lab Testing - Natural moisture content tests - Index classification tests (84 samples) - Grading analysis - Quick undrained triaxial compression tests (41 samples) - Drained triaxial compression tests (13 samples and 8 remoulded samples) - California Bearing Ratio (CBR) tests - Compaction tests

Title	Company	Year	Scope of GI
Middlemoor Wind Farm and Shipperton Burn Wildlife Crossing Ground Investigation – Final Factual Report	Halcrow Group Ltd	2012	Exploratory Holes - 3 Cable Percussion boreholes - 5 Windowless sample holes In-Situ Testing - Standard Penetration Testing (SPT) - Hand Shear Vane Testing - Dynamic probing resistance - Variable (Falling) Head Permeability Testing Lab Testing - Classification Testing - Bulk and dry density determination (by linear measurement) - Particle density determination - Particle size distribution analysis - Ground aggressiveness analysis (Chloride, Organic Content, Sulphate and pH) - CBR tests - One dimensional consolidation testing - Shear strength by Direct Shear - Undrained Triaxial Tests

A review of the BGS Borehole record viewer (Reference 11) provided records of two further investigations conducted within the site boundaries. However, the factual reports to accompany the GI logs were not obtainable. The client for the ground investigation, Northumberland County Council, has been contacted to establish availability of the data (Date contacted 14/11/2016).

Table 5-1 continued

Title	Company	Year	Scope of GI
Alnwick Bypass, Stage 2	Northumberland County Council – County Surveyors Department	1979	Exploratory Holes - 42 Trial Pits In-Situ Testing - Undrained Shear Strength (c_u) - California Bearing Ratio (CBR)
Heiferlaw Cutting, Alnwick Bypass, Stage 2	Norwest Holst Soil Engineering Ltd	1980	Exploratory Holes - 3 Cable Percussion boreholes - 5 Windowless sample holes In-Situ Testing - Permeability - Rock Quality Designation (RQD)

The exploratory holes from these logs cover the same region of the site as the 1970 Alnwick Bypass investigation, and provided Rock Quality Designation (RQD), undrained shear strength (c_u) and CBR values for various strata, at depths up to 3.5mbgl (below ground level).

Table 5-2 Ground units, depth and proven thickness

Unit	Depth Encountered (mbgl)	Thickness (m) (range)
A – Made Ground	0	1.5 (0.4 – 3.5)
B – Recent Deposits - Alluvium and peat	0.1 – 1.5	0.7 (0.2 – 1.3)
C – Glaciofluvial deposits	0.5 – 3.1	0.5 (0.1 – 0.9)
D – Glacio-lacustrine Deposits	1.3 – 3	0.7 (0.1 – 1.3)
E – Glacial Till	0.1 – 2.6	1.8 (0.7 – 5.4)
F – Bedrock (Interbedded)	1.3 – Unproven	Unproven

5.2 Geotechnical Parameters

Table 5-3 shows a summary of ground parameters determined for the materials underlying the site.

Table 5-3 Selected geotechnical parameters for the route

Engineering Properties	cu (kN/m2) (Range)	ϕ' (°) (Range)	MC (%) (Range)	LL (%) (Range)	PL (%) (Range)	PI (%) (Range)	mv (m2/MN) (Range)	CBR (%) (Range)	γ (kN/m2) (Range)
A – Made Ground	40 (20 – 124)	30 (22 – 35)	17 (6 – 26)	34 (26 – 38)	20 (14 – 23)	14 (11 – 17)	0.175 (0.15 – 0.2)	-	20
B – Recent Deposit - Alluvium and Peat	23.5 (16 – 34)	-	39.2 (38.2 – 40.3)	41 (39 – 43)	20.5 (19 – 22)	20.5 (20 – 21)	-	<0.5 (0.5 – 1)	12 (12 – 12.1)
C – Glaciofluvial	-	30 (24 – 35)	-	-	-	-	-	11 (9 – 13)	-
D – Glacio-lacustrine Clay	18 (8 – 22)	-	12.4	21	14	7	-	-	-
E –Glacial Till	103 (38 – 192) 252 (96 – 300)	20 (5 – 32)	16.5 (10.6 – 26.5)	32 (23 – 60)	14 (11 – 20)	18 (9 – 39)	0.04 (0.033 – 0.104)	3.5 (0.5 – 8)	19.1 (15.2 – 21)

5.2.1 Made Ground (Unit A)

Made ground was only identified within the Middlemoor Farm ground investigation, and was shown to typically comprise a clayey gravel with a cohesive top layer of slightly silty, slightly sandy, gravelly clay of low plasticity, of thickness between 0.5m and 0.6m. The material was found to comprise reworked glacial till and mudstone.

Particle size distribution test carried out on eleven samples of made ground typically showed a well graded gravely sand to sandy gravel. The results of 23 hand shear vane tests and 1 SPT provided a range of c_u values ranging from 20 to 124kN/m^2, with a typical value of 40kN/m^2.

Table 5-4 Made Ground (Unit A) Ground Parameters

Shear Strength	**Cohesive (c_u)**	40 (20 – 124)	kN/m^2
	Granular (ϕ)	30 (22 – 35)	°
Standard Penetration Test 'N'		27	blows
Moisture Content (MC)		17 (6 – 26)	%
Liquid Limit (LL)		34 (26 – 38)	%
Plastic Limit (PL)		20 (14 – 23)	%
Plasticity Index (PI)		14 (11 – 17)	%
One dimensional volume compressibility (m_v)		0.175 (0.15 – 0.2)	m^2/MN
Unit Weight (γ)		20	kN/m^2

5.2.2 Recent Deposits – Alluvium and Peat (Unit B)

Isolated deposits of alluvium have been identified by the BGS map data for the site, typically related to watercourses in the area. It was identified in the following locations;

- BH10 (Ch. 3700m), the material was described as a brown to grey silty, sandy clay, with traces of peat.
- TPA12 (Ch. 3300m), Soft blackish grey peaty clay with some fine sand, underlying loose damp/moist yellow sand with some fines.
- TPA15A (Ch. 3820m), very soft to soft light brown to grey sandy clay, with peat traces.
- TPA17 (Ch. 4000m), loose brown clayey silty, sand with brown coarse sand bands and mottled brown clay lenses with peat traces.

Table 5-5 Alluvium (Unit B) Ground Parameters

Shear Strength (c_u)	23.5 (16 – 34)	kN/m^2
Moisture Content (MC)	39.2 (38.2 – 40.3)	%
Liquid Limit (LL)	41 (39 – 43)	%
Plastic Limit (PL)	20.5 (19 – 22)	%
Plasticity Index (PI)	20.5 (20 – 21)	%
California Bearing Ratio (CBR)	0.5 (0.5 – 1)	%

Alnwick Bypass, Stage 2 (1979) trial pit logs provided six in situ CBR values below 1%, typically below 0.5%. Two laboratory CBR test were also conducted giving values of 0.1 and 0.45%, agreeing with those of the in-situ test results.

Four undrained shear strength values within the alluvium have been identified of between 16 and 34kN/m^2, with a typical value of 23.5kN/m^2.

5.2.3 Glaciofluvial Deposits (Unit C)

Glacial sand and gravel occurs directly below the alluvium or at depth interlayered with glacial till. It was found to occur as beds or lenses and can was found to vary in particle size distribution, thickness and lateral extent throughout the areas covered by GI scope. A significant deposit of sand and gravel is evident to the North of the South Charlton junction (Ch. 7800 to 10200m).

Table 5-6 shows the properties obtained from 12 Standard penetration Test results ranging from 24 to 50 blows, with a typical value of 33. Using the relationship presented by Stroud et al. (1975) (Reference 13), a typical shear strength value (ϕ) of 30° was derived.

Two In –situ California Bearing Ratio test results were available for the unit from the 1979 trial pit logs, giving values of 9% and 13%.

Table 5-6 Glaciofluvial Deposits (Unit C) Ground Parameters

Shear Strength (ϕ)	30 (24 – 35)	°
Standard Penetration Test 'N'	33 (24 – 50)	Blows
California Bearing Ratio (CBR)	11 (9 – 13)	%

5.2.4 Glacio-lacustrine Clay (Unit D)

The glacio-lacustrine deposits have been identified within the route and are located between an upper and lower glacial till (research identifies a lower ablation till and a basal glacial till. The lacustrine deposits are clay and silt (often varied) having formed in lakes between periods of ice advancement and retreat. The material is absent of coarse particles such as gravels and cobbles with fine silt and fine sand partings a noticeable feature.

Glacio-lacustrine clays were identified in six exploratory hole locations (BH27, TPA6, TPA18, TPA35, TPA36, TPA40), covering a wide area of the route. Thickness of the layers was found to range from 0.1 to 1.5m, with a typical value of 0.7m. In-situ shear vane tests provided seven shear strength (c_u) values ranging from 8 to 22kN/m^2 with a typical value of 18kN/m^2.

Table 5-7 Glacio-lacustrine Clay (Unit D)

Shear Strength (c_u)	18 (8 – 22)	kN/m^2
Moisture Content (MC)	17.4	%
Liquid Limit (LL)	21	%
Plastic Limit (PL)	14	%
Plasticity Index (PI)	7	%
Unit Weight (γ)	17.1 (16.6 – 17.7)	kN/m^3

A single laboratory sample (taken from BH27) provided a natural moisture content of 17.4%, a liquid limit of 21%, plastic limit of 14% and plastic index of 7%, indicating that the sample is clay of low plasticity.

5.2.5 Glacial Till (Unit E)

Based on a review of existing information three distinct layers are visible within the glacial tills. Mottled clay is an upper zone underlain and making a gradual transition with a reddish brown material, thought to result from weathering within the glacial and interglacial period. The unweathered grey clay (referred to as ablation till) has undergone no oxidation following deposition. The grey basal till exhibits an identifiable reduction in moisture content and an increase in strength/ reduction in compressibility with depth.

Glacial tills were found across the entire route as;

- Firm to stiff, rarely very stiff, sometimes mottled, brown to reddish-brown or greyish brown, sandy silty clay, with occasional gravel (known as upper glacial till).
- Stiff to very stiff, grey brown or dark grey, sandy, silly clay with occasional to abundant fine to coarse gravel and cobbles (known as lower glacial till).

Table 5-8 Glacial Till (Unit E)

Shear Strength (c_u)	103 (38 – 192) – Shear vane 252 (96 – 300) – SPT Relationship[13]	kN/m^2
Standard Penetration Test 'N'	42 (16 – 50)	
Moisture Content (MC)	13.7 (11 – 14.8)	%
Liquid Limit (LL)	28 (21 – 32)	%
Plastic Limit (PL)	14 (12 – 16)	%
Plasticity Index (PI)	14 (12 – 15)	%
One dimensional volume compressibility (m_v)	0.04 (0.033 – 0.104)	m^2/MN
California Bearing Ratio (CBR)	3.5 (0.5 – 8)	%
Unit Weight (γ)	22.3 (21.9 – 23.1)	kN/m^2

5.2.6 Bedrock (Unit F)

The sandstone, limestone, siltstone, mudstone, shale and coal of the Yoredale Group have been intercepted between proven depths of 1.5m to 7.6m. The wide spacing of the borehole data does not allow mapping of individual beds along the route. Proposed new structures will rely upon the local conditions identified within boreholes closest to them. Further investigation will be required to identify the local conditions in greater detail. See Annex A.

Rock Quality Designation (RQD) values were found to be wide ranging, between 10% and 80%, depending upon lithology and degree of weathering.

6 Preliminary Engineering Assessment

6.1 Introduction

The upgrade scheme will be to form a dual carriageway within the existing highway route. The alignment involves predominantly extending the road to the east on sloping ground thus creating asymmetric future cross sectional profile. The construction of two accommodation bridges will be required and Broxfield (Ch. 3450m) and South Charlton Junction (Ch. 8040m). Also the construction of two new culverts and the extension of five existing culverts will be required.

6.2 Earthworks

6.2.1 Cuttings

The widening of the existing carriageway requires several stretches of cutting, listed in Table 6-1. The side slopes for the preliminary design have been based upon 1V in 3H batter angle.

Table 6-1 Details of cuttings along the proposed route

Chainage from (m)	Chainage to (m)	Length (m)	Maximum Depth (m)	Side of Carriageway SB – Southbound NB - Northbound	Assumed Ground conditions
2600	2710	110	2.3	SB	Glacial till (Unproven depth >5m)
2745	2875	130	2.6	SB	Glacial till (Unproven depth >3.3m)
5050	5520	470	4.5	SB	Glacial till (Depth – 2.3 to 2.7m) Bedrock (Shale, mudstone, and sandstone) weathered (0.6m). Unweathered (unproven depth)
5540	5830	290	2.6	SB	Glacial till (Depth – 3.4 to 4m) siltstone, with weathered shale (Unproven depth)
6850	7280	430	2.9	SB	Glacial till (Depth – 5.7m) Weathered shale (Unproven depth)
10790	10200	410	2.8	SB	Glaciofluvial sand and gravel deposits, overlying glacial till (Unknown depth)

6.2.2 Embankments

During the widening of the carriageway a number of embankments are required. As with the cuttings, embankments will be cross sectional extensions to existing embankments or new ones, constructed, perpendicularly to the A1 as approaches to the proposed new overbridge structures. The embankments are up to a height of 8.3m. Table 6-2 identifies the proposed embankments, and anticipated ground conditions for them.

Table 6-2 Details of embankments along the proposed route

Chainage from (m)	Chainage to (m)	Length (m)	Maximum Height (m)	Side of Carriageway	Anticipated Ground conditions
2880	3060	180	2.8	SB	Glacial till (Unproven depth >6m)
3180	3425	245	2.3	SB	Glacial till (Unproven depth >6m)
3450	3510	240	8.3	NB/SB	Broxfield Bridge Approach Glacial till (Unproven depth >5.3m)
3490	3750	260	3.8	SB	Glacial till (Depth – 3.2m) Mudstone (Unproven depth) Ground water at 2.1m
4240	4640	400	2	SB	Glacial till (Unproven depth >3.6m) Granular lens (at depth 3.2m) Ground water at 1.4m
5830	6840	1010	3.3	SB	Variable rock head depth from Possible peat deposits (Shown on BGS maps (Reference 3).
7290	7930	640	2.6	SB	Glacial till (Unproven depth >3.6m) Granular lens (1m) (at depth 3.2m) Ground water at 3.2m
8040	8100	300	7.9	NB/SB	South Charlton Junction Bridge Approach Very soft to firm (possibly alluvial) clay (1.4m thick) overlying loose sand and gravel (to unproven depth) (TPA40A) Groundwater at 1.7m
8360	8490	130	2.7	SB	Glaciofluvial sand and gravel and glacial till (Unknown depths)
8650	8740	90	7.3	SB	Glaciofluvial sand and gravel and glacial till (Unknown depths)
8870	9100	230	2.4	SB	Glaciofluvial sand and gravel and glacial till (Unknown depths)
9250	9600	350	2.5	SB	Made ground (up to 2.5m deep, overlying firm to stiff glacial till (2 to 3m), with gravelly sand lenses up to 1m deep, overlying weak destructed mudstone.

The anticipated ground conditions for the earthworks are going to be confirmed by proposed ground investigation, outlined in the Annex A [HAGDMS No. 29385].

6.2.3 Structure Foundations

The scheme involves the construction of two new overpass structures, two new box culverts and the extension of five existing culverts. These are summarised in Table 6-3 along with the preliminary ground conditions.

Table 6-3 List of structures and expected ground conditions

Structure	Description	Assumed Ground Conditions	Foundations
Broxfield Bridge (Ch. 3450)	Overbridge - 7m x 30m with embankment	Glacial till (Unproven Depth >5.3m)	Spread foundations may be possible within the glacial clays. Piled group is an alternative terminating in the till or bedrock.
Culvert (Existing) (Ch. 3700)	Box culvert extension 2.5m wide extending from 70 to 90m in length	Glacial till (Depth – 3.2m) Mudstone (Unproven Depth) Ground water at 2.1m	Foundations for the new section of culvert should match those of the existing. Differential movement between old and new should be expected. Piled extension foundations may be appropriate, even with a spread foundation for the existing culvert, to control effects of differential movement.
Culvert (Existing) (Ch. 6000)	Box culvert extension 2.5m wide extending from 25 to 40m in length	Glacial till to 1.5m Weathered weak to mod. strong Mudstone (Unproven depth) Possible peat deposits (Shown on BGS maps [3] (unproven in BH logs)	Comments as above although excavation of peat pockets if present required beneath spread foundations and replaced with granular fill. Dewatering may be required
Culvert (Existing) (Ch. 7700)	Box culvert extension 2.5m wide extending from 65m to 80m in length	Glacial till (Unproven Depth >3.6m) Granular lens (1m) (at depth 3.2m) Ground water at 3.2m	Comments as above although excavation of peat pockets if present required beneath spread foundations and replaced with granular fil. Dewatering may be required

Structure	Description	Assumed Ground Conditions	Foundations
Culvert (New) (Ch. 8030)	Box Culvert Construction Length 40m width 2.5m	Very soft to firm (possibly alluvial) clay (1.4m thick) overlying loose sand and gravel (to unproven depth) (TPA40A) Groundwater at 1.7m	Removal of alluvial deposits may be necessary dependent on future investigation (Annex A). Conventional shallow foundations for culvert base and wing walls are anticipated to be acceptable. Piled slab is an alternative.
South Charlton Junction Bridge (Ch. 8040)	Overbridge with pier - 14.3m x 54m and approach embankment		Spread foundations unlikely to be feasible due to alluvium and peat. A piled foundation should cater for all structural eventualities.
Culvert (Existing) (Ch. 8370)	Box culvert extension 2.5m wide extending from 25m to 40m in length	Possible alluvial deposits, overlying glaciofluvial sand and gravel and glacial till (unknown depths)	Removal of alluvial deposits may be necessary. Spread foundations on stiff glacial till or medium dense gravel may be feasible. Piled foundations are an alternative.
Culvert (New) (Ch. 8450)	Box Culvert Construction Length 40m width 2.5m	Glaciofluvial sand and gravel and glacial till (unknown depths)	Spread foundations for culvert base and wing walls are anticipated to be acceptable.
Culvert (Existing) (Ch. 9450)	Box culvert extension 2.5m wide extending from 20 to 40m in length	Made ground (up to 2.5m thick), overlying firm to stiff glacial till (2 to 3m), with gravelly sand lenses up to 1m deep, overlying weak mudstone.	Made ground unlikely to be suitable for spread foundations. Pile foundations to bedrock feasible.

6.3 Material Re-use

With the exception of excavated made ground, alluvium sand/silt/clay and peat, it is envisaged that all glacial soils will be suitable for re-use as general fill Classes 1 and 2. Layers of glacial laminated clay may, upon greater classification testing, prove problematical for re-use as general fill depending upon silt content, which will influence moisture and compaction reliability. This material will be acceptable within landscape fill areas and isn't thought to represent a large proportion of the excavated materials proposed.

Layers of clean sand and gravel (glaciofluvial material) requiring excavation when encountered above formation level, could be stockpiled and re-used in more demanding applications (e.g. as capping layer, to replace soft soil at formation or within bridge foundation excavations).

Contaminated soil is not envisaged to be present in large amounts. A clearer strategy to deal with potential contamination will be devised following addition investigation (see Annex A).

A detailed appreciation of the volumes of cut and fill and hence a shortfall or excess of spoil, has not been made. Generally a balance in cut and fill appears possible upon rudimentary inspection.

6.4 Pavement Subgrade

The sub-grade when formed in cuttings or 'at grade' is expected to alternate between stiff glacial till, laminated glacial clay, glacio-fluvial sand deposits and local areas of alluvium and peat deposits. It is considered that, until further investigations confirms otherwise, all these sub-grade types, with the exception of the alluvium and peat, could provide a CBR > 2.5% for pavement design. Soft spots and peat should be removed and replaced with suitable Class 1 or better soil. Embankments that form a properly prepared formation at sub-grade, using suitable Class 1 and 2 General fill, should also achieve a sub-grade CBR of greater than 2.5% and 5%.

6.5 Drainage

Earthworks drainage will take the form of longitudinal toe drains in cuttings and open drains at the crest of cuttings and toe of embankments. These will be incorporated into a drainage system involving the creation of swales and shallow balancing ponds and outlet structures. The construction of three balancing ponds is proposed at chainage 4350m, 6000m and 9500m.

6.6 Contaminated Land Assessment

There are a number of potential sources of contamination within the study area. Table 6-4 summarises the contaminant sources and the potential pathways, receptors and management options. The possible contaminants associated with these sources are detailed in Table 4.13.

Table 6-4 Contaminated Land Assessment

<table>
<tr><th>Potential Source</th><th>Potential Migration Pathways</th><th>Potential Receptors</th><th>Management Options</th></tr>
<tr><td>Existing Road Network (A1)</td><td rowspan="3">Underground service conduits and trenches.
Groundwater flow beneath the site
Surface water flow.
Made ground acting as a preferential pathway for contaminant migration.
Direct contact with soil / groundwater and inhalation of soil dust.</td><td rowspan="4">• Site workers
• Construction materials
• Surface waters
• Groundwater</td><td rowspan="4">• Utility pit vapour monitoring
• Soil, gas and groundwater sampling on site
• Appropriate OHS techniques to minimise potential exposure</td></tr>
<tr><td>Agriculture</td></tr>
<tr><td>Historical Tanks</td></tr>
<tr><td>Infilled ponds/quarries</td><td>Underground service conduits and trenches.
Groundwater flow beneath the site.
Surface water flow.
Made ground acting as a preferential pathway for contaminant migration.
Direct contact with soil / groundwater and inhalation of soil dust.
Migration and accumulation of ground gases in excavations / confined spaces.</td></tr>
</table>

The main impacts related to contaminated land that will influence the scheme are summarised in Table 6.5.

Table 6-5 Evaluation of contamination-related impacts

Potential Receptors	Assessment of Impact	Comments
Site Workers	Low	There are few sources of contamination within the study area, being limited to the existing A1 carriageway, infilled quarries and ponds, and historical tanks.
Surface Waters	Low	There are few sources of contamination within the study area and the proposed scheme follows the route of the existing A1. However, a new crossing over an existing drain will be required associated with the proposed diversionary route of the B6341.
Groundwater	Low	There are few sources of contamination within the study area and the proposed scheme follows the route of the existing A1. However, the scheme includes construction of a new overbridge associated with the B6347 junction, thus the use of deep / piled foundations may create pollution pathways into the underlying aquifers.

6.7 Existing Geotechnical Problems

The following geotechnical problems have been identified based on a review of ground conditions from the site;

- Highly compressible soils (e.g. peat and alluvium), with low bearing capacity; this creates issues during construction in terms of trafficking by site traffic, as well as the material being unacceptable for re-use, thus requiring removal from site with the consequential increase in site traffic on public roads.
- Permeable layers within glacial till deposits, which would be of benefit during construction in terms of providing a stable foundation for site traffic for haul/access roads and for a road construction base. However groundwater control will be required in such events and sump pumping is considered appropriate.
- Laminated clays, due to their planes of weakness, can cause instability in cuttings and excavations.
- Shallow coal seams may have been worked adjacent to the proposed route, which could result in future ground instability. The thickness of the glacial till is important in determining risks to earthworks activity where coal seams underlie the glacial cover. Where glacial till is thin, bedrock is encountered at shallower depth and should coal seams exist within the bedrock, unrecorded workings within the seams pose greater risk if present.

These problems will be evaluated and possible mitigation measures highlighted in the geotechnical risk register, updated from the 'Statement of Intent' and presented in Section 7.

6.8 Proposals for further work

A ground investigation is proposed, the aims of which are to understand ground conditions to the north of South Charlton. Details of the scope of the suggested ground investigation can be found in the accompanying Annex A report. Consideration is given to the following when locating investigation holes.

- Exploratory holes at all structure foundation and approach embankment locations.
- Areas containing highly compressible soils (e.g. alluvium and peat)
- Areas not covered by existing ground investigations (Ch. 7400 to 8400 and Ch. 9700 to 10200m) including gaps in areas already covered.

The investigation will also provide monitoring of groundwater, ground gas (if encountered) and their seasonal variations.

7 Geotechnical and Contamination Risk Register

The geotechnical and contamination risk register assesses the design risks associated with the project and identifies their potential impact on the progression of the scheme. The risk register forms an assessment for given design hazards based on the potential likelihood of occurrence and the severity of any impact on the scheme. The assessment of the Risk (R) to the scheme is determined by the Likelihood (L) x Severity (S). The risk register also presents mitigation techniques to reduce the risk of potential design hazards.

The mitigation measures considered are those that may be applied during design or construction, as appropriate, to mitigate against the hazard identified and, in most cases, to reduce the Risk to “As Low as Reasonably Practicable” (ALARP). For some situations the risks may have been reduced, but significant residual risk may remain, which must be controlled during construction phase of the project.

When the risk assessment identifies that the risk falls into the medium to high category, control measures are required to reduce the risk to ALARP.

Table 7-1 Likelihood and Severity Rating

Rating	Likelihood (L)		Severity (S)
1	Very unlikely	Once in over 100 years	Incident, Minor injury, damage, sickness or other loss (with no time off). Minor impact to programme. Minor impact on scheme cost. Minor, easily rectified environmental impact.
2	Unlikely	Once in 10 to 100 years	Minor damage or loss, First Aid injury or illness, (and/or up to 3 days off) Lost time injury. Impact to programme. Small effect on scheme costs. Any environmental impact regarded as significant.
3	Likely	Once in one to 10 years	Serious / substantial damage or loss Reportable injury or illness, (or over 3 days off). Impact to construction and maintenance/operational costs/programme. Third party environmental impact requiring management response to recover.
4	Very Likely	Once in two to 10 per year	Major loss, or injury, long term absence. Significantly increased construction costs &operational difficulty. Environmental incident triggers damage &/or nuisance prosecution and /or compensation.
5	Certain	More than 10 per year	Catastrophic damage, or Fatality Construction/maintenance/operation unsustainable. Major environmental incident, threat to public health and safety.

Table 7-2 Risk Matrix

Geotechnical Hazard						
		Severity (S)				
		5	4	3	2	1
Likelihood (L)	5	25	20	15	10	5
	4	20	16	12	8	4
	3	15	12	9	6	3
	2	10	8	6	4	2
	1	5	4	3	2	1

Key	Risk (R)	Action Required	As Low As Reasonably Practicable (ALARP) Criteria
High (H)	12 - 25	Hazard must be avoided (or the level of risk reduced significantly and reliably by controls)	Intolerable risk
Medium (M)	5 - 10	Hazard should be avoided (or the level of risk reduced significantly and reliably by controls)	Within the ALARP region, but the higher the number the more critical it is to reduce the risk.
Low (L)	1 - 4	Risks to be controlled	Tolerable

Table 7-3 Geotechnical and Contamination Risk Register

Ref.	Activity	Hazard	Stage of Work	Initial			Mitigation	Residual			Residual Risk	Status
				L	S	R		L	S	R		
1	Areas with alluvium and peat	Differential settlement and subsidence of structures founded on soft ground.	Design, Construction, Maintenance period.	4	3	12	Carry out a detailed ground investigation for the proposed site extents and structures where relevant.	4	1	4	Y (Passed to GI Engineer)	Active
2	Unknown groundwater depth	Potentially impact on temporary works if shallow ground water.	Design, Construction, Maintenance period.	3	2	6	Carry out a detailed ground investigation for the proposed site extents and structures where relevant.	2	2	4	Y (Passed to GI Engineer)	Active

Ref.	Activity	Hazard	Stage of Work	Initial			Mitigation	Residual			Residual Risk	Status
				L	S	R		L	S	R		
3	Intermittent Laminated glacio-lacustrine deposits.	Long term failure of earthworks following construction via bearing failure and slope instability. Preferential pathway for failure within shallow slopes. Anisotropic shear strength throughout the material.	Design, Construction, Maintenance period.	3	4	12	Ground investigation to confirm the residual shear strength along the axis of laminations. Detailed design to take cognisance of locations of lenses and use suitable parameters in the designs of earthworks in the area.	2	4	8	Y (Designer to speculate failure mode relating to this risk)	Active
4	Cobbles and boulders within cohesive glacial till	Damage to Ground Investigation equipment and lack of supplementary evidence of in situ strength due to lack of Class 1 Sampling.	Detailed design, GI, Structure / Earthwork construction	4	3	12	Design to take account of the possible increased in situ strength and difficulty in driving. Design parameters to include both reduced strength for earthwork stability and high strength for drivability of piles where required. Suitable section sizes to reduce diversion whilst driving where required.	2	3	6	Y (Inform variability and stratification of Northumberland Till to Designer)	Active
5	Unknown workings within shallow coal seams	Long term failure of earthworks and structures due to subsidence.	Design, Construction, Maintenance period.	2	4	8	CON29M survey of area has been completed, and based on outcome of search no further actions will be required (See Appendix B). To be considered within exploratory ground investigation, including the inspection of boreholes on site. Residual risk of unrecorded coal working will still exist.	1	4	4	Y (residual risk carried by client)	Active

Ref.	Activity	Hazard	Stage of Work	Initial			Mitigation	Residual			Residual Risk	Status
				L	S	R		L	S	R		
6	Weak heavily weathered laminated bedrock	Failure in bearing of piles within bedrock as block leading to failure of the structure.	Detailed Design, Construction phase	3	5	15	Design of piles to be founded within suitably strong and intact bedrock where the strength of the overlying clay is not suitable.	2	5	10	Y (Designer to be informed)	Active
7	Existing road network (A1), agricultural land use, infilled ponds/quarries and historical tanks. Potential contamination could include: Oils/hydrocarbons, PAHs, BTEX, MTBE, VOCs, SVOCs, heavy metals, antifreeze, brake fluids, road salt, slurry, pesticides, herbicides, fertilisers, pathogens, solvents, lubricants and asbestos.	Contamination could cause sickness, injury or fatality to site workers through dermal contact/ingestion of soils, and inhalation of soil dust. Contaminated soils or material may require waste disposal or treatment, resulting in increased costs, programme delays and potential redesign.	Ground investigation, construction phases	2	3	6	Undertake targeted and non-targeted contamination sampling and laboratory testing to determine the presence and extent of any contamination. This could include VOC vapour monitoring depending on the contaminant source. Undertake supplementary ground investigation to better delineate areas of significant contamination. If required, remediate the land by treatment or material removal. Appropriate OHS techniques to be employed to minimise exposure.	1	3	3	Y (Passed to GI Engineer)	Active

Ref.	Activity	Hazard	Stage of Work	Initial			Mitigation	Residual			Residual Risk	Status
				L	S	R		L	S	R		
8	Existing road network (A1), agricultural land use, infilled ponds/quarries and historical tanks. Potential contamination could include: Oils/hydrocarbons, PAHs, BTEX, MTBE, VOCs, SVOCs, heavy metals, antifreeze, brake fluids, road salt, slurry, pesticides, herbicides, fertilisers, pathogens, solvents, lubricants and asbestos.	Creation of pollutant pathways during development works could cause pollution of controlled waters, including groundwater and surface waters. This could result in possible programme delays, redesign and litigation.	Ground investigation	2	3	6	Undertake targeted and non-targeted contamination sampling and laboratory testing to determine the presence and extent of any contamination. This could include VOC vapour monitoring depending on the contaminant source. Undertake supplementary ground investigation to better delineate areas of significant contamination. If required, remediate the land by treatment or material removal. Appropriate environmental control measures to be employed during development works to prevent cross-contamination and the creation of pollution pathways.	1	3	3	Y (Passed to GI Engineer)	Active

Ref.	Activity	Hazard	Stage of Work	Initial			Mitigation	Residual			Residual Risk	Status
				L	S	R		L	S	R		
9	Infilled ponds and quarries – potential source of ground gas.	Migration and accumulation of ground gases within excavations and confined spaces could create a risk of explosion and/or asphyxiation.	Ground investigation, maintenance	2	5	10	Undertake targeted and non-targeted ground investigation to establish presence of ground gas, including VOC and gas monitoring. Undertake supplementary ground investigation to better delineate areas of significant ground gas. Appropriate OHS techniques to be employed to minimise exposure, i.e. passive gas monitoring within excavations and confined spaces, plus use of personal gas alarms by site workers.	1	5	5	Y (Passed to GI Engineer)	Active

8 References

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9 Drawings and Figures

List of Drawings

List of Figures

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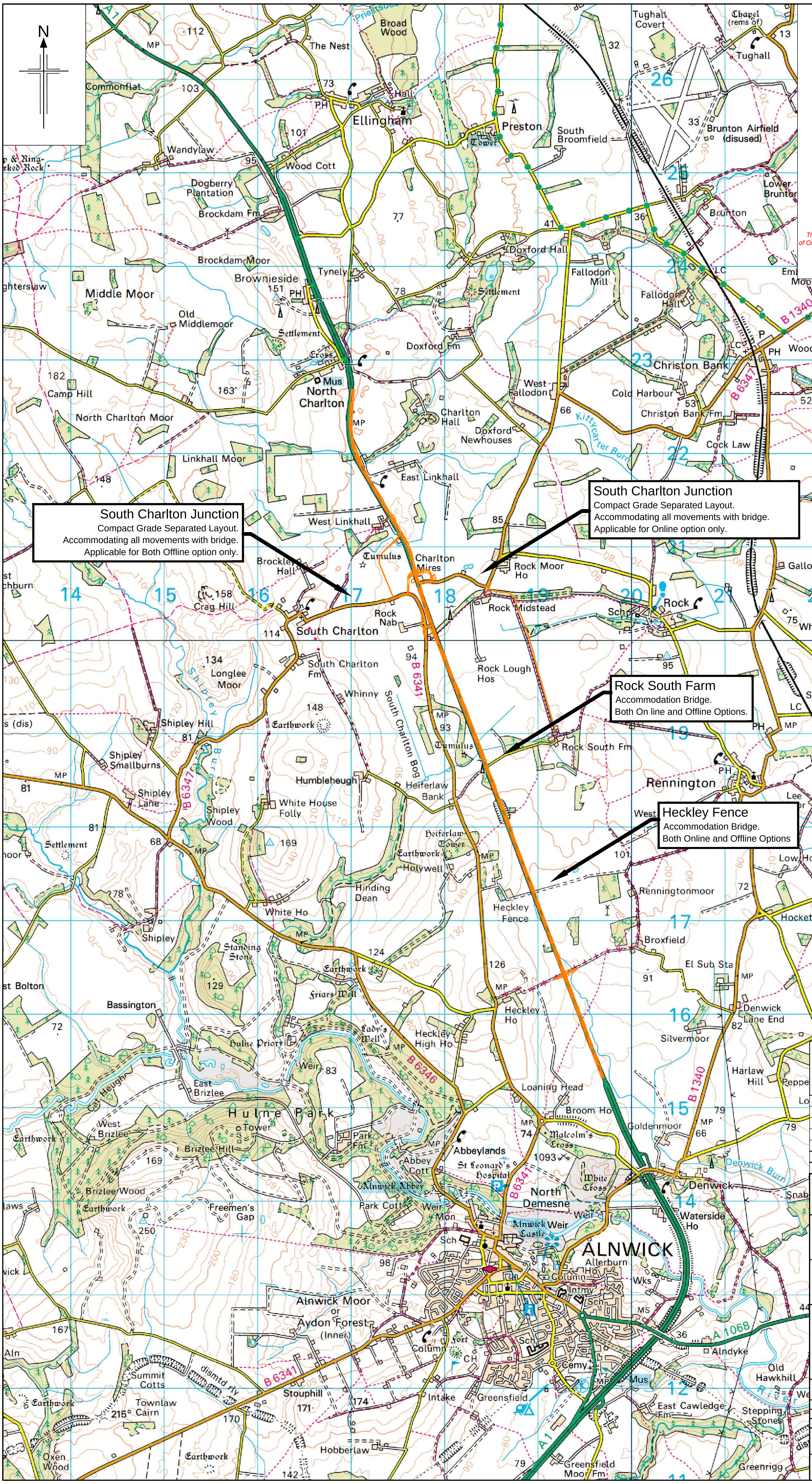

KEY

Orange Route Option

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0	Oct 15	Inititial Issue	CS	CS	PF	MC
		Purpose of revision	Drawn	Check'd	Rev'd	Appr'd

JACOBS

Client

highways england
driving forward

Project

A1 IN NORTHUMBERLAND
ALNWICK TO ELLINGHAM

Drawing title

ALIGNMENT OPTIONEERING
SECTION B

Drawing status

WORKING DRAWING

Scale	NTS	DO NOT SCALE
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Client no.	551459	

Drawing number

HA551459-JAC-GEN-Section B-WD-C-001

Rev
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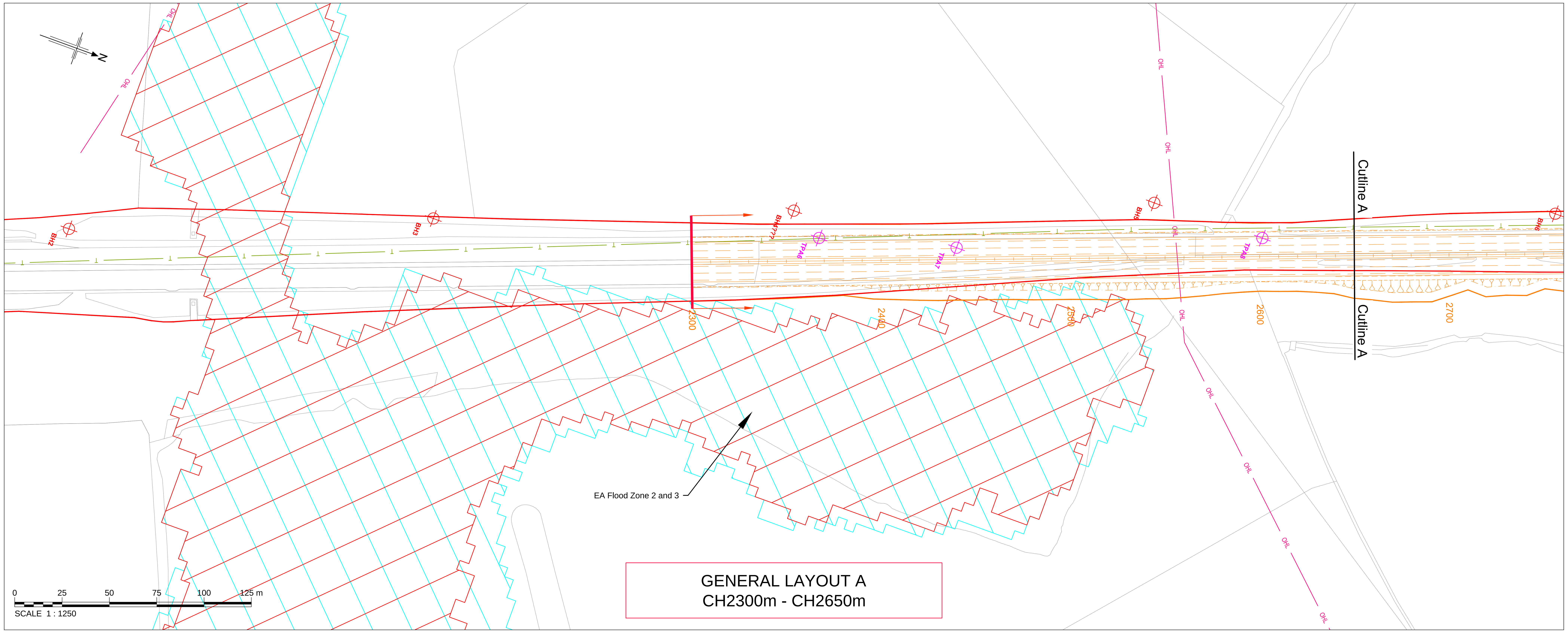

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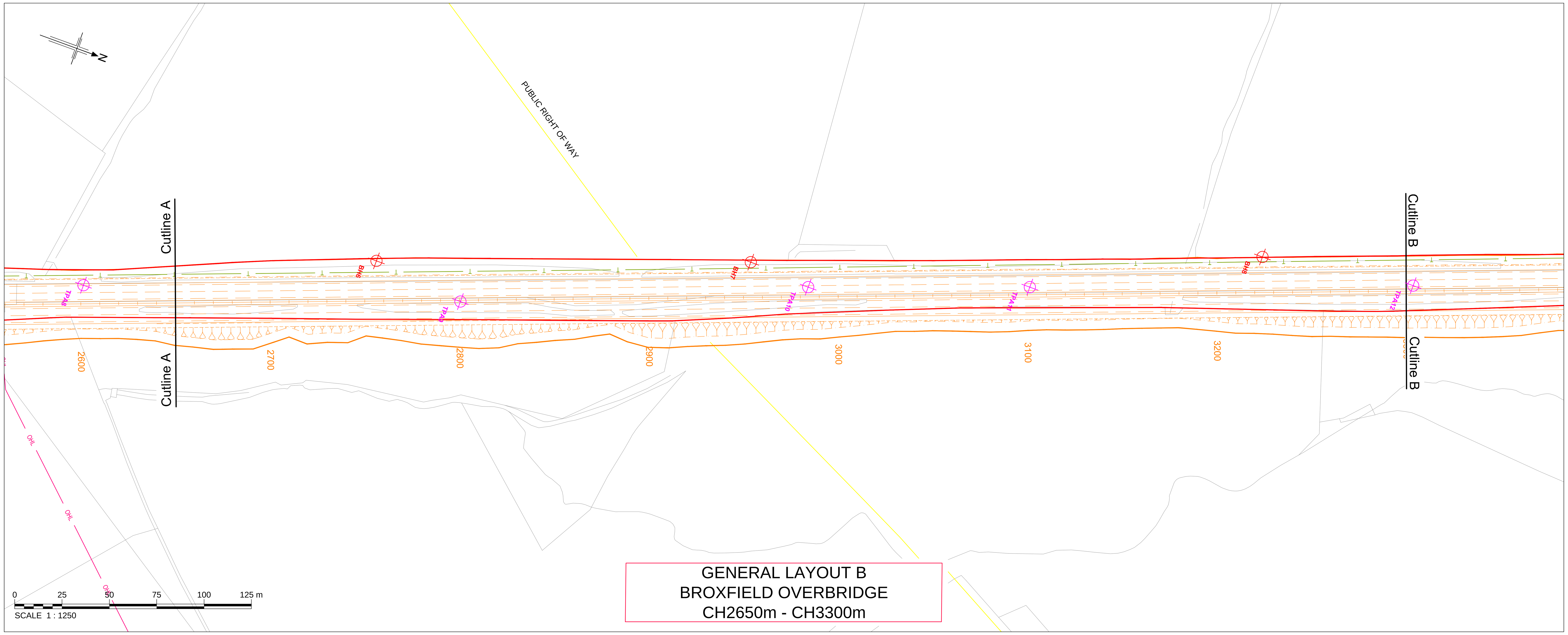


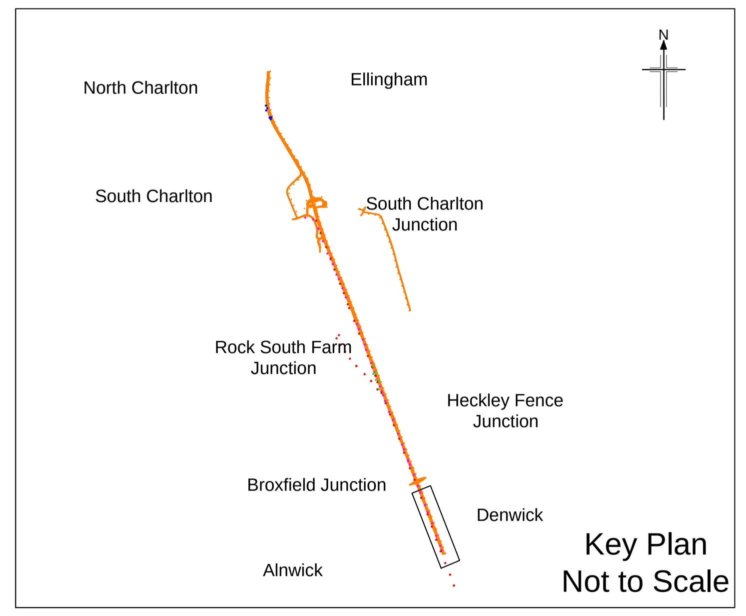
GENERAL LAYOUT B
BROXFIELD OVERBRIDGE
CH2650m - CH3300m

NOTES

1. All dimensions in metres unless stated otherwise.
2. This drawing shows the preliminary layout for online carriageway upgrade for the A1 from a Single Carriageway (S2) to a Dual Carriageway (D2AP) from Alnwick to Ellingham.
3. This drawing shows Orange Option as the primary alignment.
4. This drawing shall be read in conjunction with drawing number:
   - HA551459-JAC-GEN-Section B-WD-C-02 to 08.
5. The Design is based upon Ordnance Survey Mastermap data and Ordnance Survey Digital Terrain Model data 5m grid. No warranty for its accuracy can be given or implied.

KEY

- Existing Highway Boundary
- Option A Highway Footprint
- Extents of Scheme
- GAS — Northern Gas
- OHL — Northern Powergrid
- W — Northumbrian Water Mains
- FWDR — Northumbrian Water Abandoned Pipes
- T — Vodafone
- A1 Alnwick Bypass Stage II Boreholes (1969)
- A1 Alnwick Bypass Stage II Trial Pits (1979)
- Heiferlaw Cutting Alnwick Bypass Stage II (1980)
- Middlemoor Wind Farm and Shipperton Burn Wildlife Crossing Ground Investigation (2012)



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C	OCT 16	Post Public Awareness Design	ML	CS	PF	MC
B	APR 16	Revised Alignment	CS	CS	PF	MC
A	NOV 15	CORRIDOR LAYOUT	CR	CS	PF	MC

JACOBS

Client
highways england

Project
A1 IN NORTHUMBERLAND

Drawing title
ORANGE OPTION
ONLINE DUAL CARRIAGEWAY
GENERAL LAYOUT
SHEET 1 OF 7

Drawing status
WORKING PROGRESS

Scale	1:1250	DO NOT SCALE
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Client no.	551459	

Drawing number: HA551459-JAC-GEN-Section B-WD-C-002 — Rev: C

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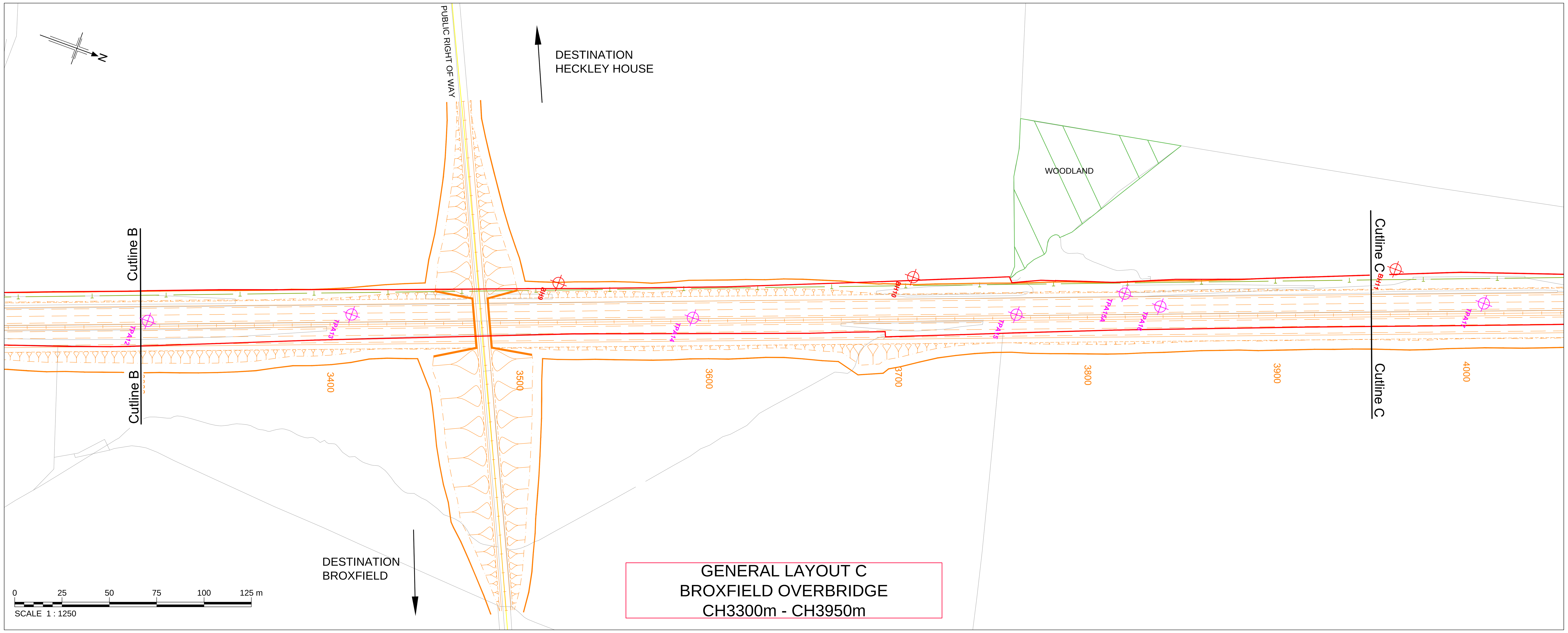

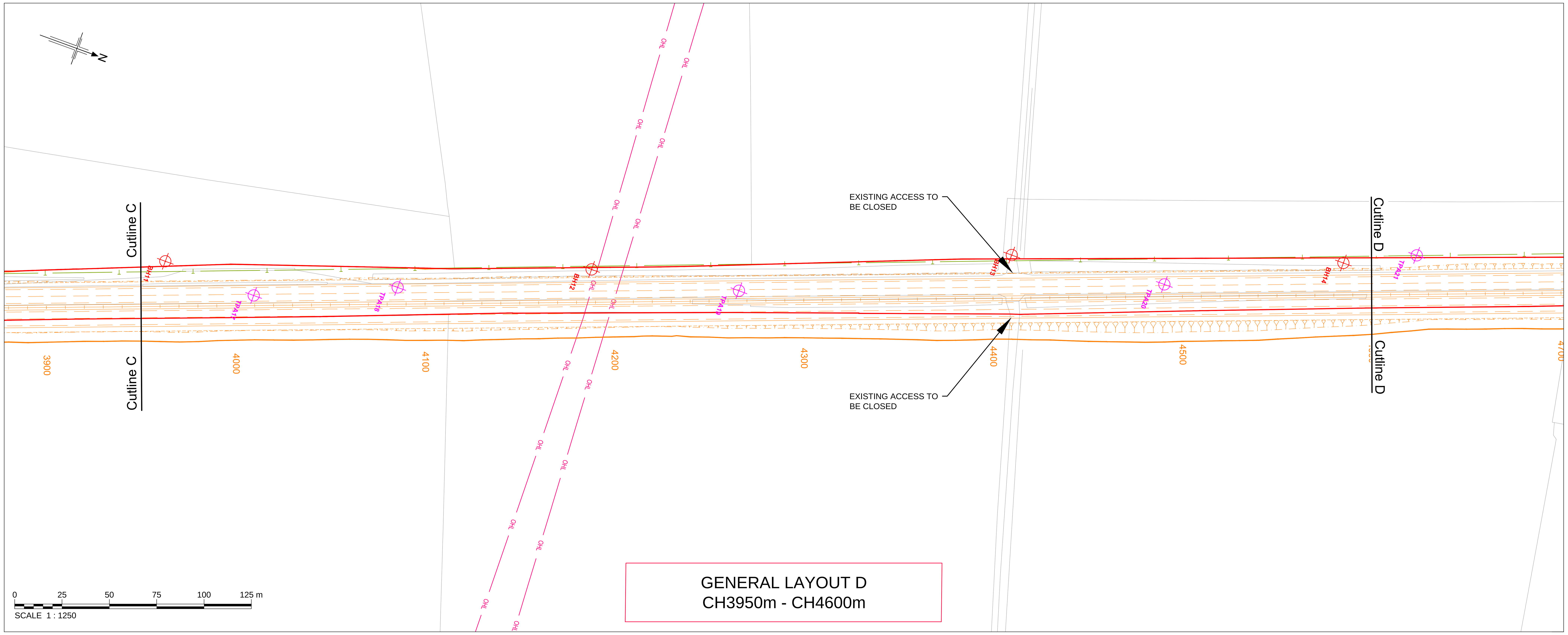

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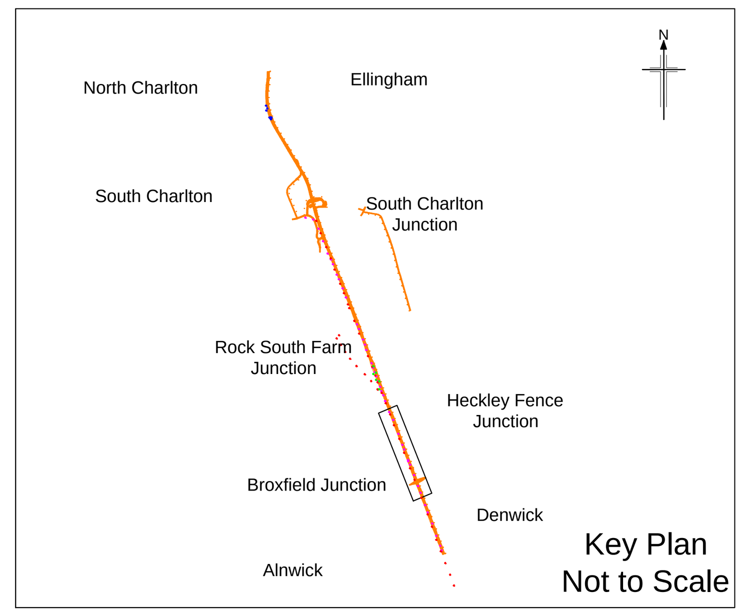

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C	OCT 16	Post Public Awareness Design	ML	CS	PF	MC
B	Apr 2016	Revised Alignment	CS	CS	PF	MC
A	NOV 15	CORRIDOR LAYOUT	CR	CS	PF	MC

JACOBS

Client
highways england

Project
A1 IN NORTHUMBERLAND
ALNWICK TO ELLINGHAM

Drawing title
ORANGE OPTION
ONLINE DUAL CARRIAGEWAY
GENERAL LAYOUT
SHEET 2 OF 7

Drawing status
WORKING PROGRESS

Scale	1:1250	DO NOT SCALE
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Client no.	551459	

Drawing number: HA551459-JAC-GEN-Section B-WD-C-003 — Rev: C

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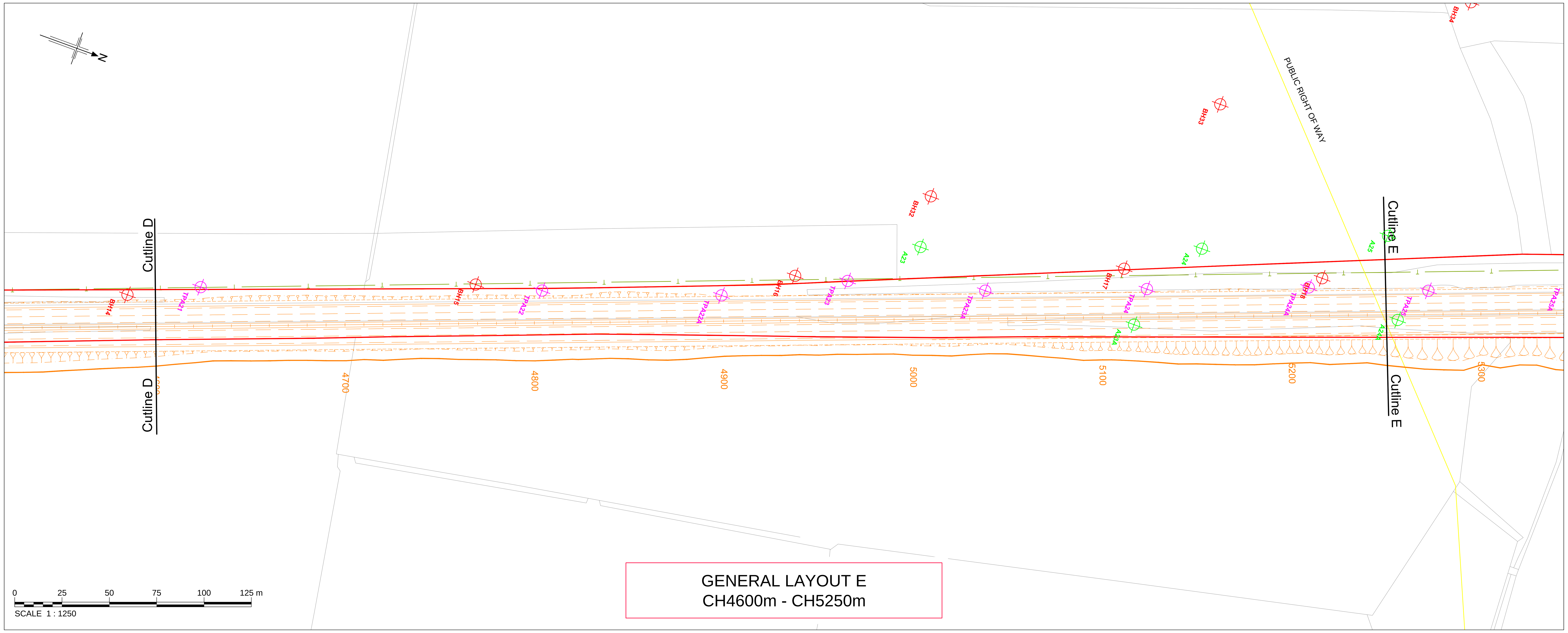

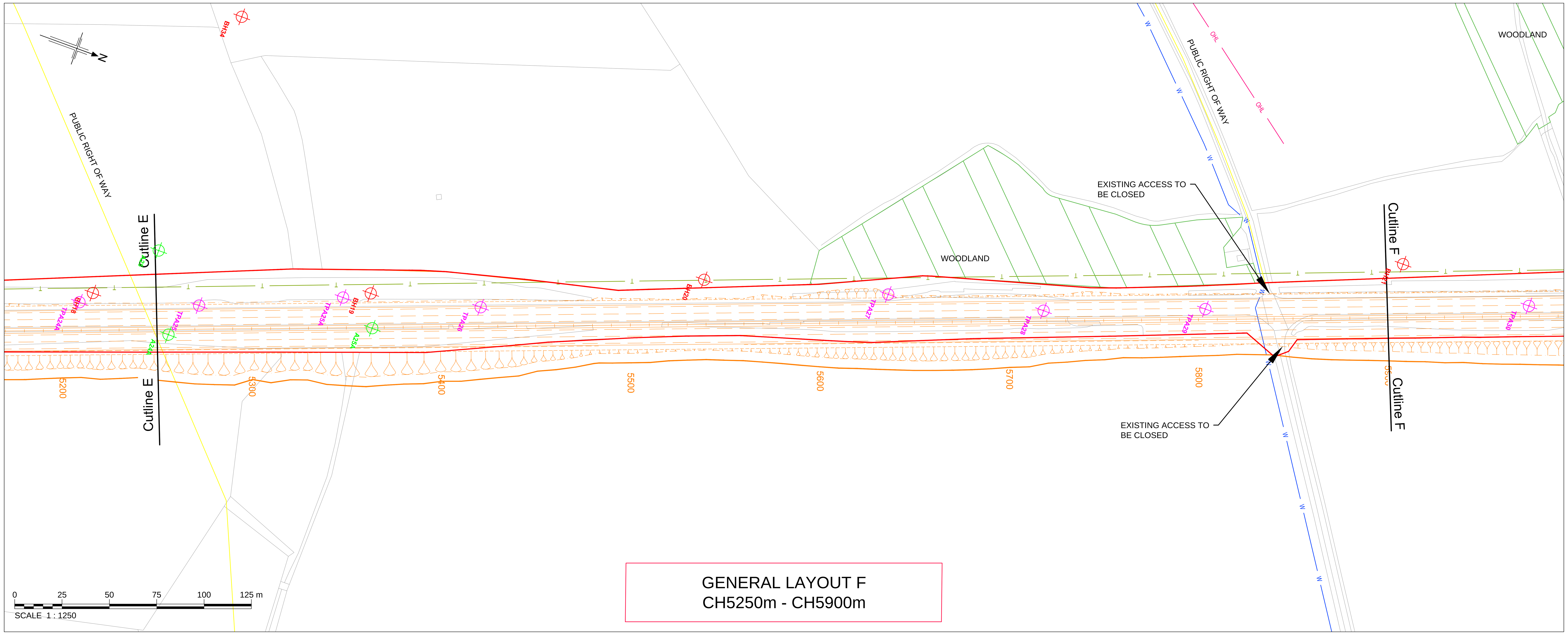

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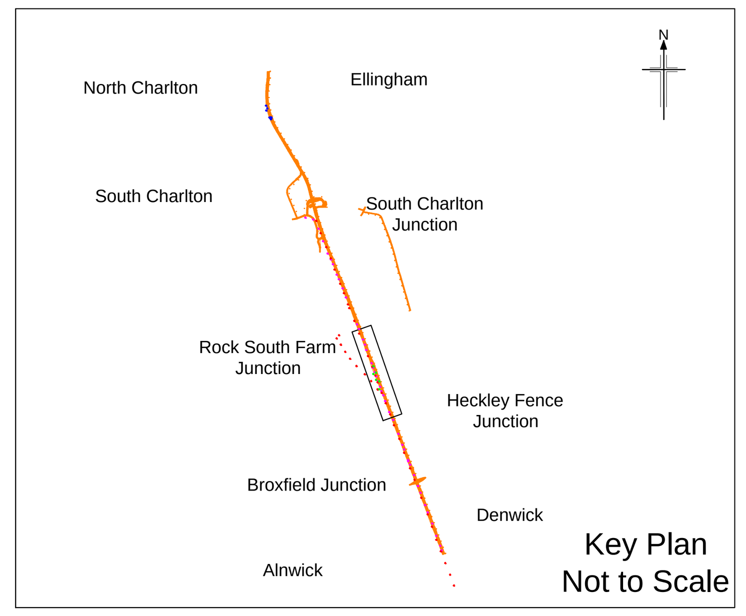


Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Rev'd	Apprv'd
-	-	-	-	-	-	-
C	OCT 16	Post Public Awareness Design	ML	CS	PF	MC
B	Apr 2016	Revised Alignment	CS	CS	PF	MC
A	NOV 15	CORRIDOR LAYOUT	CR	CS	PF	MC

JACOBS

Client
highways england

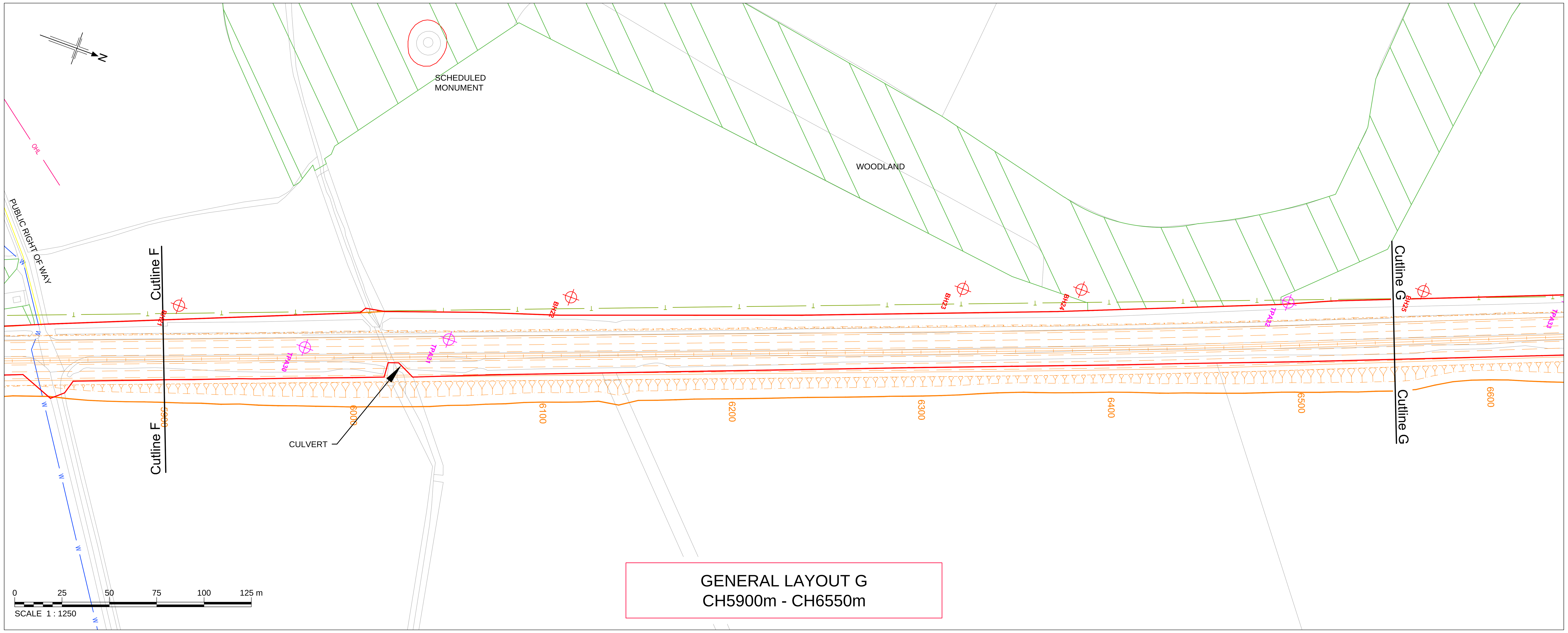
Project
A1 IN NORTHUMBERLAND
ALNWICK TO ELLINGHAM

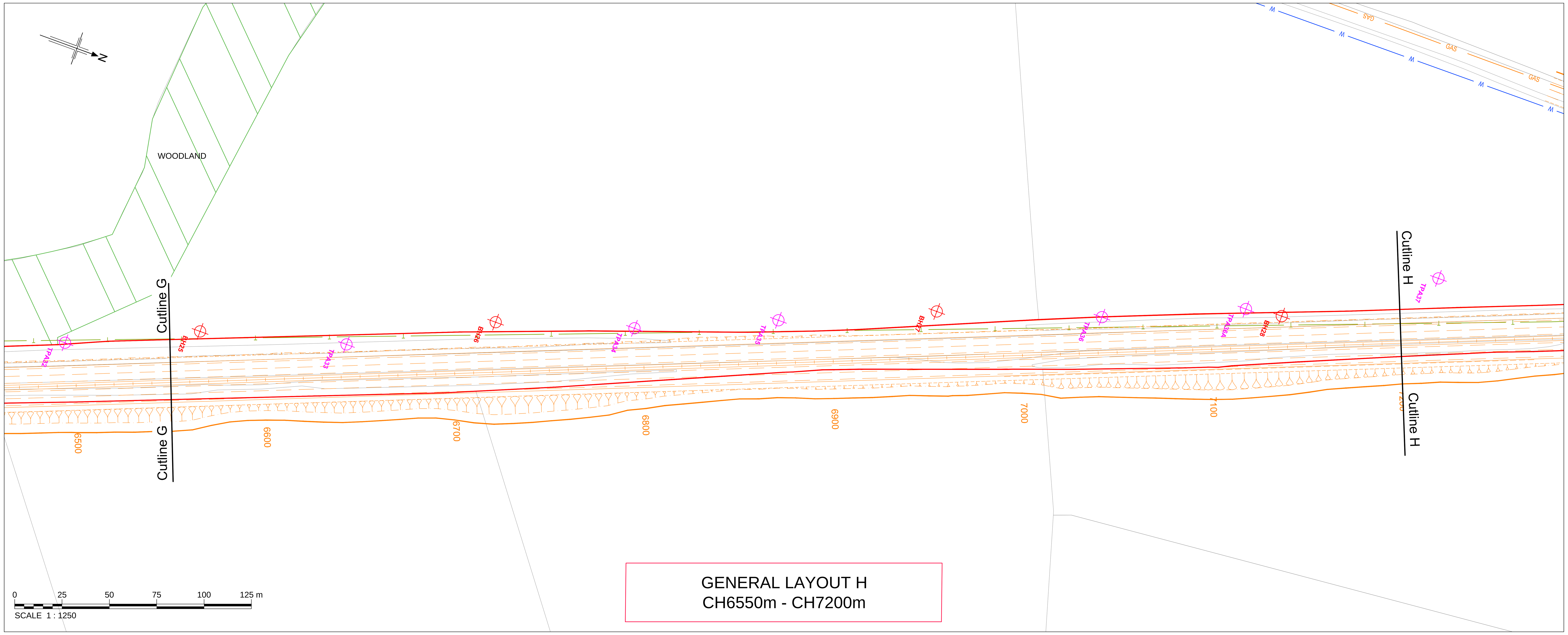
Drawing title
ORANGE OPTION
ONLINE DUAL CARRIAGEWAY
GENERAL LAYOUT
SHEET 3 OF 7

Drawing status
WORKING PROGRESS

Scale	1:1250	DO NOT SCALE
Jacobs No.	B2104700	
Client no.	551459	

Drawing number: HA551459-JAC-GEN-Section B-WD-C-004 — Rev: C



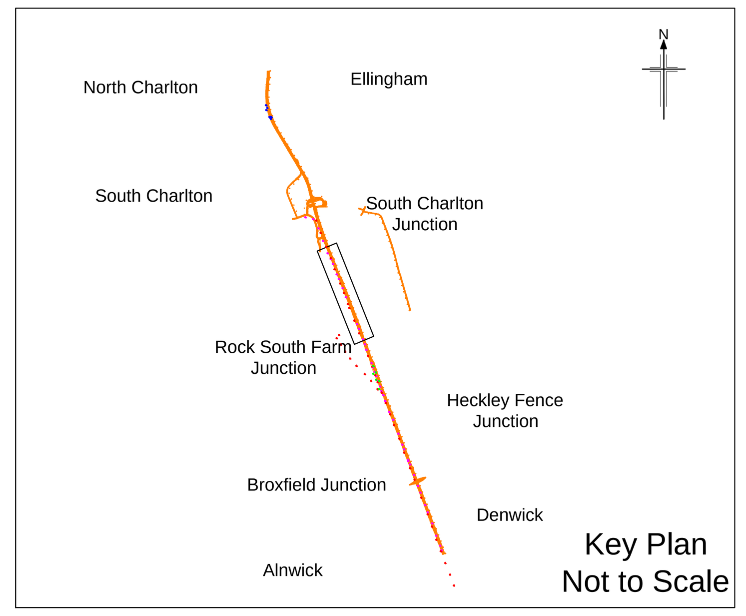


NOTES

1. All dimensions in metres unless stated otherwise.
2. This drawing shows the preliminary layout for online carriageway upgrade for the A1 from a Single Carriageway (S2) to a Dual Carriageway (D2AP) from Alnwick to Ellingham.
3. This drawing shows Orange Option as the primary alignment.
4. This drawing shall be read in conjunction with drawing number:
   - HA551459-JAC-GEN-Section B-WD-C-02 to 08.
5. The Design is based upon Ordnance Survey Mastermap data and Ordnance Survey Digital Terrain Model data 5m grid. No warranty for its accuracy can be given or implied.

KEY

- Existing Highway Boundary
- Option A Highway Footprint
- Extents of Scheme
- Northern Gas
- Northern Powergrid
- Northumbrian Water Mains
- Northumbrian Water Abandoned Pipes
- Vodafone
- A1 Alnwick Bypass Stage II Boreholes (1969)
- A1 Alnwick Bypass Stage II Trial Pits (1979)
- Heiferlaw Cutting Alnwick Bypass Stage II (1980)
- Middlemoor Wind Farm and Shipperton Burn Wildlife Crossing Ground Investigation (2012)



Key Plan
Not to Scale

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Rev'd	Apprv'd
-	-	-	-	-	-	-
C	OCT 16	Post Public Awareness Design	ML	CS	PF	MC
B	Apr 2016	Revised Alignment	CS	CS	PF	PF
A	NOV 15	CORRIDOR LAYOUT	CR	CS	PF	MC

JACOBS

Client
highways england

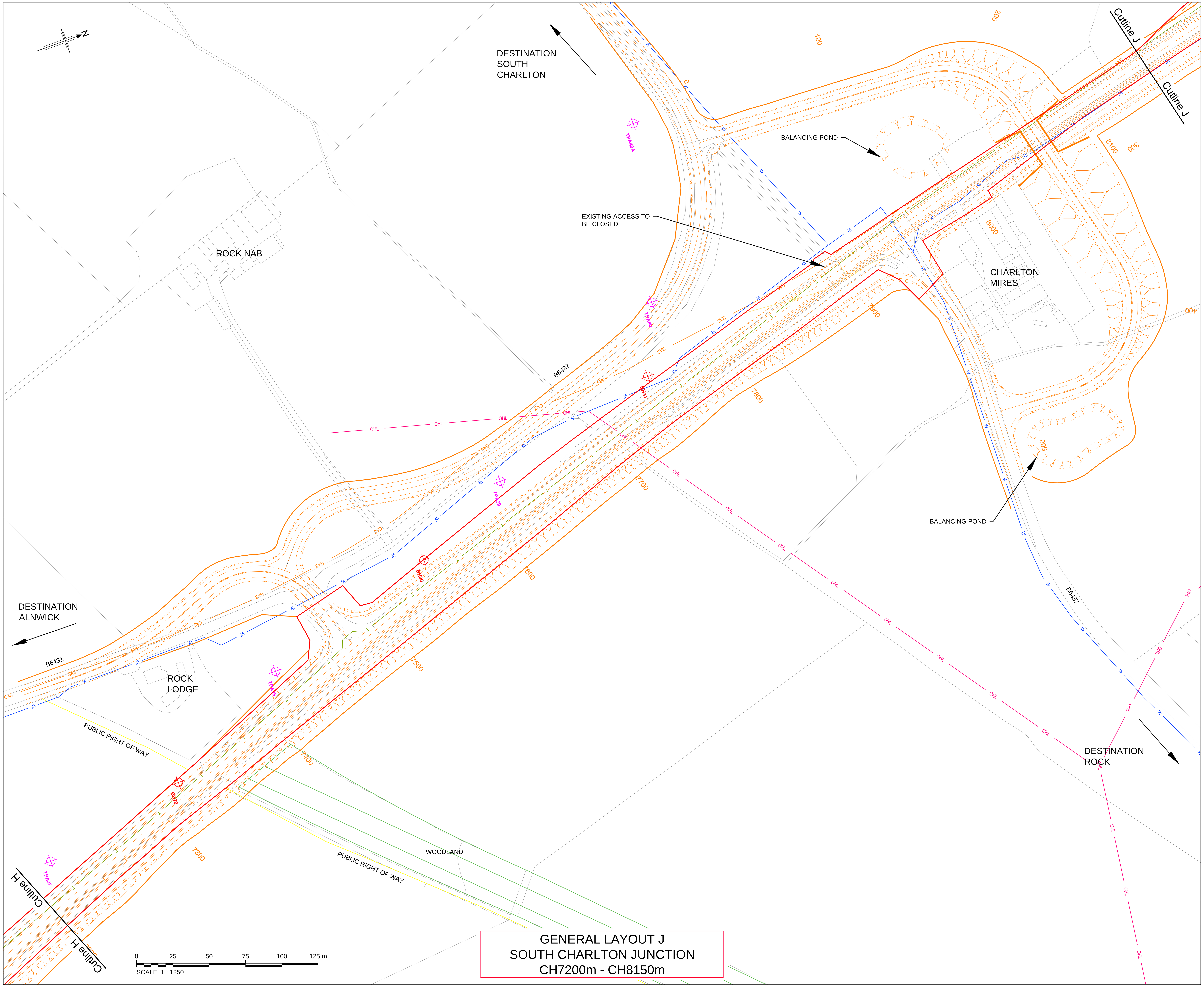
Project
A1 IN NORTHUMBERLAND
ALNWICK TO ELLINGHAM

Drawing title
ORANGE OPTION
ONLINE DUAL CARRIAGEWAY
GENERAL LAYOUT
SHEET 4 OF 7

Drawing status
WORKING PROGRESS

Scale	1:1250	DO NOT SCALE
Jacobs No.	B2104700	
Client no.	551459	

Drawing number: HA551459-JAC-GEN-Section B-WD-C-005
Rev: C



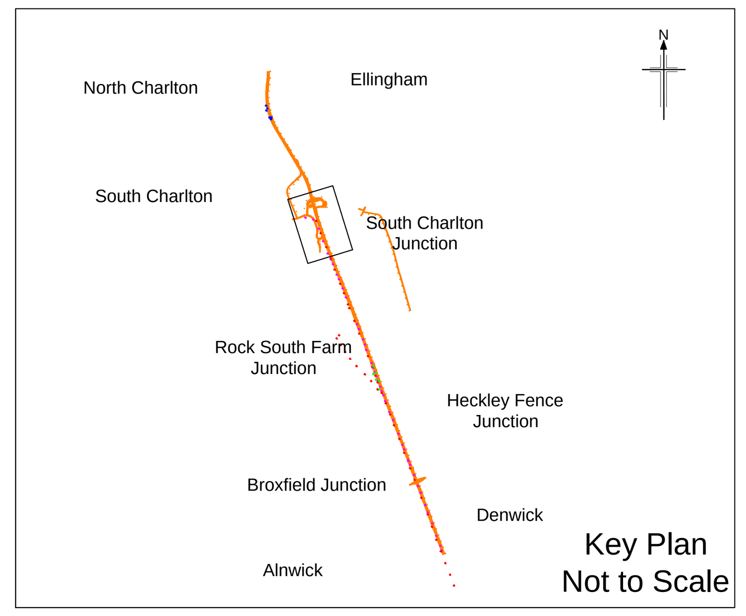
GENERAL LAYOUT J
SOUTH CHARLTON JUNCTION
CH7200m - CH8150m

NOTES

1. All dimensions in metres unless stated otherwise.
2. This drawing shows the preliminary layout for online carriageway upgrade for the A1 from a Single Carriageway (S2) to a Dual Carriageway (D2AP) from Alnwick to Ellingham.
3. This drawing shows Orange Option as the primary alignment.
4. This drawing shall be read in conjunction with drawing number:
- HA551459-JAC-GEN-Section B-WD-C-02 to 08.
5. The Design is based upon Ordnance Survey Mastermap data and Ordnance Survey Digital Terrain Model data 5m grid. No warranty for its accuracy can be given or implied.

KEY

- Existing Highway Boundary
- Option A Highway Footprint
- Extents of Scheme
- GAS — Northern Gas
- OHL — Northern Powergrid
- W — Northumbrian Water Mains
- FWDR — Northumbrian Water Abandoned Pipes
- T — Vodafone
- A1 Alnwick Bypass Stage II Boreholes (1969)
- A1 Alnwick Bypass Stage II Trial Pits (1979)
- Heiferlaw Cutting Alnwick Bypass Stage II (1980)
- Middlemoor Wind Farm and Shipperton Burn Wildlife Crossing Ground Investigation (2012)



Key Plan
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C	OCT 16	Post Public Awareness Design	ML	CS	PF	MC
B	Apr 2016	Revised Alignment	CS	CS	PF	MC
A	NOV 15	CORRIDOR LAYOUT	CR	CS	PF	MC

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Client
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Project
A1 IN NORTHUMBERLAND
ALNWICK TO ELLINGHAM

Drawing title
ONLINE OPTION A
ONLINE DUAL CARRIAGEWAY
GENERAL LAYOUT
SHEET 5 OF 7

Drawing status
WORKING PROGRESS

Scale	1:1250	DO NOT SCALE
Jacobs No.	B2104700	
Client no.	551459	

Drawing number: HA551459-JAC-GEN-Section B-WD-C-006 — Rev: C

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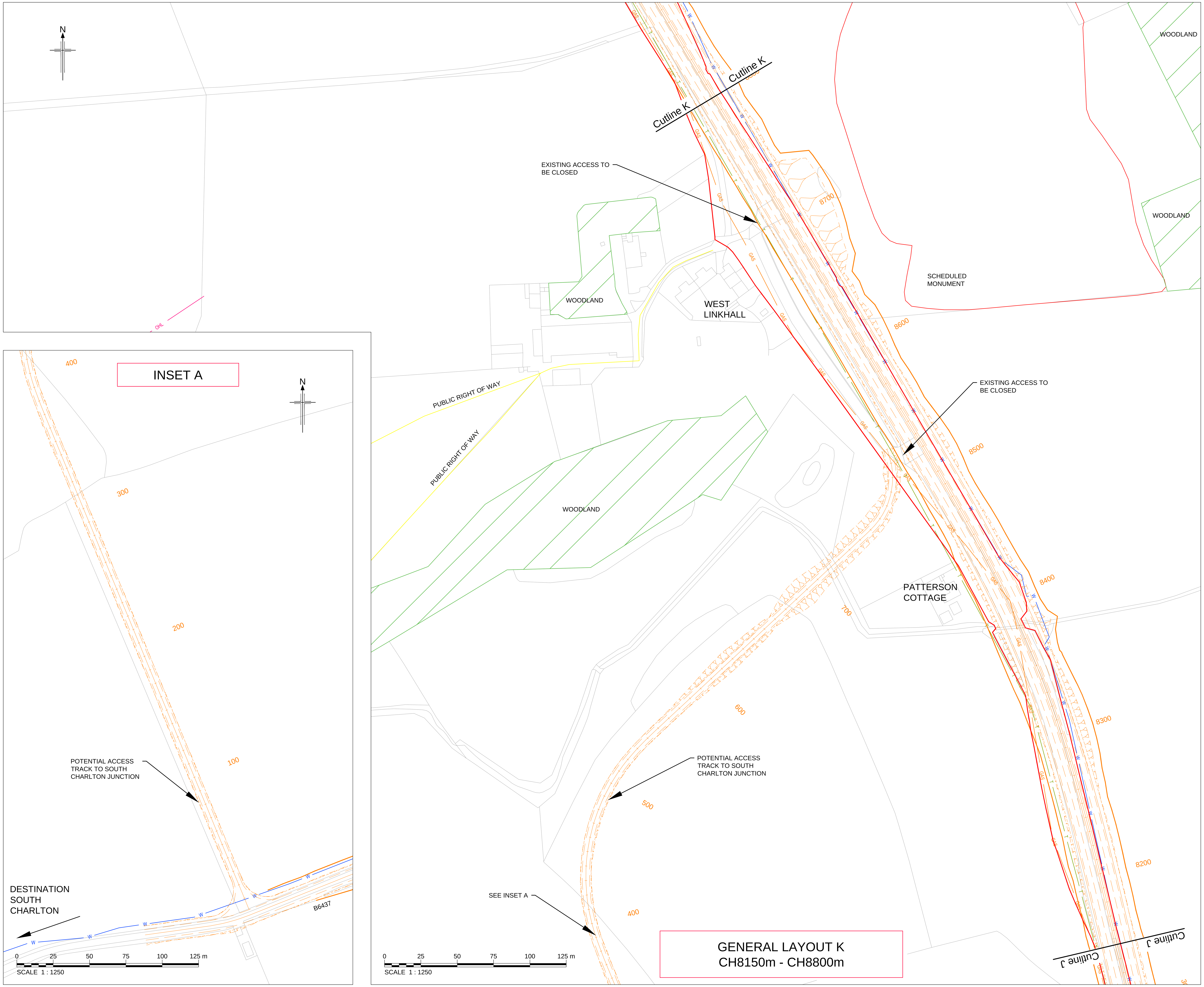
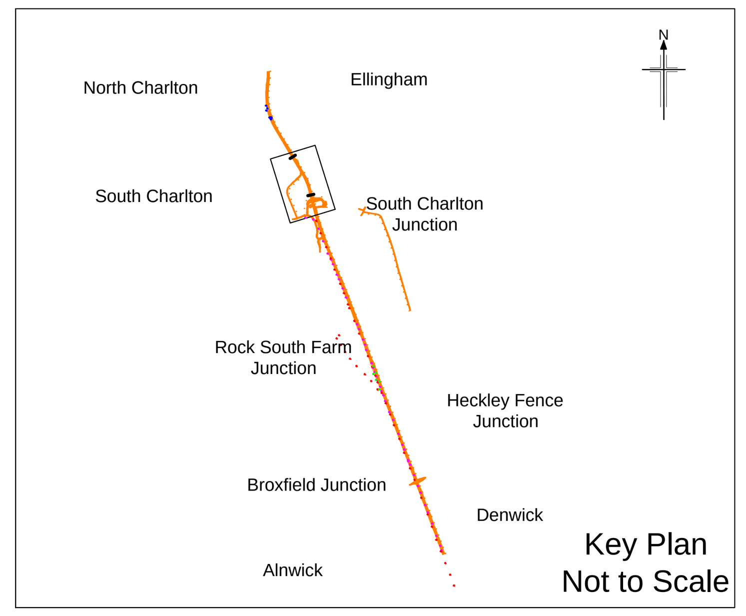


NOTES

1. All dimensions in metres unless stated otherwise.
2. This drawing shows the preliminary layout for online carriageway upgrade for the A1 from a Single Carriageway (S2) to a Dual Carriageway (D2AP) from Alnwick to Ellingham.
3. This drawing shows Orange Option as the primary alignment.
4. This drawing shall be read in conjunction with drawing number:
   - HA551459-JAC-GEN-Section B-WD-C-02 to 08.
5. The Design is based upon Ordnance Survey Mastermap data and Ordnance Survey Digital Terrain Model data 5m grid. No warranty for its accuracy can be given or implied.

KEY

- Existing Highway Boundary
- Option A Highway Footprint
- Extents of Scheme
- GAS — Northern Gas
- OHL — Northern Powergrid
- W — Northumbrian Water Mains
- NWDA — Northumbrian Water Abandoned Pipes
- T — Vodafone
- A1 Alnwick Bypass Stage II Boreholes (1969)
- A1 Alnwick Bypass Stage II Trial Pits (1979)
- Heiferlaw Cutting Alnwick Bypass Stage II (1980)
- Middlemoor Wind Farm and Shipperton Burn Wildlife Crossing Ground Investigation (2012)



Key Plan
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Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Rev'd	Apprv'd
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C	OCT 16	Post Public Awareness Design	ML	CS	PF	MC
B	APR 16	Revised Alignment	CS	CS	PF	MC
A	NOV 15	CORRIDOR LAYOUT	CR	CS	PF	MC

JACOBS

Client: highways england

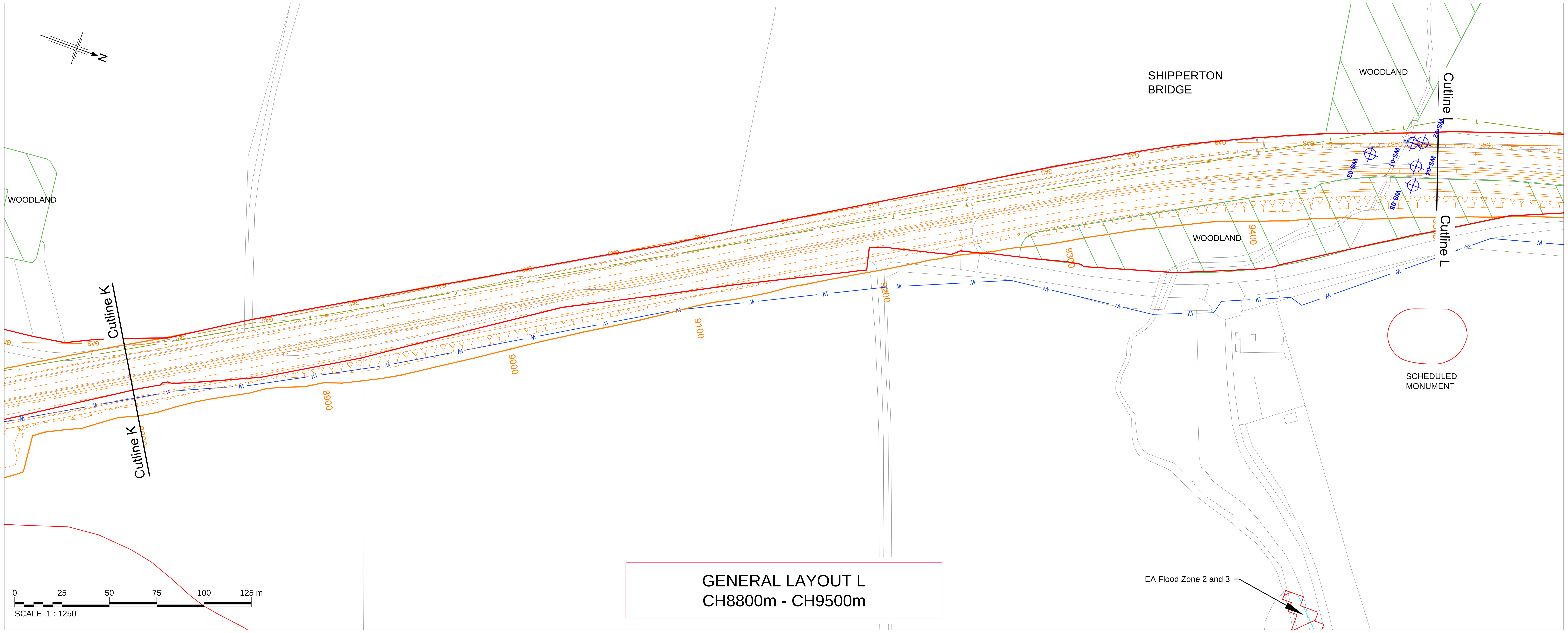
Project: A1 IN NORTHUMBERLAND ALNWICK TO ELLINGHAM

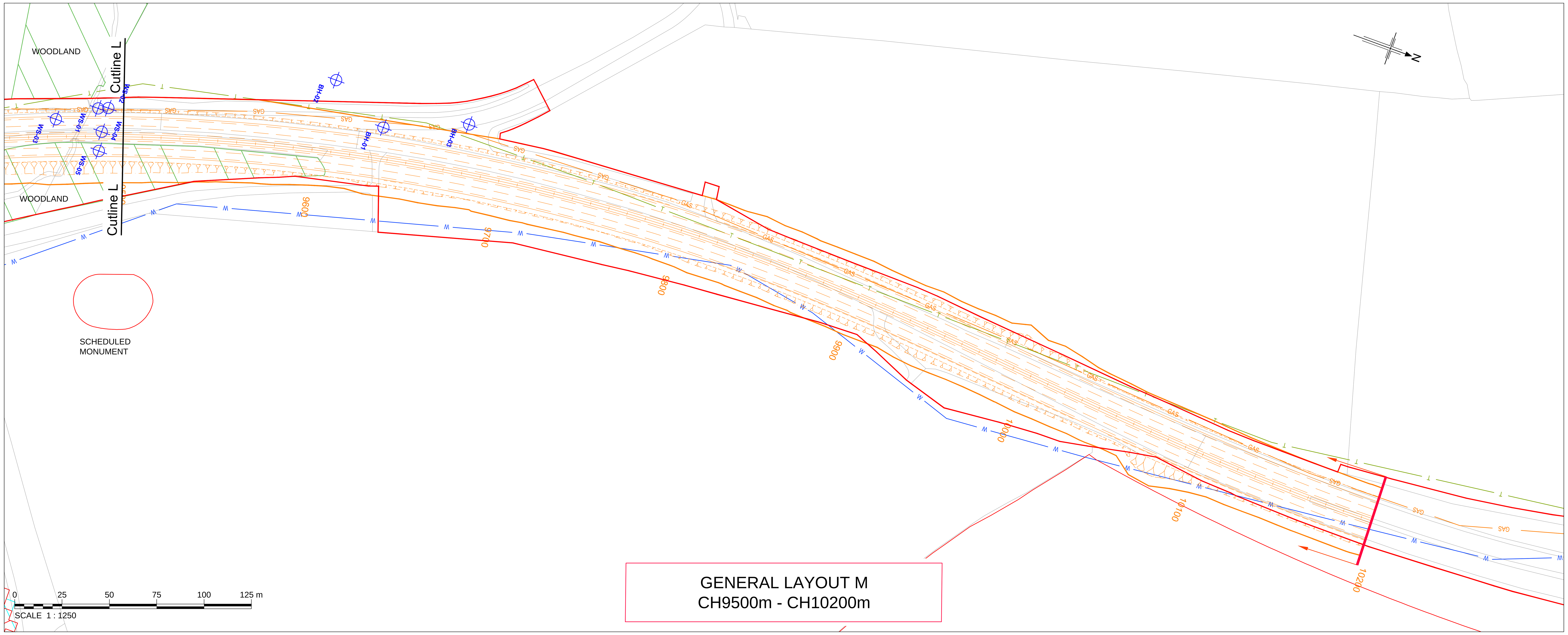
Drawing title:

ORANGE OPTION ONLINE DUAL CARRIAGEWAY GENERAL LAYOUT SHEET 6 OF 7

Drawing status: WORKING PROGRESS

Scale	1:1250 — DO NOT SCALE
Jacobs No.	B2104700
Client no.	551459
Drawing number	HA551459-JAC-GEN-Section B-WD-C-007
Rev	C





NOTES

1. All dimensions in metres unless stated otherwise.
2. This drawing shows the preliminary layout for online carriageway upgrade for the A1 from a Single Carriageway (S2) to a Dual Carriageway (D2AP) from Alnwick to Ellingham.
3. This drawing shows Orange Option as the primary alignment.
4. This drawing shall be read in conjunction with drawing number:
- HA551459-JAC-GEN-Section B-WD-C-02 to 08.
5. The Design is based upon Ordnance Survey Mastermap data and Ordnance Survey Digital Terrain Model data 5m grid. No warranty for its accuracy can be given or implied.

KEY

- Existing Highway Boundary
- Option A Highway Footprint
- Extents of Scheme
- GAS — Northern Gas
- OHL — Northern Powergrid
- W — Northumbrian Water Mains
- FWDR — Northumbrian Water Abandoned Pipes
- T — Vodafone
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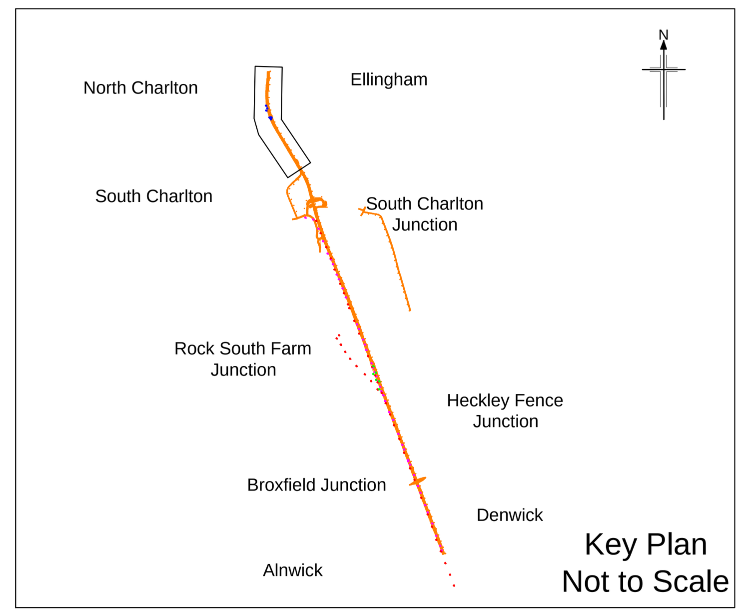
- Heiferlaw Cutting Alnwick Bypass Stage II (1980)
- Middlemoor Wind Farm and Shipperton Burn Wildlife Crossing Ground Investigation (2012)



Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Rev'd	Apprv'd
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C	OCT 16	Post Public Awareness Design	ML	CS	PF	MC
B	Apr 2016	Revised Alignment	CS	CS	PF	MC
A	NOV 15	CORRIDOR LAYOUT	CR	CS	PF	MC

JACOBS

Client: highways england

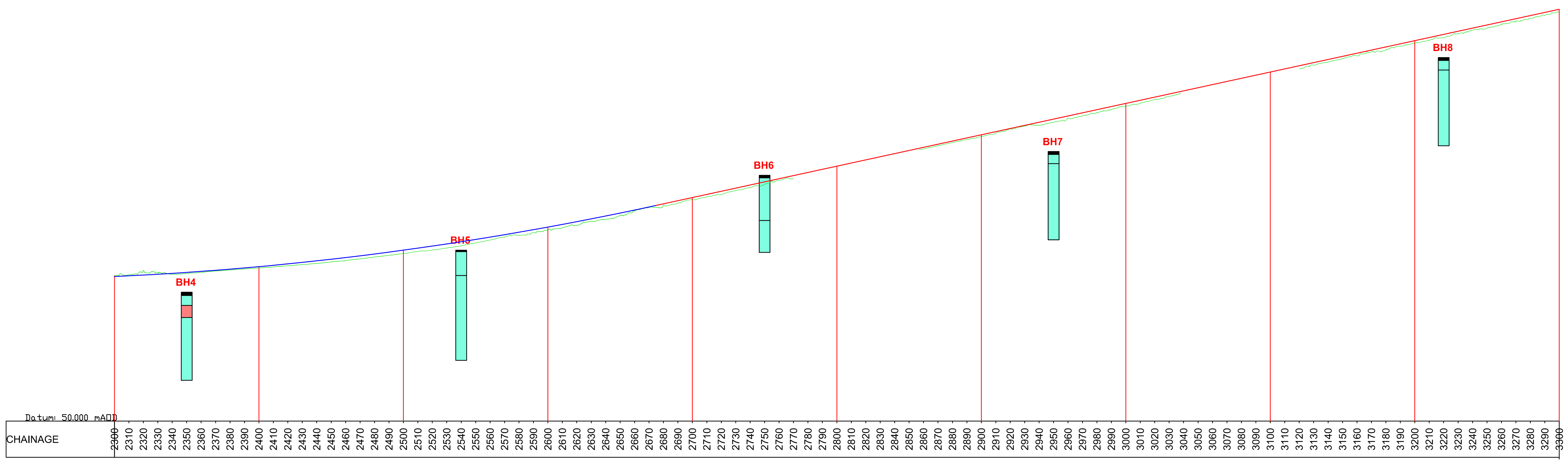
Project: A1 IN NORTHUMBERLAND
ALNWICK TO ELLINGHAM

Drawing title:
ORANGE OPTION
ONLINE DUAL CARRIAGEWAY
GENERAL LAYOUT
SHEET 7 OF 7

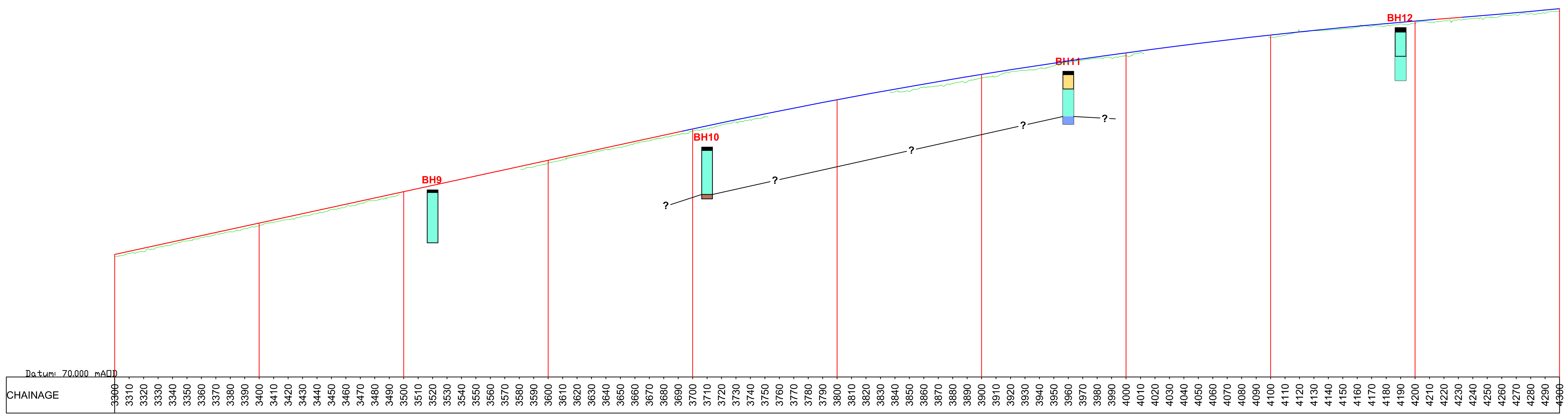
Drawing status: WORKING PROGRESS

Scale	1:1250	DO NOT SCALE
Jacobs No.	B2104700	
Client no.	551459	

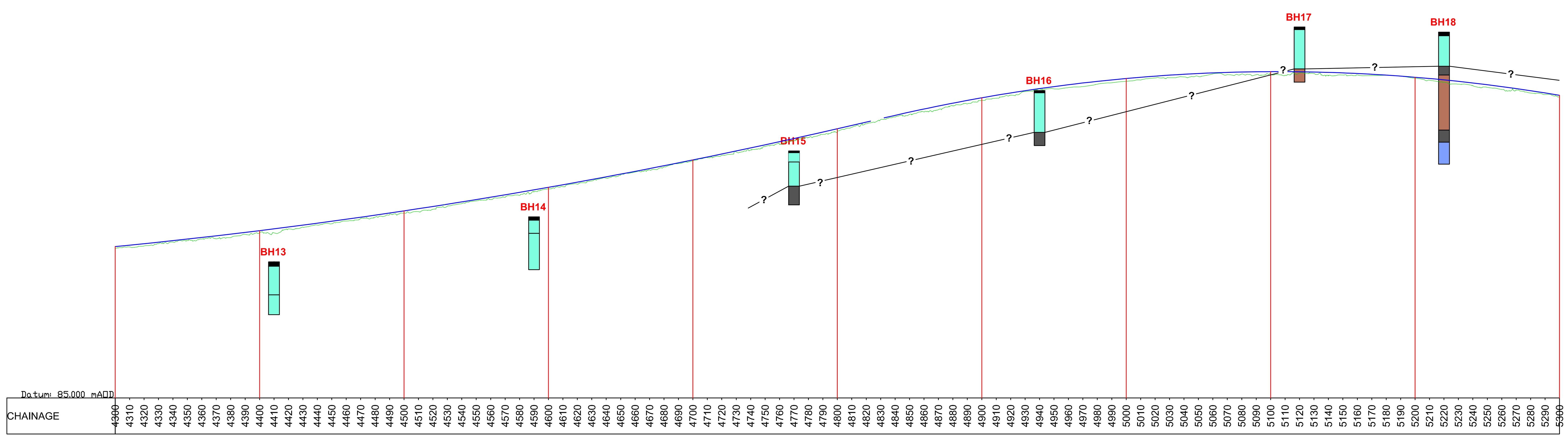
Drawing number: HA551459-JAC-GEN-Section B-WD-C-008 — Rev: C



A1 ALNWICK TO ELLINGHAM ONLINE LONGITUDINAL SECTION 1 OF 8
SCALE: H 1:500,V 1:100. DATUM: 50.000



A1 ALNWICK TO ELLINGHAM ONLINE LONGITUDINAL SECTION 2 OF 8
SCALE: H 1:500,V 1:100. DATUM: 70.000



A1 ALNWICK TO ELLINGHAM ONLINE LONGITUDINAL SECTION 3 OF 8
SCALE: H 1:500,V 1:100. DATUM: 85.000

NOTES

1. This drawing shall be read in conjunction with drawing number HA551459-JAC-GEN-Section B-WD-C-002 to 008 General Layout.

KEY

- Proposed Vertical Alignment Gradient
- Proposed Vertical Alignment Curve
- Existing Ground Surface
- — ? — Apparent rock head

Ground Units

- Topsoil
- Unit A - Made Ground
- Unit B - Recent Deposits - Alluvium and Peat
- Unit C - Glacio fluvial
- Unit D - Glacio-lacustrine
- Unit E - Glacial Till

Bedrock

- Mudstone
- Shale
- Sandstone
- Siltstone

0 50 100 150 200 m
SCALE 1 : 2000

0 10 20 30 40 m
SCALE 1 : 400

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Rev'd	Apprv'd

JACOBS

Client: highways england

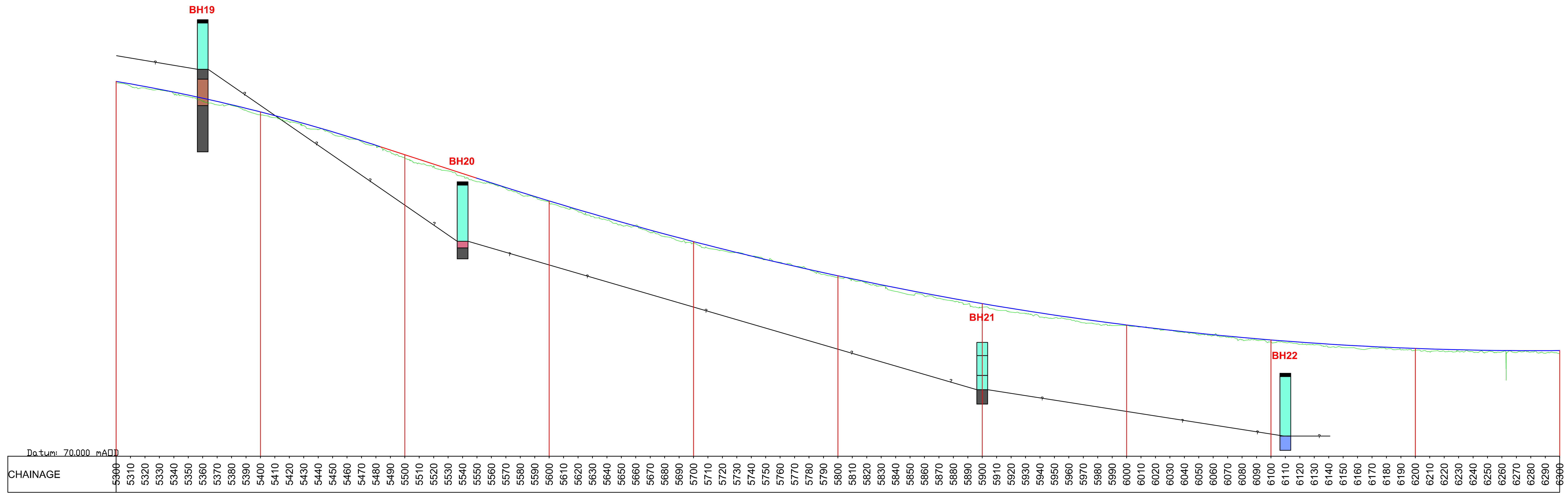
Project: A1 IN NORTHUMBERLAND ALNWICK TO ELLINGHAM

Drawing title: SECTION B GEOTECHNICAL LONGITUDINAL SECTION SHEET 1 OF 3

Drawing status: WORKING PROGRESS

Scale	AS SHOWN @ A1	DO NOT SCALE
Jacobs No.	B2104700	
Client no.	551459	

Drawing number	Rev
HA551459-JAC-GEN-Section B-WD-C-073A	0



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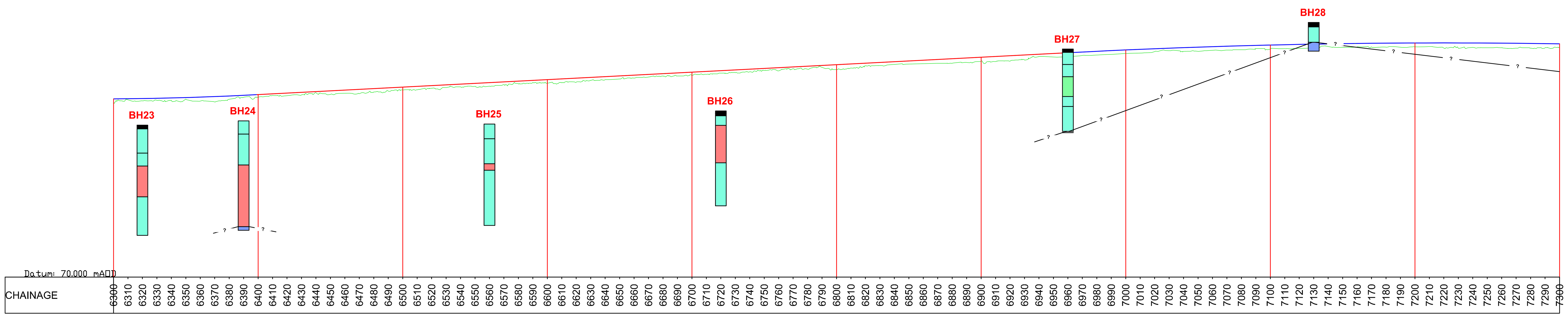
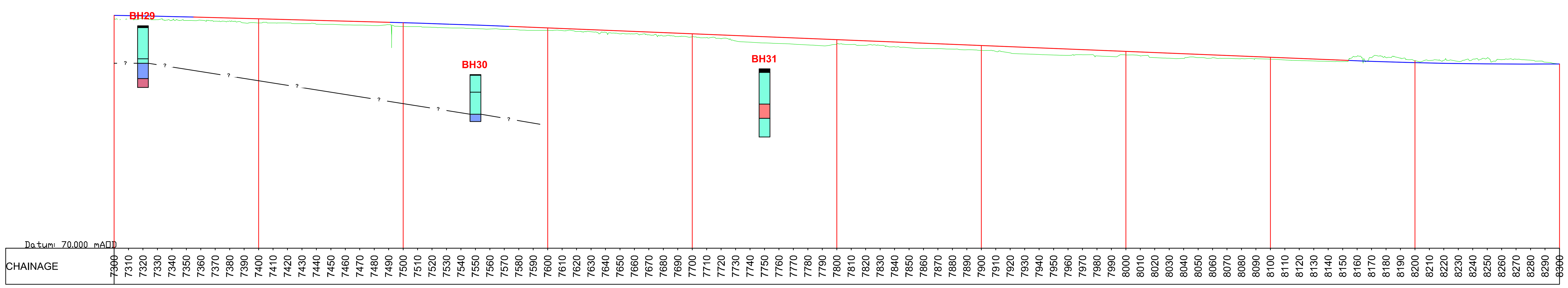
SCALE: H 1:500,V 1:100. DATUM: 75.000



A1 ALNWICK TO ELLINGHAM ONLINE LONGITUDINAL SECTION 5 OF 8
SCALE: H 1:500,V 1:100. DATUM: 75.000



A1 ALNWICK TO ELLINGHAM ONLINE LONGITUDINAL SECTION 6 OF 8
SCALE: H 1:500,V 1:100. DATUM: 80.000

NOTES

1. This drawing shall be read in conjunction with drawing number HA551459-JAC-GEN-Section B-WD-C-002 to 008 General Layout.

KEY

- Proposed Vertical Alignment Gradient
- Proposed Vertical Alignment Curve
- Existing Ground Surface
- – ? – Apparent rock head

Ground Units

- Topsoil
- Unit A - Made Ground
- Unit B - Recent Deposits - Alluvium and Peat
- Unit C - Glacio fluvial
- Unit D - Glacio-lacustrine
- Unit E - Glacial Till

Bedrock

- Mudstone
- Shale
- Sandstone
- Siltstone

0 50 100 150 200 m
SCALE 1 : 2000

0 10 20 30 40 m
SCALE 1 : 400

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Rev'd	Apprv'd

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Client
highways england

Project
A1 IN NORTHUMBERLAND
ALNWICK TO ELLINGHAM

Drawing title
ONLINE OPTION A
ONLINE DUAL CARRIAGEWAY
LONGITUDINAL SECTION
SHEET 1 OF 3

Drawing status
WORKING PROGRESS

Scale	AS SHOWN @ A1	DO NOT SCALE
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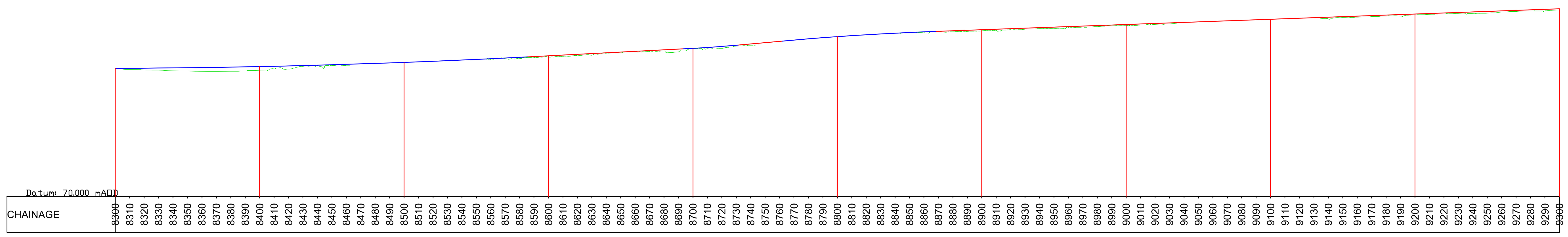
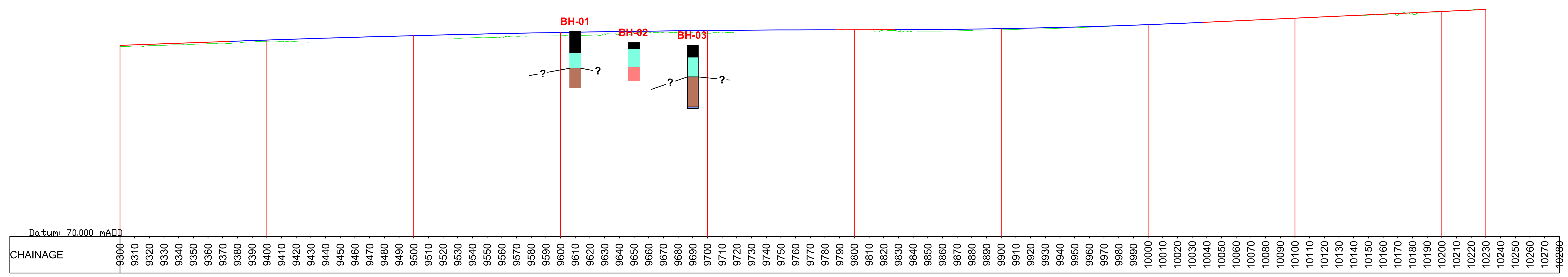
Client no.	551459	

Drawing number: HA551459-JAC-GEN-Section B-WD-C-73B
Rev: B



A1 ALNWICK TO ELLINGHAM ONLINE LONGITUDINAL SECTION 7 OF 8
SCALE: H 1:500,V 1:100. DATUM: 70.000



A1 ALNWICK TO ELLINGHAM ONLINE LONGITUDINAL SECTION 8 OF 8
SCALE: H 1:500,V 1:100. DATUM: 70.000

NOTES

1. This drawing shall be read in conjunction with drawing number HA551459-JAC-GEN-Section B-WD-C-002 to 008 General Layout.

KEY

- Proposed Vertical Alignment Gradient
- Proposed Vertical Alignment Curve
- Existing Ground Surface
- Apparent rock head

Ground Units

- Topsoil
- Unit A - Made Ground
- Unit B - Recent Deposits - Alluvium and Peat
- Unit C - Glacio fluvial
- Unit D - Glacio-lacustrine
- Unit E - Glacial Till

Bedrock

- Mudstone
- Shale
- Sandstone
- Siltstone

SCALE 1 : 2000 (0, 50, 100, 150, 200 m)

SCALE 1 : 400 (0, 10, 20, 30, 40 m)

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Rev'd	Apprv'd

JACOBS

Client: highways england

Project: A1 IN NORTHUMBERLAND ALNWICK TO ELLINGHAM

Drawing title: SECTION B GEOTECHNICAL LONGITUDINAL SECTION SHEET 3 OF 3

Drawing status: WORKING PROGRESS

Scale	AS SHOWN @ A1	DO NOT SCALE
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Client no.	551459	

Drawing number: HA551459-JAC-GEN-Section B-WD-C-073C | Rev: 0

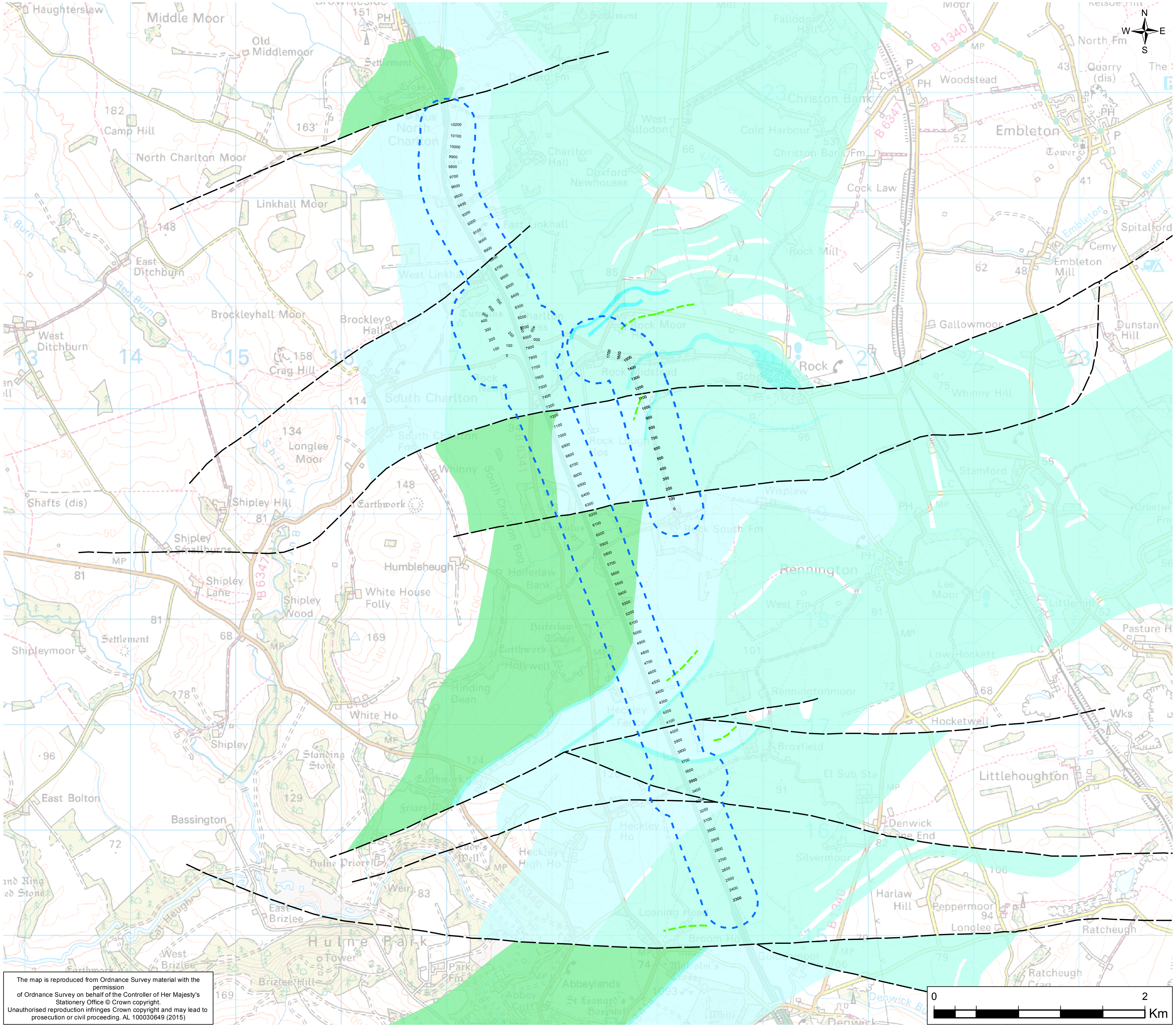


FIGURE 1B

Legend

250m Buffer

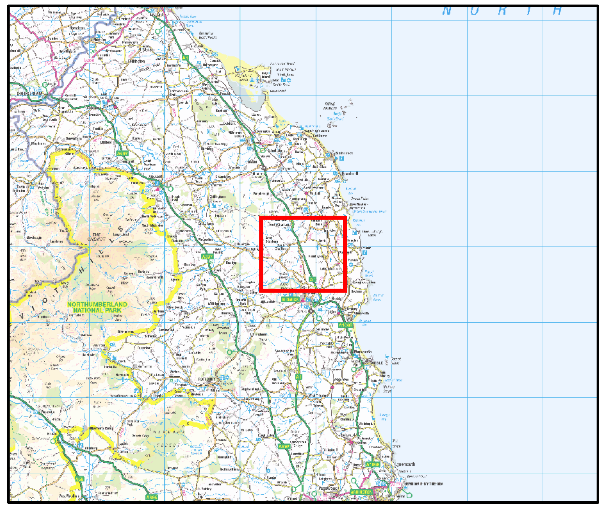
Linear Features

Coal seam, inferred

Fault, inferred, displacement unknown

Solid Geology

- Ellwell Limestone Member
- Four Fathom Limestone Member
- Oxford Limestone Member
- Alston Formation
- Alston Formation
- Dun Limestone Member
- Woodend Limestone
- Scremerston Coal Member
- Tyne Limestone Formation
- Tyne Limestone Formation



Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
0	NOV 16	Initial Issue	IM	DJ	RS	MC

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Project

A1 NORTHUMBERLAND

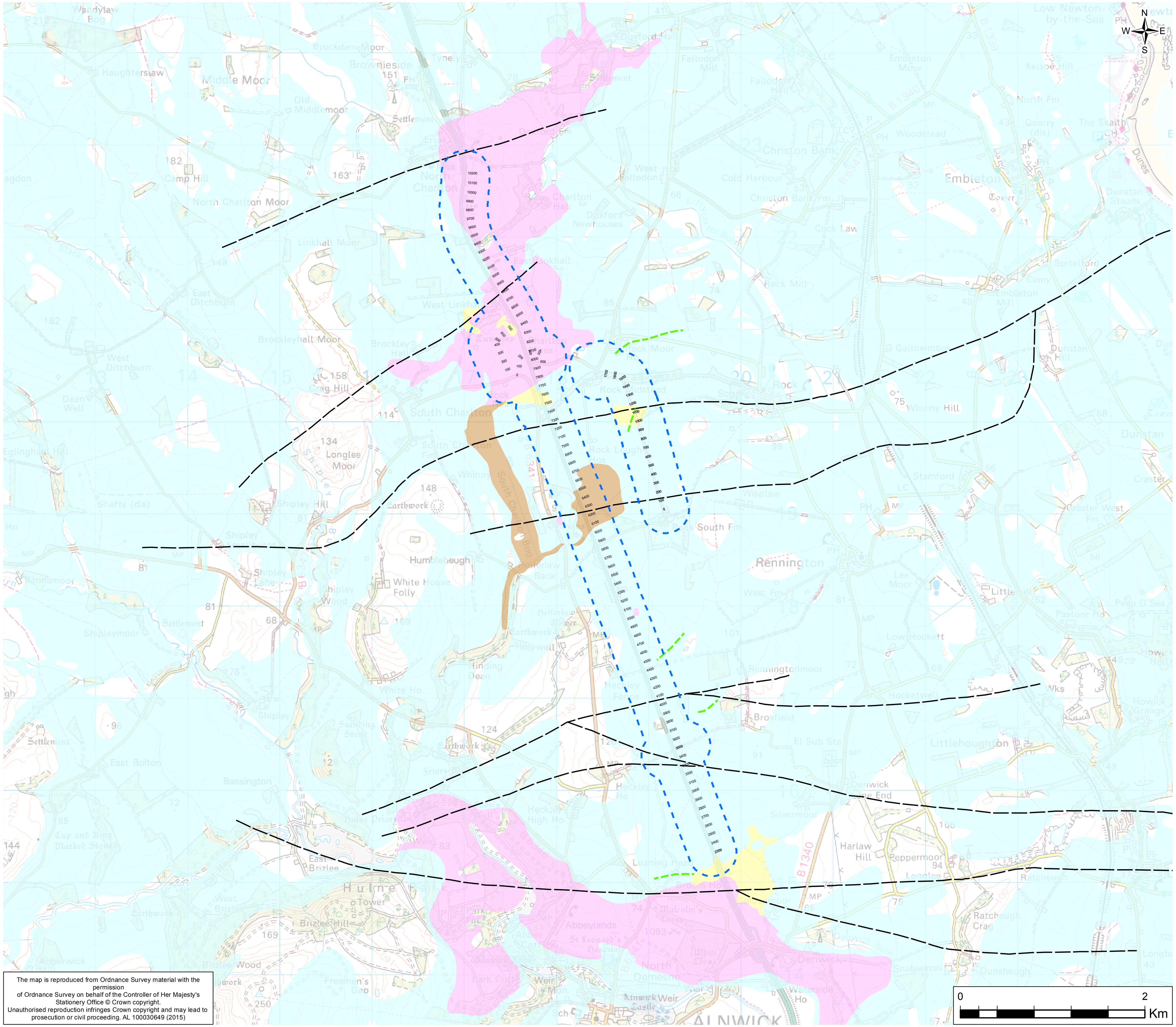
Drawing Title

SECTION B - ALNWICK TO ELLINGHAM
SOLID GEOLOGY

Drawing Status

Scale @ A3	1:35,000	DO NOT SCALE
Jacobs No.	B2104700	
Client No.	551459	
Drawing No.	B2104700_PSSR_01b	

FIGURE 2B



Legend

250m Buffer

Linear Features

Coal seam, inferred

Fault, inferred, displacement unknown

Drift Geology

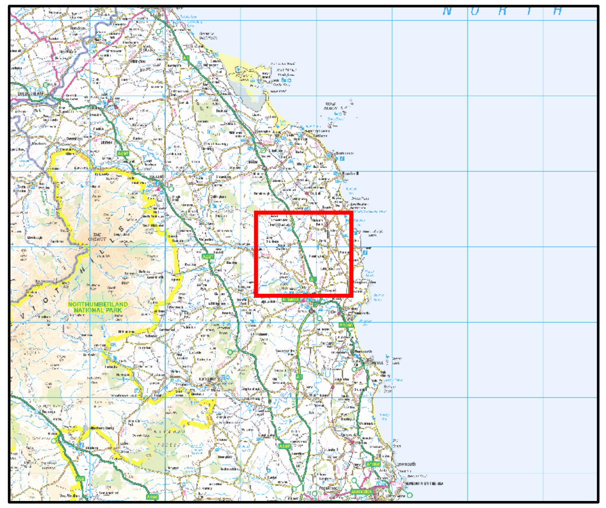
Alluvium

Glaciofluvial Deposits

Glacial Till

Peat

Superficial Absent



Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
0	NOV 16	Initial Issue	IM	DJ	RS	MC

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Client

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Project

A1 NORTHUMBERLAND

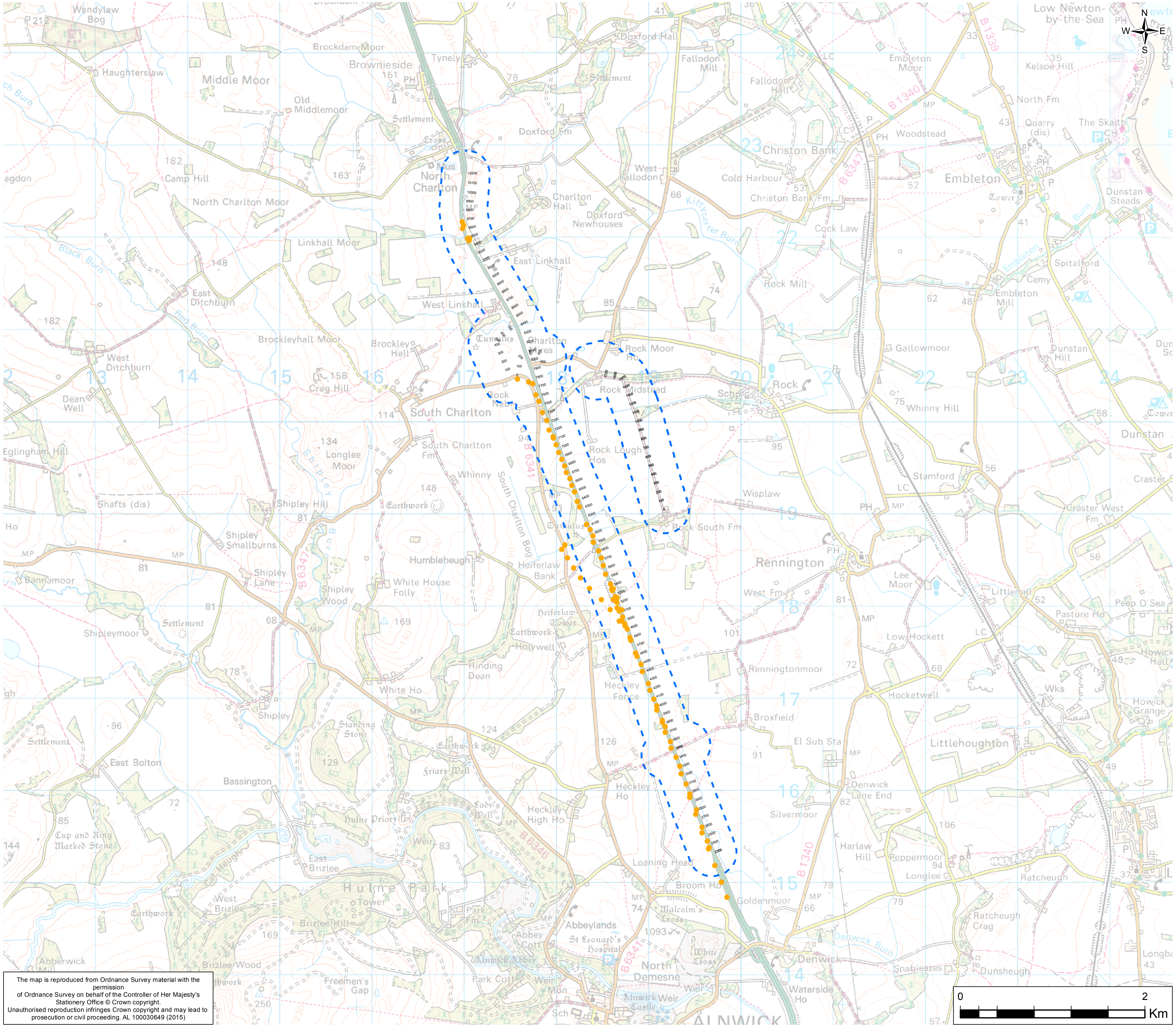
Drawing Title

SECTION B - ALNWICK TO ELLINGHAM
DRIFT GEOLOGY

Drawing Status

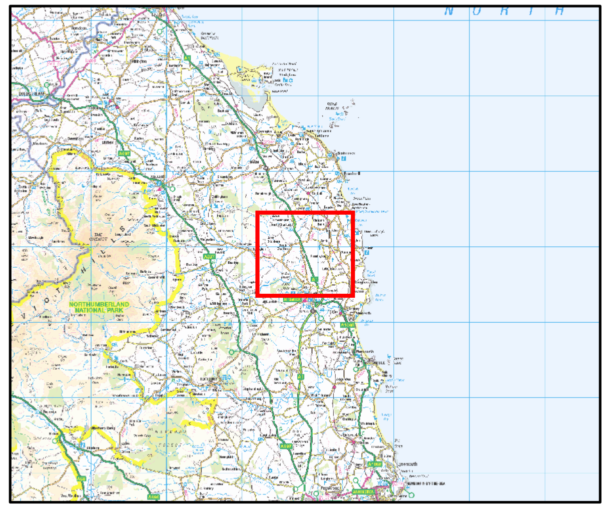
Scale @ A3	1:40,000	DO NOT SCALE
Jacobs No.	B2104700	
Client No.	551459	
Drawing No.	B2104700_PSSR_02b	

FIGURE 3B



Legend

- Existing Borehole Location
- 250m Buffer



0	NOV 16	Initial Issue	IM	DJ	RS	MC
Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd

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Client

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Project

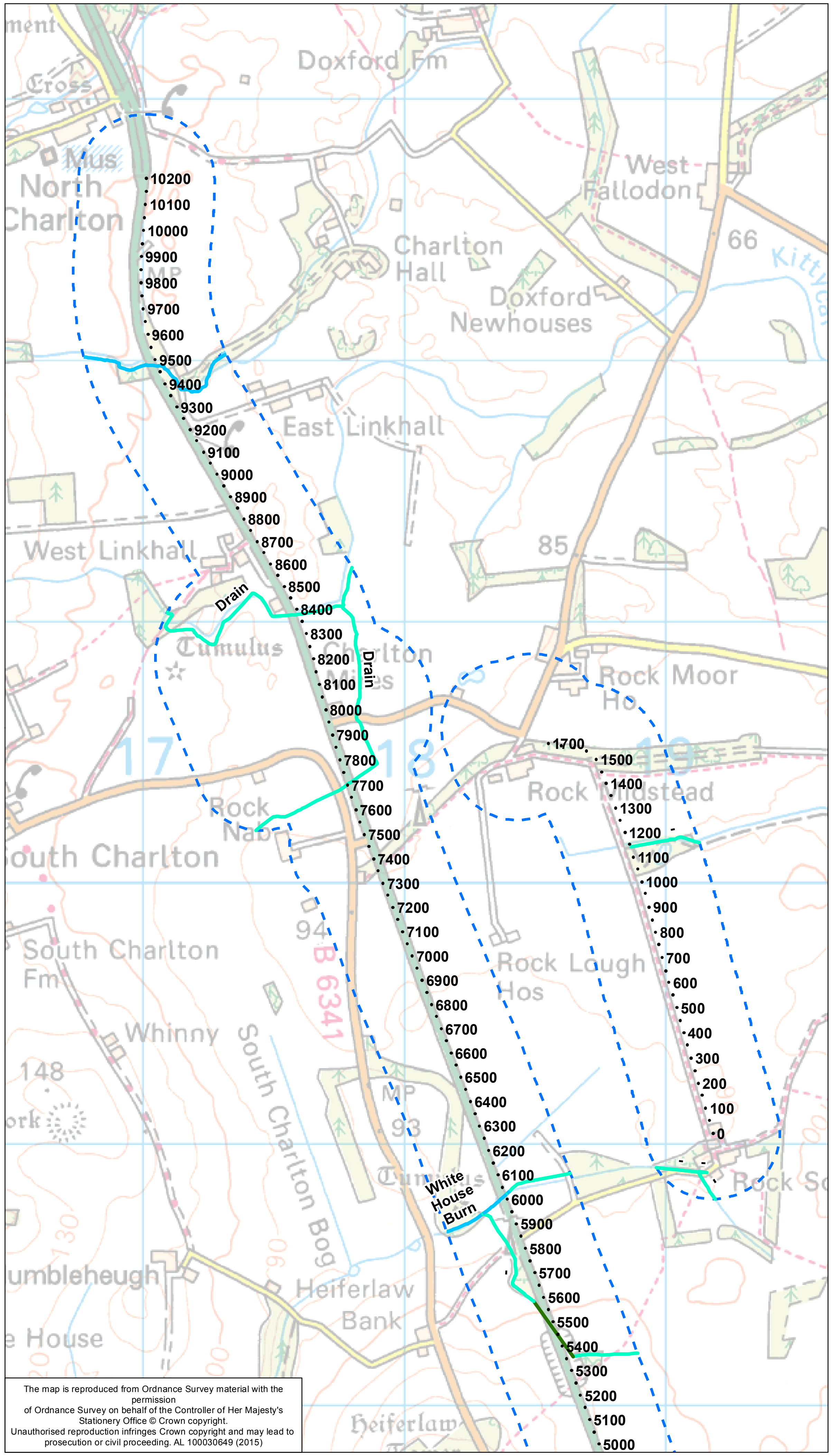
A1 NORTHUMBERLAND

Drawing Title

SECTION B - ALNWICK TO ELLINGHAM
EXISTING BOREHOLE LOCATION PLAN

Drawing Status

Scale @ A3	1:40,000	DO NOT SCALE
Jacobs No.	B2104700	
Client No.	551459	
Drawing No.	B2104700_PSSR_03b	



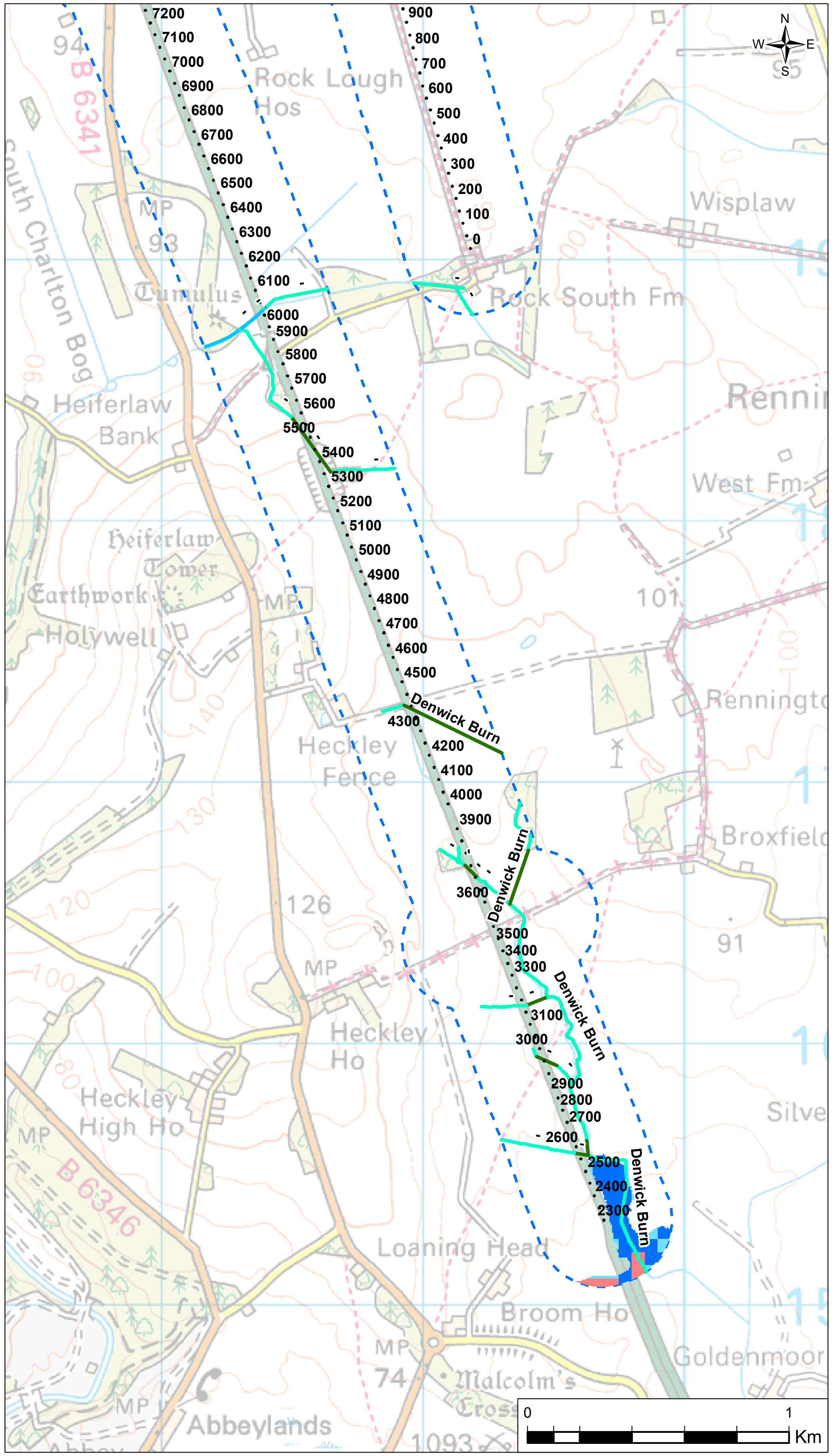


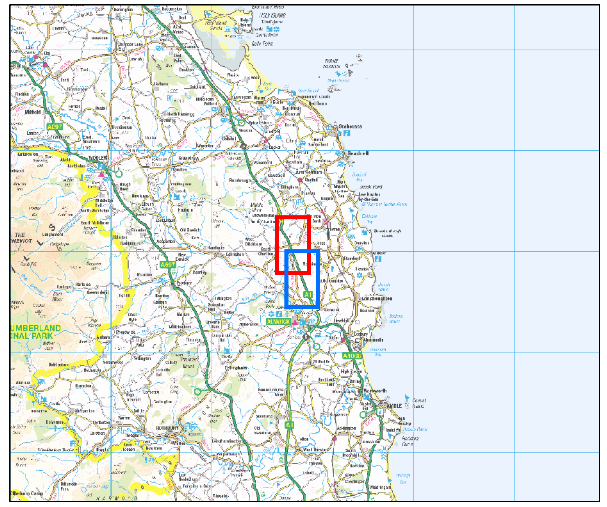
FIGURE 4B

Legend

- 250m Buffer
- Primary River
- Secondary River
- Tertiary River
- Lake/Reservoir
- Underground River (inferred)
- Canal
- Canal Tunnel
- Culvert
- Multiple Channel Culvert
- Underground River (Potential Sewer)
- Underground River (local knowledge)

Flood Risk

- Very Low
- Low
- Medium
- High



Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
0	NOV 16	Initial Issue	IM	HW	RS	MC

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Client

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Project

A1 NORTHUMBERLAND

Drawing Title

SECTION B - ALNWICK TO ELLINGHAM
FLOOD RISK

Drawing Status

Scale @ A3	1:20,000	DO NOT SCALE
Jacobs No.	B2104700	
Client No.	551459	
Drawing No.	B2104700_PSSR_05b	

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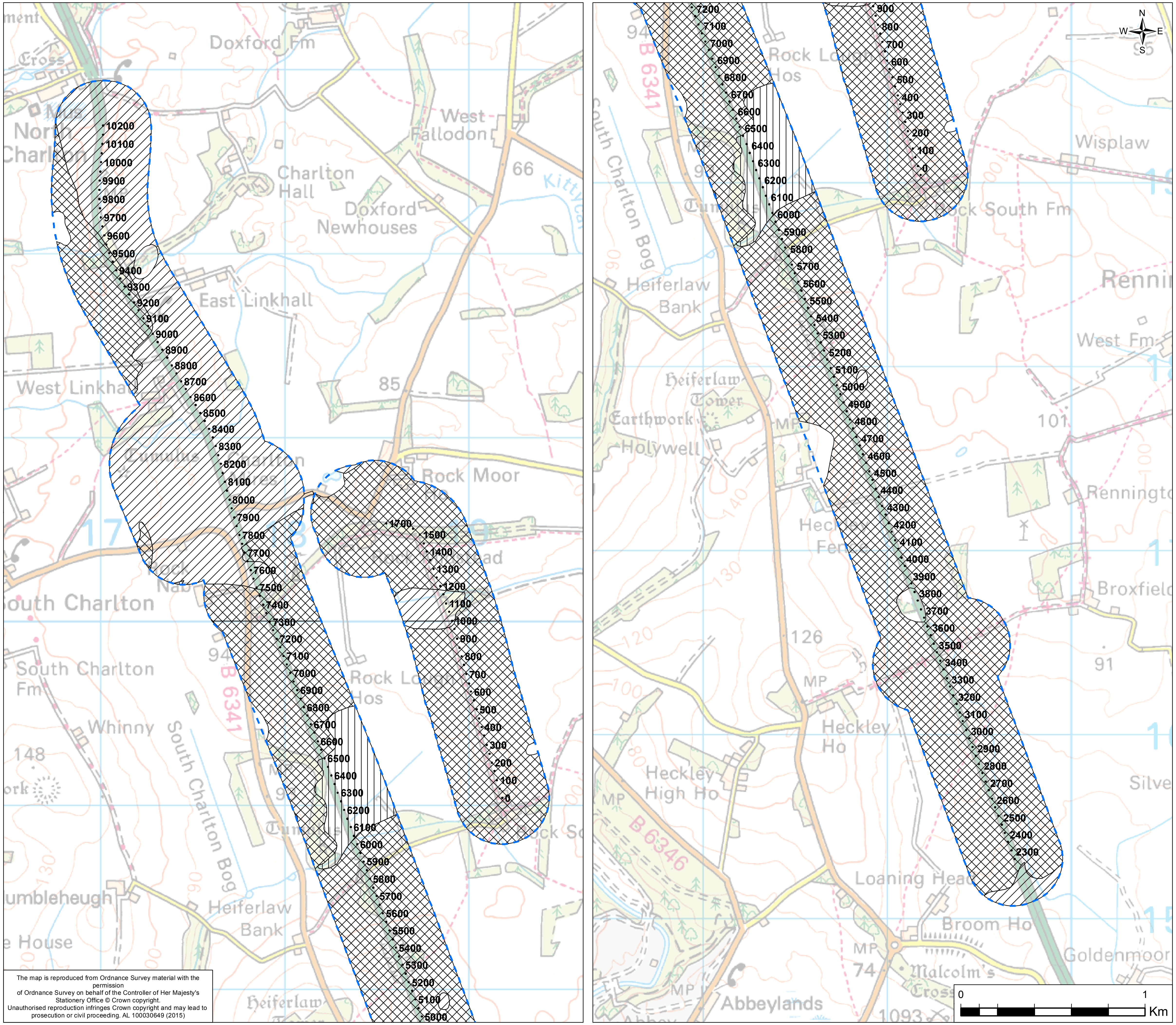
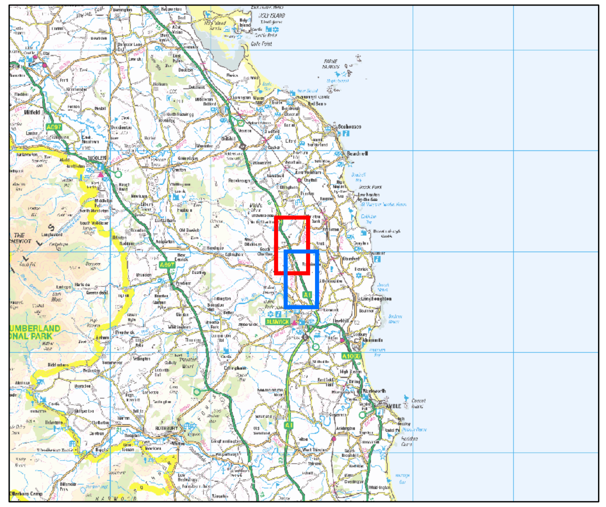


FIGURE 5B

Legend

- 250m Buffer
- Secondary A Superficial Aquifer
- Secondary Superficial Aquifer Undifferentiated Layers
- Unproductive Superficial Aquifer



Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
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SECTION B - ALNWICK TO ELLINGHAM
SUPERFICIAL HYDROGEOLOGY

Drawing Status

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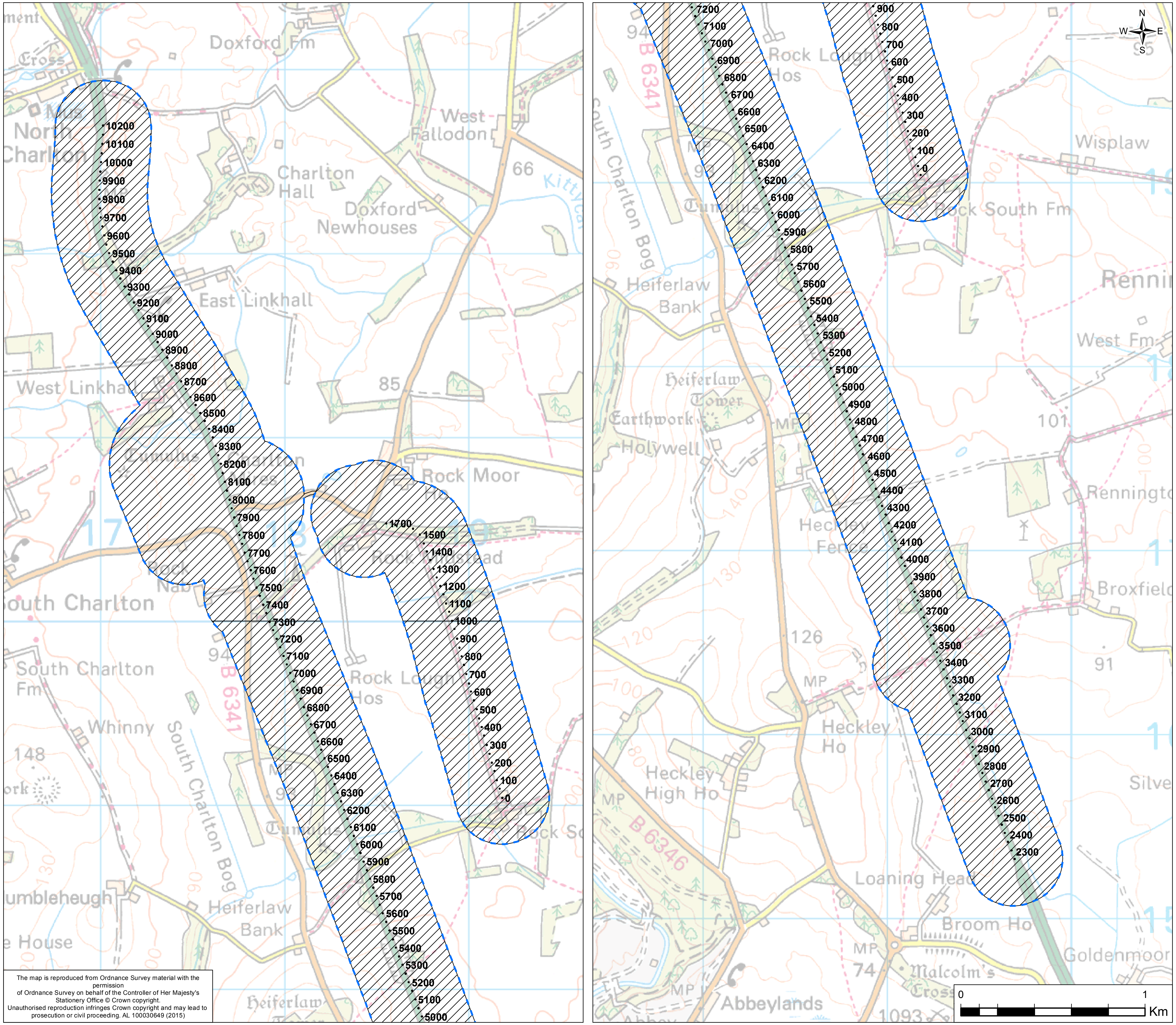
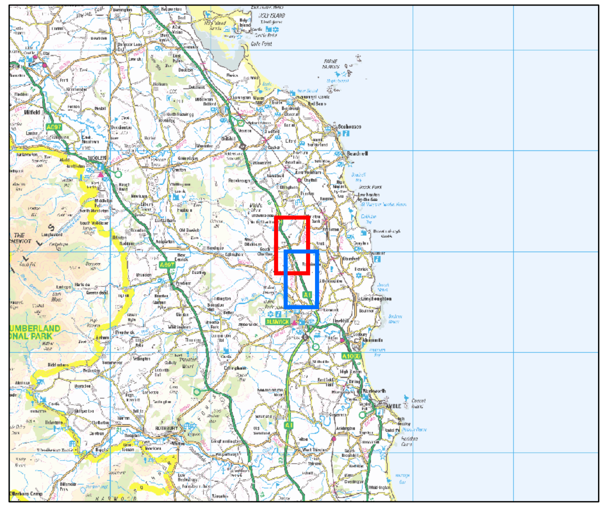


FIGURE 6B

Legend

250m Buffer

Secondary A Bedrock Aquifer



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Drawing Title

SECTION B - ALNWICK TO ELLINGHAM
BEDROCK HYDROGEOLOGY

Drawing Status

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Client No.	551459	
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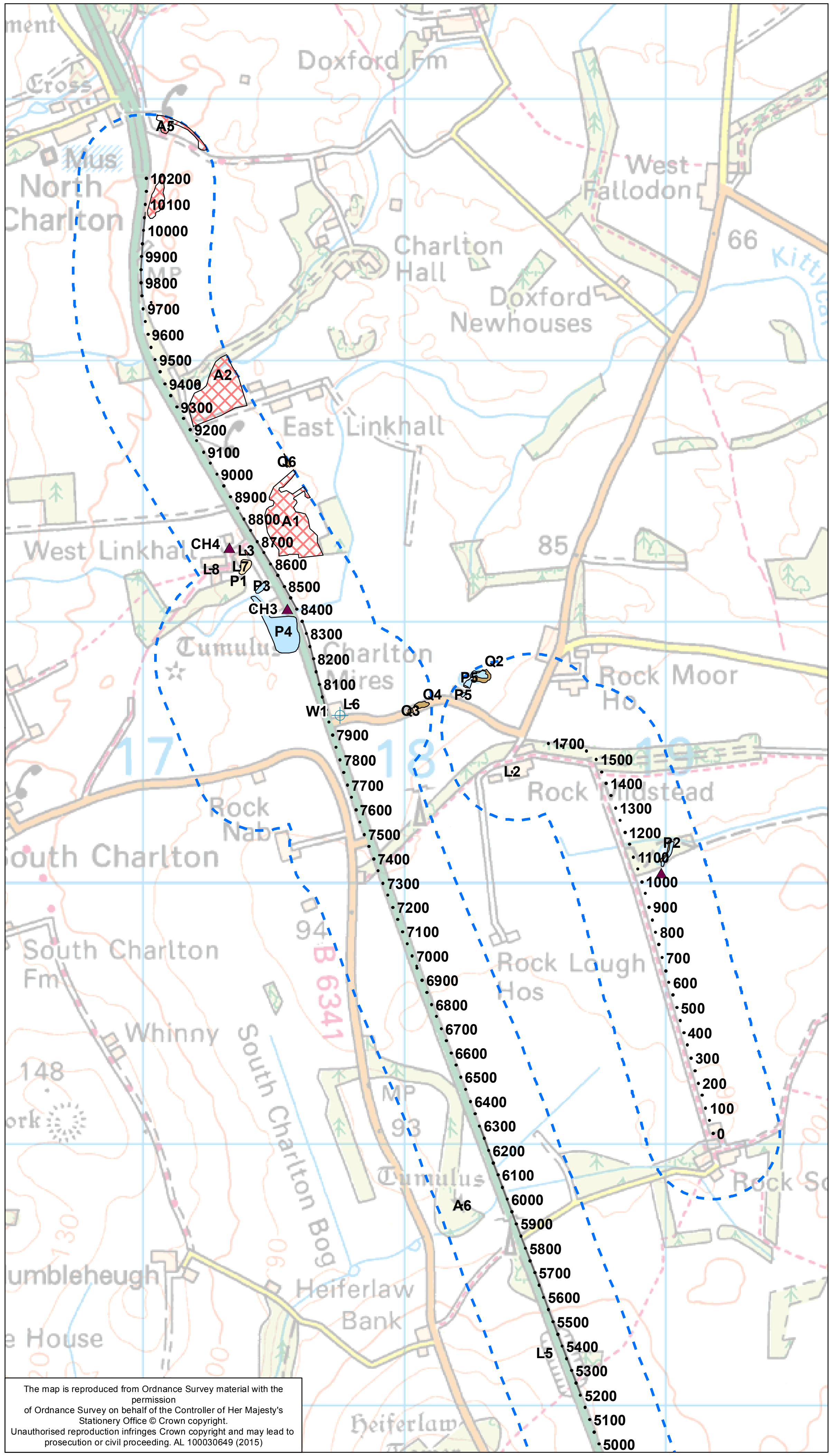

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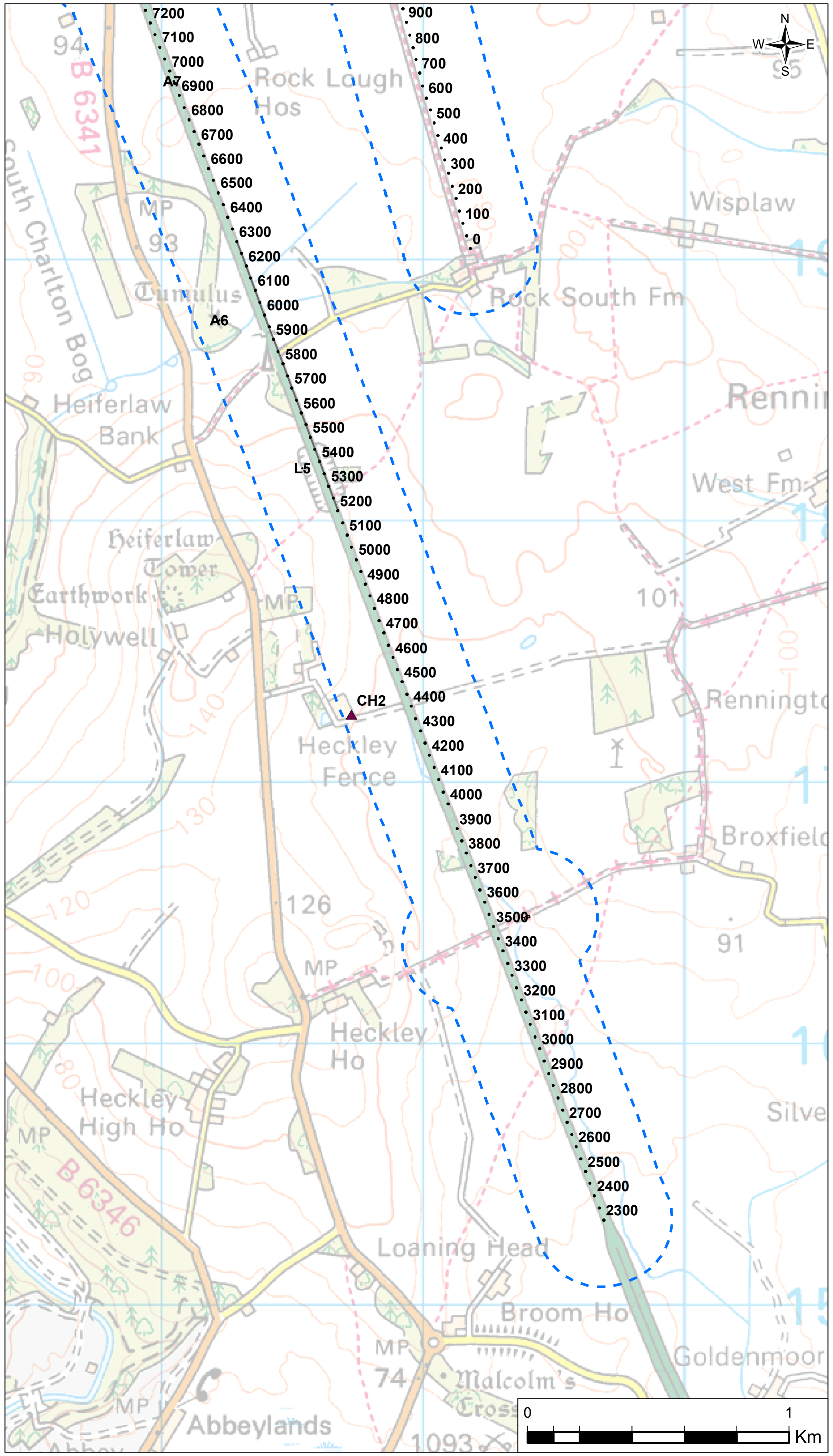
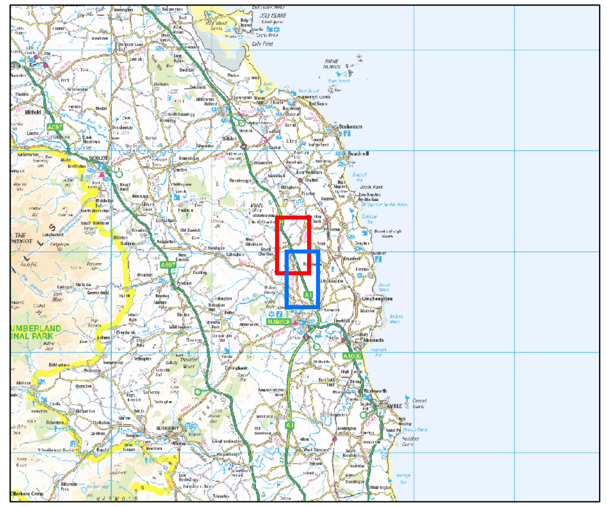


FIGURE 7B

Legend

- 250m Buffer
- Designated Sites - See Table 4.14 in Report
- Waterpumps - See Table 4.9 in Report
- Highways 2B
- Archaeology - See Table 4.11 in Report
- Land Use - See Table 4.9 in Report
- Infilled Pond - See Table 4.9 in Report
- Present Pond - See Table 4.5 in Report
- Quarries - See Table 4.9 in Report



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A1 NORTHUMBERLAND

Drawing Title

SECTION B - ALNWICK TO ELLINGHAM
HISTORICAL LAND USE

Drawing Status

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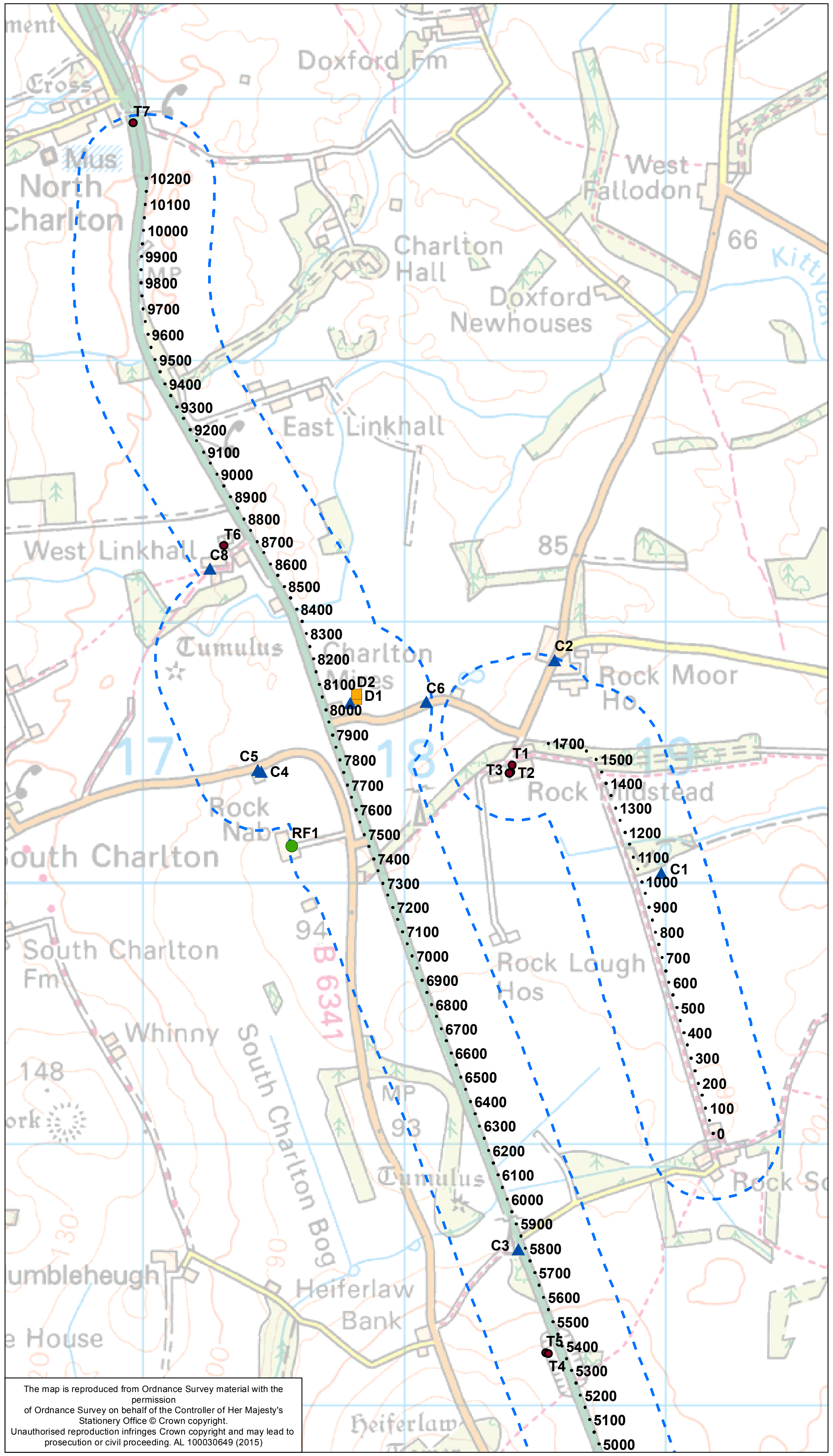
FIGURE 8B



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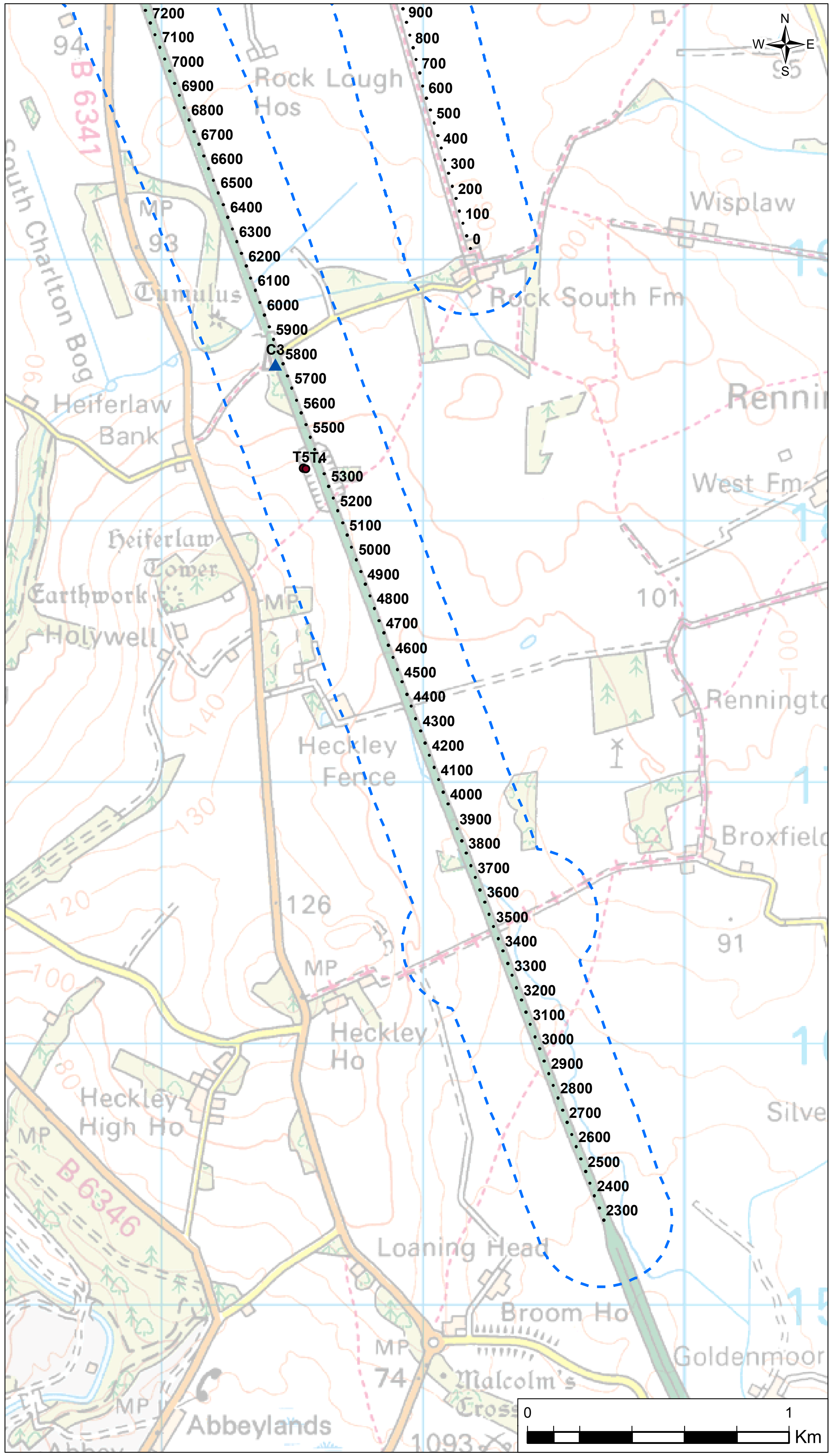
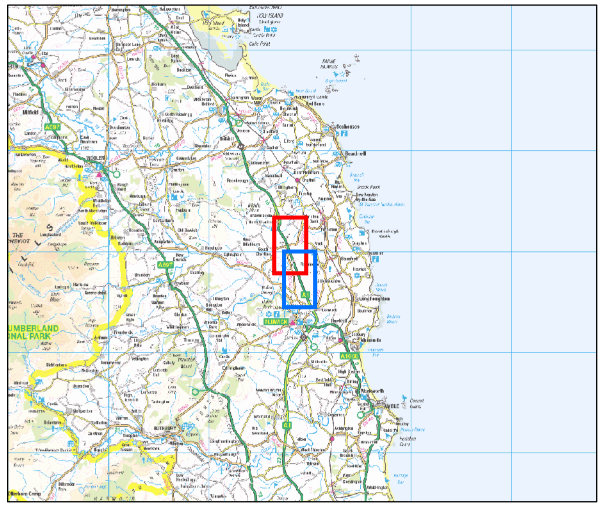


Legend

- 250m Buffer
- Current Land Use - See Table 4.8 in Report
- Discharge Consents - See Table 4.13 in Report
- Recycling Facility - See Section 4.11 of Report
- Tanks - See Table 4.10 in Report



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Project

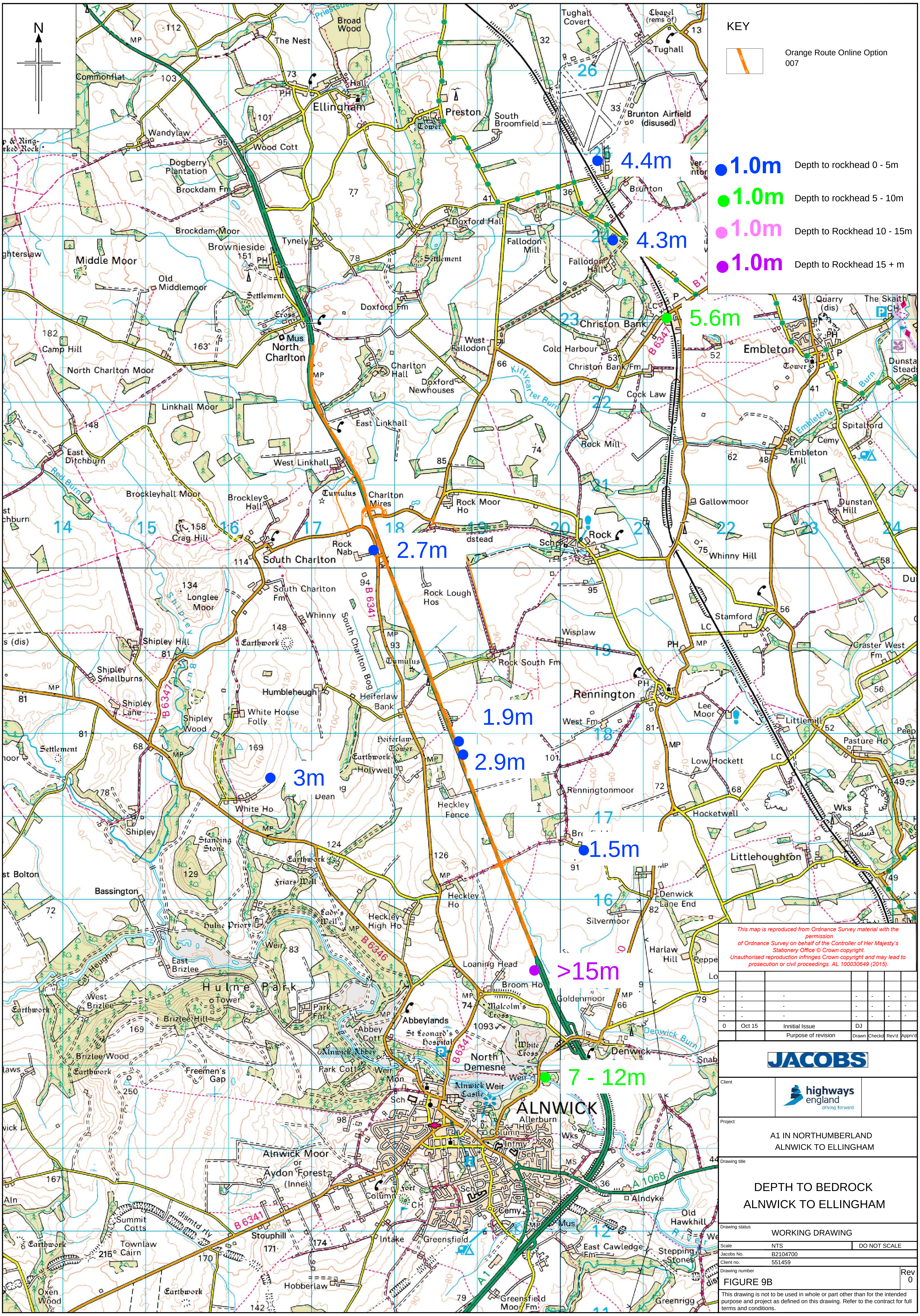
A1 NORTHUMBERLAND

Drawing Title

SECTION B - ALNWICK TO ELLINGHAM WASTE

Drawing Status

Scale @ A3	1:20,000	DO NOT SCALE
Jacobs No.	B2104700	
Client No.	551459	
Drawing No.	B2104700_PSSR_09b	



Rev	Date	Purpose of revision	Drawn	Checkd	Rev'd	Apprv'd
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-	-	-	-	-	-	-
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Project

A1 IN NORTHUMBERLAND
ALNWICK TO ELLINGHAM

Drawing title

DEPTH TO BEDROCK
ALNWICK TO ELLINGHAM

Drawing status: WORKING DRAWING

Scale	NTS	DO NOT SCALE
Jacobs No.	B2104700	
Client no.	551459	

Drawing number: FIGURE 9B — Rev 0

A1 in Northumberland
Section B Alnwick to Ellingham
Alignment Option

Figure 10B
Orange Route
Geotechnical Aspects Plan
Scale 125,000

Appendix A –Zetica Unexploded Ordnance (UXO) Pre-Desk-Study-Assessment (PDSA) (November 2016)

[PAGE NOT USED]

Pre-Desk Study Assessment

Site:	A1 Alnwick to Ellingham, Northumberland
Client:	Jacobs
Contact:	Dale Johnstone
Date:	3rd November 2016
Pre-WWI Military Activity on or Affecting the Site	None identified.
WWI Military Activity on or Affecting the Site	None identified.
WWI Strategic Targets (within 5km of Site)	The following strategic targets were located in the vicinity of the Site: ■ Transport infrastructure, including a mainline railway, sidings and junctions. ■ Industry, including iron works. ■ Public utilities, including a power station.
WWI Bombing	None identified on the Site.
Interwar Military Activity on or Affecting the Site	None identified.
WWII Military Activity on or Affecting the Site	None identified.
WWII Strategic Targets (within 5km of Site)	The following strategic targets were located in the vicinity of the Site: ■ Transport infrastructure, including a mainline railway, sidings and junctions. ■ Industry and public utilities. ■ Military airfields. ■ Anti-invasion defences.
WWII Bombing Decoys (within 5km of Site)	1No. located approximately 5km from the Site.

WWII Bombing	During WWII the Site passed through the Rural District (RD) of Belford, Alnwick RD and the Urban District (UD) of Alnwick. Belford RD officially recorded 33No. High Explosive (HE) bombs with a very low regional bombing density of 0.8 bombs per 405 hectares (ha). Alnwick RD officially recorded 113No. HE bombs with a very low regional bombing density of 1.2 bombs per 405 ha. Alnwick UD officially recorded 4No. HE bombs with a very low regional bombing density of 0.8 bombs per 405 ha. No readily available records have been found to indicate that the Site was bombed.
Post-WWII Military Activity on or Affecting the Site	None identified.
Recommendation	No readily available records of bombing or other significant military activity on the Site have been found. It is considered that the Site is likely to have a low Unexploded Ordnance (UXO) hazard level. A detailed desk study, whilst always prudent, is likely to do no more than confirm a low UXO hazard level for the Site.

This summary is based on a cursory review of readily available records. Caution is advised if you plan to action work based on this summary. It is possible that further research may change the level of identified hazard.

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

Appendix B – CON29M Non-Residential Mining Report

[PAGE NOT USED]

The Coal Authority

Resolving the impacts of mining

CON29M Non-Residential Mining Report

SITE AT DENWICK
NORTHUMBERLAND

Date of enquiry:	22 November 2016
Date enquiry received:	22 November 2016
Issue date:	30 November 2016
Our reference:	51001291374001
Your reference:	Quote

CON29M Non-Residential Mining Report

This report is based on, and limited to, the records held by the Coal Authority and the Cheshire Brine Subsidence Compensation Board's records, at the time we answer the search.

Client name

LANDMARK INFORMATION GROUP LIMITED

Enquiry address

SITE AT DENWICK, NORTHUMBERLAND

Approximate position of property

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Summary

Has the search report highlighted evidence or potential of		
1	Past underground coal mining	Yes
2	Present underground coal mining	No
3	Future underground coal mining	Yes
4	Mine entries	Yes
5	Coal mining geology	No
6	Past opencast coal mining	No
7	Present opencast coal mining	No
8	Future opencast coal mining	No
9	Coal mining subsidence	No
10	Mine gas	No
11	Hazards related to coal mining	No
12	Withdrawal of support	No
13	Working facilities order	No
14	Payments to owners of former copyhold land	No
15	Information from the Cheshire Brine Subsidence Compensation Board	No

For detailed findings, please go to page 4.

Detailed findings

1. Past underground coal mining

The property is not within a surface area that could be affected by past underground mining.

However the property is in an area where the Coal Authority believe there is coal at or close to the surface. This coal may have been worked at some time in the past. The potential presence of coal workings at or close to the surface should be considered prior to any site works or future development activity. Your attention is drawn to the Comments on the Coal Authority information section of the report.

2. Present underground coal mining

The property is not within a surface area that could be affected by present underground mining.

3. Future underground coal mining

The property is not in an area where the Coal Authority has plans to grant a licence to remove coal using underground methods.

The property is not in an area where a licence has been granted to remove or otherwise work coal using underground methods.

The property is not in an area likely to be affected from any planned future underground coal mining.

However, reserves of coal exist in the local area which could be worked at some time in the future.

No notices have been given, under section 46 of the Coal Mining Subsidence Act 1991, stating that the land is at risk of subsidence.

4. Mine entries

There are no known coal mine entries within, or within 20 metres of, the boundary of the property.

There may however be mine entries/additional mine entries in the local area which the Coal Authority has no knowledge of.

5. Coal mining geology

The Coal Authority is not aware of any damage due to geological faults or other lines of weakness that have been affected by coal mining.

6. Past opencast coal mining

The property is not within the boundary of an opencast site from which coal has been removed by opencast methods.

7. Present opencast coal mining

The property does not lie within 200 metres of the boundary of an opencast site from which coal is being removed by opencast methods.

8. Future opencast coal mining

There are no licence requests outstanding to remove coal by opencast methods within 800 metres of the boundary.

The property is not within 800 metres of the boundary of an opencast site for which a licence to remove coal by opencast methods has been granted.

9. Coal mining subsidence

The Coal Authority has not received a damage notice or claim for the subject property, or any property within 50 metres, since 31 October 1994.

There is no current Stop Notice delaying the start of remedial works or repairs to the property.

The Coal Authority is not aware of any request having been made to carry out preventive works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991.

10. Mine gas

The Coal Authority has no record of a mine gas emission requiring action.

11. Hazards related to coal mining

The property has not been subject to remedial works, by or on behalf of the Authority, under its Emergency Surface Hazard Call Out procedures.

12. Withdrawal of support

The property is not in an area where a notice to withdraw support has been given.

The property is not in an area where a notice has been given under section 41 of the Coal Industry Act 1994, cancelling the entitlement to withdraw support.

13. Working facilities order

The property is not in an area where an order has been made, under the provisions of the Mines (Working Facilities and Support) Acts 1923 and 1966 or any statutory modification or amendment thereof.

14. Payments to owners of former copyhold land

The property is not in an area where a relevant notice has been published under the Coal Industry Act 1975/Coal Industry Act 1994.

15. Information from the Cheshire Brine Subsidence Compensation Board

The property lies outside the Cheshire Brine Compensation District.

Comments on the Coal Authority information

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In view of the mining circumstances a prudent developer would seek appropriate technical advice before any works are undertaken.

Therefore if development proposals are being considered, technical advice relating to both the investigation of coal and former coal mines and their treatment should be obtained before beginning work on site. All proposals should apply good engineering practice developed for mining areas. No development should be undertaken that intersects, disturbs or interferes with any coal or mines of coal without the permission of the Coal Authority. Developers should be aware that the investigation of coal seams/former mines of coal may have the potential to generate and/or displace underground gases and these risks both under and adjacent to the development should be fully considered in developing any proposals. The need for effective measures to prevent gases entering into public properties either during investigation or after development also needs to be assessed and properly addressed. This is necessary due to the public safety implications of any development in these circumstances.

A site investigation was carried out in November 2008 by The Land Consultancy Ltd, Fairweather House, 4 Parker Lane, Whitestake, Preston, PR4 4JX.

Additional remarks

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Enquiry boundary

The map image is too large for this page and will be sent in a separate document

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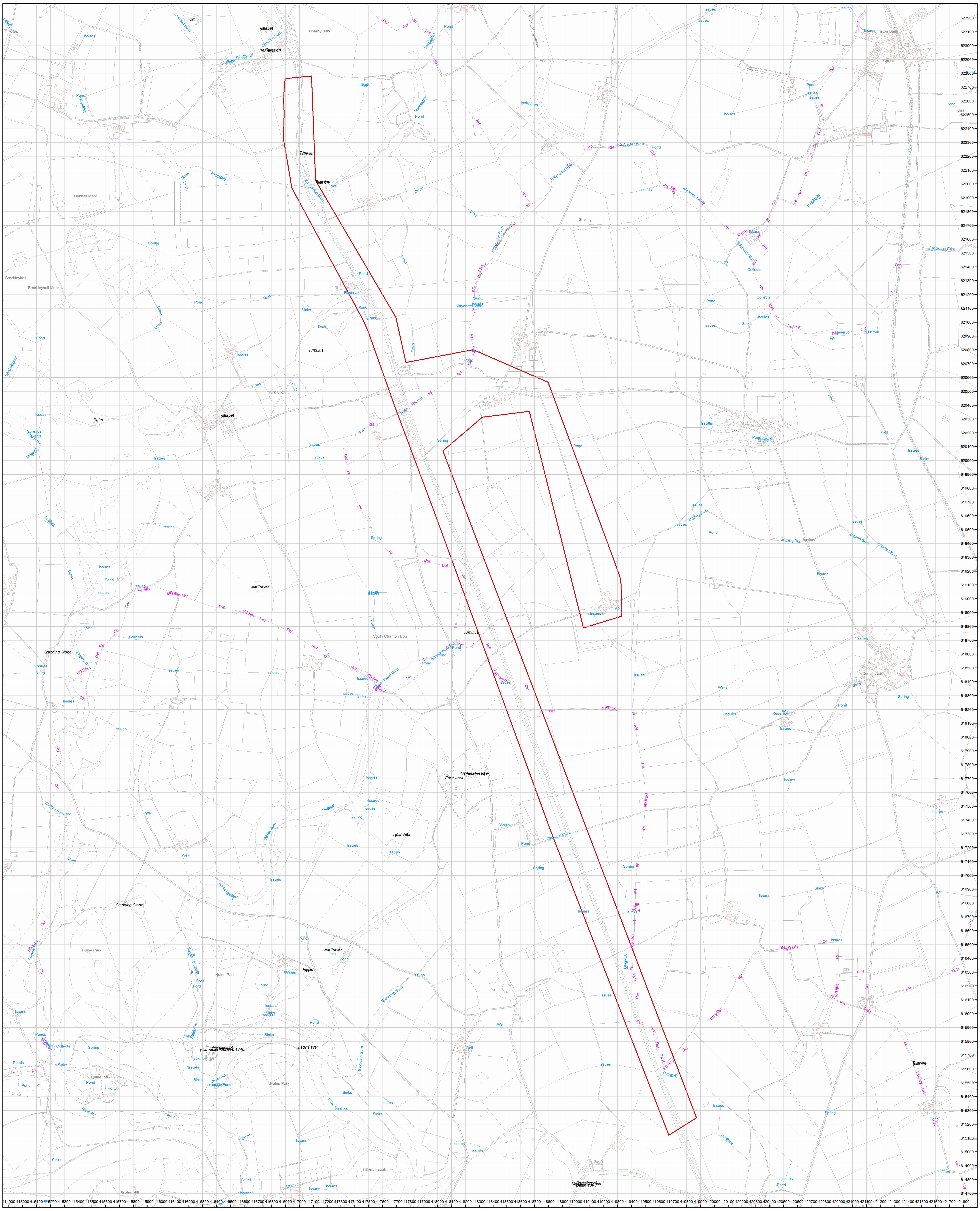
Enquiry boundary

Key

Approximate position of enquiry boundary shown



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