Great North Road Solar and Biodiversity Park

Environmental Statement

Volume 4 – Technical Appendices

Technical Appendix A9.1 – Flood Risk Assessment

Document reference – EN010162/APP/6.4.9.1A

Revision number 2 (Tracked)

August 2025

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

Contents

A9.1.1 INTRODUCTION

A9.1.1.1 BACKGROUND

1 This Technical Appendix (TA) presents the assessment of Flood Risk and surface water run-off management. This Flood Risk Assessment has been prepared as part of an Environmental Statement for a solar PV (the Development) located on land to the northwest of Newark, in the Newark and Sherwood district, Nottinghamshire, East Midlands, which comprise the Order Limits.

2 The Order Limits form the Core Study Area (CSA) for this assessment.

3 The areas within the CSA are described in ES Chapter 5, Development Description, [EN010162/APP/6.2.5] as being one of the following areas:

- Work Area 1: Solar PV;
- Work Area 2: Cables;
- Work Area 3: Mitigation/enhancement;
- Work Area 4: Intermediate substations;
- Work Area 5a: BESS;
- Work Area 5b: 400 kV Substation;
- Work Area 6: National Grid Staythorpe Substation and connection point;
- Work Area 7: Consented Staythorpe BESS and Connection; and
- Work Area 8: Access Works.

4 The layout of the above areas, including field numbers, is shown on ES Figure 5.1 [EN010162/APP/6.3.5.1].

5 Following consultee feedback, the following changes to the Development layout have occurred:

- Removal of Work Area 1 in Fields 16, 19, 20 - 30, 45 and 58;
- Reduction in extent of Work Area 1 in Fields 0, 7, 13, 31, 35, 36, 38, 40, 42-47, 49, 51 - 53, 55 - 57 and 59;
- Removal of sections of Work Area 2;
- Removal of one substation in Work Area 4; and
- Reduction in the Order Limits.

6 The Order Limits are located wholly within the administrative area of Newark and Sherwood District Council (NSDC).

7 Due to the rural setting in which the Order Limits are located, flooding from artificial sources (e.g., highways drainage) has been scoped out of the assessment, as set out at the PEIR stage.

A9.1.1.2 CONSULTATION

8 As set out in Appendix E, the Development has been subject to consultation with the relevant authorities; namely the Environment Agency (EA), Nottingham County Council (as the Lead Local Flood Authority (LLFA)) and the Trent Valley Internal Drainage Board (Trent Valley IDB).

9 The LLFA confirmed in their response to the FRA presented in the PEIR that "*The Flood Risk Management Team has reviewed the Flood Risk Assessment (Technical Appendix A9.1) and is broadly satisfied with its content*". The EA and Trent Valley IDB have made a number of detailed

comments in respect of hydrology, and have not commented on the methodology used.

10 Feedback received by those parties has been considered in the preparation of this assessment and it is understood that the approach and methodology to the assessment has been substantially agreed. Statements of Common Ground are being progressed with the EA and NCC and will seek to confirm agreement with each relevant party.

~~A9.1.1.2~~A9.1.1.3 METHODOLOGY

11 This FRA has been prepared with reference to data, documents and guidance published by the EA, the Lead Local Flood Authority (LLFA) (Nottinghamshire County Council) and the Local Planning Authority (NSDC).

~~8~~12 Flood risk will be classed as Negligible (where little or no risk is identified), Low (where theoretical risk is identified but mitigating factors may influence flood levels) or Moderate to High (where modelled levels or historical events show risk to the Work Areas)).

~~9~~13 Several factors will be considered when attributing the residual risk of flooding to the Development, including:

- The depth of flooding;
- The hazard to life during flood water ingress;
- The velocity of floodwater;
- Flooding extent / ingress;
- Type of infrastructure affected; and
- Intervening structures / flood protection.

~~10~~14 The conclusion section of this FRA provides justification for the risk category using professional judgement and experience of assessing similar types of projects / scenarios. This approach is consistent with the Flood Risk Assessments prepared in support of a number of made DCOs including the Cleve Hill Solar Park DCO and the Mallard Pass Solar Park DCO, in which both the Examining Authority and Secretary of State were content with the approach adopted in the assessment methodology.

~~A9.1.1.2.1~~A9.1.1.3.1 Study Area

~~11~~15 The Core Study Area is defined by the Order Limits. The Wider Study Area (WSA) is defined as a 5 km buffer of the Order Limits.

~~12~~16 Where figures within this FRA show the CSA, this also refers to the Order Limits.

~~A9.1.1.2.2~~A9.1.1.3.2 Climate Change Allowances

~~*A9.1.1.2.2.1*~~*A9.1.1.3.2.1* *Fluvial*

~~13~~17 As the Development is Essential Infrastructure in Annex 3: Flood risk vulnerability classification - Guidance to the NPPF[1] and will have a lifespan of 40 years (anticipated to be decommissioned from 2069) the Development is required by the Environment Agency (EA) Flood risk assessments: climate

[1] https://www.gov.uk/guidance/national-planning-policy-framework/annex-3-flood-risk-vulnerability-classification

change allowances guidance[2] to account for a 23 % climate change (CC) allowance (Higher Central) for the 2050s epoch (2040-2069) for the Lower Trent and Erewash Management Catchment[3].

~~14~~18 Where fluvial modelling indicates that the required 23 % CC allowance is not available, then a higher proxy value will be used.

~~15~~19 The Development has also been assessed against the Higher CC allowance of 38 % for the 2050s epoch as a validation check.

~~A9.1.2.2~~A9.1.3.2 Tidal

~~16~~20 A 39 % CC (2050s epoch) allowance has been used to assess tidal flooding, while a 62 % CC allowance (2080s epoch) has been used as a validation check.

~~A9.1.2.3~~A9.1.3.3 Pluvial

~~17~~21 The Lower Trent and Erewash Management Catchment peak rainfall Central Allowance of 25 % for the 2070s epoch will be used to assess pluvial flooding.

~~A9.1.2.4~~A9.1.3.4 SuDS

~~18~~22 Whilst the Lower Trent and Erewash Management Catchment peak rainfall Central Allowance of 25 % for the 2070s epoch is required by the EA, consultation with the Lead Local Flood Authority (LLFA) highlighted that a 40 % CC allowance should be used where possible.

~~19~~23 As such, a 40 % CC allowance will be used for Sustainable Drainage Systems (SuDS) structures such as those which will serve Work Area 5a, BESS, and 5b, 400 kV Compound.

~~A9.1.1.3~~A9.1.1.4 GUIDANCE AND LEGISLATION

~~20~~24 This document is intended to meet the requirements of:

- The EA[4];
- National Policy Statement (NPS) for Energy EN-1[5];
- NPS for Renewable Energy EN-3[6];
- NPS for Electricity Networks Infrastructure EN-5[7];
- Nottinghamshire Local Flood Risk Management Strategy (LFRMS) 2021-2027[8];
- NSDC Strategic Flood Risk Assessment (SFRA) Update (2016)[9];

[2] https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances
[3] https://environment-test.data.gov.uk/hydrology/climate-change-allowances/river-flow?mgmtcatid=3052
[4] https://www.gov.uk/guidance/flood-risk-assessment-standing-advice
[5] https://www.gov.uk/government/publications/overarching-national-policy-statement-for-energy-en-1
[6] https://www.gov.uk/government/publications/national-policy-statement-for-renewable-energy-infrastructure-en-3
[7] https://www.gov.uk/government/publications/national-policy-statement-for-electricity-networks-infrastructure-en-5
[8] https://www.nottinghamshire.gov.uk/media/4346719/nottinghamshire-local-flood-risk-mangement-stategy-2021-27.pdf
[9] https://www.newark-sherwooddc.gov.uk/sfraupdate/

- The NSDC ENV 13 SFRA Level 1 Refresh (September 2023)[10];
- National Fire Chiefs Council (NFCC) – Grid Scale Battery Energy Storage System planning – Guidance for FRS;
- NFCC – Grid Scale Battery Energy Storage System planning – Guidance for FRS – July 2024 Update[11];
- The National Fire Protection Association (NFPA) 855 Standard for the Installation of Stationary Energy Storage Systems[12]; and
- The revised National Planning Policy Framework 2024 ('NPPF')[13].

~~21~~25 As outlined in NPS EN-1 (paragraph 5.8.15) the minimum requirements for FRAs are that they should be proportionate to the risk and appropriate to the scale, nature and location of the project. Importantly, this FRA should identify and secure opportunities to reduce the causes and impacts of flooding overall during the period of construction.

~~22~~26 Throughout the early stages of the Development, design opportunities to identify existing pluvial flow pathways and extensive consultation with communities affected by pluvial flooding has been undertaken, with a view to identifying positive interventions to reduce the existing impacts of prolonged or intense rainfall events.

~~A9.1.1.4~~A9.1.1.5 SITE CHARACTERISTICS

~~23~~27 The Order Limits are shown on ES Figure 5.1 [EN010162/APP/6.3.5.1] as being to the west of the A1, north of the A617, east of Eakring, south of Egmanton, and to the north and north-west of Staythorpe. The Development essentially consists of discrete land parcels proposed to be occupied by solar PV panels and connected by cable route areas. The eastern side of the Development runs from the north of North Muskham to Egmanton in the north. The western side of the Development runs north-west from National Grid Staythorpe Substation and then splits at Maplebeck, with spurs running to Eakring in the north-west and Kneesall to the north-northeast, then connecting with the eastern side of the Development.

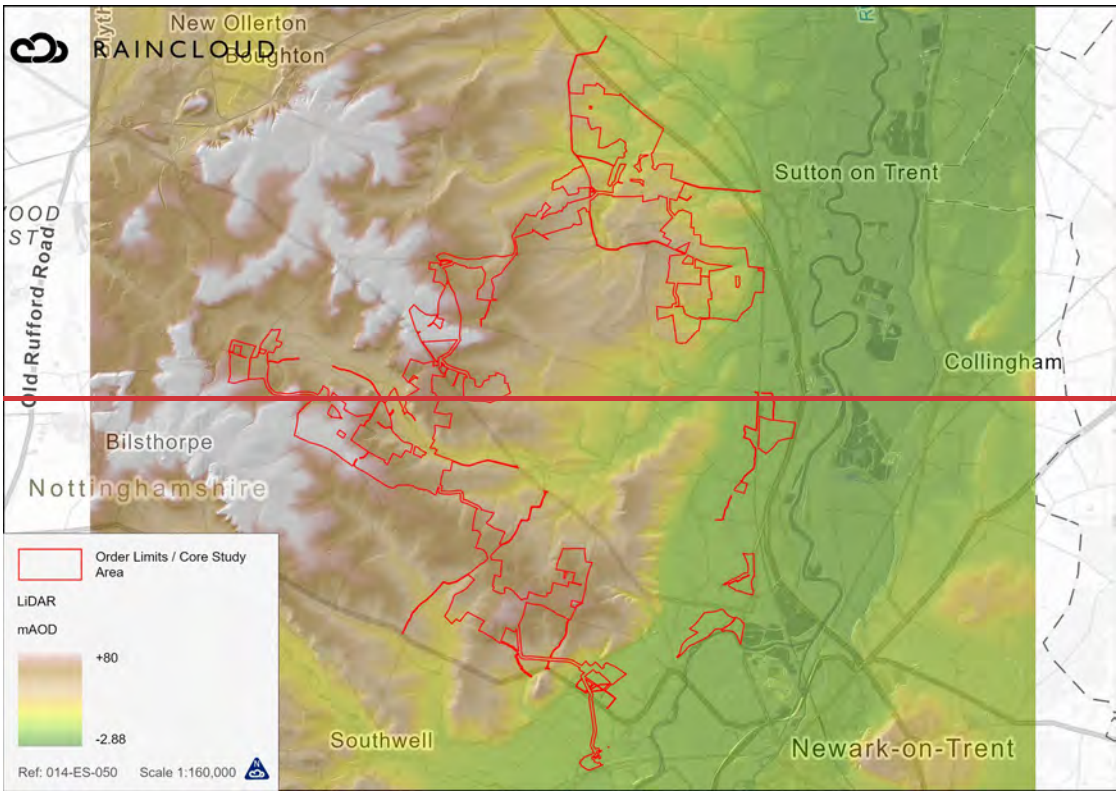
~~24~~28 The CSA is generally in arable use, interspersed with woodland and some minor areas of pastoral use, as shown in Plate A9.1.1.

[10] https://www.newark-sherwooddc.gov.uk/media/nsdc-redesign/documents-and-images/your-council/planning-policy/local-development-framework/amended-allocations-and-development-management-dpd/SFRA_Level_1_P04.pdf
[11] https://nfcc.org.uk/
[12] https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=855
[13] https://www.gov.uk/government/publications/national-planning-policy-framework--2

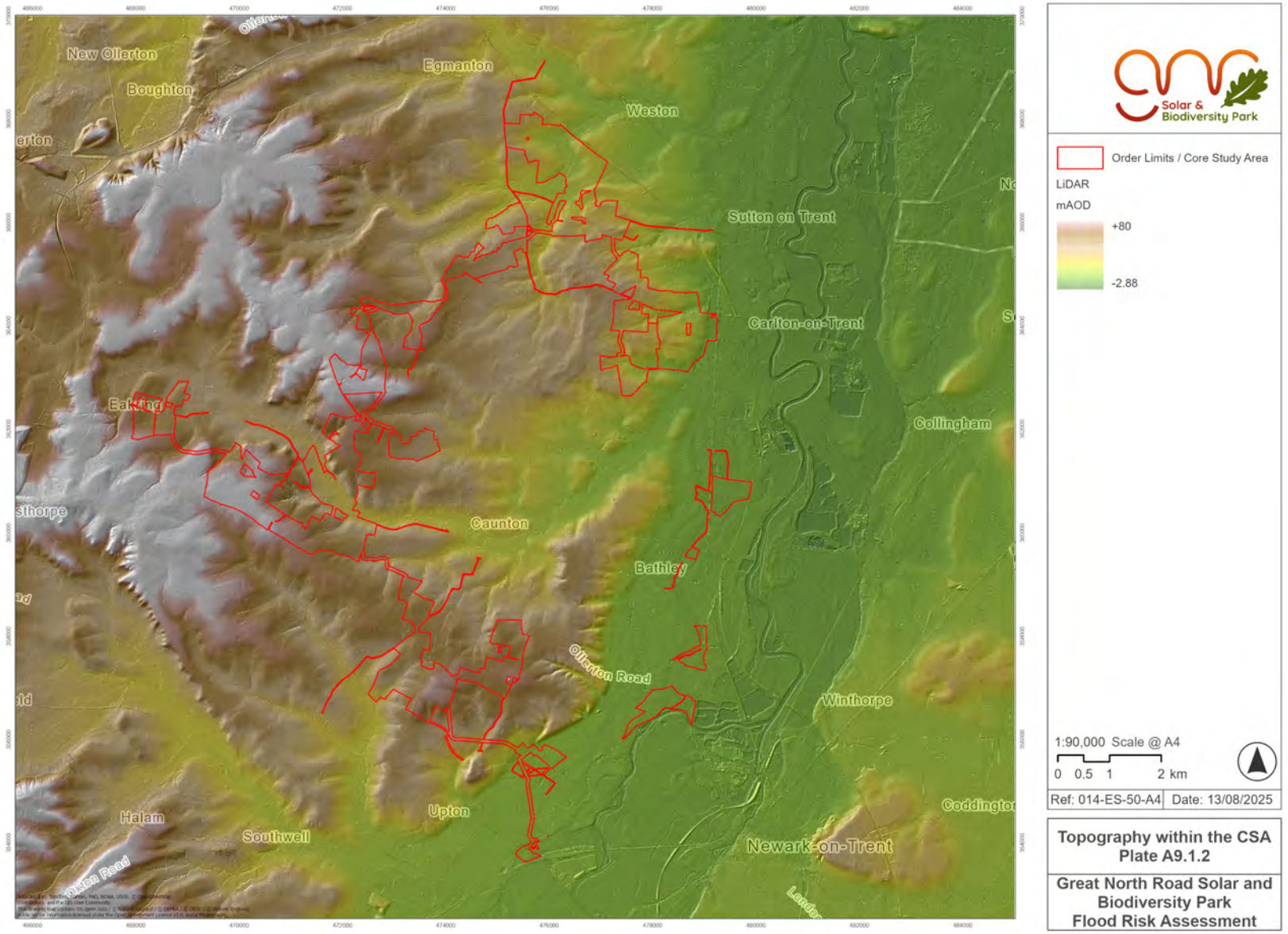
Plate A9.1.1: Greenfield areas - arable conditions west of Maplebeck

25 1 m resolution Lidar data[14] shows that land within the CSA is generally gently sloping, with elevations from 6.85 m AOD in the west to 92.43 m AOD in the east, as shown in Plate A9.1.2.

~~Plate A9.1.2: Topography within the CSA~~



[14] https://environment.data.gov.uk/survey

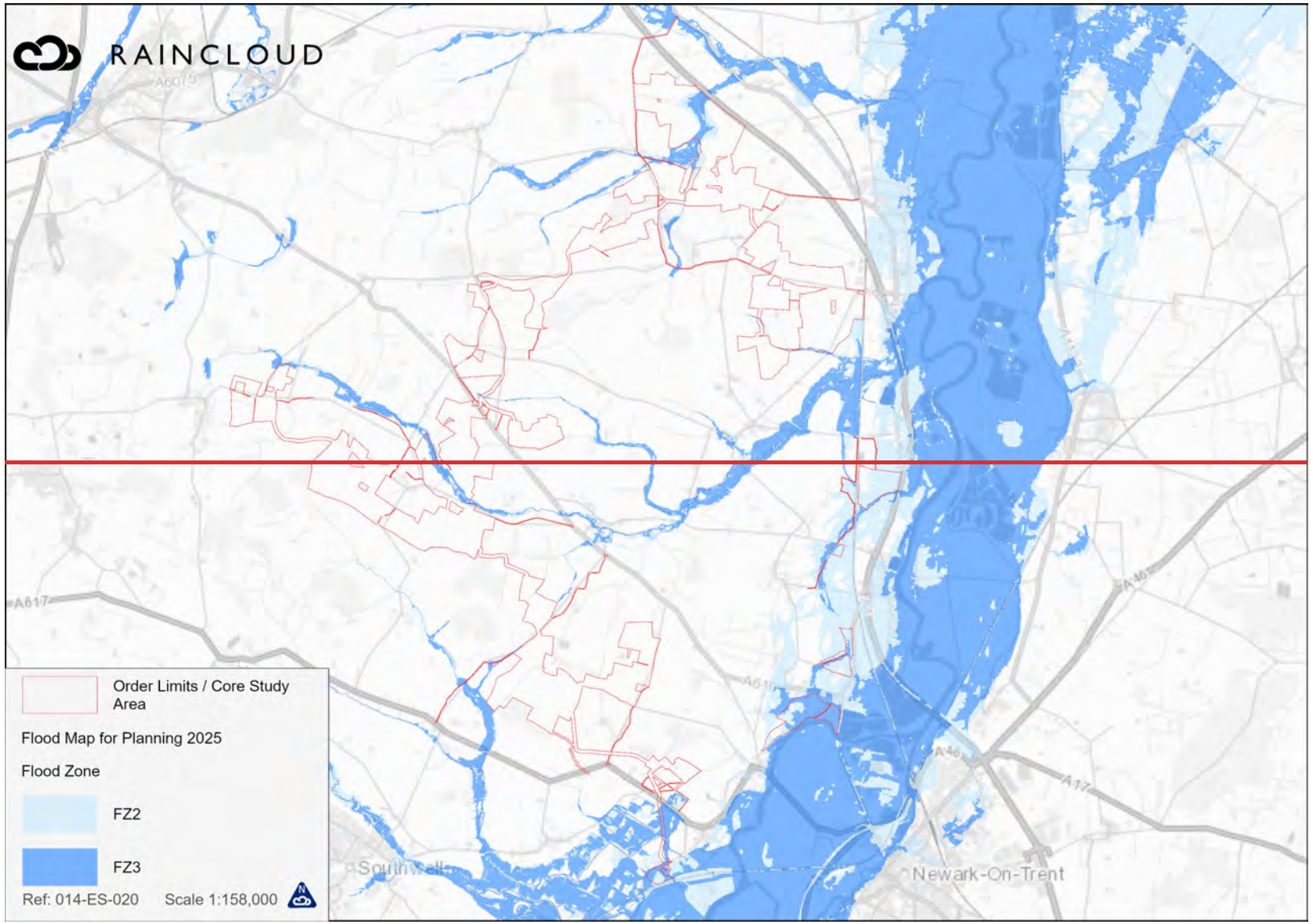

New Ollerton
Boughton
Egmanton
Weston
Sutton on Trent
Carlton-on-Trent
Collingham
Eakring
Caunton
Bathley
Ollerton Road
Winthorpe
Coddington
Upton
Halam
Southwell
Newark-on-Trent
Oxton Road
Solar & Biodiversity Park
Order Limits / Core Study Area
LiDAR
mAOD
+80
-2.88
1:90,000 Scale @ A4
0 0.5 1 2 km
Ref: 014-ES-50-A4
Date: 13/08/2025
Topography within the CSA
Plate A9.1.2
Great North Road Solar and Biodiversity Park
Flood Risk Assessment

~~A9.1.1.5~~A9.1.1.6 FLOOD CLASSIFICATION

~~26~~ The EA Flood Map for Planning (2025)[15] shows that the CSA is mostly located in Flood Zone (FZ) 1 (89.99 %), while 10.01 % lies in FZ 2 and FZ 3, as shown in ~~Plate A9.1.3.~~

[15] https://flood-map-for-planning.service.gov.uk/

~~***Plate A9.1.3: Flood Zones 2025***~~

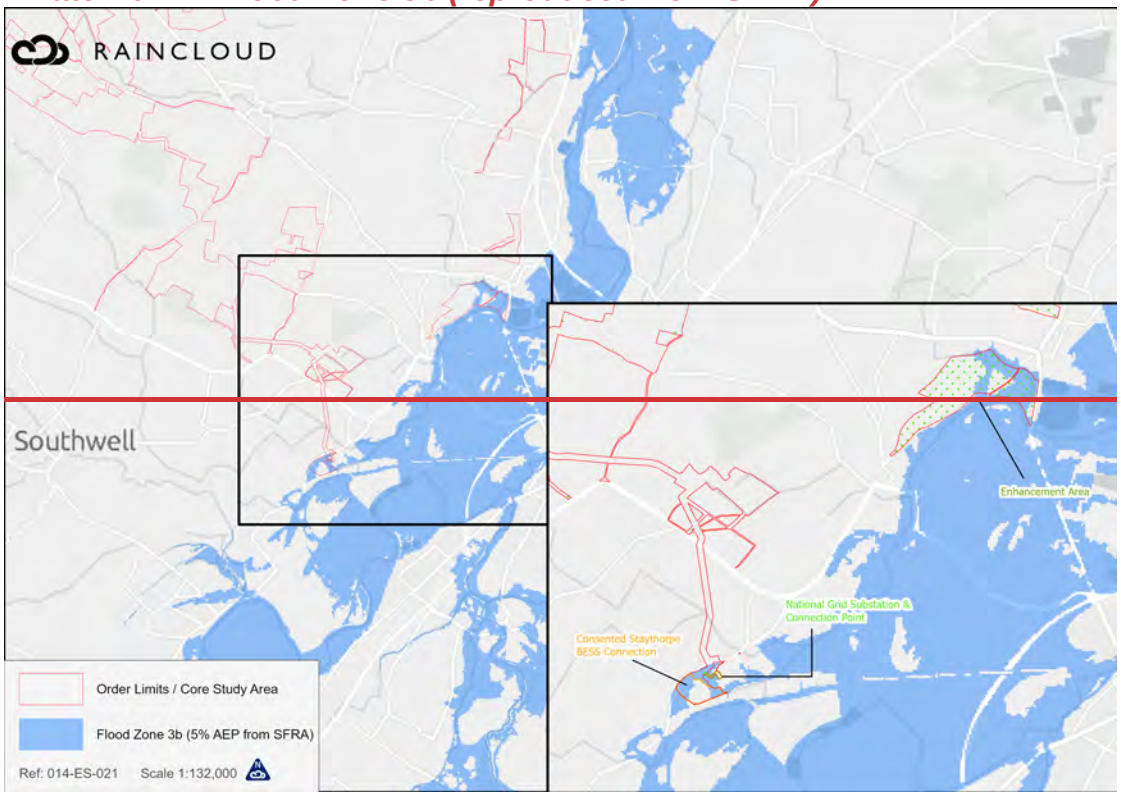

RAINCLOUD
Order Limits / Core Study Area
Flood Map for Planning 2025
Flood Zone
FZ2
FZ3
Ref: 014-ES-020
Scale 1:158,000
Southwell
Newark-On-Trent
A617
A46
A17

2729Figure A9.1 in Appendix D, which assumes all watercourses are flooded at the same time and is represented by the EA's NaFRA2 data. The following Work Areas are located outside FZ 2, FZ 3 and the future floodplain:

- Work Area 1: Solar PV (based on illustrative design);
- Work Area 4: Intermediate Substations;
- Work Area 5a: BESS; and
- Work Area 5b: 400 kV substation.

2830As identified in the SFRA, minor areas of the CSA are located within the functional floodplain (Flood Zone 3b), specifically Work Area 3: Mitigation, Work Area 6: National Grid Staythorpe Substation and connection point, Work Area 7: Consented Staythorpe BESS and Connection and Work Area 8: Access, as shown in PlateFigure A9.1.42 in Appendix D.

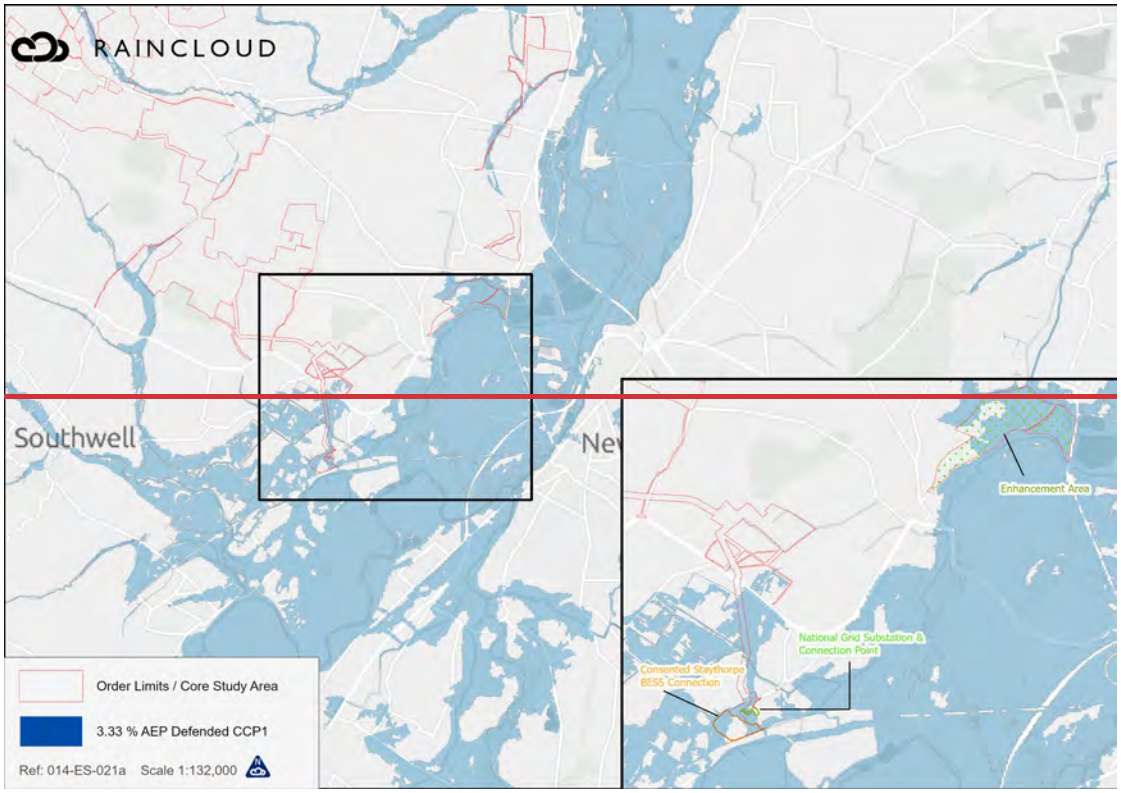
Plate A9.1.4: Flood Zone 3b (reproduced from SFRA)



2931The NaFRA2 dataset[16] includes the 3.33 % AEP Defended CCP1 outline as the future functional floodplain, with the extents being very similar to the SFRA functional floodplain and is shown in PlateFigure A9.1.4a3 in Appendix D.

[16] https://www.gov.uk/guidance/updates-to-national-flood-and-coastal-erosion-risk-information

~~Plate A9.1.4a: 3.33 % AEP Defended CCP1 Extents~~

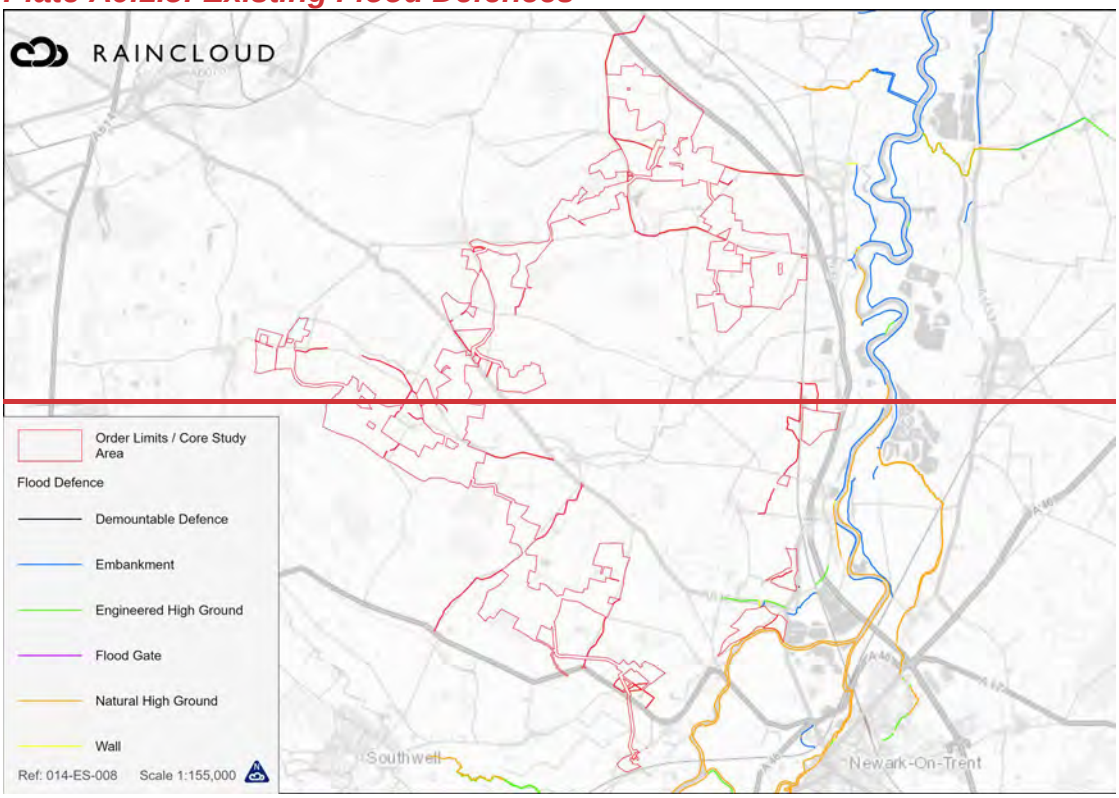


~~30~~32 No Solar PV or new aboveground ancillary infrastructure will be located in the functional or future floodplain.

~~A9.1.1.6~~A9.1.1.7 FLOOD DEFENCES

~~31~~33 Existing flood defences are located adjacent to the River Trent and River Greet and are shown on ~~Plate~~Figure A9.~~1.5~~4 in Appendix D and in Appendix A (EA Consultation).

~~Plate A9.1.5: Existing Flood Defences~~



~~32~~34 The left (west) bank of the River Trent is flanked by embankments and naturally high ground which have a Standard of Protection between 1:2 and 1:10 (50 % annual exceedance probability (AEP) and 10 % AEP)[17].

~~33~~35 The operational National Grid Staythorpe Substation (Work Area 6) has a private flood defence scheme, which comprises 'hard' engineered walls and 'soft' spoil embankments to a level of 13.10 m AOD, as part of NSDC planning application 14/00091/ELE[18].

~~34~~36 The EA Asset Management Database[19] shows that the defences adjacent to the River Trent have not been accounted for in the Flood Map for Planning.

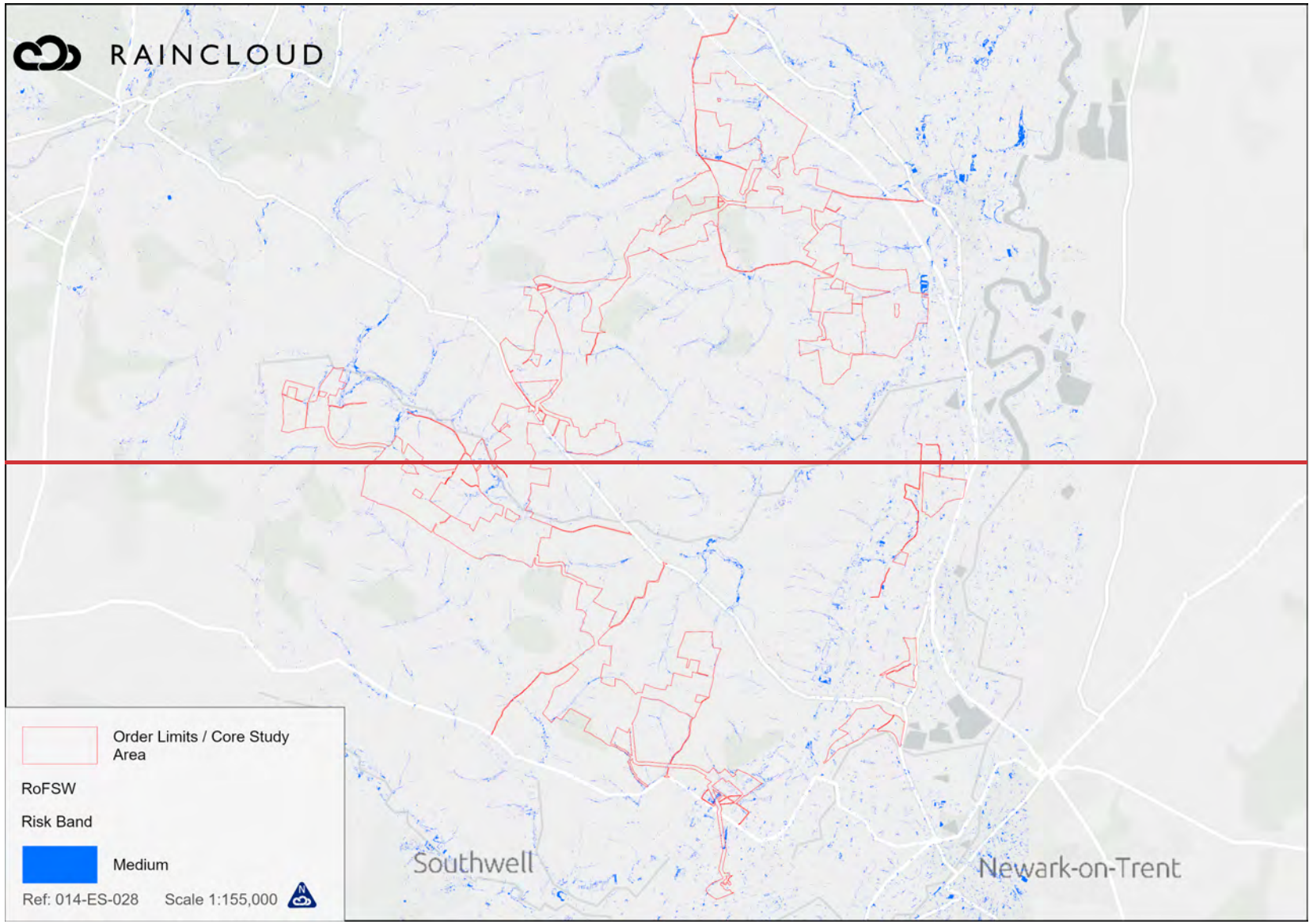
~~A9.1.1.7~~A9.1.1.8 PLUVIAL FLOODING

~~35~~37 The Flood Risk Assessments: Climate Change Allowances Guidance (Environment Agency 2022)[20] state that 'for modelling large areas (larger than 5 square kilometres) with rural land use, direct rainfall modelling is

[17] https://environment.data.gov.uk/asset-management/index.html
[18] https://publicaccess.newark-sherwooddc.gov.uk/online-applications/applicationDetails.do?activeTab=documents&keyVal=MZPFEZLB08200
[19] https://environment.data.gov.uk/asset-management/index.html
[20] https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

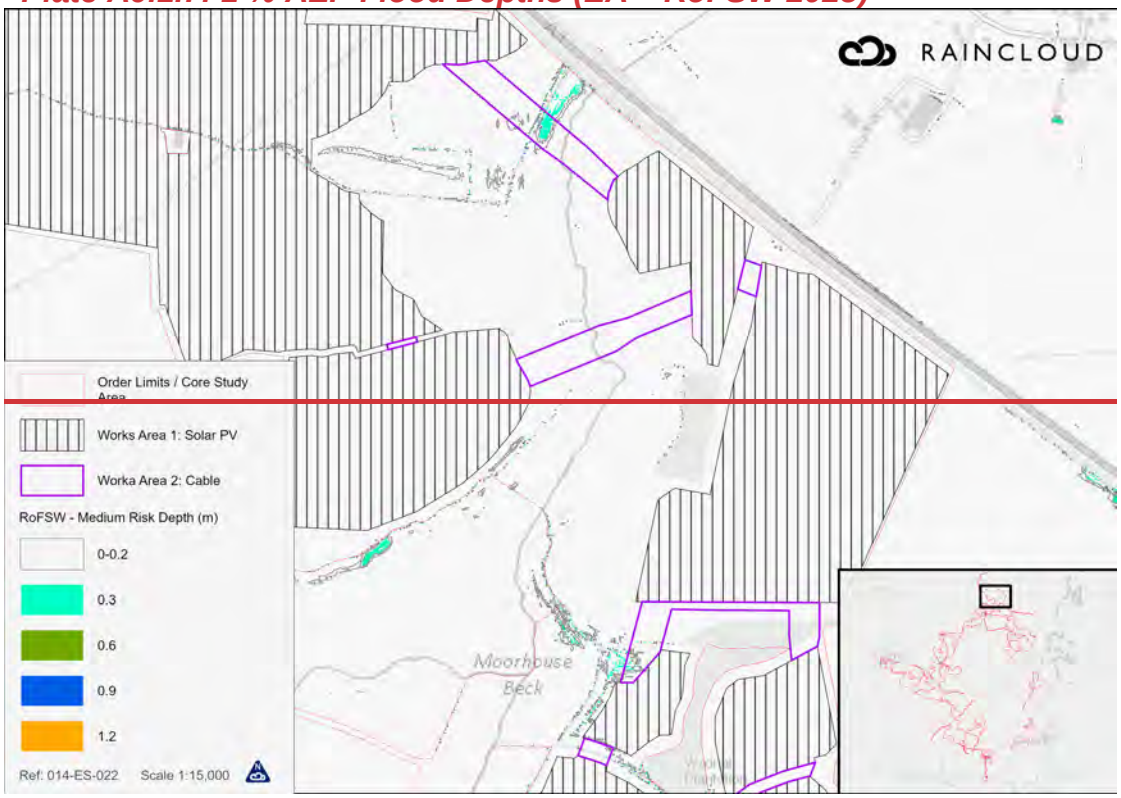
unlikely to be appropriate'. As such, the initial constraints process used the best available dataset, which is the EA pluvial flood depth datasets (Risk of Flooding from Surface Water 2025), which do not apply a CC allowance, as shown in ~~Plate~~Figure A9.~~1.6~~5 in Appendix D.

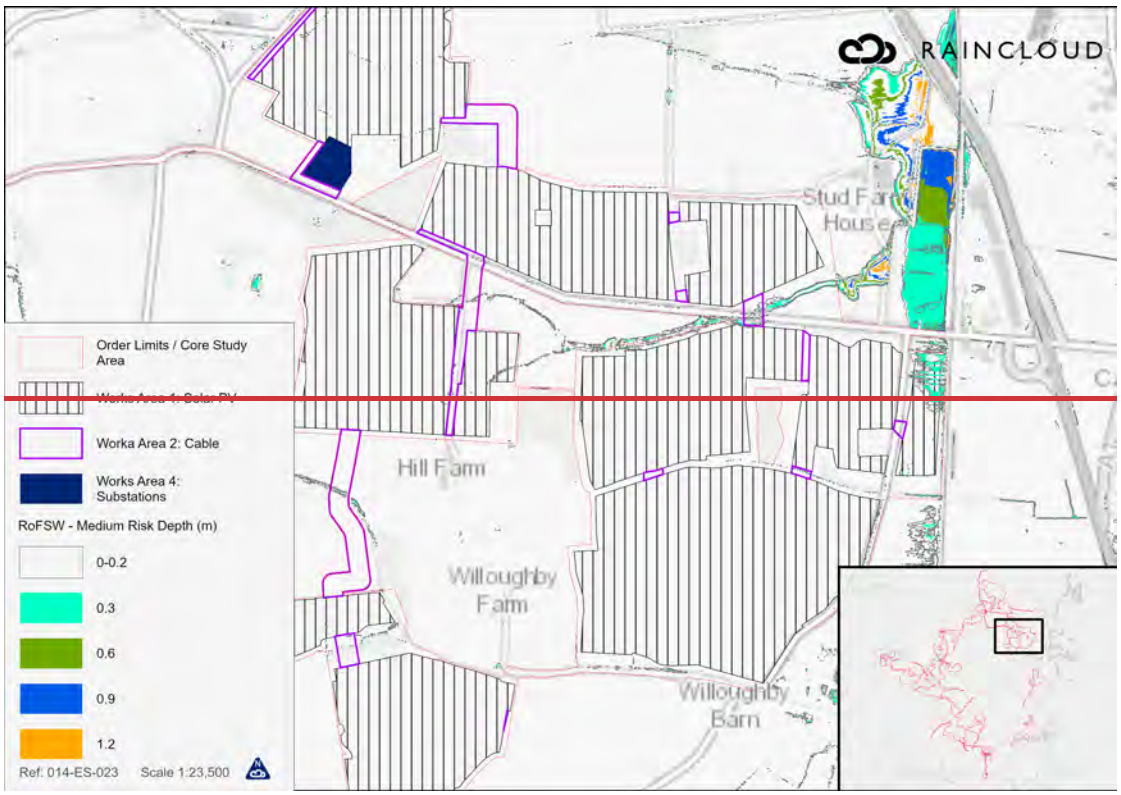
~~***Plate A9.1.6: 1 % AEP Pluvial Flood Extents***~~

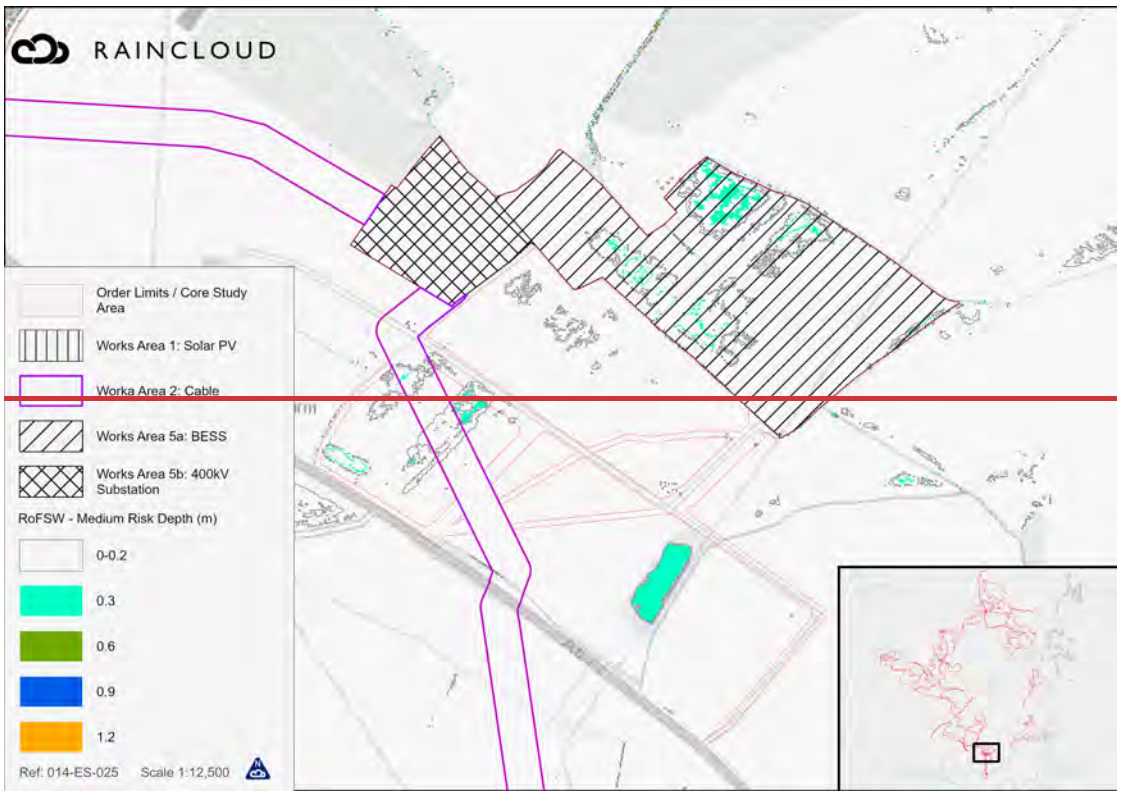

RAINCLOUD
Order Limits / Core Study Area
RoFSW
Risk Band
Medium
Ref: 014-ES-028
Scale 1:155,000
Southwell
Newark-on-Trent

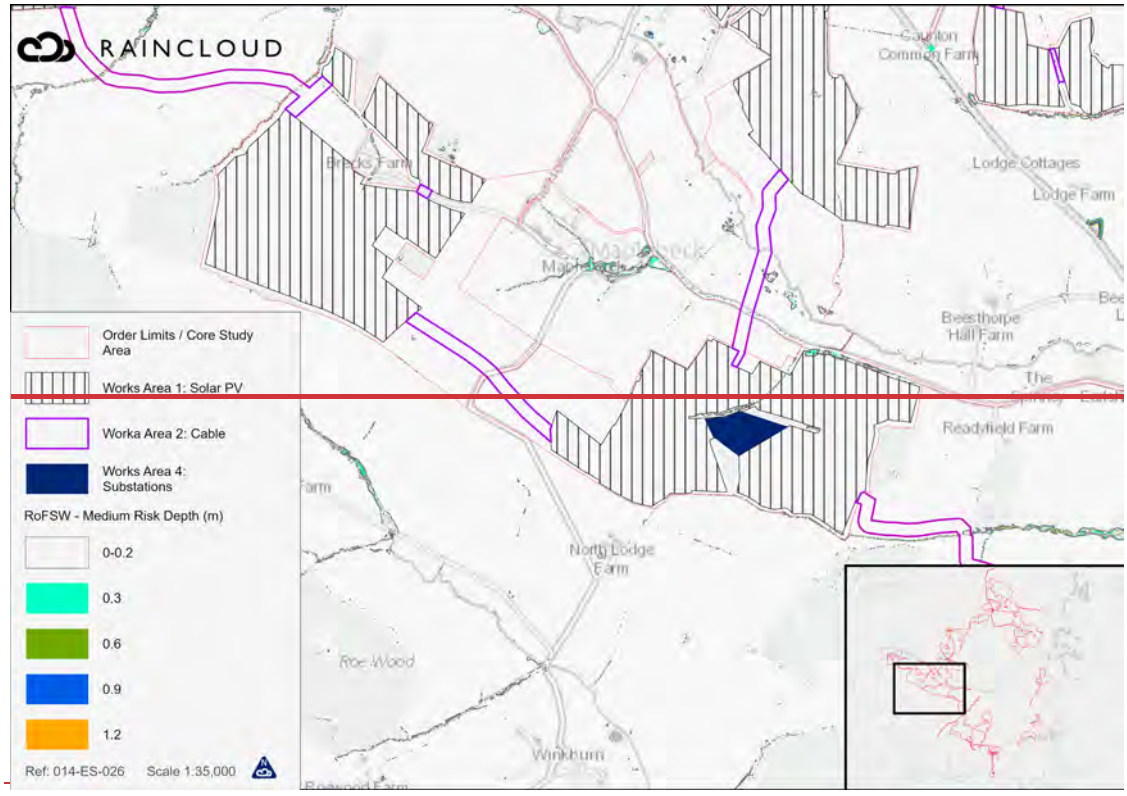
3638Depths are shown on Figure A9.6 in ~~Plate A9.1.7~~Appendix D for specific areas of the CSA.

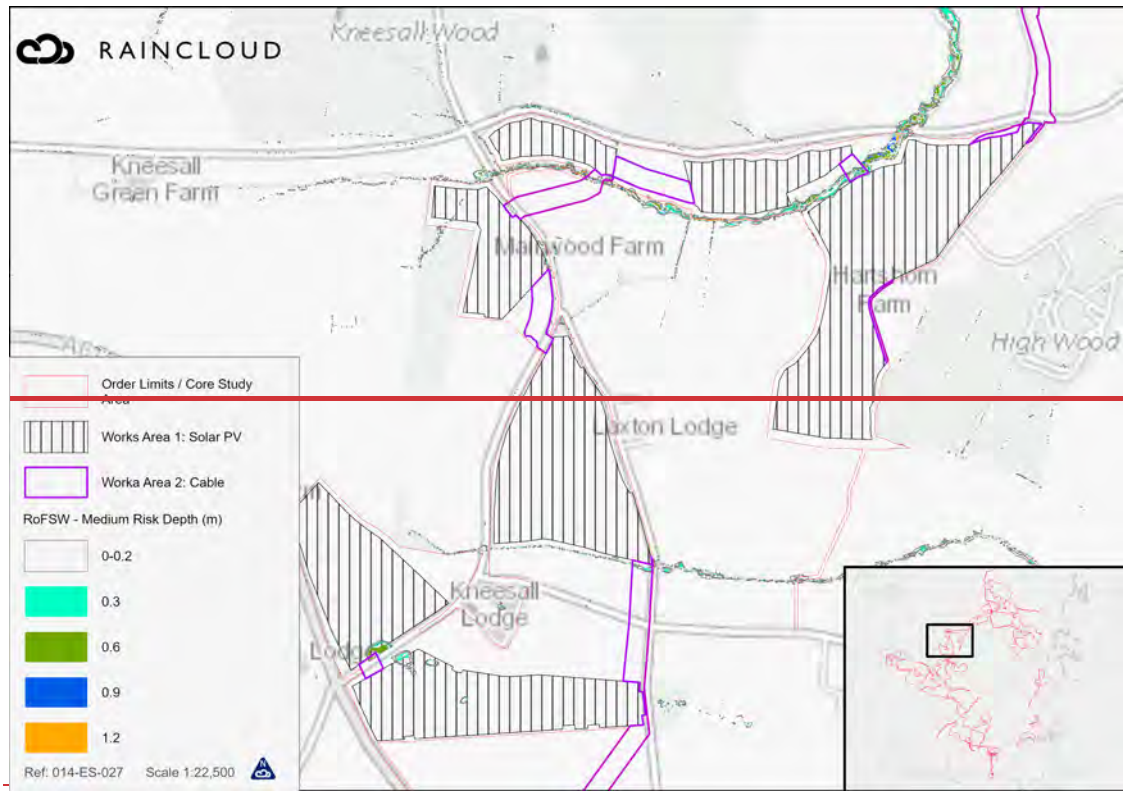
~~Plate A9.1.7: 1 % AEP Flood Depths (EA – RoFSW 2025)~~






RAINCLOUD
Order Limits / Core Study Area
Works Area 1: Solar PV
Worka Area 2: Cable
Works Area 5a: BESS
Works Area 5b: 400kV Substation
RoFSW - Medium Risk Depth (m)
0-0.2
0.3
0.6
0.9
1.2
Ref: 014-ES-025
Scale 1:12,500


RAINCLOUD
Brooks Farm
Lodge Cottages
Lodge Farm
Beesthorpe Hall Farm
Readyfield Farm
North Lodge Farm
Roe Wood
Winkburn
Order Limits / Core Study Area
Works Area 1: Solar PV
Worka Area 2: Cable
Works Area 4: Substations
RoFSW - Medium Risk Depth (m)
0-0.2
0.3
0.6
0.9
1.2
Ref: 014-ES-026
Scale 1:35,000



~~37~~39 Pluvial flood depths and flow routes at Calton-on-Trent (amongst other locations) have been verified by direct rainfall method (DRM) 2D pluvial flood modelling in Flood Modeller Pro using the parameters outlined in Table A9.1.1.

Table A9.1.1: 2D Pluvial Flood Model Parameters – Carlton-on-Trent

Return Period	1 % AEP
Storm Duration	3 hours
Season	Summer
FEH Rainfall Design Depth	55.314 mm
Rural runoff	55 %
CC Allowance – Central 2070s[21]	25 %
Drainage / Infiltration Allowance (0 or 12 mm)	0 mm[22]
Manning's n Values	• Floodplain - mature row crops[23]: 0.035; • Roads: 0.01; • Buildings: 0.01; and • Woodland: 0.1.
Model Timestep	0.5 second
Grid Resolution	2 m
Height Data	1 m LiDAR, 2022
Data Stamping (OS MasterMap)	• Buildings – Raise +2 m; and • Roads – Depress -0.1 m.
Mass Error	0.0%
Largest Courant (Cr) Value	3.5

3840 Storm durations used in modelling reflect the nature of the catchment assessed. As the CSA is predominantly rural, the peak 1 % AEP event has been assessed in accordance with the parameters outlined within the Table in Section 4.2.1 of the EA's *What is the Risk of Flooding from Surface Water map?* Report (version 2.0 April 2019).

3941 An Active area for the 2D domain was chosen based on the area of interest, i.e., areas modelled to flood on the EA's pluvial flood depth datasets (Risk of Flooding from Surface Water Depth).

4042 Outputs from Flood Modeller, using the Alternating Direction Implicit (ADI) solver on a 2 m grid resolution, show a good correlation with the EA's modelling (also see ~~Plate~~Figure A9.~~1.7~~6) for the area upslope of Carlton-on-Trent, as shown in ~~Plate~~Figure A9.~~1.8~~7 in Appendix D.

[21] https://environment-test.data.gov.uk/hydrology/climate-change-allowances/rainfall?mgmtcatid=3052
[22] Monte Carlo approach used to derive the national default 12 mm per hour drainage rate value disapplied due to rural catchment
[23] Manning's n for Channels (Chow, 1959)

Plate A9.1.8: 1 % AEP Flood Depths – Raincloud 2D Modelling

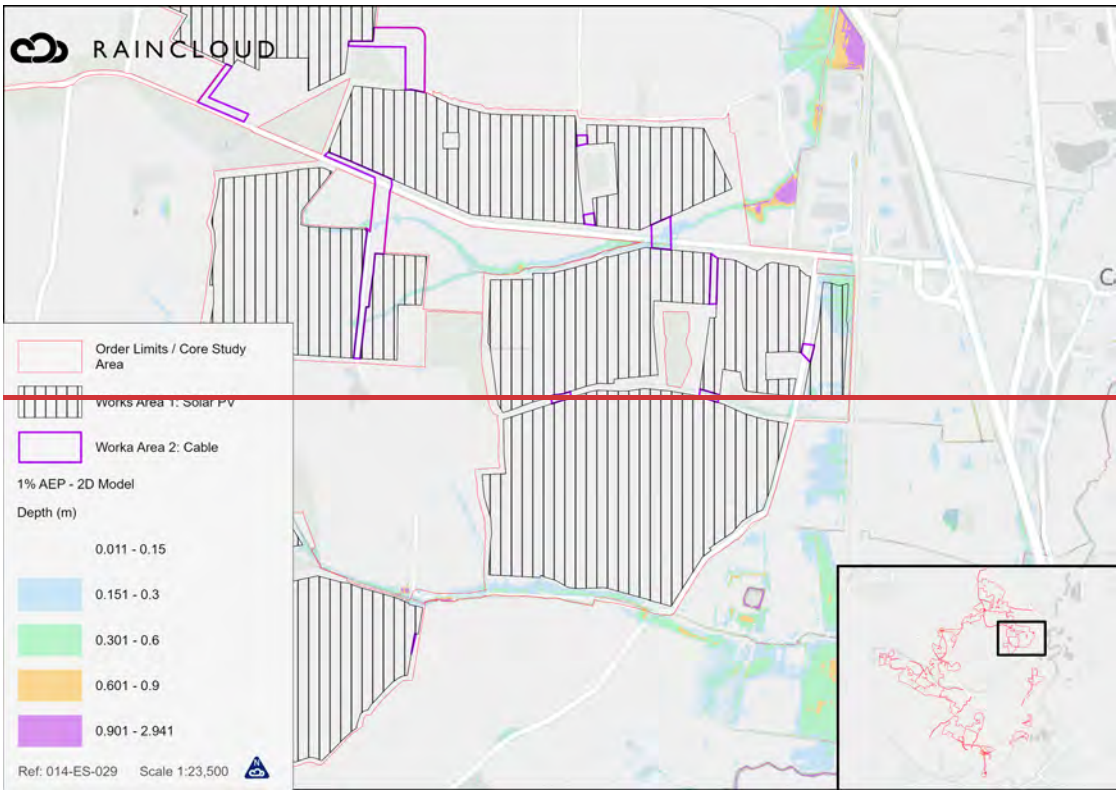
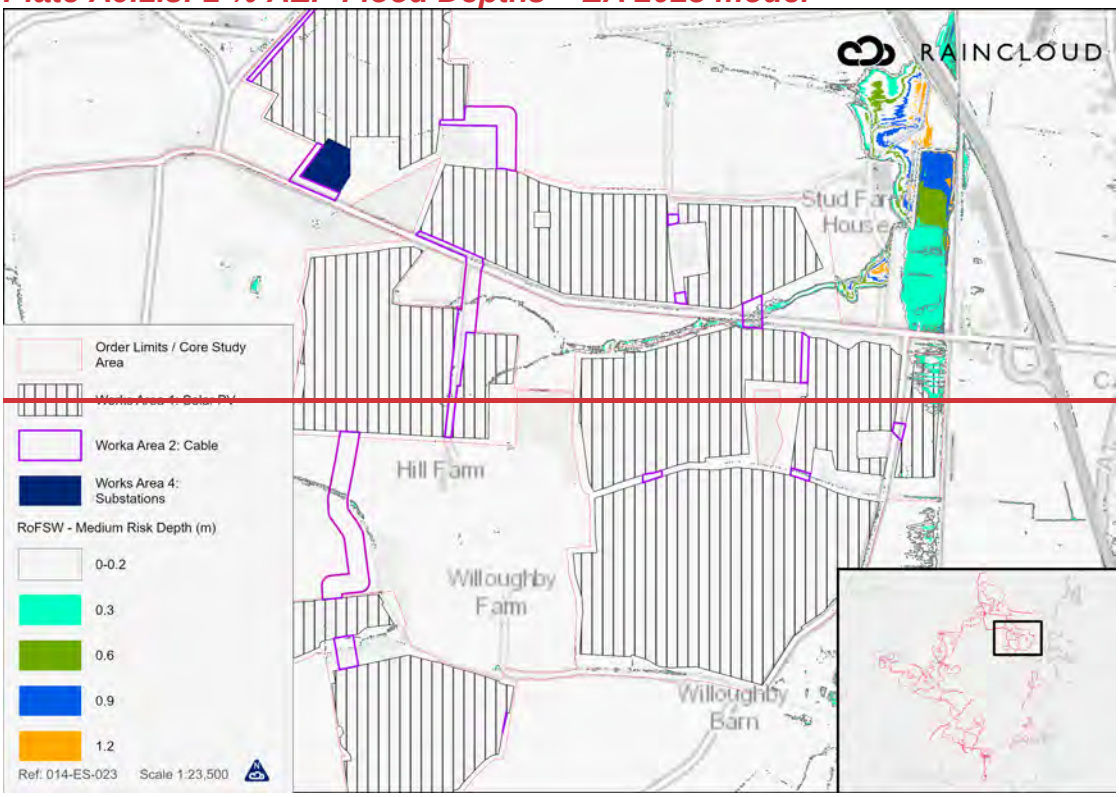


Plate A9.1.8: 1 % AEP Flood Depths – EA 2025 model



~~A9.1.1.8~~A9.1.1.9 RESERVOIR FLOODING

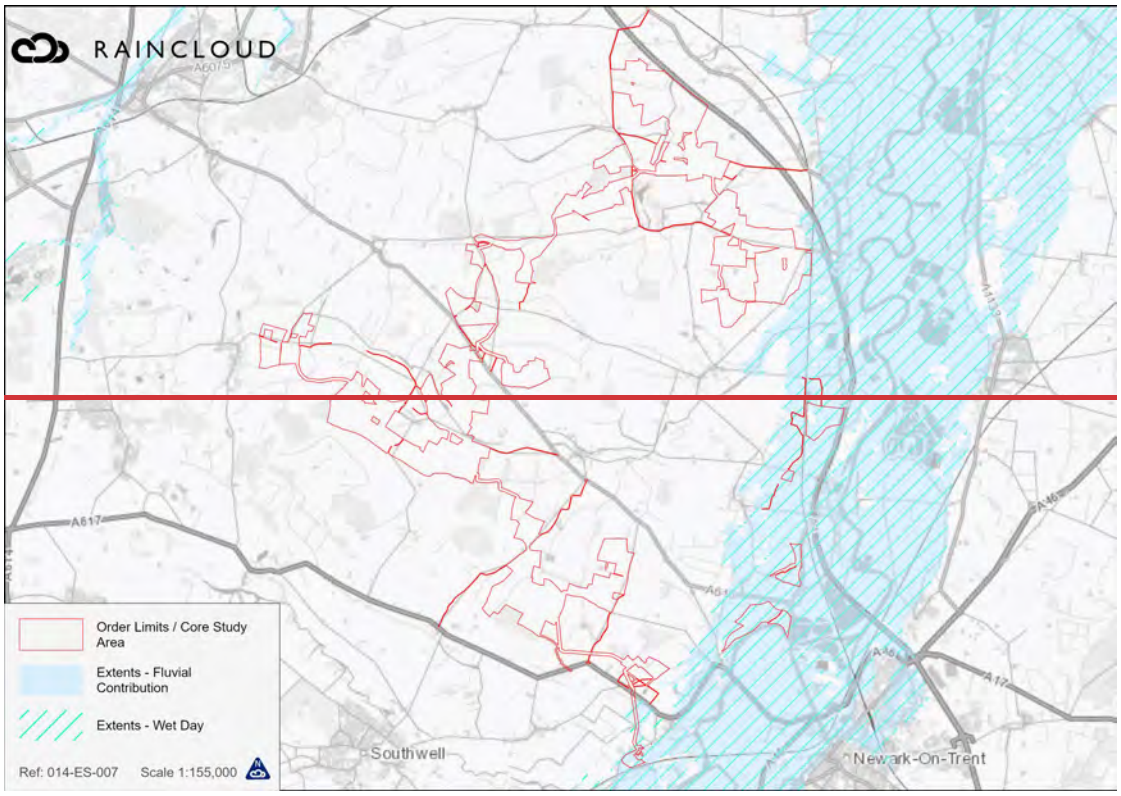
~~41~~43 The eastern section of the CSA is modelled to flood should there be a breach in the retaining walls of the reservoirs outlined upstream of the CSA, specifically those identified in Table A9.1.2.

Table A9.1.2: Reservoirs which could affect the CSA in a breach event

Reservoir name	Approx. Distance to CSA
Blithfield	75 km south west
Carsington	45 km west
Derwent	59 km north west
Foremark	51 km south west
Howden	59 km north west
Ladybower	48 km north west

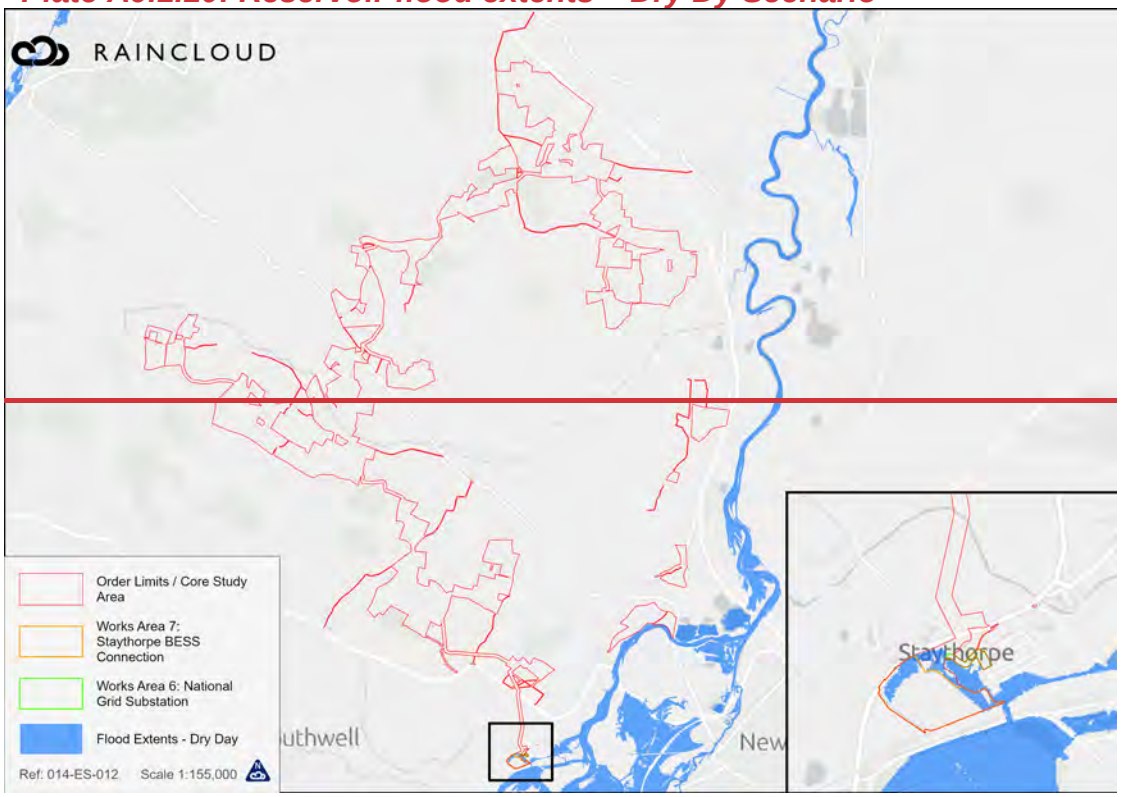
~~42~~44 The extent of reservoir flooding which interacts with the CSA largely follows the corridor of the River Trent. The Fluvial Contribution and Wet Day scenarios are shown in ~~Plate~~Figure A9.~~1.9~~8 in Appendix D.

~~Plate 9.1.9: Reservoir Flood Extents~~



~~43~~45 Should there be a breach of reservoir retaining walls when river levels are within normal range, then only a very minor area of the CSA, in proximity to Work Area 7, Consented Staythorpe BESS and Connection, is modelled to be within the flood extent, as shown in ~~Plate~~Figure A9.~~1.10~~9 in Appendix D.

~~***Plate A9.1.10: Reservoir flood extents – Dry Dy Scenario***~~



~~44~~46 The SFRA identifies reservoirs within the administrative area of the LLFA and these are noted to be downstream of the CSA, and are listed in Table A9.1.3.

Table A9.1.3: Reservoirs downstream of the CSA

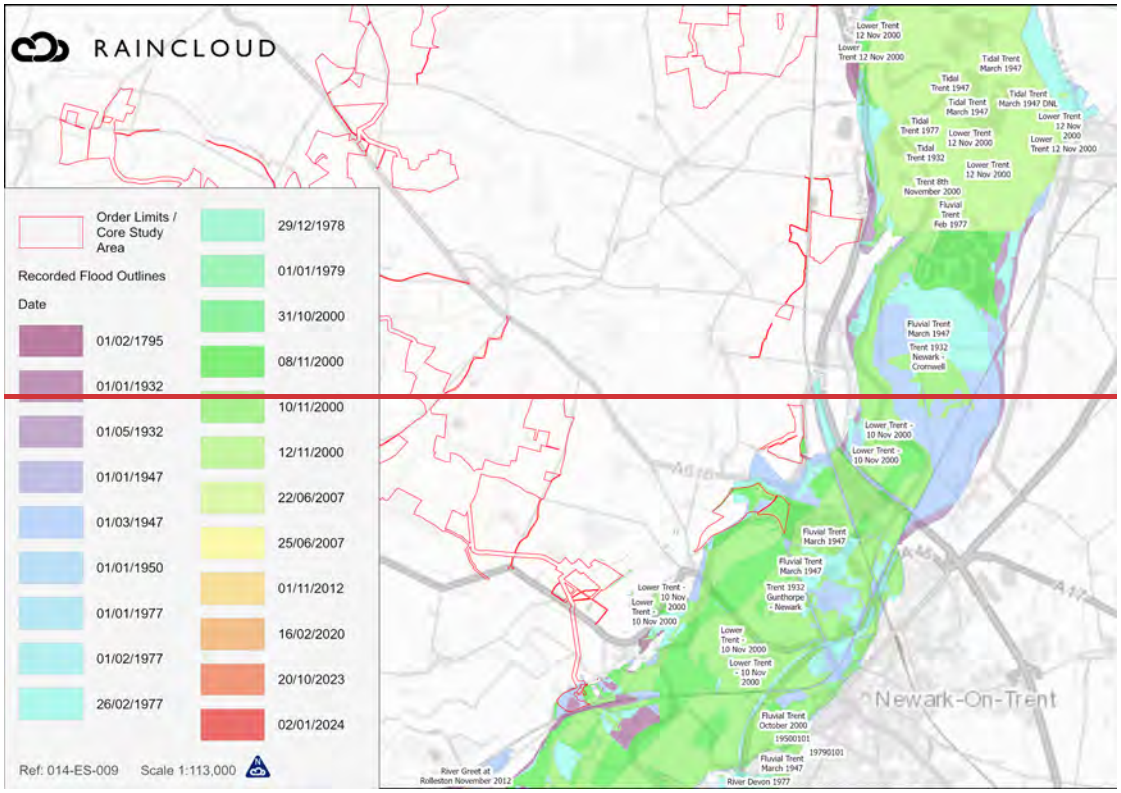
Reservoir name	**Approx. distance to CSA**	**Catchment**
Ash Buffer Lagoon, Besthorpe	3.1 km east	River Trent
Rufford Lake	4.1 km west	River Maun
Sherwood Forest Lake	4.8 km west	River Maun
South Farm Reservoir 1	10.2 km north west	River Maun
South Farm Reservoir 2	10.2 km north west	River Maun
Thoresby Lake (Upper)	11.2 km north west	River Maun
Thoresby Lake	11.1 km north west	River Maun

~~A9.1.1.9~~A9.1.1.10 FLOOD HISTORY

~~45~~47 Anecdotal evidence suggests that the eastern section of the CSA has previously flooded from fluvial sources, principally the River Trent.

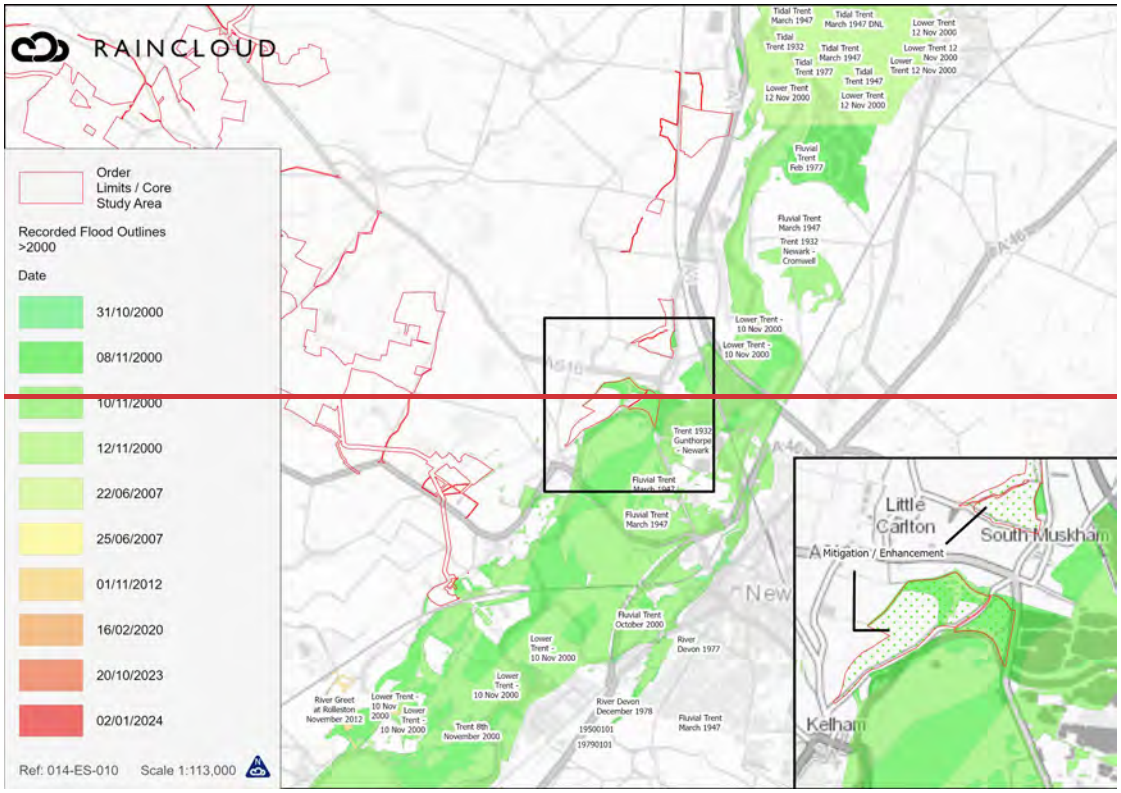
~~46~~48 The EA historic flood outline dataset also indicates that the CSA has previously flooded, as shown in ~~Plate~~Figure A9.~~1.11~~10 in Appendix D.

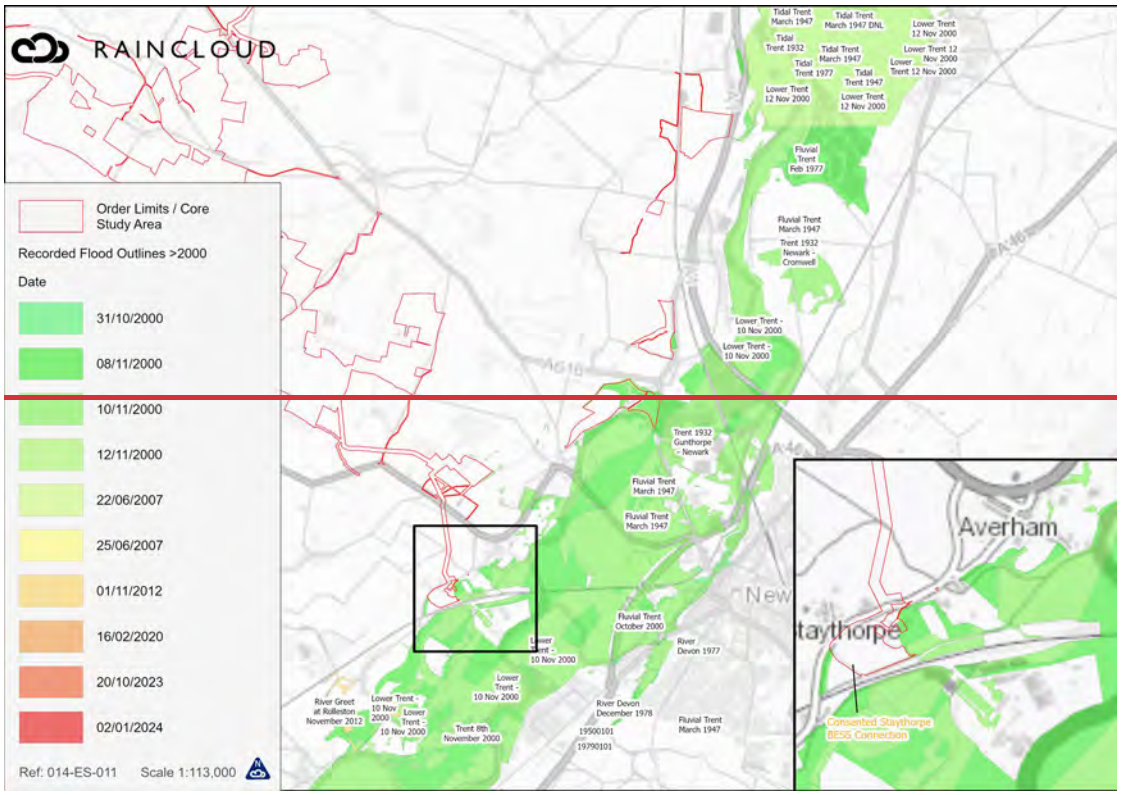
~~Plate A9.1.11: Historic Flood Outlines~~



~~47~~49Only minor areas of the CSA, and no areas of Work Area 1 – PV Arrays or the substations or BESS areas, have flooded since 2000, as shown in ~~Plate~~Figure A9.~~1.12~~11 in Appendix D.

Plate A9.1.12: Recent Flood Outlines





4850From public feedback, attendance at Parish Council meetings and NCC's Section 19 reports (reports which investigate significant flood events), it is evident that areas surrounding the CSA have previously flooded from pluvial sources, with the following communities affected:

- Maplebeck[24];
- Sutton-on-Trent[25,26];
- Carlton-on-Trent[27];
- Weston; and
- Caunton[28].

4951 2D direct rainfall modelling has been undertaken for this FRA in Flood Modeller to verify surface water flow pathways and predict flood depths during a range of storm return periods for several communities in proximity to the CSA.

5052 The area around Maplebeck was initially investigated as an area of concern following feedback from the Parish Council regarding the existing pluvial flood risk and the effects of Storm Babet (October 2023).

51 The Flood Modelling exercise for Maplebeck is discussed in Section A9.1.3.2 of this FRA.

~~A9.1.1.10~~A9.1.1.11 FLOOD STUDIES

5253 Following feedback received from the EA during the Scoping stage, outputs from a number of flood studies within the Wider Study Area were obtained, including:

- Tidal Trent, Jacobs, (2023);
- Trent and Tributaries at Newark SFRM2 (2011~~);~~
-), Halcrow, July 2011 plus the EA climate change (2020 rerun);
- Mill Dam Dyke, Tidal Trent Tributaries, Jeremy Benn Associates (JBA) (2022);
- River Greet, Nottingham Tributaries SFRM, JBA (2014);
- River Maun at Mansfield, HR Wallingford (2021); and
- Slough Dyke, Tidal Trent Tributaries, JBA (2022).

5354 Outputs from the River Maun, Slough Dyke and Mill Dam Dyke do not encroach on the CSA and are therefore not discussed further within this FRA.

[24] https://www.nottinghamshire.gov.uk/media/fbznap5u/maplebeck-s19-storm-babet-oct-2023.pdf
[25] https://www.nottinghamshire.gov.uk/media/vvhcdwlc/sutton-on-trent-s19-storm-babet-oct-2023.pdf
[26] https://www.nottinghamshire.gov.uk/media/1529265/suttonontrentsection19flooding.pdf
[27] https://www.nottinghamshire.gov.uk/media/1494226/carlton-on-trent-section-19-report.pdf
[28] https://www.nottinghamshire.gov.uk/media/yqjcqi1z/caunton-s19-storm-babet-oct-2023.pdf

55 Catchments for each of the flood studies is shown on Figure A9.12 in Appendix D.

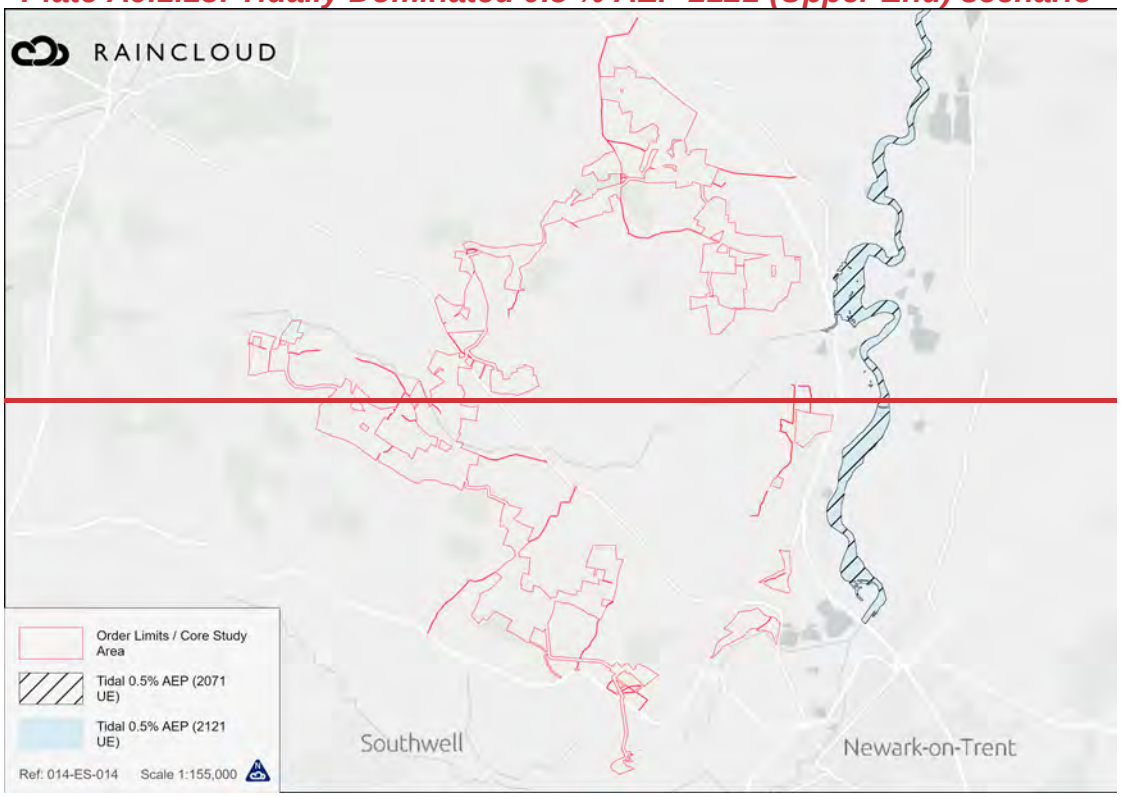
56 Where the Development is located in Flood Zone 1 and is sufficiently distant from a watercourse e.g. not in proximity to The Beck and Moorhouse Beck, national scale modelling has been utilised and validated against the EA's CCP1 climate change dataset to assess the risk of flooding in those areas.

57 Watercourses which interact with the Order Limits are not close enough to be influenced by other watercourses during a flood event, either in isolation or if they were to flood at the same time. It should also be noted that the River Trent is not a rapid response catchment due to the wide area which it drains, meaning the smaller tributaries which are located within and close to the Order Limits will transfer water downstream more rapidly than the River Trent and therefore it's influence on water levels within the tributaries is limited. Structures, such as the A1, East Coast Mainline Railway embankments and culverts / bridges also limit the influence and flood extent of the River Trent.

~~A9.1.1.11~~A9.1.1.12 TIDAL TRENT

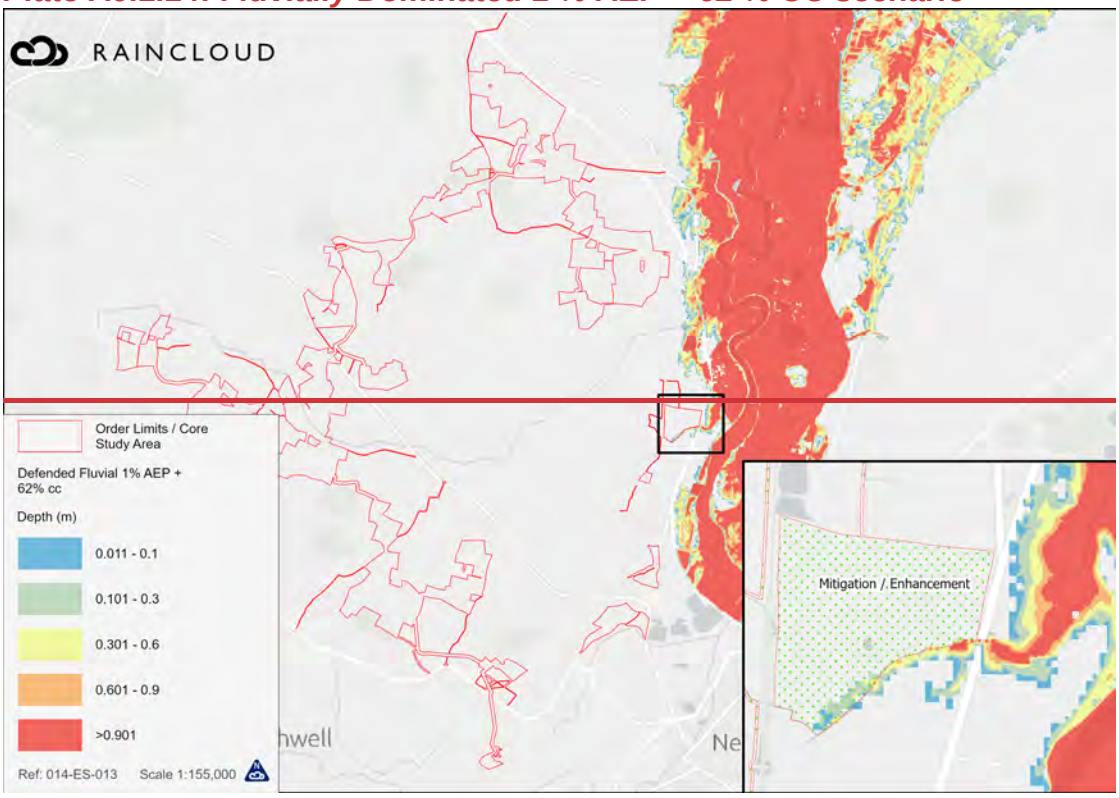
~~54~~58 Outputs from the Tidal Trent, Jacobs, (2023) Flood Study show that the extents for the tidally dominated 0.5 % AEP 2021 (Upper End) scenario do not encroach upon the CSA, as shown in ~~Plate~~Figure A9.~~1.~~13 in Appendix D.

~~Plate A9.1.13: Tidally Dominated 0.5 % AEP 2121 (Upper End) scenario~~



~~55~~59 The fluvially dominated 1 % AEP + 39 % CC (2050s epoch) and 62 % CC (for the 2080s epoch (2070 – 2125)) defended scenario outputs show that a minor section of Work Area 3, Mitigation / Enhancement, shown to be diverse grassland on the Sitewide Plan of the LEMP, would flood to a depth of 0.6 m, as shown in ~~Plate~~Figure A9.~~1.~~14 in Appendix D.

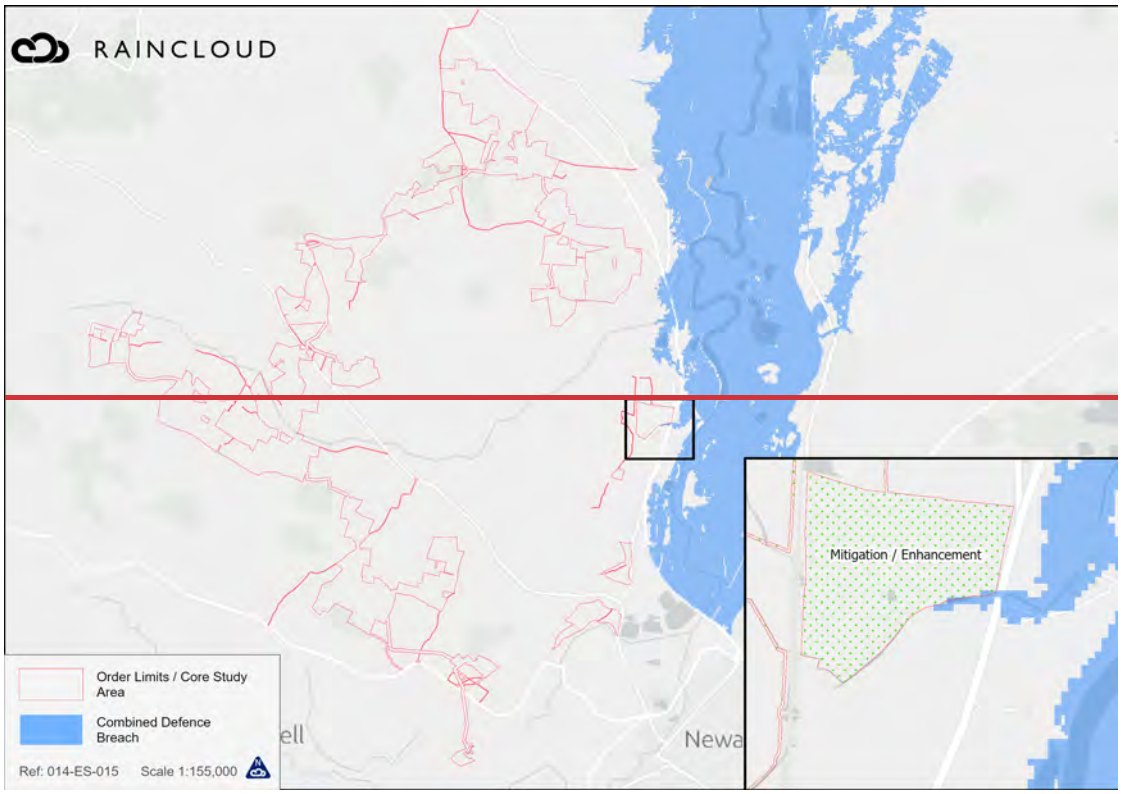
~~Plate A9.1.14: Fluvially Dominated 1 % AEP + 62 % CC scenario~~



~~56~~60 No other work areas are located in the fluvially dominated 1 % AEP + 62 % CC defended scenario extent.

~~57~~61 The Combined Breach of defences outline shows that whilst several breach scenarios marginally encroach upon the eastern section of the CSA, no flood outline extends into any of Work Area other than Work Area 3, Mitigation / Enhancement, proposed to be diverse grassland, as shown in ~~Plate~~Figure A9.~~1.~~15 in Appendix D.

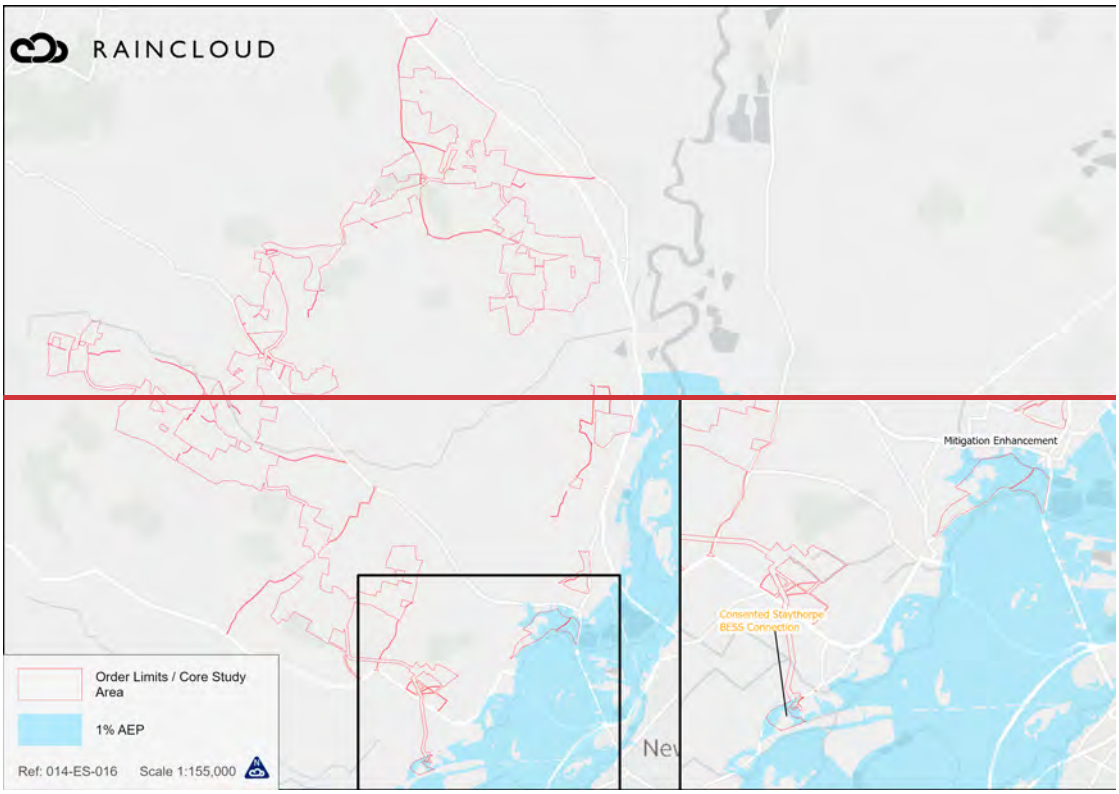
~~Plate A9.1.15: Combined Tidal Breach Outline~~



~~A9.1.1.12~~A9.1.1.13 FLUVIAL TRENT

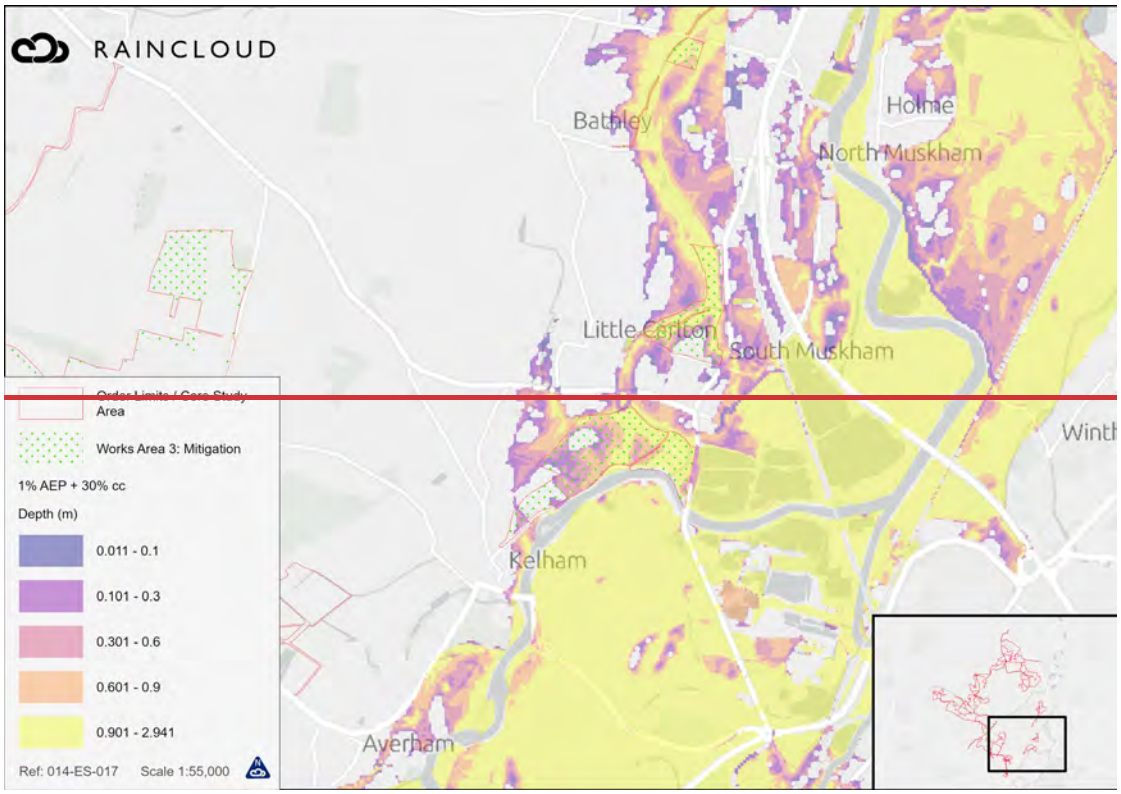
~~58~~62 Outputs from the Trent and tributaries at Newark SFRM2 Flood Study show that the extents of the 1 % AEP event do not encroach upon the Solar PV area (Work Area 1) and marginally encroaches on the Consented Staythorpe BESS and Connection (Work Area 7) and National Grid Substation Connection Point (Work Area 6) as shown on ~~Plate~~Figure A9.~~1.~~16 in Appendix D.

~~***Plate A9.1.16: 1 % AEP – River Trent***~~



5963As the Development will have an operational life of 40 years the Development is required to be assessed against the 1 % AEP + 23 % CC allowance in accordance with 2050s Higher Central allowance for the Lower Trent and Erewash Management Catchment. In the absence of a modelling study incorporating a 23 % CC allowance the 1 % AEP + 30 % CC event has been used as a proxy and the extents encroach further into the eastern section of the CSA and specifically into Work Area 3, Mitigation / Enhancement, Work Area 6, National Grid Staythorpe Substation, and Work Area 7, Consented Staythorpe BESS and Connection compared to the 1 % AEP as shown in ~~Plate~~Figure A9.~~1.~~17~~.~~ in Appendix D.

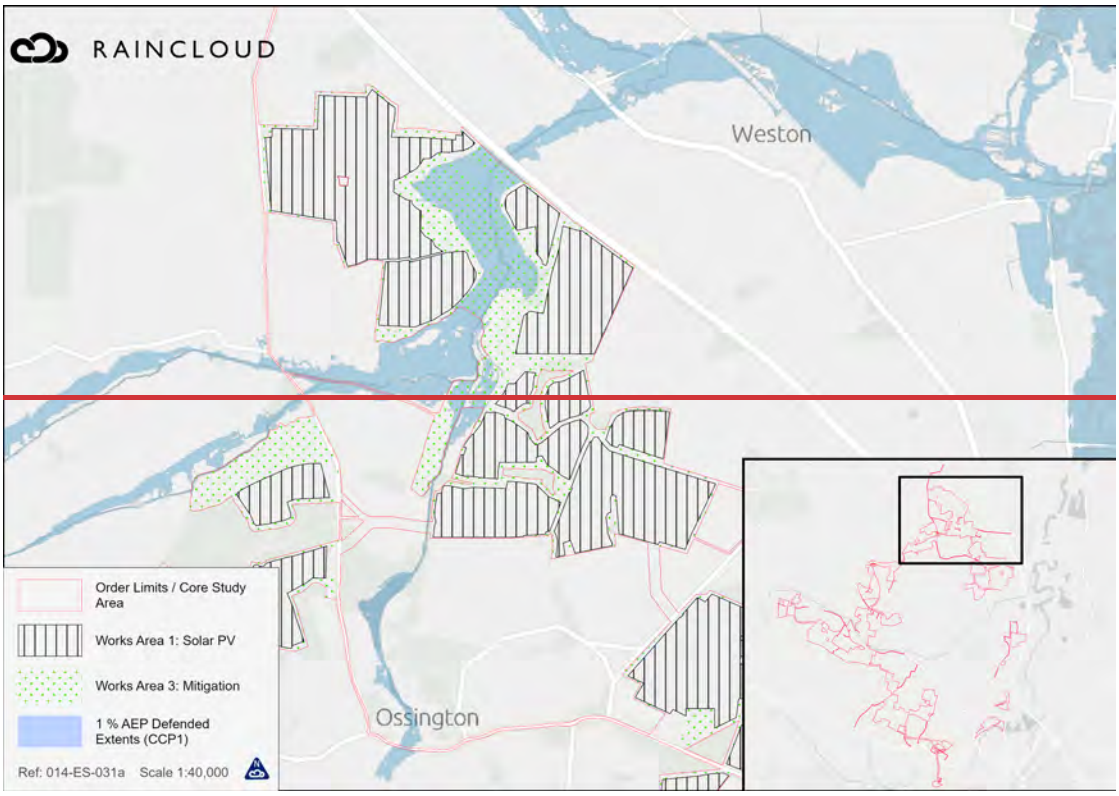
~~Plate: A9.1.17: 1 % AEP + 30 % CC – River Trent~~

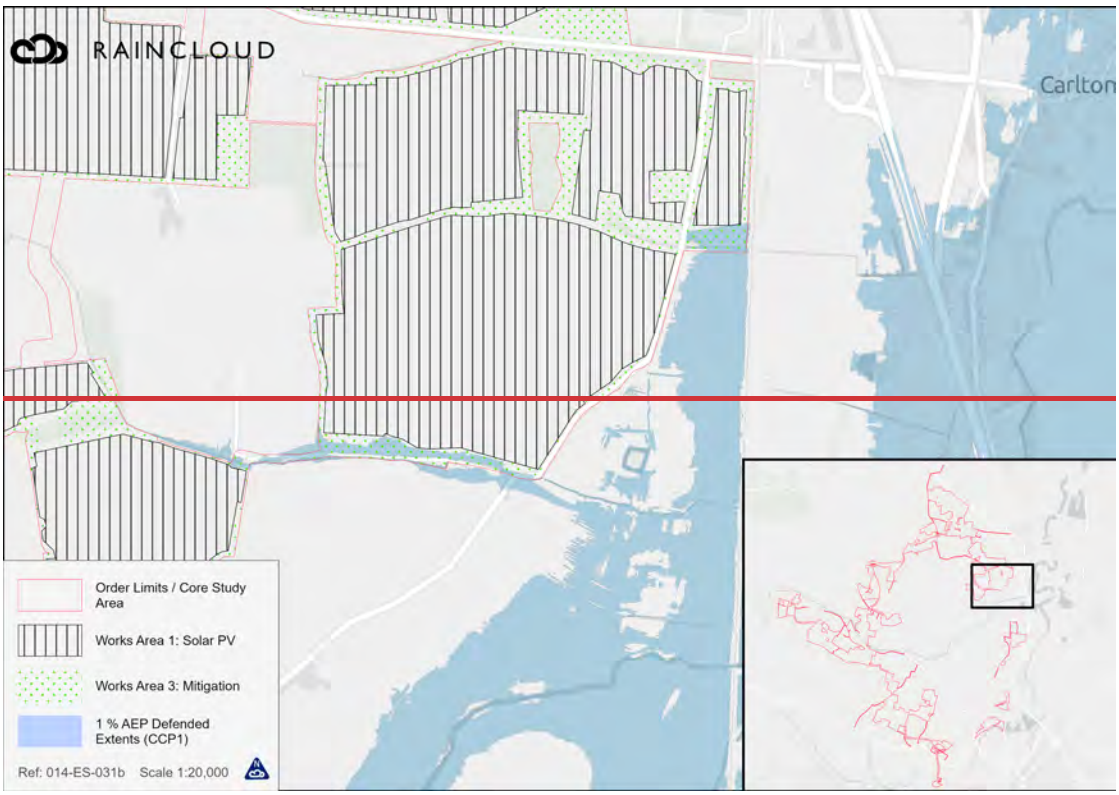


~~60~~64 Work Area 1 (Solar PV Area) has been designed to avoid the 1 % AEP + 30 % CC extent, based on the illustrative design.

65 ~~Plate~~Figure 9.~~1.~~18 in Appendix D, shows that new above ground development in Work Areas 1 and 4 (e.g. Solar PV, substations etc.) have been located outside the 1 % AEP 2036-2069 flood extent.

~~Plate 9.1.18: 1 % AEP Defended Extents (CCP1)~~





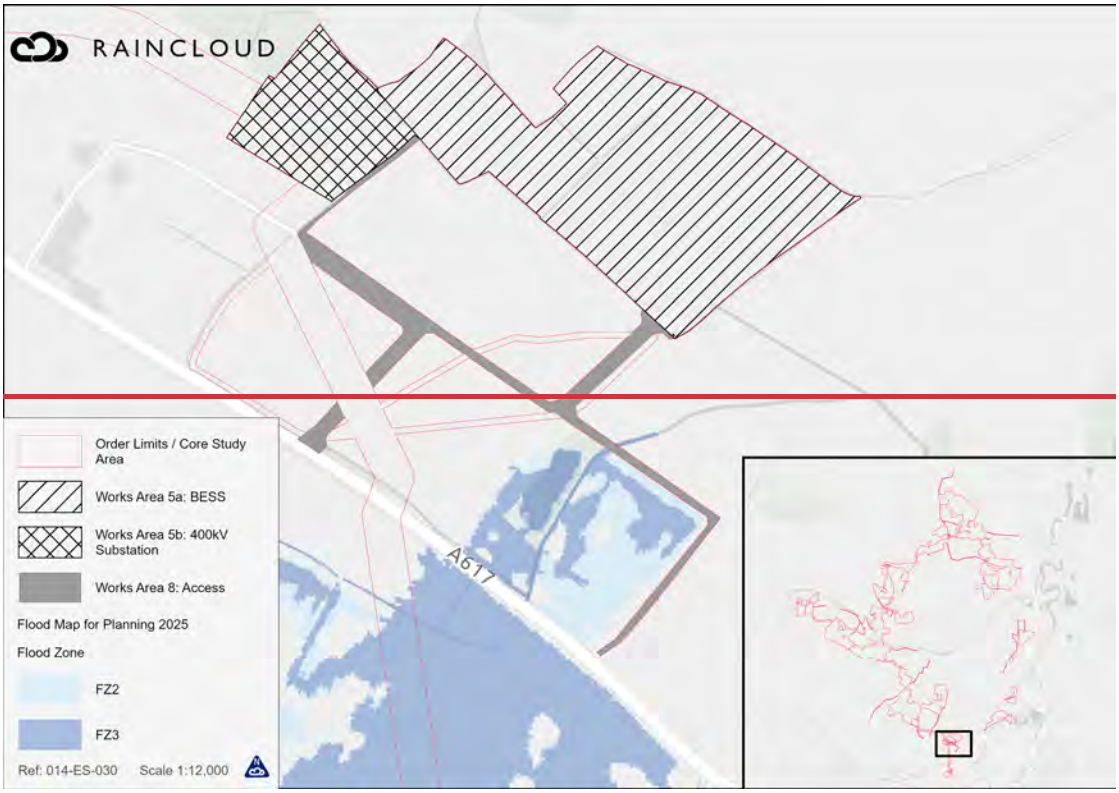
6166 The Canal and River Trust are currently in the process of building two variable height weir structures at points along the River Trent, with these being used to generate hydroelectric power. Hydroelectric schemes will have a failsafe whereby the weir can be lowered during flooding events, and therefore the schemes should have no impact on flooding to the

Development. This failsafe mechanism means the weirs pose no flood risk to the Development and are not considered further within this FRA.

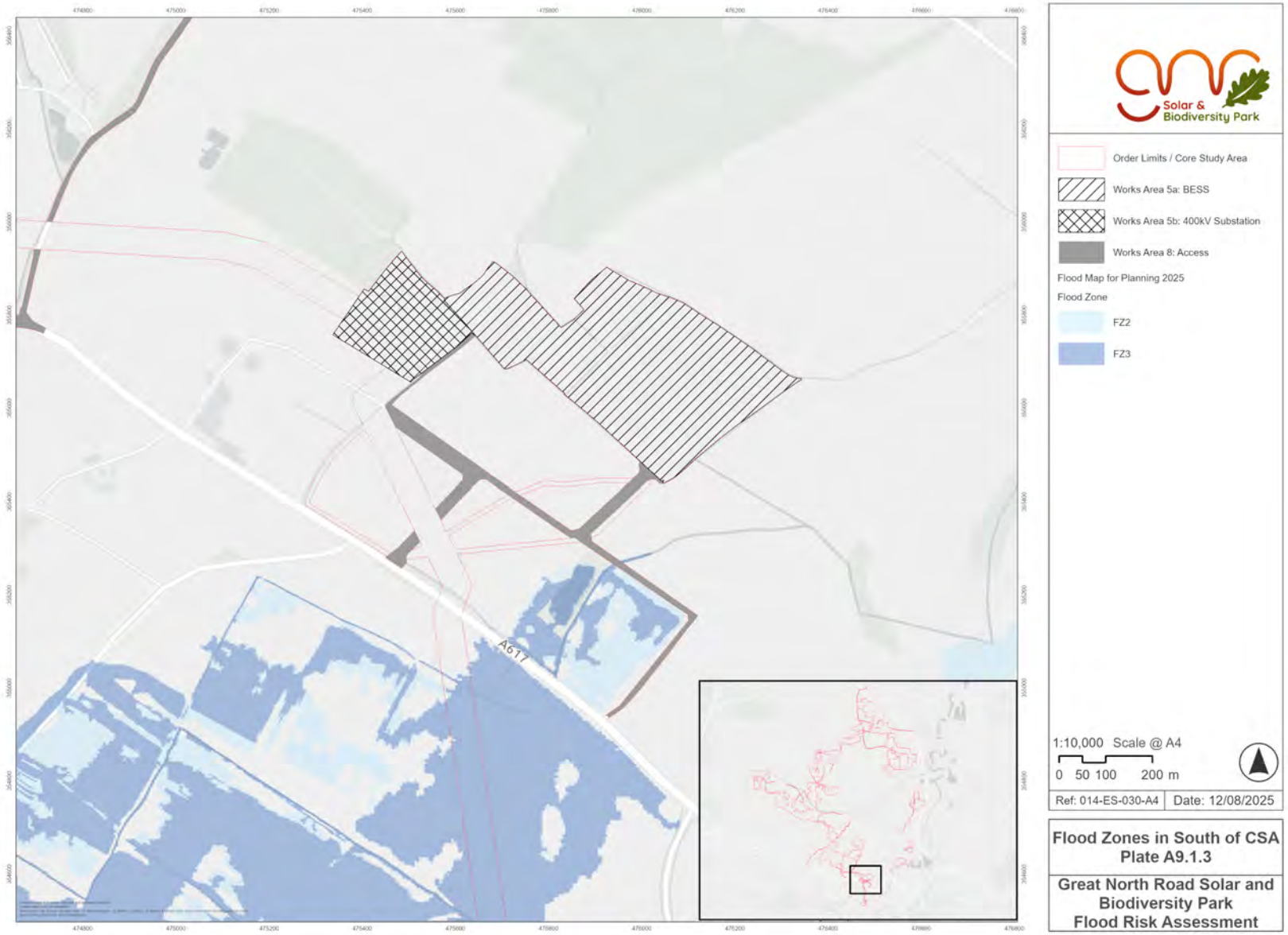
~~A9.1.1.13~~A9.1.1.14 RIVER GREET

~~62~~ The Flood Map for Planning shows that the eastern access track to the BESS/400 kV Compound (Work Area 5a and 5b) borders Flood Zone 2 and 3, as shown in Plate A9.1.~~19.~~

~~Plate A9.1.19: Flood Zones in south of CSA~~

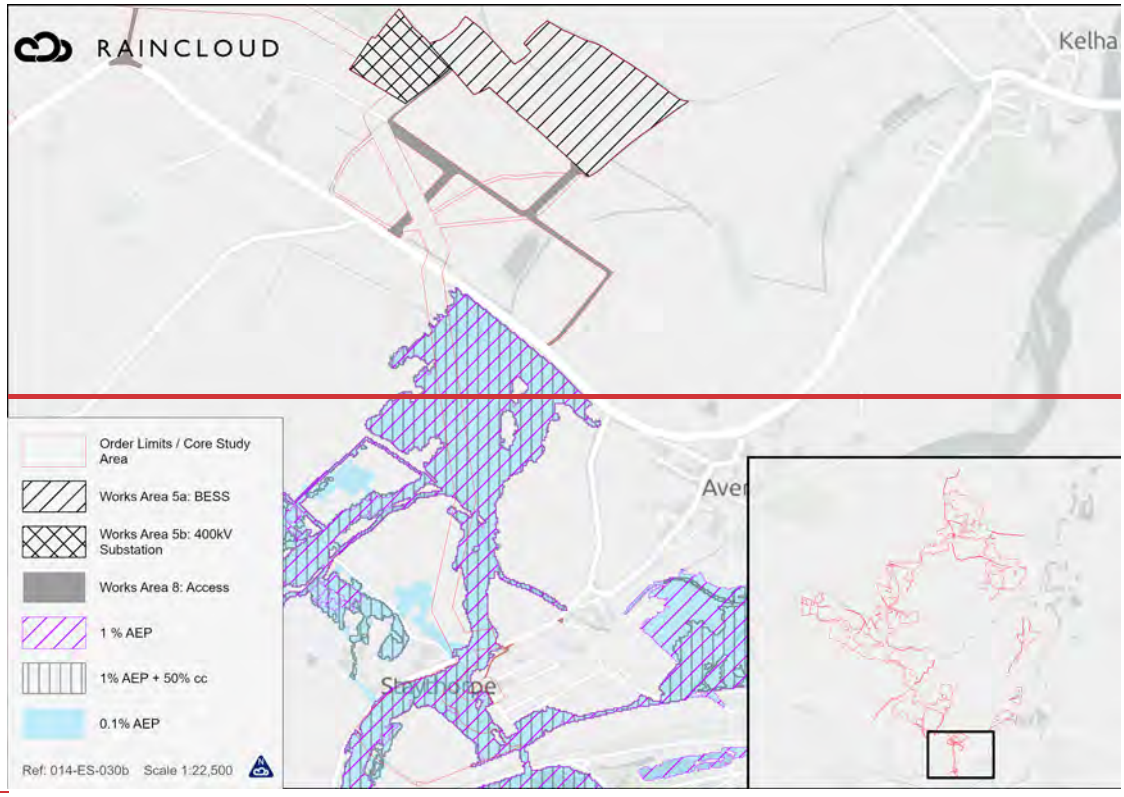


67 39.


A611
Solar & Biodiversity Park
Order Limits / Core Study Area
Works Area 5a: BESS
Works Area 5b: 400kV Substation
Works Area 8: Access
Flood Map for Planning 2025
Flood Zone
FZ2
FZ3
1:10,000 Scale @ A4
0 50 100 200 m
Ref: 014-ES-030-A4
Date: 12/08/2025
Flood Zones in South of CSA
Plate A9.1.3
Great North Road Solar and Biodiversity Park
Flood Risk Assessment

~~63~~ Outputs from the River Greet Flood Study (JBA 2014) and the River Greet Climate Change Scenarios, (EA 2021) show that the 1 % AEP, 1 % AEP + 50 % CC and the 0.1 % AEP events only encroach upon the southern section of the CSA, specifically the Consented Staythorpe BESS (Work Area 6) and National Grid Substation Point of Connection (Work Area 7), but does not encroach upon the Solar PV Arrays (Work Area 1), Intermediate Substations (Work Area 4) and BESS (Work Area 5a), as shown in Plate A9.1.~~20.~~

~~Plate A9.1.20: Modelled River Greet Flood Extents – JBA 2014 and EA 2021~~



~~68~~ 4.

6469 As such the discrepancy between the pre-NaFRA2 Flood Map for Planning and the outputs from the River Greet flood studies was queried with the EA who responded stating "*We are sorry that we cannot explain why Flood Zone 3 is of a lesser extent than the 2004 1 % AEP JFLOW outline to the north west of Averham. Flood Zone 3 in the wider area has utilised part of the River Greet 2008 model but this is of a smaller extent than the current Flood Zone 3 as shown below (Flood Zone 3 in darker blue and the 1% AEP 2008 River Greet model in lighter blue). The Flood Zone outline does not align to a modelled outline or recorded flood outline. The Flood Zones in this area were last updated in 2014 and unfortunately our records do not answer your question*." (see Appendix A).

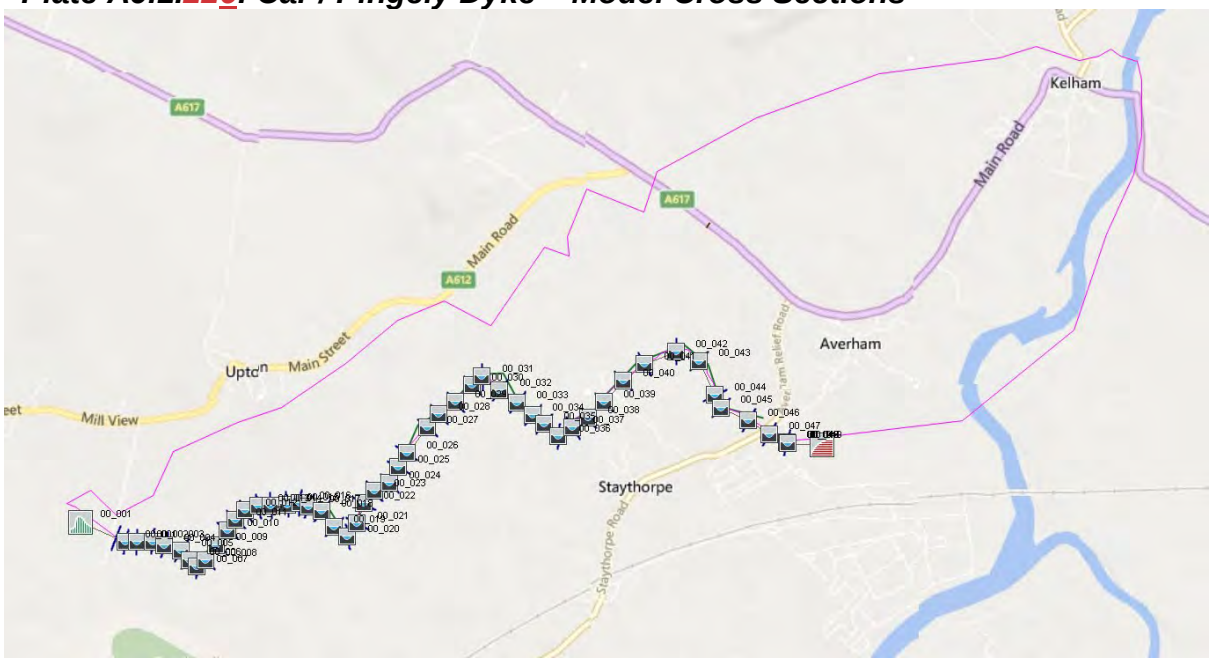
6570 Following a meeting with the EA, it was suggested that whilst the source of the discrepancy could not be fully ascertained, the source of flooding could possibly be attributed to flood waters from Car Dyke / Pingley Dyke. To verify this Raincloud undertook a 1D-2D linked hydrological model of the watercourse in 2024, derived from LiDAR. The model was updated in March 2025 to include a culvert carrying the A617, following consultation comments on the Preliminary Environmental Information Report (PEIR) from the EA.

6671 The culvert was surveyed on 28th March 2025 by Greenhatch Group and is shown in Plate A9.1.~~21~~5.

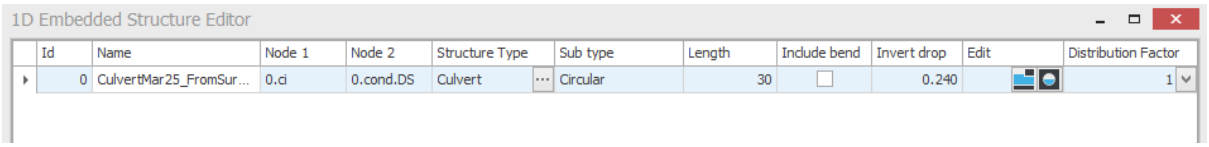
Plate A9.1.~~215~~: Culvert under A617 (southern side)

~~67~~72Cross sections and the active model area (pink outline) are shown in Plate A9.1.~~226~~, while the model parameters in provided in Table A9.1.4.

Plate A9.1.~~226~~: Car / Pingely Dyke – Model Cross Sections



6873The culvert has been modelled using the following parameters which are derived from survey:



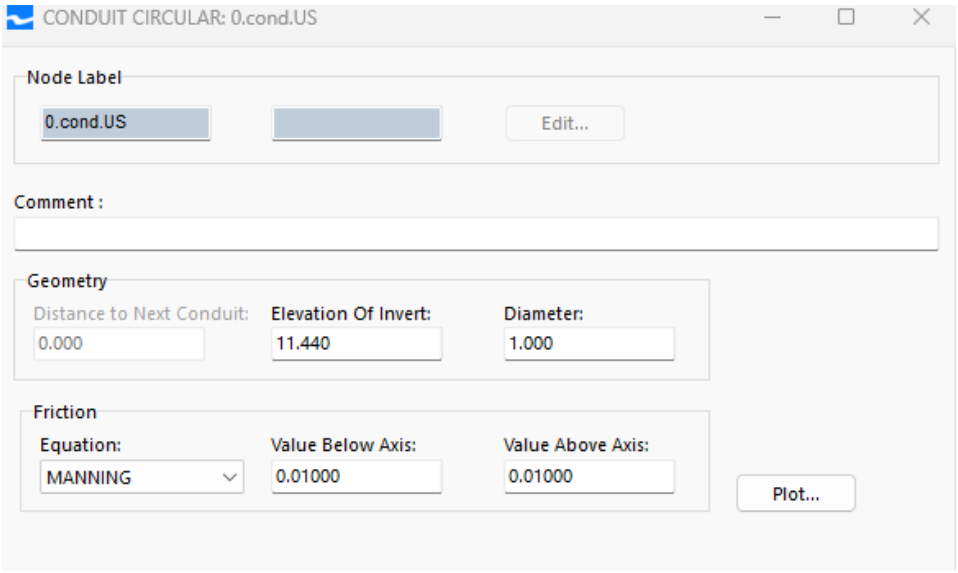
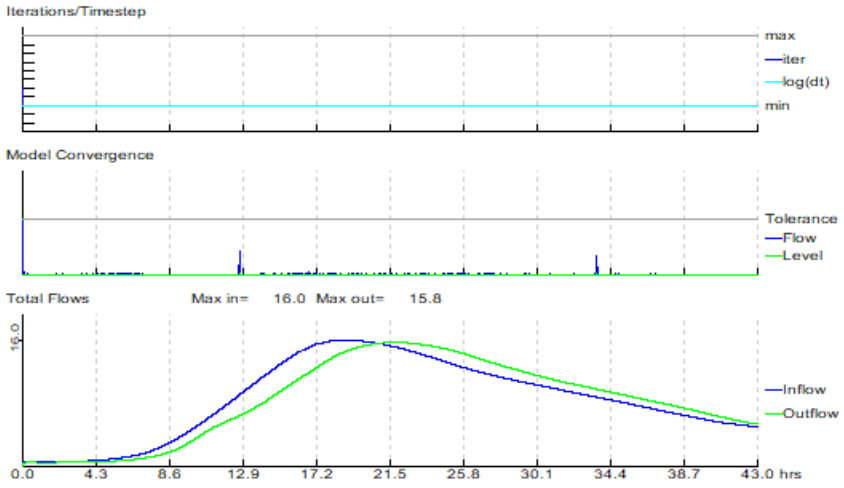
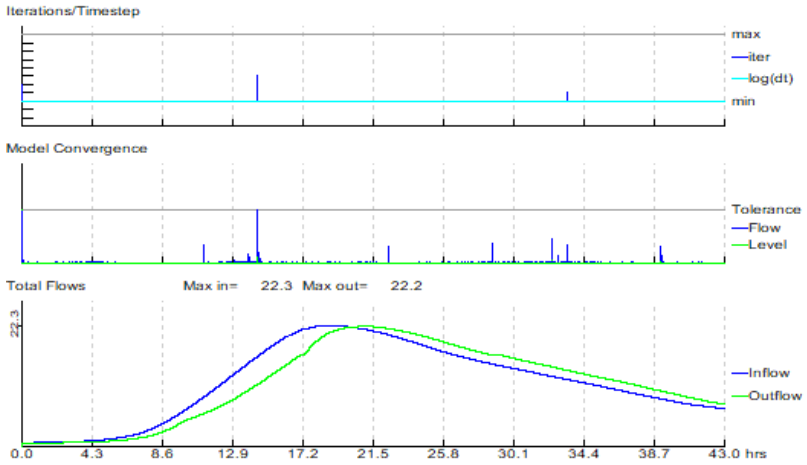


Table A9.1.4: 1D-2D modelling parameters

Return Period	1 % AEP
Storm Duration	43 hours
Season	Summer
FEH Hydrograph	 Datafile: ...\014_GNR\FM\CARDYKE\NETWORK\CARDYKE_1AEP.DAT Results: ...\FM\CarDyke\1D\1D_CARD_UNSTEADY_1AEP.zzl Ran at 21:02:40 on 30/08/2024 Ended at 21:03:46 on 30/08/2024 Start Time: 0.000 hrs End Time: 43.000 hrs Timestep: 1.0 secs Current Model Time: 43.00 hrs Percent Complete: 100 % Simulation time elapsed (s): 40 run completed Number of unconverged timesteps: 0 Proportion of simulation unconverged: 0.00% ********* Mass balance summary ********* Mass balance calculated every 300.0s Initial volume: 5495.73 m3 Final volume: 26133.9 m3 ---------- Total boundary inflow : 0.131259E+07m3 Total boundary outflow : 0.129184E+07m3 Total lat. link inflow : 0.00000 m3 Total lat. link outflow: 0.00000 m3 ---------- Max. system volume: 108661. m3 Max. |volume| increase: 103165. m3 Max. boundary inflow: 16.0460 m3/s Max. boundary outflow: 15.7780 m3/s ---------- Net increase in volume: 20638.2 m3 Net inflow volume: 20754.2 m3 Volume discrepancy: 116.078 m3 Mass balance error: -0.11% (of peak system volume) Mass balance error [2]: -0.01% (of boundary inflow volume) ******* End mass balance summary ******* Writing binary results to D:\Raincloud\Projects\014_GNR\FM\CarDyke\1D\1D_CARD_UNSTEADY_1AEP.zzn outputting max/min/means to D:\Raincloud\Projects\014_GNR\FM\CarDyke\1D\1D_CARD_UNSTEADY_1AEP.mmm Convergence plot saved to D:\Raincloud\Projects\014_GNR\FM\CarDyke\1D\1D_CARD_UNSTEADY_1AEP_005.bmp Peak flow: 16.046 m^3/s

CC Allowance – Central 2080s **39 %**	 Datafile: ...\FM\CARDYKE\NETWORK\CARDYKE_1AEP_39CC.DAT Results: ...\FM\CarDyke\1D\1D_CARD_UNSTEADY_1AEP_39CC.zzl Ran at 21:07:40 on 30/08/2024 Ended at 21:08:45 on 30/08/2024 Start Time: 0.000 hrs End Time: 43.000 hrs Timestep: 1.0 secs Current Model Time: 43.00 hrs Percent Complete: 100 % Simulation time elapsed (s): 39 run completed Number of unconverged timesteps: 0 Proportion of simulation unconverged: 0.00% ********* Mass balance summary ********* Mass balance calculated every 300.0s Initial volume: 5495.73 m3 Final volume: 38922.9 m3 ---------- Total boundary inflow : 0.182412E+07m3 Total boundary outflow : 0.179063E+07m3 Total lat. link inflow : 0.00000 m3 Total lat. link outflow: 0.00000 m3 ---------- Max. system volume: 156777. m3 Max. |volume| increase: 151282. m3 Max. boundary inflow: 22.3040 m3/s Max. boundary outflow: 22.1705 m3/s ---------- Net increase in volume: 33427.2 m3 Net inflow volume: 33491.1 m3 Volume discrepancy: 63.9531 m3 Mass balance error: -0.04% (of peak system volume) Mass balance error [2]: -0.00% (of boundary inflow volume) ******* End mass balance summary ******* Writing binary results to D:\Raincloud\Projects\014_GNR\FM\CarDyke\1D\1D_CARD_UNSTEADY_1AEP_39CC.zzn outputting max/min/means to D:\Raincloud\Projects\014_GNR\FM\CarDyke\1D\1D_CARD_UNSTEADY_1AEP_39CC.mmm Convergence plot saved to D:\Raincloud\Projects\014 GNR\FM\CarDyke\1D\1D CARD UNSTEADY 1AEP 39CC 003.bmp Peak flow: 22.304 m^3/s
Boundaries	Upstream: QT Downstream: Normal Depth

Drainage / Infiltration Allowance (0 or 12 mm)	0 mm[29] (Green-Ampt not applied)
Manning's n Values	• Floodplain - mature row crops[30]: 0.035 • Channel - clean, straight, full stage, no rifts or deep pools: 0.03
Model Timestep	1 second
Grid Resolution	2 m
Height Data	1 m LiDAR, 2022
Data Stamping (OS MasterMap)	None
1D Mass Error	0.11 %
Largest Courant (Cr) Value	2.4

~~69~~74 Flood extents from the initial analysis show a good correlation with the outputs from the NaFRA2 data (see Plate A9.1.19), whereby the embankment on the south side of A617 Road acts as a topographical barrier to flood flows, with flows constricted north via the culvert under the A617, as shown in ~~Plate~~Plates A9.1.~~23~~7 and A9.1.~~24~~8.

[29] Monte Carlo approach used to derive the ~~national~~natonal default 12 mm per hour drainage rate value disapplied due to rural catchment
[30] Manning's n for Channels (Chow, 1959)

Plate A9.1.23: 1 % AEP outputs from 2025 1D-2D linked modelling

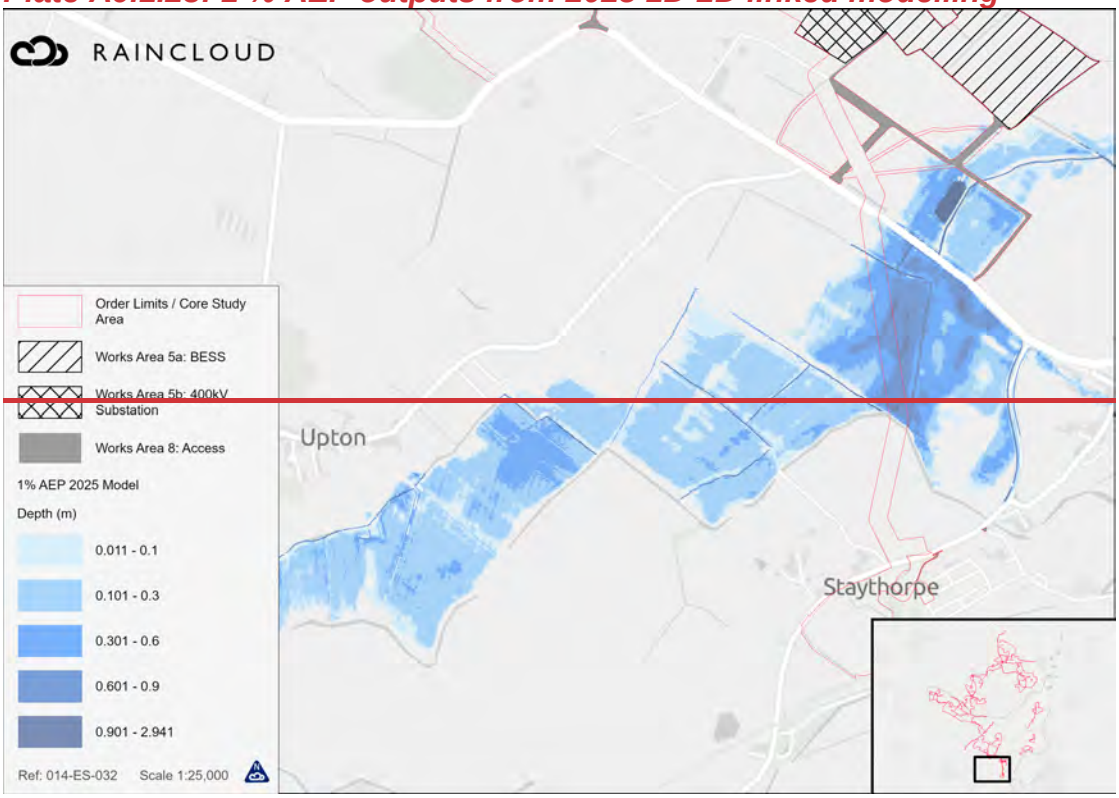
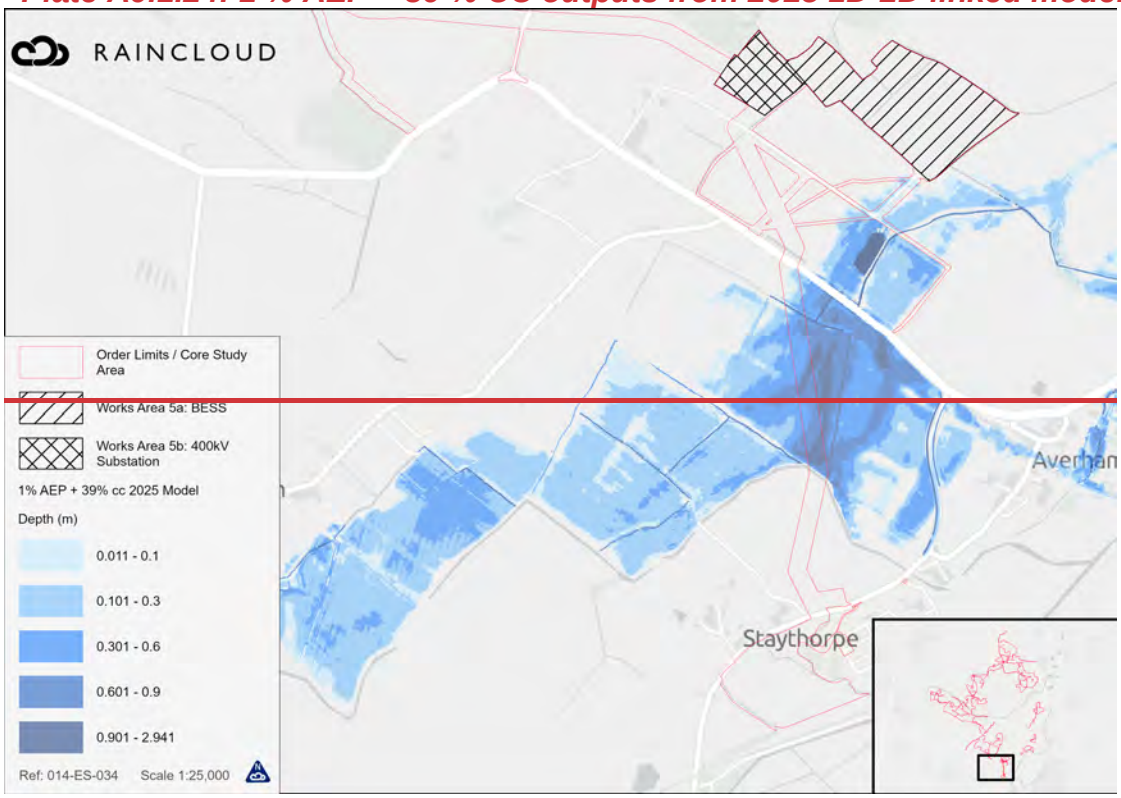
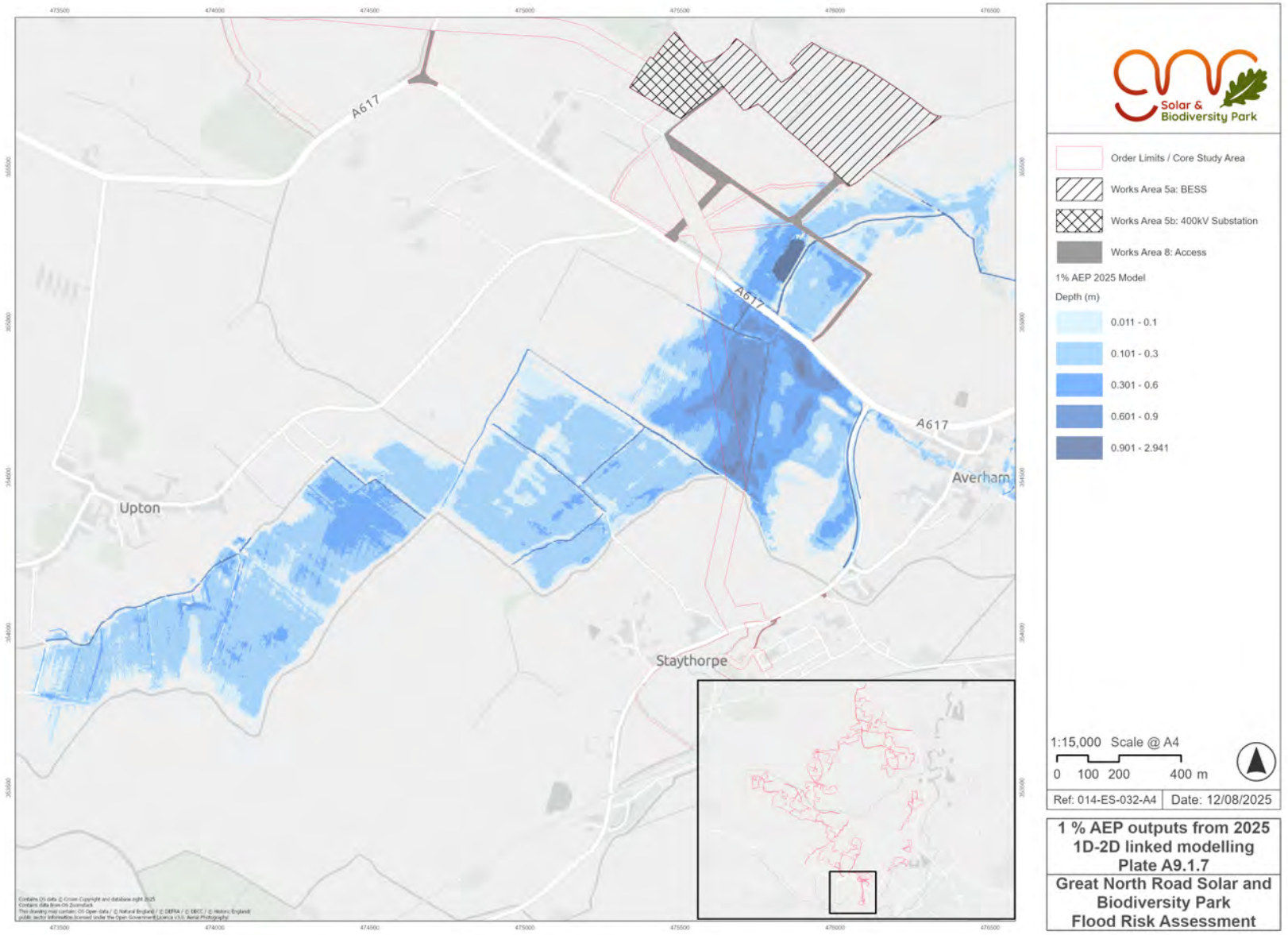
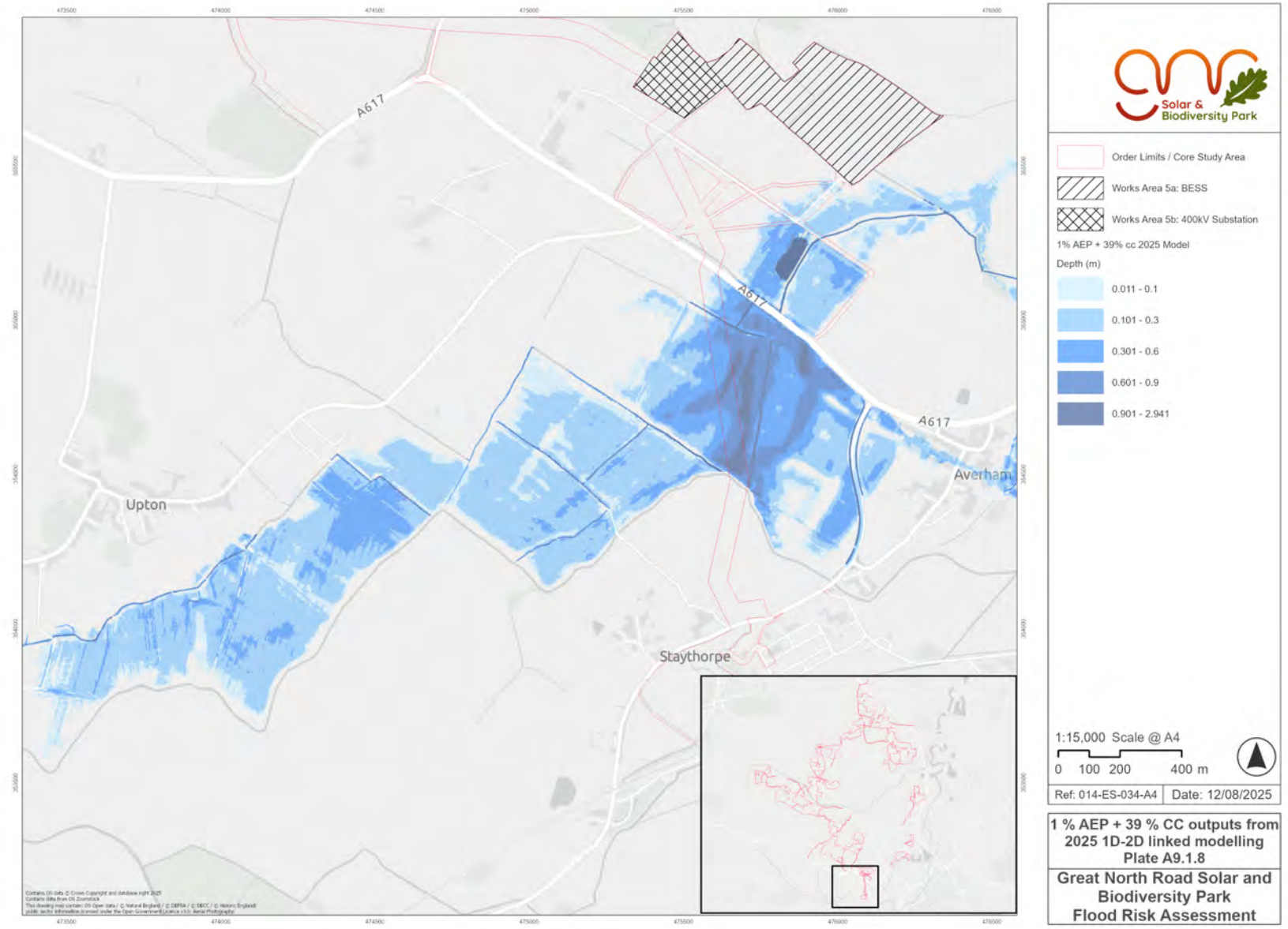


Plate A9.1.24: 1 % AEP + 39 % CC outputs from 2025 1D-2D linked modelling



75 Flood extents for the 1 % AEP and 1 % AEP +39 % CC do not encroach into Work Areas 5a or 5b.


A617
A617
A617
Upton
Averham
Staythorpe
Solar & Biodiversity Park
Order Limits / Core Study Area
Works Area 5a: BESS
Works Area 5b: 400kV Substation
Works Area 8: Access
1% AEP 2025 Model
Depth (m)
0.011 - 0.1
0.101 - 0.3
0.301 - 0.6
0.601 - 0.9
0.901 - 2.941
1:15,000 Scale @ A4
0 100 200 400 m
Ref: 014-ES-032-A4
Date: 12/08/2025
1 % AEP outputs from 2025 1D-2D linked modelling
Plate A9.1.7
Great North Road Solar and Biodiversity Park
Flood Risk Assessment


A617
A617
A617
Upton
Staythorpe
Averham
Solar & Biodiversity Park
Order Limits / Core Study Area
Works Area 5a: BESS
Works Area 5b: 400kV Substation
1% AEP + 39% cc 2025 Model
Depth (m)
0.011 - 0.1
0.101 - 0.3
0.301 - 0.6
0.601 - 0.9
0.901 - 2.941
1:15,000 Scale @ A4
0 100 200 400 m
Ref: 014-ES-034-A4
Date: 12/08/2025
1 % AEP + 39 % CC outputs from 2025 1D-2D linked modelling
Plate A9.1.8
Great North Road Solar and Biodiversity Park
Flood Risk Assessment

A9.1.2 FLOOD RISK ASSESSMENT

A9.1.2.1 TIDAL

7076 Outputs from the Tidal Trent 2023 flood model (see section 1.10) show that the CSA would not flood during both the 0.5 % AEP (2121 UE scenario) with defences in place and 0.5 % AEP flood defence breach scenarios, ensuring the Development would be safe for its lifetime (40 years, through to 2067 from the assumed commission date of 2027).

7177 The fluvially dominated 1 % AEP + 62 % CC defended scenario outputs show that a minor section of Work Area 3, Mitigation/Enhancement (Fields 18 and 390) would flood to a depth of 0.6 m.

7278 Works Area 3, Mitigation/Enhancement, will comprise grassland in the affected area. As such, the minor area located in the tidal flood extent is compatible with the EA's "Working with natural processes to reduce flood risk 2024" Flood and Coastal Erosion Risk Management (FCERM) research report[31].

7379 No other Work Area is located within the tidal flood extents of the River Trent.

7480 As such, the risk of the Development flooding from tidal sources is Negligible.

A9.1.2.2 FLUVIAL

7581 Work Area 1: Solar PV, based on the illustrative layout, is located outside Flood Zones 2 and 3.

7682 Regardless, flood zones do not account for CC and as such, each source of flooding is assessed in the following sections in accordance with the NPPF and NPS documents.

7783 As the Development is Essential Infrastructure and will have a lifespan of 40 years (anticipated to be decommissioned from the end of 2069) the Development is required to account for a 23 % CC allowance for the 2050s epoch (2040-2069) for the Lower Trent and Erewash Management Catchment.

A9.1.2.2.1 River Trent (Fluvial)

7884 As shown in Plate A9.1.4, the only aspect of the Development located within the 1 % AEP flood extents of the River Trent is Work Area 3, Mitigation / Enhancement, which will comprise grassland, scrub, scattered trees and an orchard. As such, this is compatible with the EA's "Working with natural processes to reduce flood risk 2024" FCERM report.

7985 The 1 % AEP extent also marginally encroaches into Work Area 6: National Grid Staythorpe Substation, which has private flood defences, and Work Area 7: Consented Staythorpe BESS and Connection, which included flood

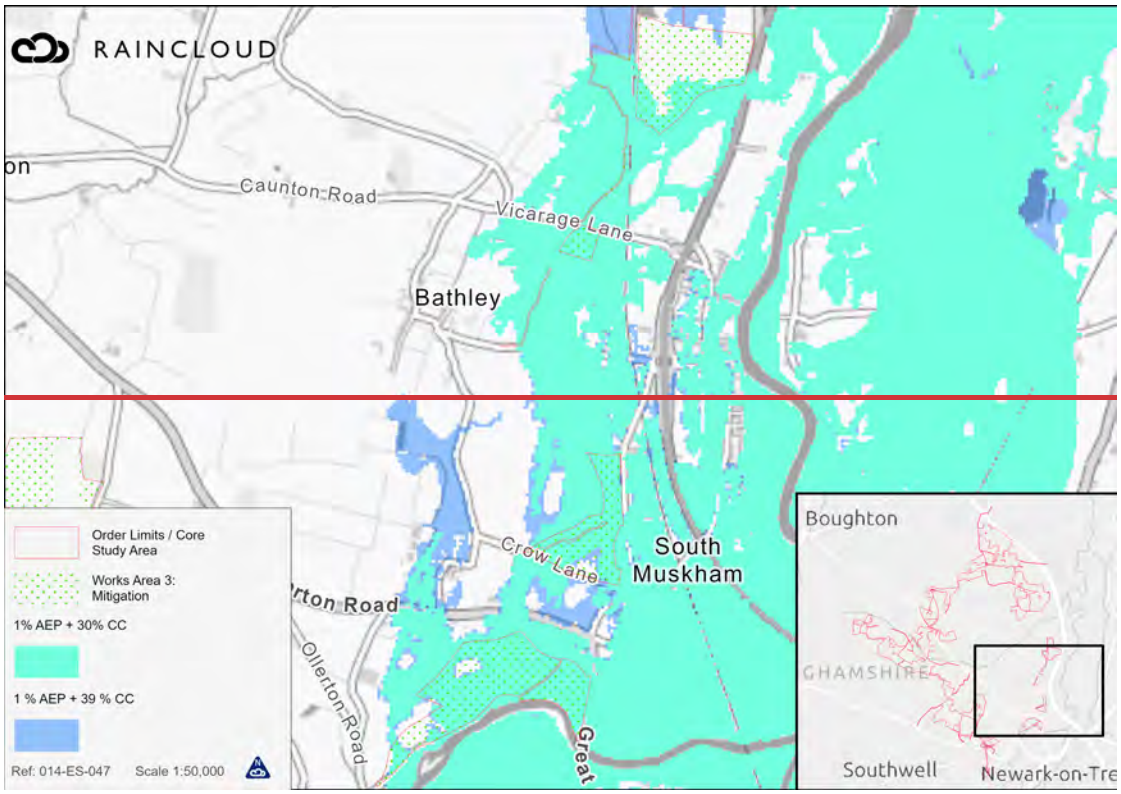
[31] https://www.gov.uk/flood-and-coastal-erosion-risk-management-research-reports/working-with-natural-processes-to-reduce-flood-risk-2024?utm_medium=email&utm_campaign=govuk-notifications-topic&utm_source=a06ab0c7-b939-430c-a4b4-14734d0c1c23&utm_content=weekly

resilient design as part of NSDC planning application reference numbers 22/01840/FULM and 24/01261/FULM).

~~A9.1.2.2.1.1~~ *Climate change scenarios*

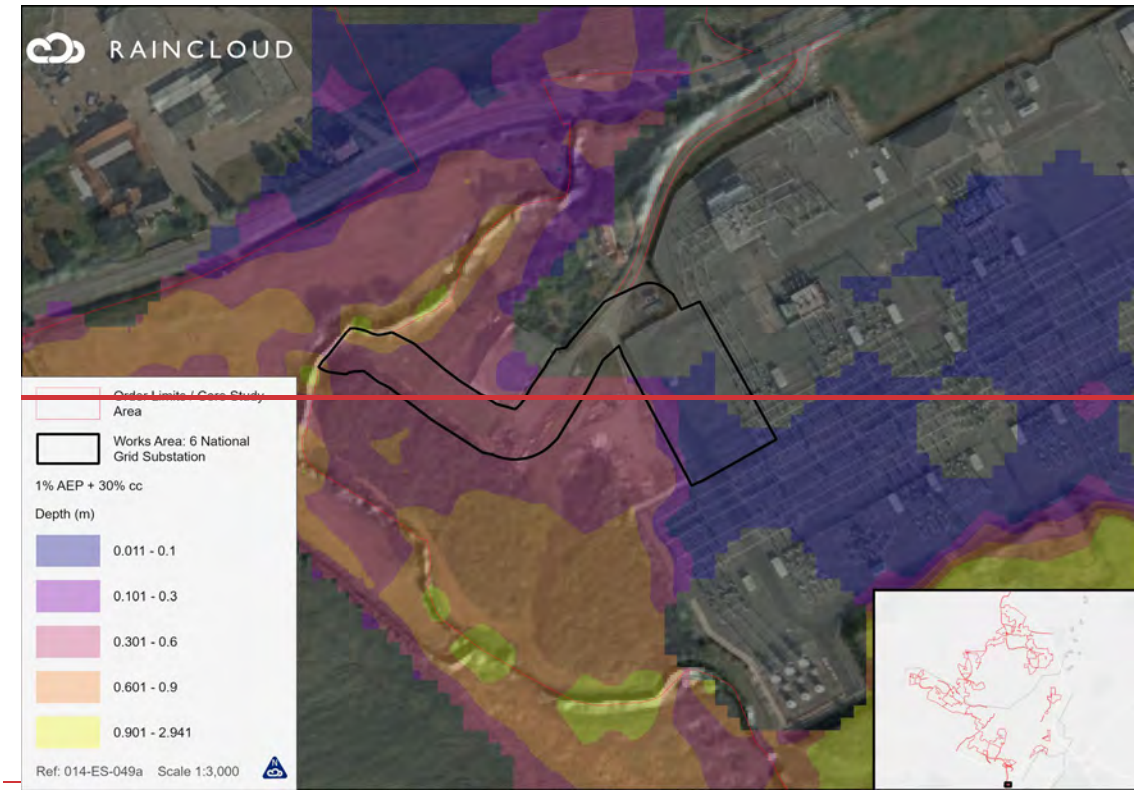
~~80~~86 The A46 upgrade DCO application to the east of the CSA has modelled the 1 % AEP + 39 % CC (2080s epoch Central Allowance) flood scenario for the fluvial River Trent. Outputs from the model, made available by Skanska, show that there is a marginal increase in the extent of flooding (within the CSA) during the 1 % AEP + 39 % CC (2080's epoch Central Allowance) flood scenario compared to the 30 % CC scenario, as shown in ~~Plate~~Figure A9.~~1.25~~19 in Appendix D.

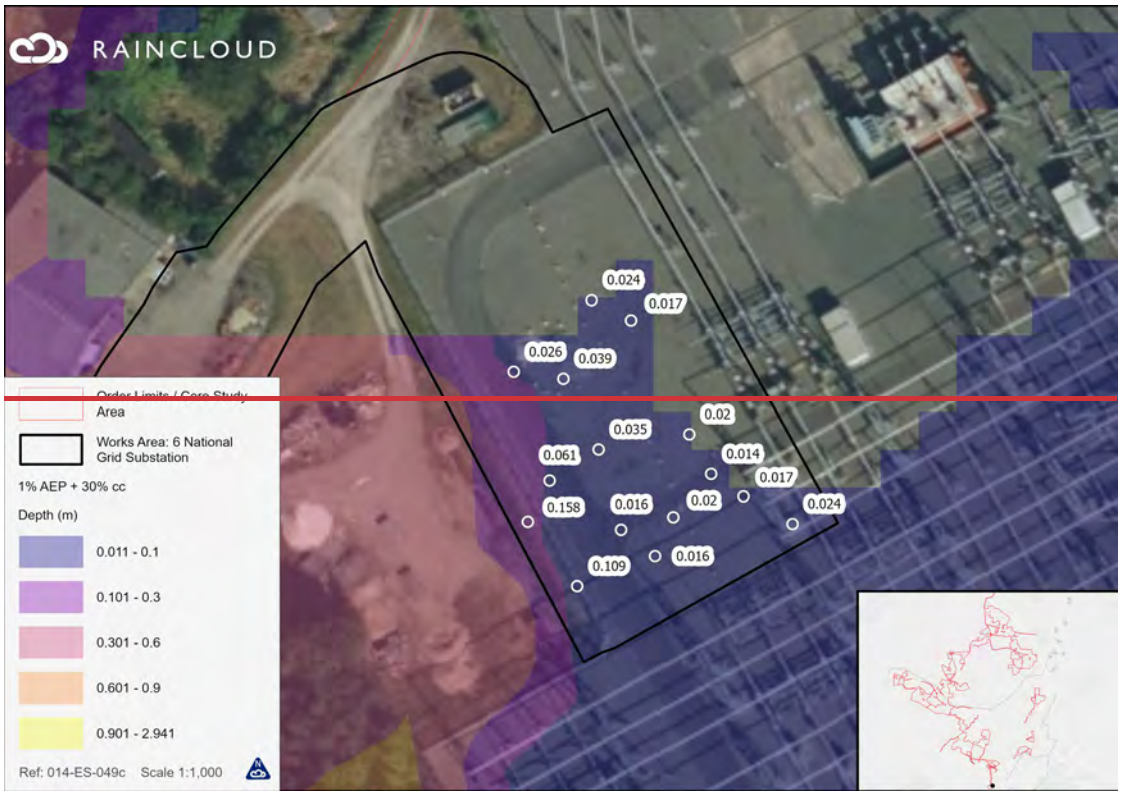
~~Plate A9.1.25: 1 % AEP + 30 % CC and + 39 % CC scenarios~~

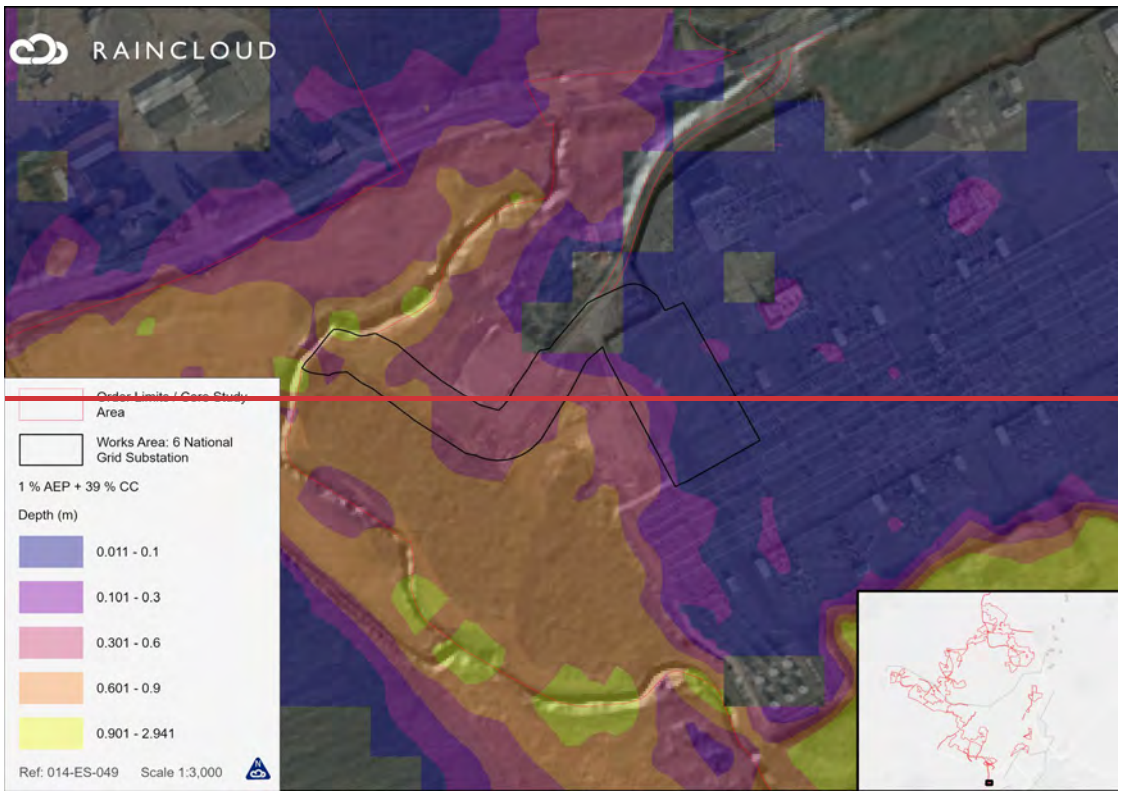


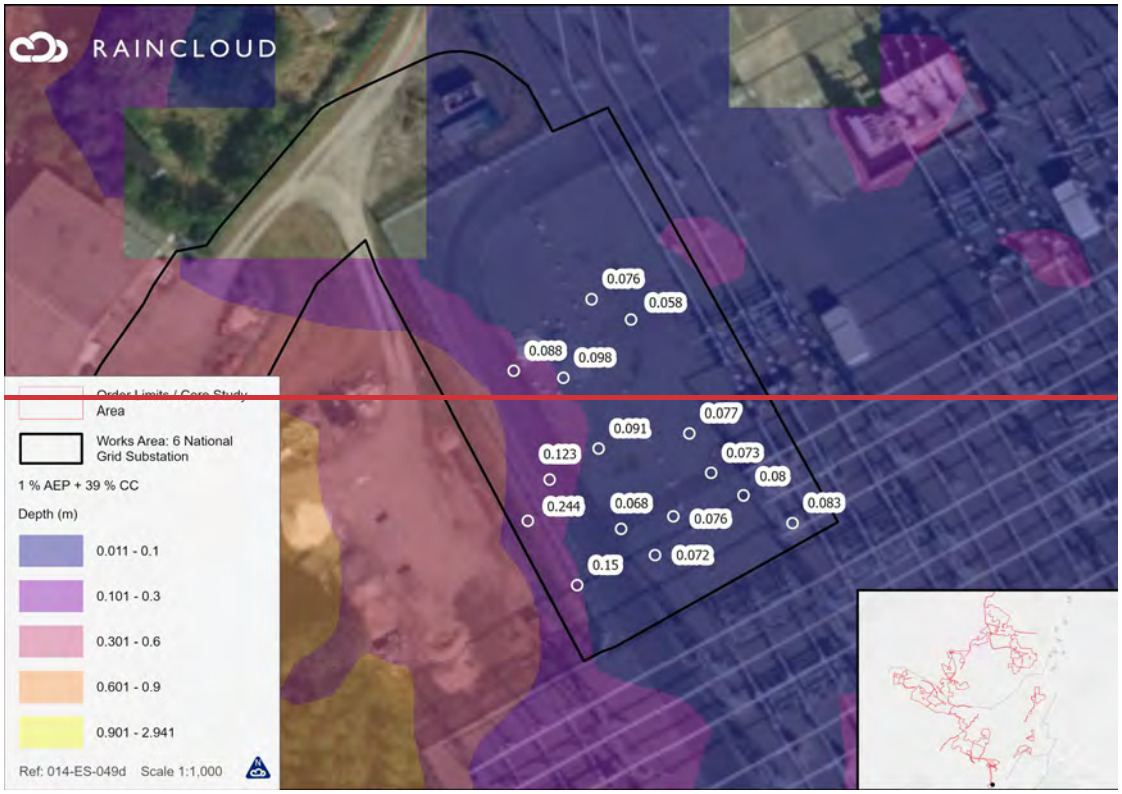
~~81~~ Compared to the 30 % CC scenario, the 39 % CC allowance leads to a marginal increase in the extent of areas modelled to flood within Work Area 6: National Grid Staythorpe Substation, as shown in Plate A9.1.~~26.~~

Plate A9.1.26: 1 % AEP + 30 % and 39 % CC scenarios[32]

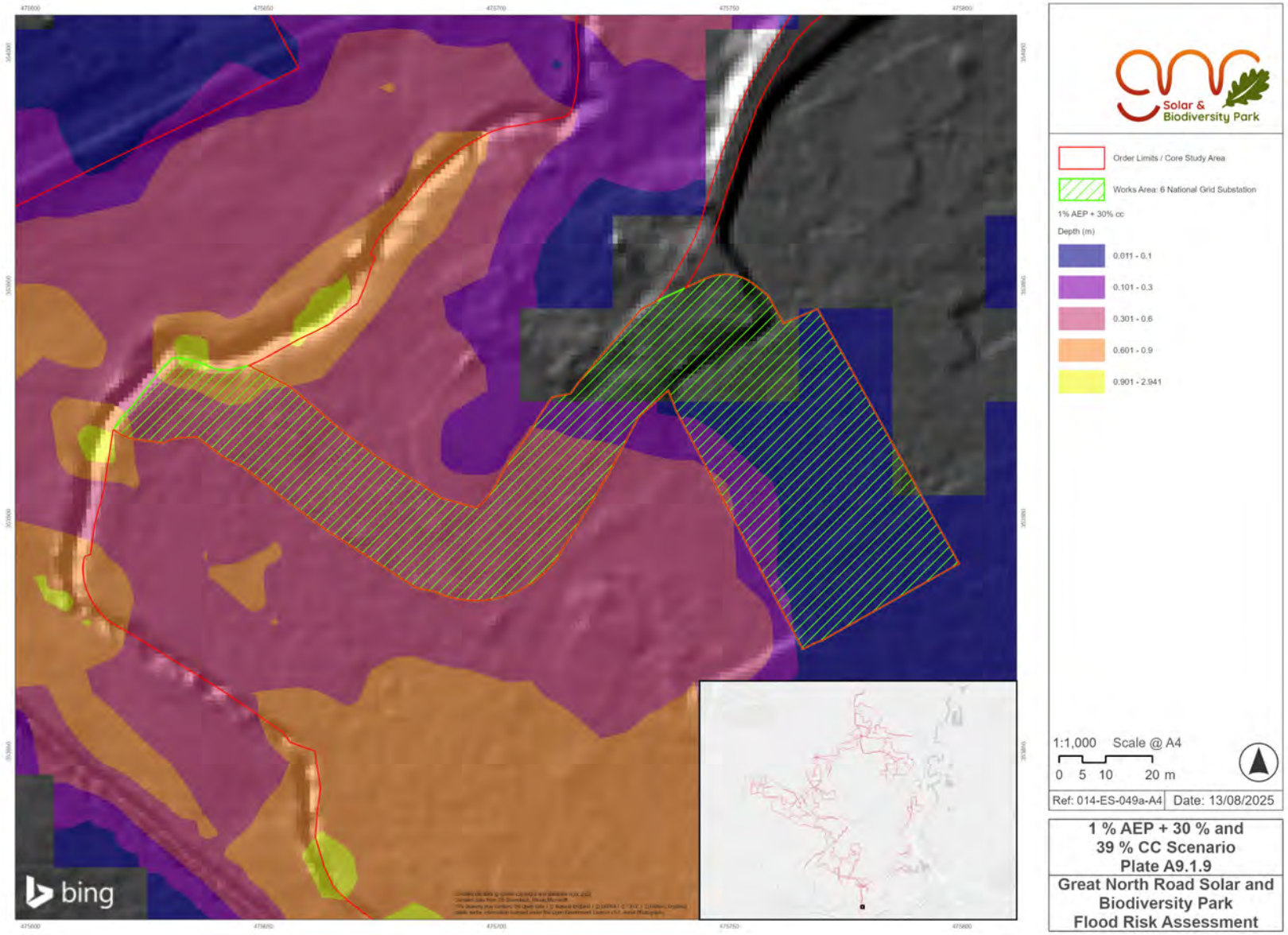


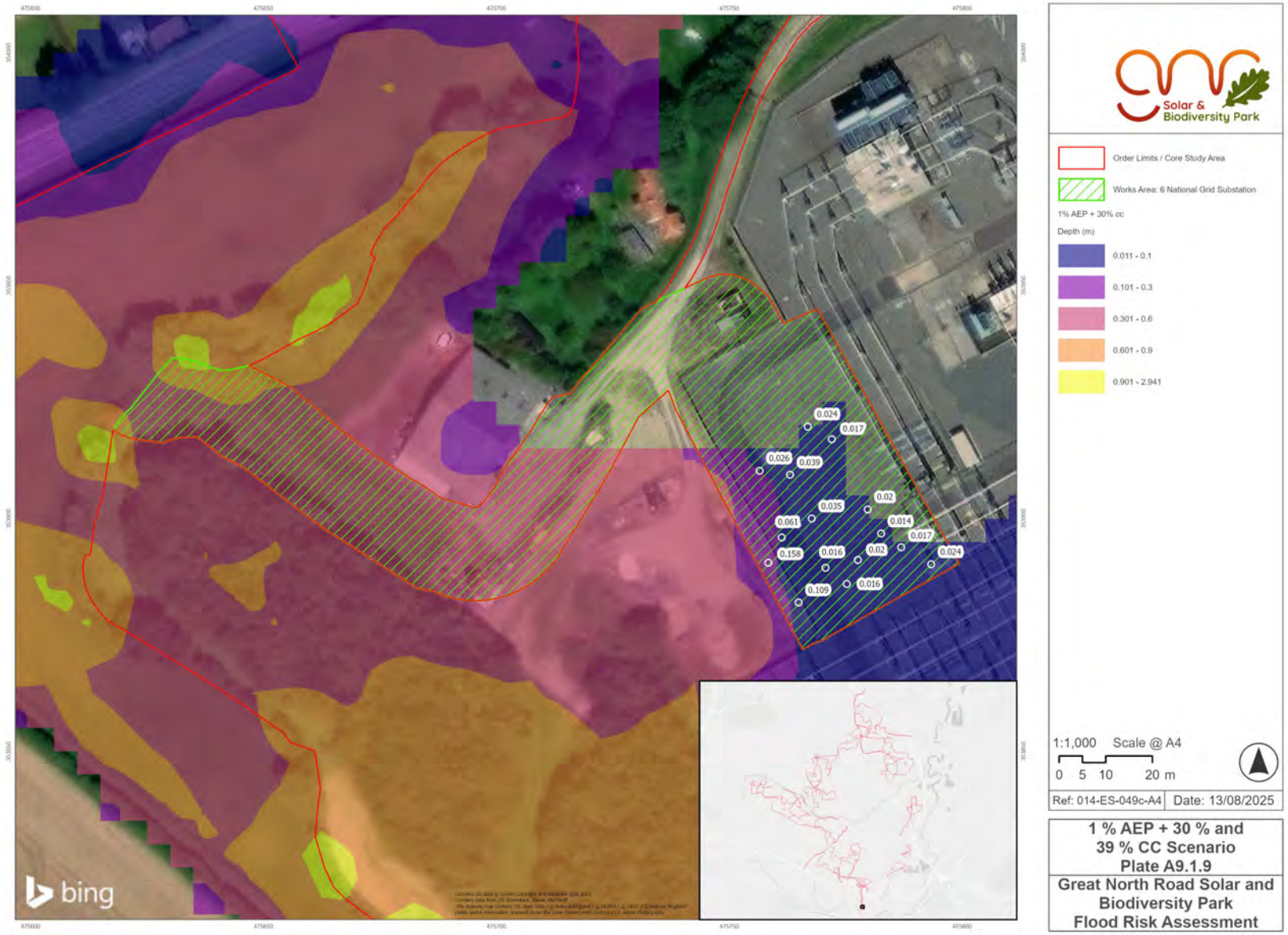


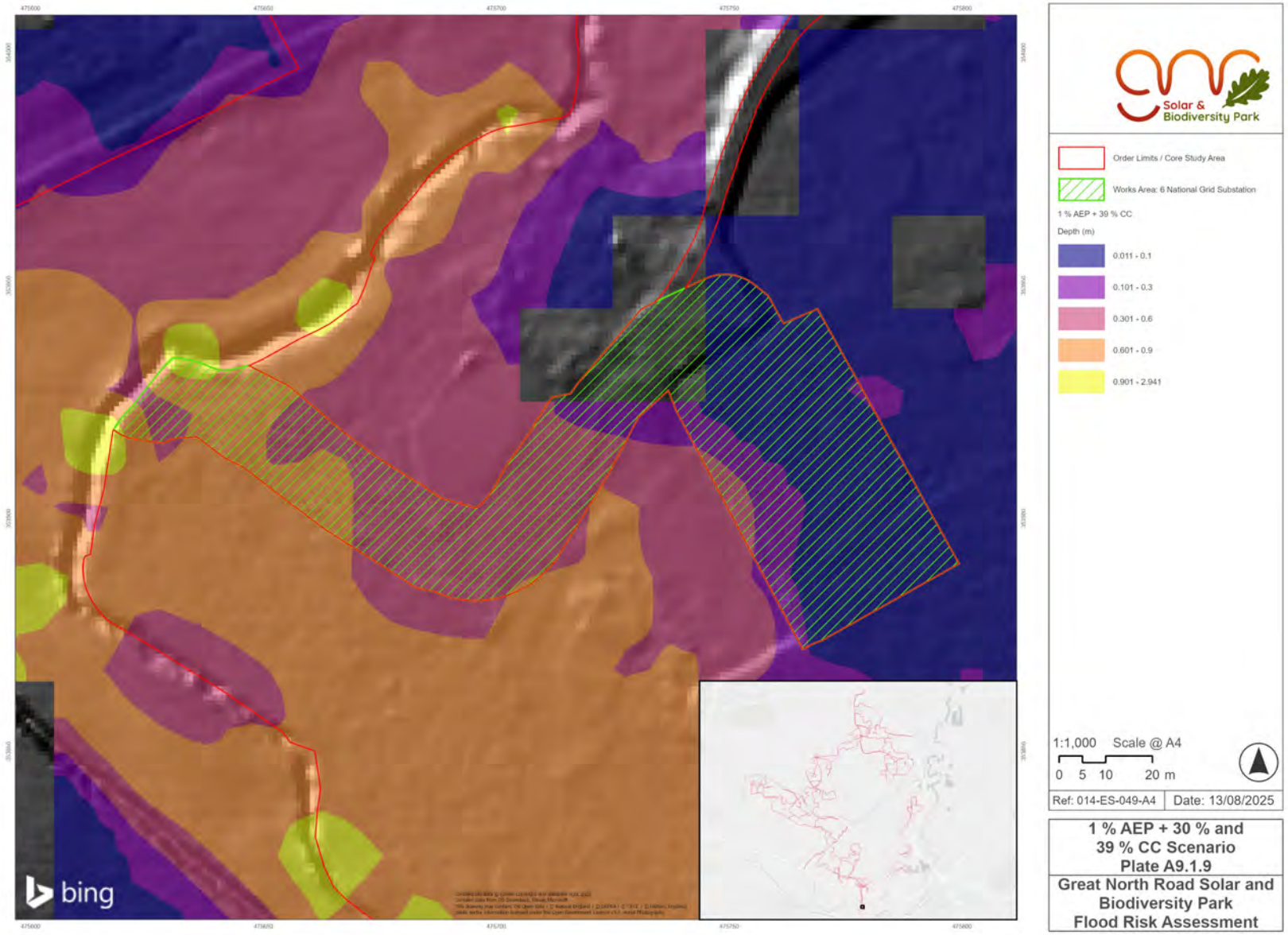

RAINCLOUD
Order Limits / Core Study Area
Works Area: 6 National Grid Substation
1 % AEP + 39 % CC
Depth (m)
0.011 - 0.1
0.101 - 0.3
0.301 - 0.6
0.601 - 0.9
0.901 - 2.941
Ref: 014-ES-049
Scale 1:3,000

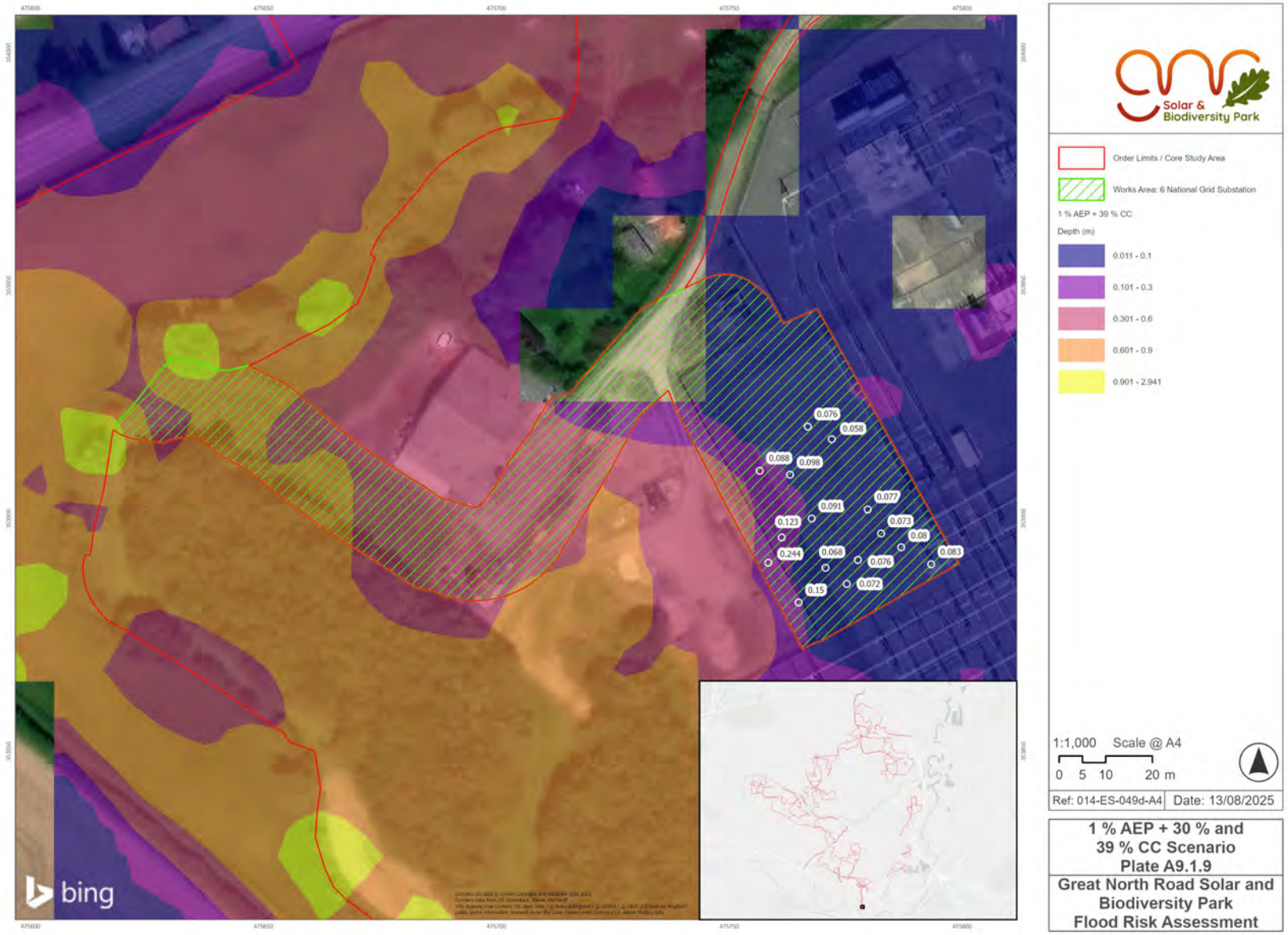

RAINCLOUD
0.076
0.058
0.088
0.098
0.077
0.091
0.123
0.073
0.08
0.244
0.068
0.076
0.083
0.15
0.072
Order Limits / Core Study Area
Works Area: 6 National Grid Substation
1 % AEP + 39 % CC
Depth (m)
0.011 - 0.1
0.101 - 0.3
0.301 - 0.6
0.601 - 0.9
0.901 - 2.941
Ref: 014-ES-049d
Scale 1:1,000

87 9.


Solar & Biodiversity Park
Order Limits / Core Study Area
Works Area: 6 National Grid Substation
1% AEP + 30% cc
Depth (m)
0.011 - 0.1
0.101 - 0.3
0.301 - 0.6
0.601 - 0.9
0.901 - 2.941
1:1,000 Scale @ A4
0 5 10 20 m
Ref: 014-ES-049a-A4
Date: 13/08/2025
1 % AEP + 30 % and 39 % CC Scenario
Plate A9.1.9
Great North Road Solar and Biodiversity Park
Flood Risk Assessment
bing

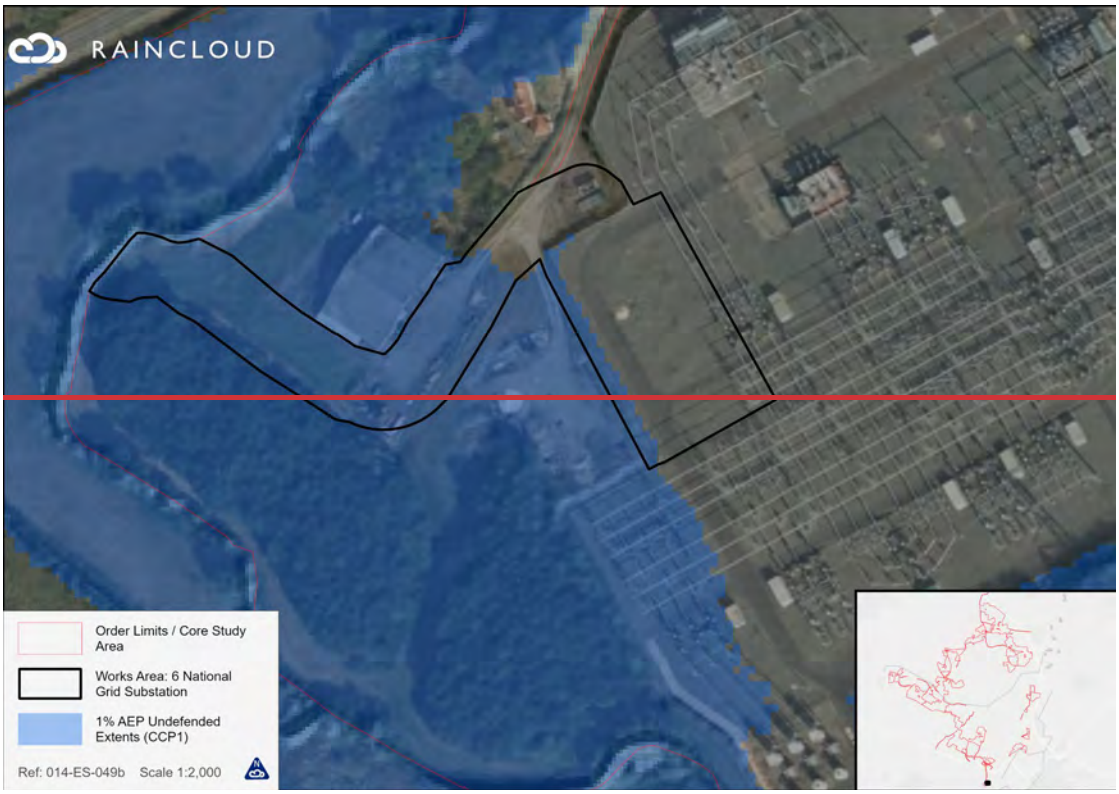

Solar & Biodiversity Park
Order Limits / Core Study Area
Works Area: 6 National Grid Substation
1% AEP + 30% cc
Depth (m)
0.011 - 0.1
0.101 - 0.3
0.301 - 0.6
0.601 - 0.9
0.901 - 2.941
0.024
0.017
0.026
0.039
0.035
0.02
0.061
0.014
0.017
0.158
0.016
0.02
0.024
0.109
0.016
bing
1:1,000 Scale @ A4
0 5 10 20 m
Ref: 014-ES-049c-A4
Date: 13/08/2025
1 % AEP + 30 % and 39 % CC Scenario Plate A9.1.9
Great North Road Solar and Biodiversity Park Flood Risk Assessment


Solar & Biodiversity Park
Order Limits / Core Study Area
Works Area: 6 National Grid Substation
1 % AEP + 39 % CC
Depth (m)
0.011 - 0.1
0.101 - 0.3
0.301 - 0.6
0.601 - 0.9
0.901 - 2.941
1:1,000 Scale @ A4
0 5 10 20 m
Ref: 014-ES-049-A4
Date: 13/08/2025
1 % AEP + 30 % and 39 % CC Scenario
Plate A9.1.9
Great North Road Solar and Biodiversity Park
Flood Risk Assessment
bing


Solar & Biodiversity Park
Order Limits / Core Study Area
Works Area: 6 National Grid Substation
1 % AEP + 39 % CC
Depth (m)
0.011 - 0.1
0.101 - 0.3
0.301 - 0.6
0.601 - 0.9
0.901 - 2.941
0.076
0.058
0.088
0.098
0.091
0.077
0.123
0.073
0.08
0.244
0.068
0.076
0.083
0.072
0.15
bing
1:1,000 Scale @ A4
0 5 10 20 m
Ref: 014-ES-049d-A4
Date: 13/08/2025
1 % AEP + 30 % and 39 % CC Scenario Plate A9.1.9
Great North Road Solar and Biodiversity Park Flood Risk Assessment

~~82~~88 The EA 1 % AEP undefended CCP1 dataset (2036-2069) shows Work Area 6 is almost entirely located outside the flood extent (i.e. the main platform area), as shown in ~~Plate~~Figure A9.~~1.27~~20 in Appendix D.

~~Plate A9.1.27: 1 % AEP undefended CCP1~~



~~83~~89 Given the time-limited nature of the operational phase of the Development, the conservative approach of applying 30 % CC allowance, in the absence of the 23 % CC allowance for the 2050s epoch, is acceptable and should there be a delay in the completion of the construction of the Development, resulting in the operational phase extending into the 2080s epoch, then the design of the Development will ensure compliance with the 39 % CC allowance i.e., no electrically sensitive equipment flush to ground, as shown in Plate A9.1.~~28~~10 which illustrates a typical arrangement within substations.

Plate A9.1.~~28~~10: Typical substation connection arrangement

~~84~~90 All new aboveground infrastructure i.e. solar PV (Works Area 1), substations (Work Area 4), BESS and substation compound (Work Area 5a and 5b), are located outside the 1 % AEP + 39 % CC extent from the River Trent.

~~85~~91 Work Area 2, Cables, (including jointing bays) will be below ground and will therefore not influence conveyance or displace floodwater.

~~86~~92 Work Area 3, Mitigation/Enhancement areas located within the flood extent of the River Trent 1 % AEP + 30 % CC, will comprise grassland, scrub, orchard, scattered trees and arable fields. As such, this is compatible with the EA's "Working with natural processes to reduce flood risk 2024" FCERM research report. No dense planting (woodland or orchards will be planted in Flood Zone 3).

~~87~~93 Work Area 6: National Grid Staythorpe Substation is located within the 1 % AEP + 23 % CC extent (30 % CC used as proxy) and is mostly modelled to flood to depths of less than 0.1 m (i.e. within the main platform area), as shown in Plate A9.1.26.

~~88~~94 Similarly, using the 39 % CC allowance as a sense check, Work Area 6 could flood to a nominal depth of less than 0.1 m (i.e. within the main platform area).

~~89~~95 The National Grid Staythorpe Substation has private hard (walls) and soft (embankments) defences to a level of 13.10 m AOD. As such, Work Area 6 is unlikely to be inundated during the 1 % AEP + 30 % CC and 39 % CC events, should the Development operate marginally into the 2080s epoch.

~~90~~96 Work Area 7, Consented Staythorpe BESS and Connection, will utilise the existing infrastructure associated with the Staythorpe BESS (construction due to commence at the time of writing). The Staythorpe BESS design included flood resilience measures and the critical aspects of the scheme are located outside the 1 % AEP + 30 % CC and 39 % CC extents. As such, connecting the Development in Work Area 7 to the existing 400 kV infrastructure will be within an area not modelled to flood during the 1 % AEP + 30 % CC and 39 % CC event.

~~91~~97 Work Area 8, Access, will utilise existing roads or be flush to the existing ground level and will therefore not influence conveyance or displace floodwater.

9298 The commitment in the oEMP is that should the Development lifetime be anticipated to extend into the 2080s epoch, as a result of delays to the construction programme for example, then modelling will be undertaken in year 2069 using the appropriate climate change allowances at the time, in consultation with the EA (and other regulators). Should modelling results show that the Development has the potential to interact with flood depths then the Development design will be altered accordingly to ensure that flood storage and conveyance is maintained for the River Trent. This could involve raising the PV Arrays (subject to negligible loss of storage and conveyance), the removal of the first row of panels on a PV table or removing the mounting system and associated infrastructure from the modelled extent.

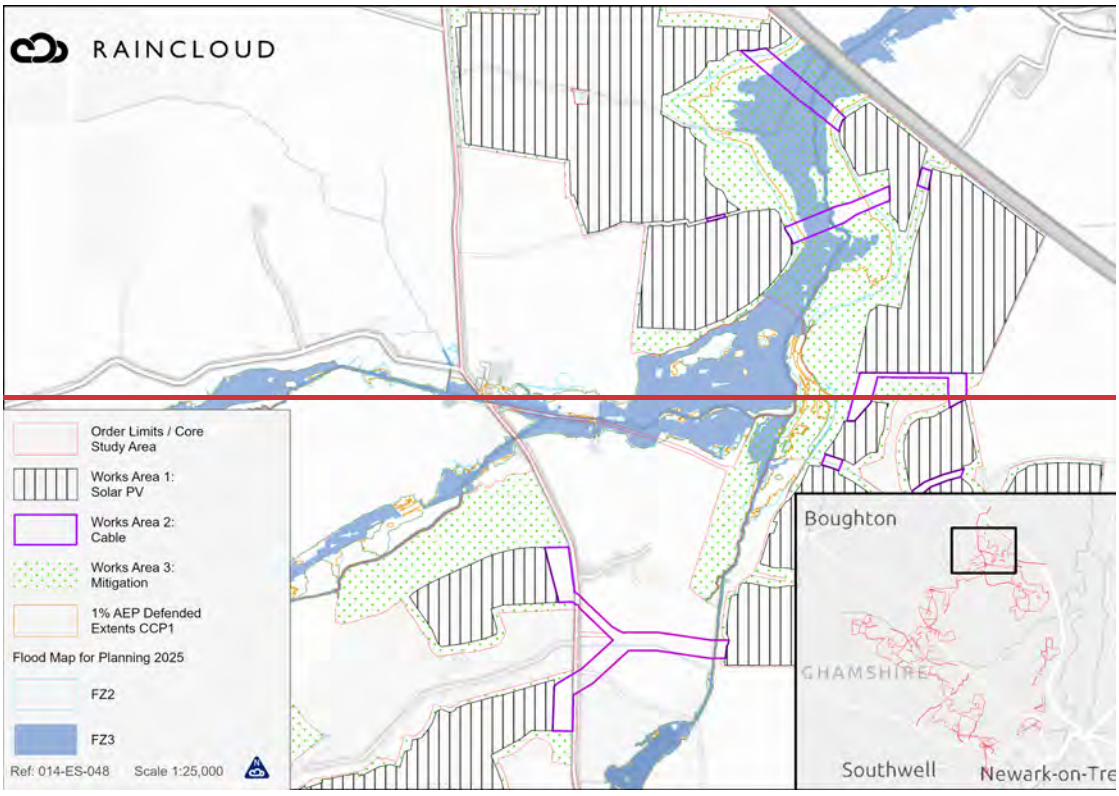
9399 As such, the risk of flooding from the River Trent (fluvial) is Low.

A9.1.2.2.2 Moorhouse Beck

94100 Only Work Area 2, Cables, i.e., below-ground structures and Work Area 3: Mitigation / Enhancement are located within the 1 % AEP flood extents of Moorhouse Beck.

95101 Work Area 1 and 4 have been located outside of Flood Zones 2 and 3 and the future floodplain (2036-2069) associated with Moorhouse Beck, as shown in ~~Plate~~Figure A9.~~1.29~~21 in Appendix D.

~~Plate A9.1.29: Moorhouse Beck – Flood Zones~~



96102 Wrack marks, as shown in Plate A9.1.~~30~~11, were observed along the stretch of Moorhouse Beck adjacent to Fields 0 and 57 to be at less than 50 % channel depth following a persistent rainfall event (week commencing 30th September 2024), where the area received 175 % of the 1991-2020 average

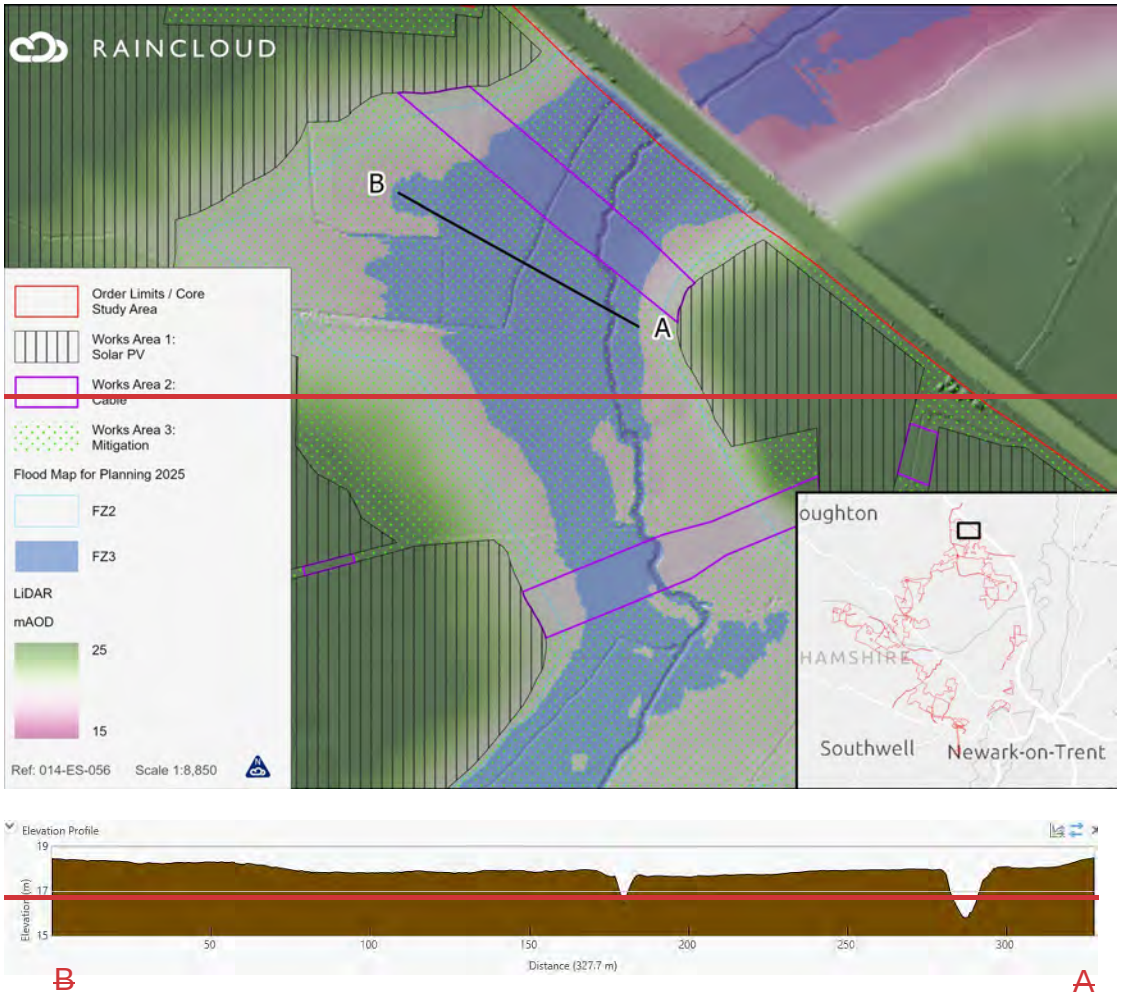
rainfall in September 2024[33], suggesting a capacity to convey substantial flows without becoming bankful.

Plate A9.1.~~30~~11: Wrack marks on Moorhouse Beck following persistent rainfall

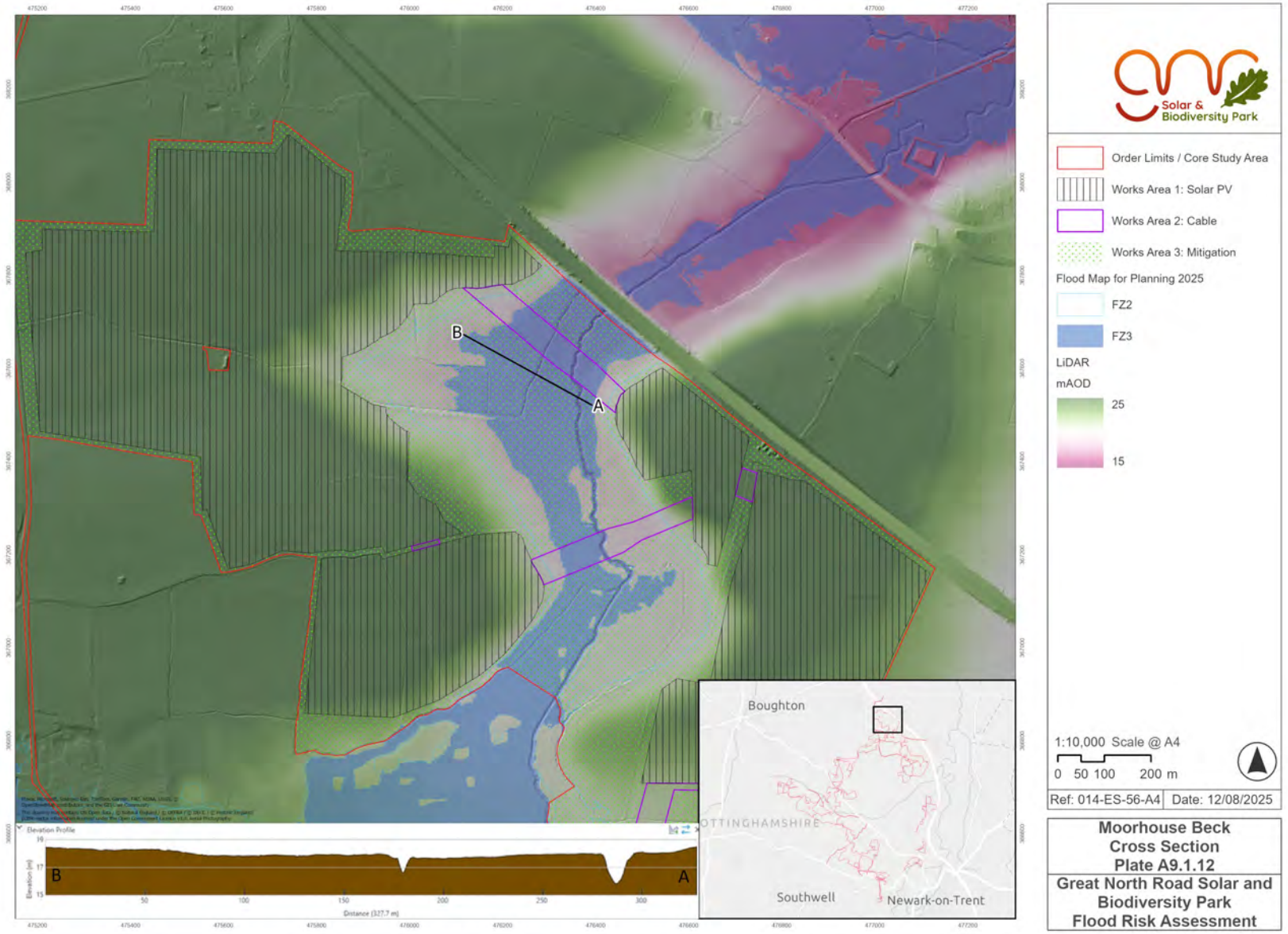
~~97~~ Plate A9.1.~~31~~12 shows a cross section through the floodplain suggesting that should Moorhouse Beck overtop its banks then floodwater will spread over a wide flat area to shallow depths, and not interact with electrically sensitive infrastructure in Work Area 1, Solar PV.

[33] https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/weather/learn-about/uk-past-events/summaries/mwr_2024_09_for_print_v1.pdf

Plate A9.1.31: Moorhouse Beck cross section



~~B~~ ~~A~~


B
A
Elevation Profile
Elevation (m)
Distance (327.7 m)
Boughton
Southwell
Newark-on-Trent
Solar & Biodiversity Park
Order Limits / Core Study Area
Works Area 1: Solar PV
Works Area 2: Cable
Works Area 3: Mitigation
Flood Map for Planning 2025
FZ2
FZ3
LiDAR
mAOD
25
15
1:10,000 Scale @ A4
0 50 100 200 m
Ref: 014-ES-56-A4
Date: 12/08/2025
Moorhouse Beck
Cross Section
Plate A9.1.12
Great North Road Solar and Biodiversity Park
Flood Risk Assessment

~~98~~104 Whilst Work Area 3, Mitigation/Enhancement, is located within the floodplain of Moorhouse Beck. Work Area 3 will comprise grassland, scrub and scattered trees. No blocks of woodland are located in Flood Zone 3. As such, this is compatible with the EA's "Working with natural processes to reduce flood risk 2024" FCERM research report.

~~99~~105 As such, the risk of flooding from Moorhouse Beck is Negligible.

A9.1.2.2.3 River Greet, Pingley / Car Dyke

~~100~~106 As outlined in Section A9.1.1.13, the A617 Road acts as a topographical barrier which restricts floodwater from the River Greet and Pingley Dyke from propagating north via a culvert towards Work Area 5a, BESS, and 5b, 400 kV Compound.

~~101~~107 1D-2D modelling shows that no aspect of Work Area 5a or 5b are located within the extents of the 1 % AEP + 39 % CC event.

~~102~~108 Similarly, Work Area 6 (excluding potential underground cable area) is located outside the extents of the 1 % AEP + 30 % CC and 50 % CC extents.

~~103~~109 One of the two access routes (Work Area 8) to Work Area 5a is located within the 1 % AEP + 39 % CC extent and has a maximum depth of 0.14 m. Velocities are mostly below 0.1 m/s.

~~104~~110 As such, the risk of flooding at Work Area 5a is Low.

~~105~~111 The risk to the Development from the River Greet / Pingley Dyke is therefore Low.

A9.1.2.3 PLUVIAL

~~106~~112 The majority (89.3 %) of the CSA is located outside areas classified as at risk of pluvial flooding for the 1 % AEP event, based on the EA Risk of Flooding from Surface Water (RoFSW) mapping.

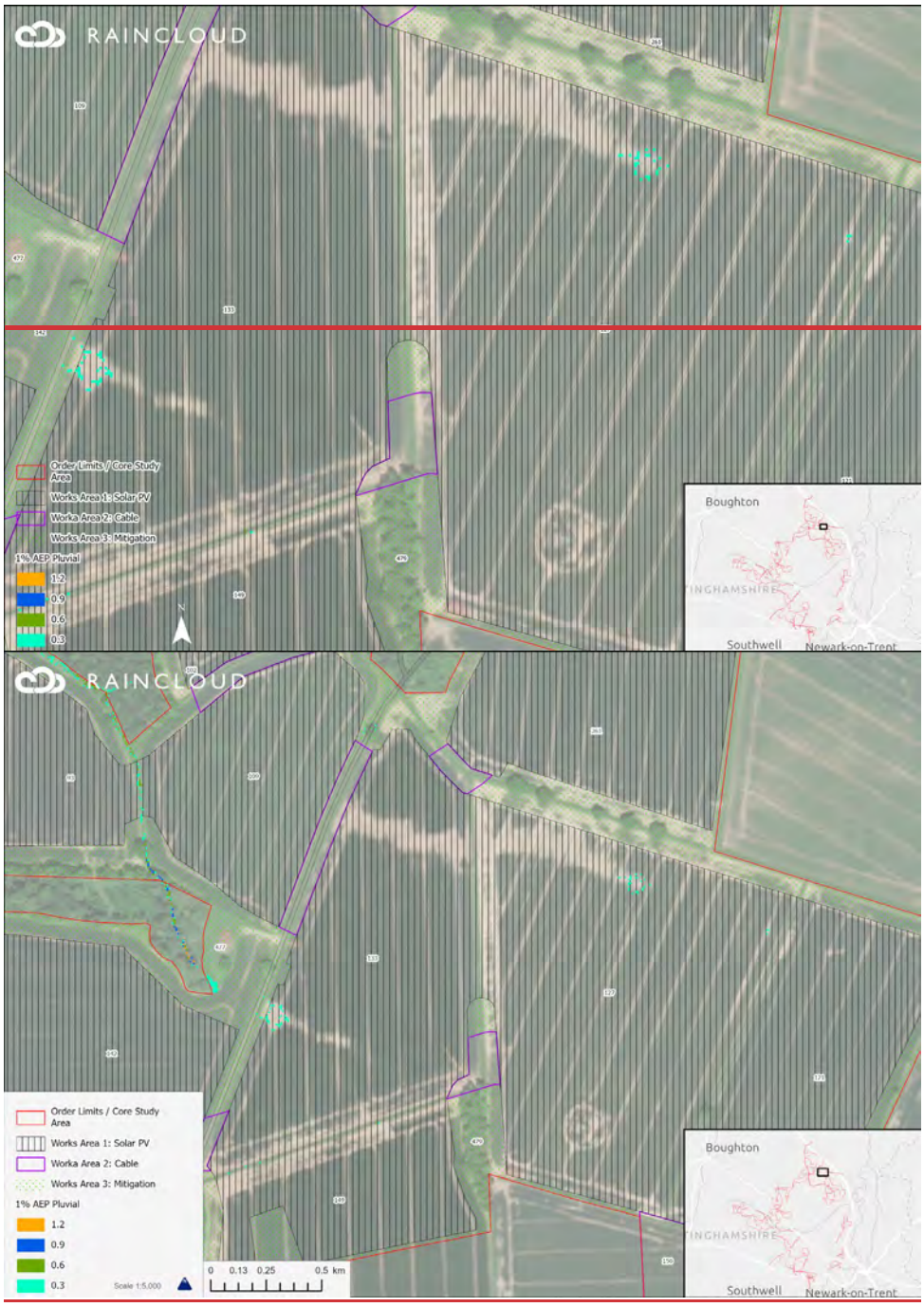
~~107~~113 Electrically sensitive infrastructure, such as inverters, will be located outside the 3.3 %, 1 % and 1 % AEP surface water flooding extent, as shown in Plate A9.1.7 of this FRA.

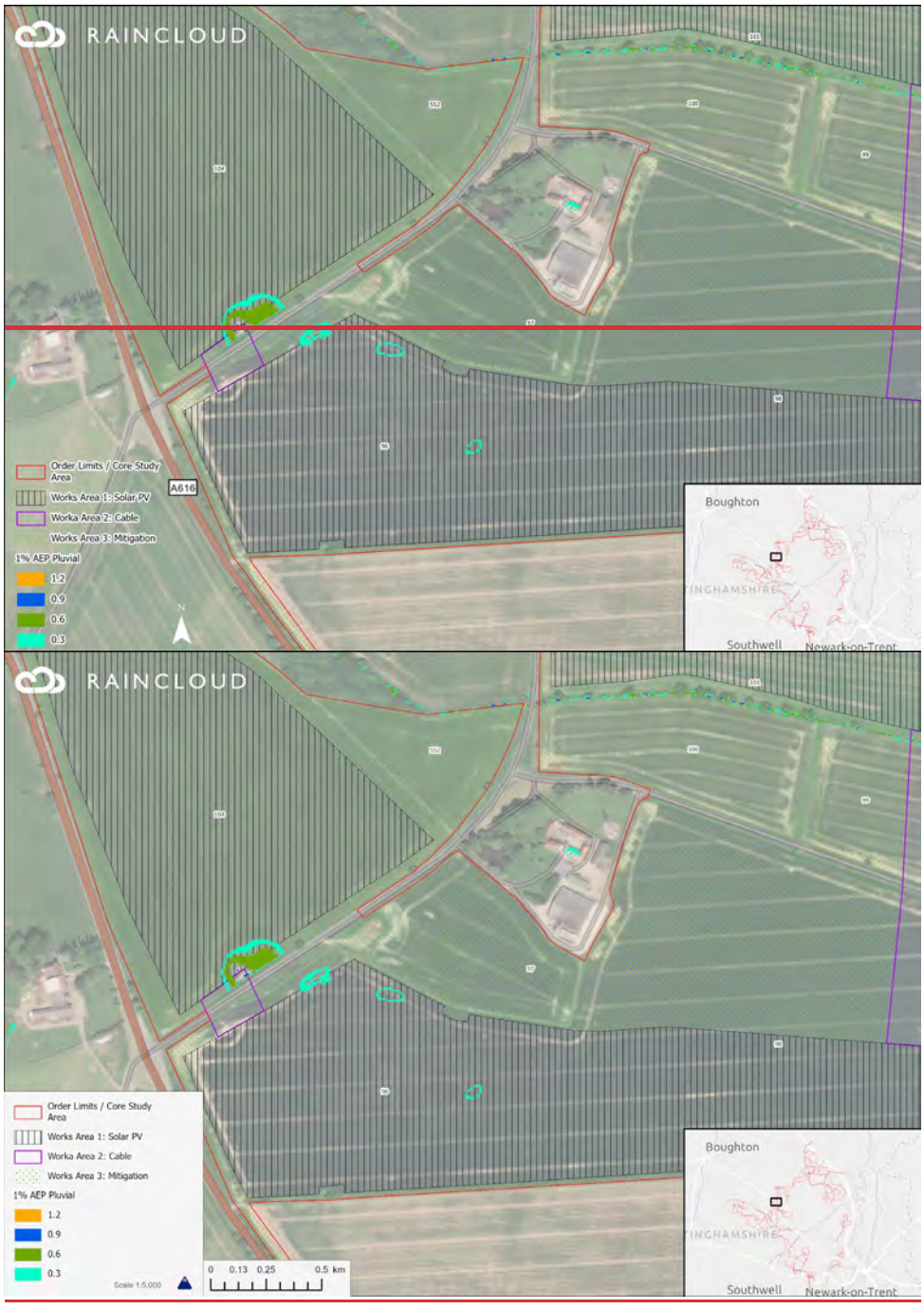
~~108~~114 The CSA is in agricultural (arable and pastoral) use, however it is known that some areas are prone to generating substantial surface water run-off during extreme or prolonged rainfall events, which has been evidenced by properties downslope of the CSA being flooded.

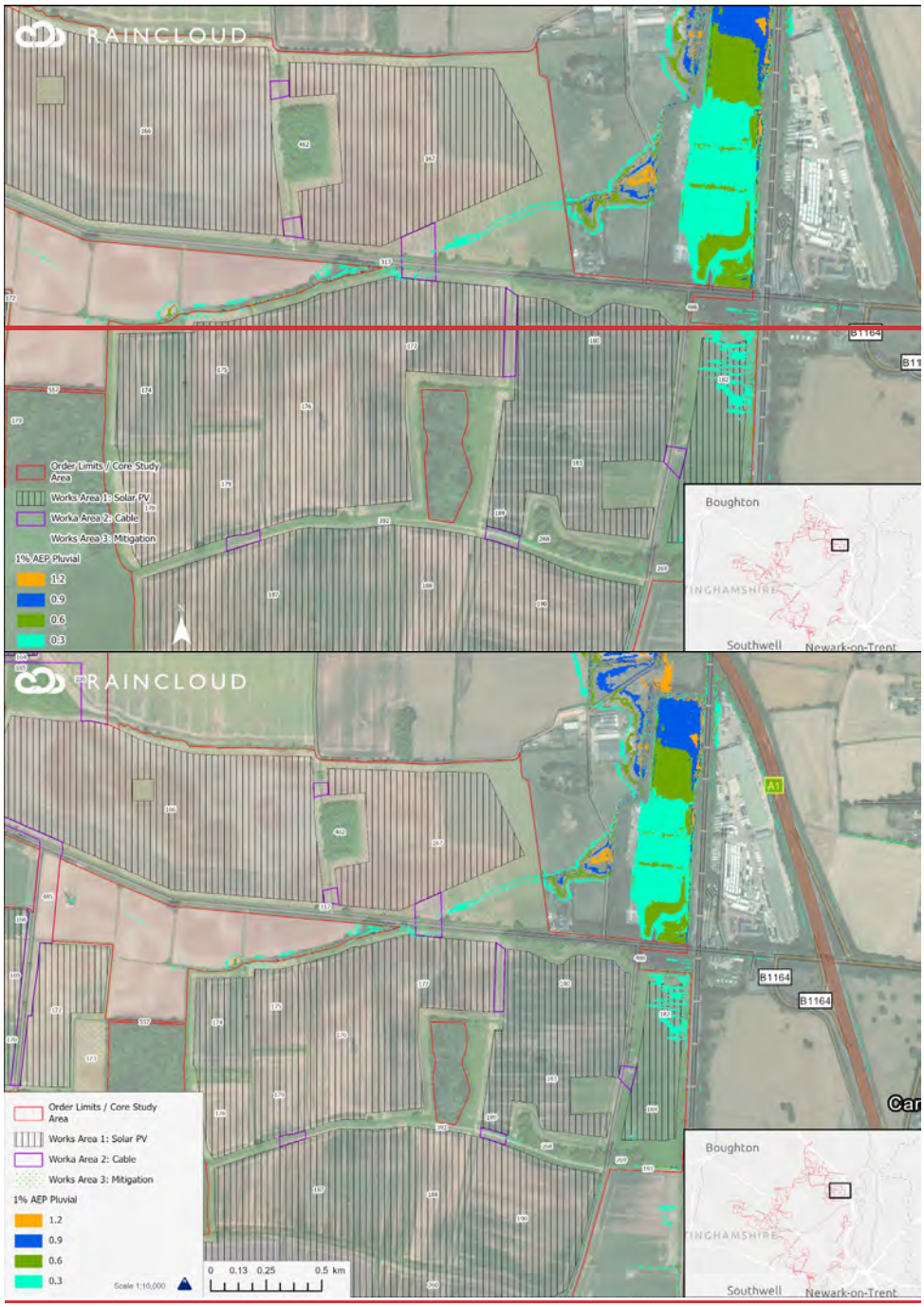
A9.1.2.3.1 Work Area 1: Solar PV

~~109~~115 The majority of Work Area 1 has been sited to avoid pluvial flood pathways and areas of pooling. Table A9.1.5 identifies fields in Work Area 1, Solar PV, Area are identified by the EA as being at risk of pluvial flooding, to depths of more than 0.3 m (filters out isolated modelled cells).

Table A9.1.5: Work Area 1 over 0.3 m pluvial depth

Field Number	Map
133 and 127	

Field Number	Map
96 and 104	

Field Number	Map
184	

110116 PV arrays will have a leading edge (bottom edge ~~pf~~of panels) raised off ground level by approximately 0.5 m, with the exception of areas modelled to flood to a depth of 0.5 m or higher for the 1 % AEP + 25 % CC event (in accordance with Lower Trent and Erewash Management Catchment peak rainfall allowances (2070s)), whereby the leading edge will be higher, to allow for 300 mm freeboard to account for residual uncertainty in the modelling.

111117 Pluvial flood depths have been verified by 2D direct rainfall modelling, as shown on ~~Plate~~Figure A9.~~1.8~~7 in Appendix D: 1 % AEP Flood Depths – Raincloud 2D Modelling of this FRA.

~~112~~118 As such, the impact of pluvial flooding on Work Area 1, Solar PV, will be Negligible.

A9.1.2.3.2 Work Area 2: Cables

~~113~~119 Cables will be located underground in waterproof ducting. Areas of cable trench excavations will not be left open for considerable periods of time therefore limiting the potential interaction with surface water.

~~114~~120 As such the risk of pluvial flooding is Negligible.

A9.1.2.3.3 Work area 3: Mitigation/Enhancement

~~115~~121 Work Area 3 is reserved for enhancement measures and these will be cognisant of existing flood risk from pluvial sources, and grassland upslope of these areas within these areas will serve to improve the downstream effects of run off.

~~116~~122 As such, the risk of flooding to Work Area 3 is Negligible.

~~117~~123 The beneficial impacts of enhancement on pluvial flooding are discussed in Section A9.1.3.

A9.1.2.3.4 Work Area 4: Intermediate Substations

~~118~~124 No areas of Work Area 4: Substations are located within the modelled 0.1 % AEP pluvial outline.

~~119~~125 As such the risk of pluvial flooding is Negligible.

A9.1.2.3.5 Work Area 5a BESS

~~120~~126 As outlined in Section A9.1.1.7, sections of Work Area 5a, BESS, is located within an area modelled to be at risk of pluvial flooding, as shown on the EA long term flood risk map.

~~121~~ The EA pluvial flood map depths have been verified through 2D direct rainfall analysis for the 1 % AEP and 1 % AEP + 25 % CC, 3-hour event using FEH data, as shown in ~~Plate~~Plates A9.1.~~32~~13 and ~~Plate~~ A9.1.~~33.~~

Plate A9.1.32: Modelled 1 % AEP Pluvial Flood Depth

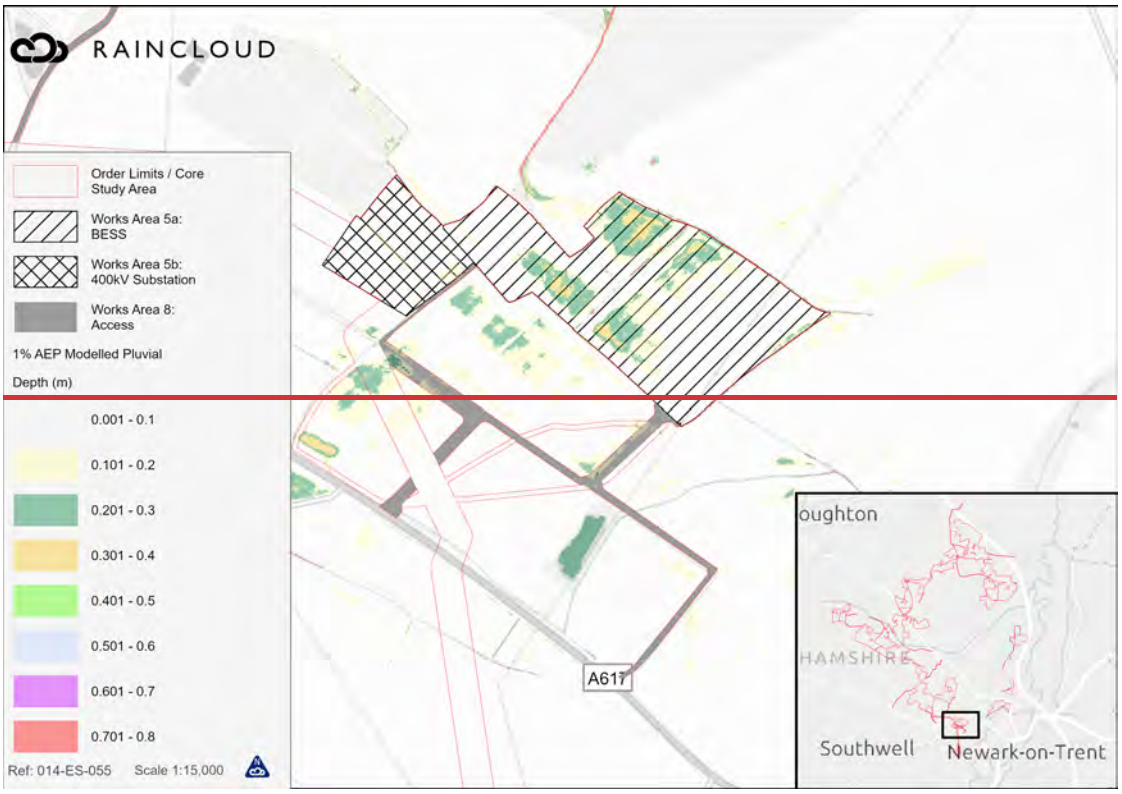
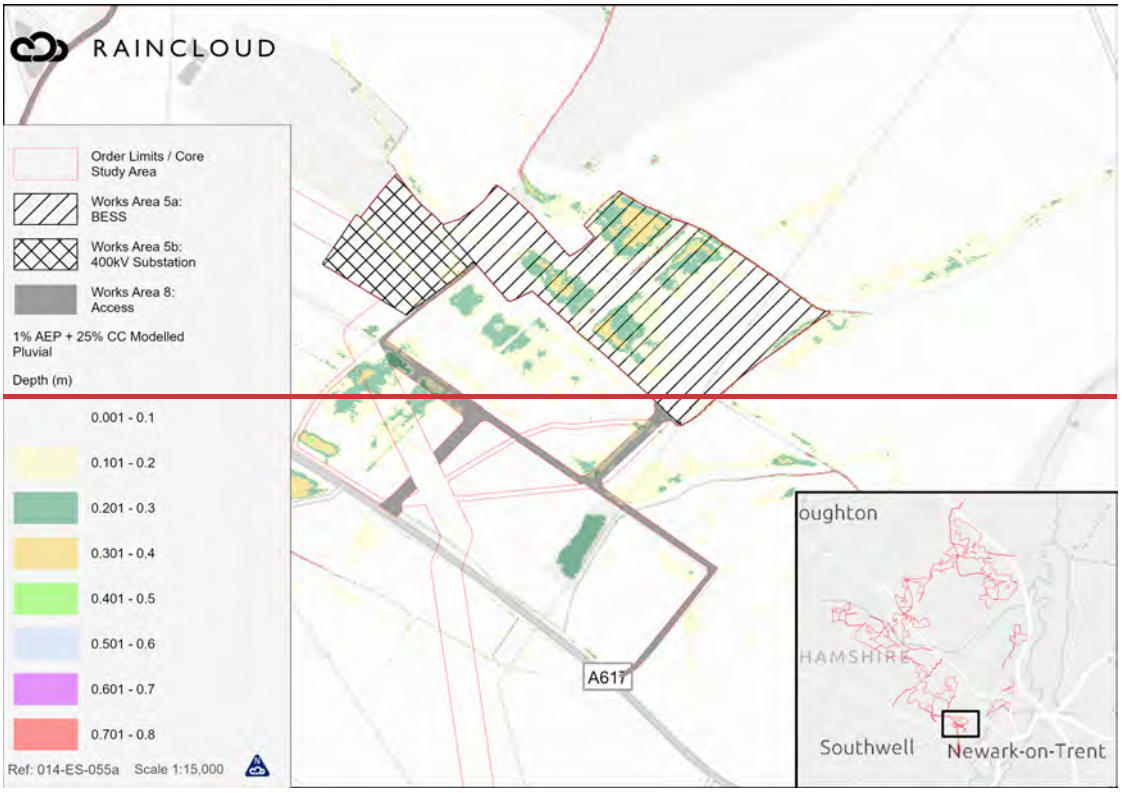
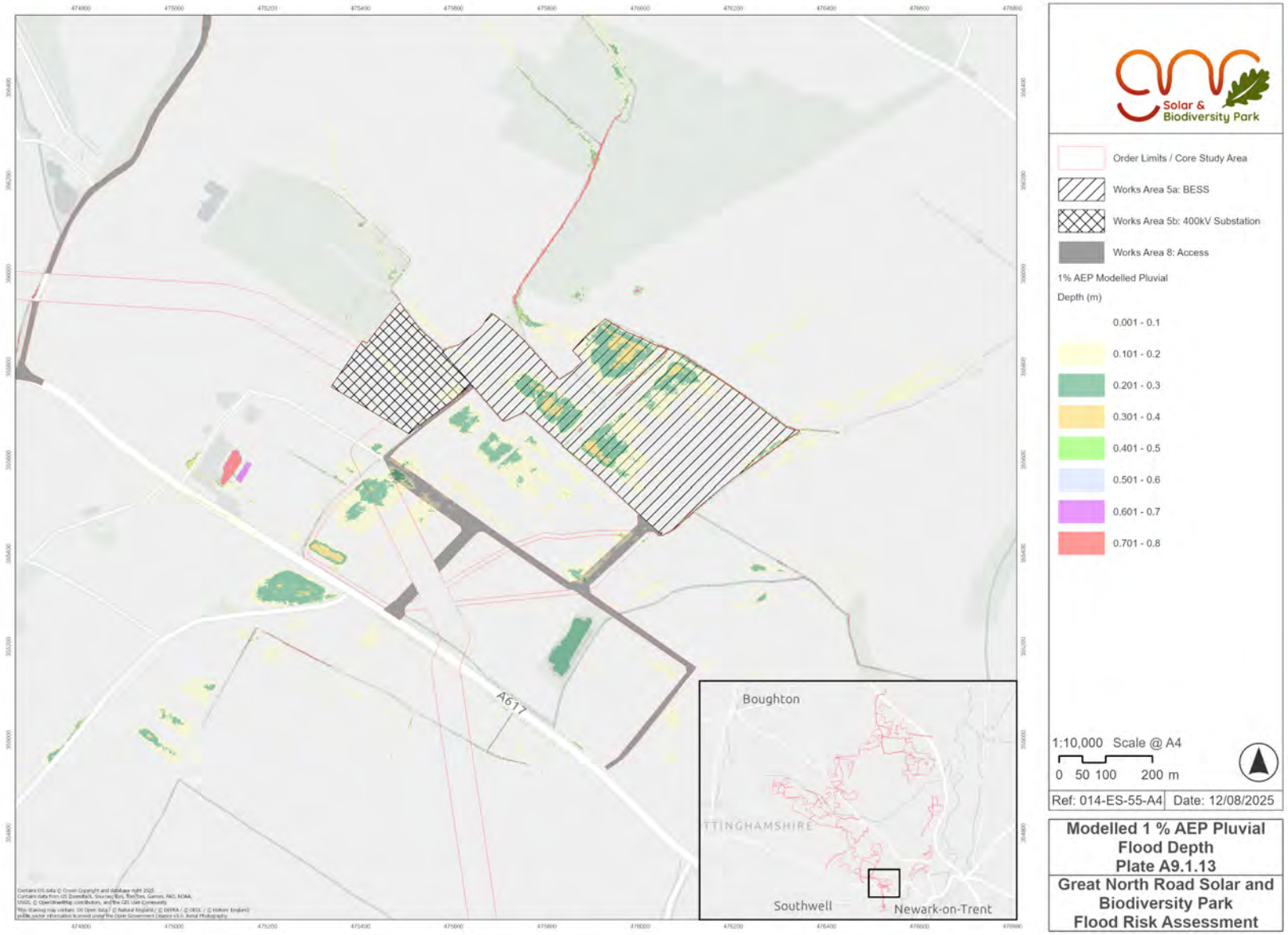


Plate A9.1.33: Modelled 1 % AEP + 25 % CC Pluvial Flood Depth



127 14.


Solar & Biodiversity Park
Order Limits / Core Study Area
Works Area 5a: BESS
Works Area 5b: 400kV Substation
Works Area 8: Access
1% AEP Modelled Pluvial Depth (m)
0.001 - 0.1
0.101 - 0.2
0.201 - 0.3
0.301 - 0.4
0.401 - 0.5
0.501 - 0.6
0.601 - 0.7
0.701 - 0.8
A617
Boughton
Southwell
Newark-on-Trent
1:10,000 Scale @ A4
0 50 100 200 m
Ref: 014-ES-55-A4
Date: 12/08/2025
Modelled 1 % AEP Pluvial Flood Depth
Plate A9.1.13
Great North Road Solar and Biodiversity Park
Flood Risk Assessment


Solar & Biodiversity Park
Order Limits / Core Study Area
Works Area 5a: BESS
Works Area 5b: 400kV Substation
Works Area 8: Access
1% AEP + 25% CC Modelled Pluvial Depth (m)
0.001 - 0.1
0.101 - 0.2
0.201 - 0.3
0.301 - 0.4
0.401 - 0.5
0.501 - 0.6
0.601 - 0.7
0.701 - 0.8
A617
Boughton
Southwell
Newark-on-Trent
1:10,000 Scale @ A4
0 50 100 200 m
Ref: 014-ES-55a-A4
Date: 12/08/2025
Modelled 1 % AEP + 25 % CC Pluvial Flood Depth
Plate A9.1.14
Great North Road Solar and Biodiversity Park
Flood Risk Assessment

~~122~~128 The placement of above ground infrastructure will avoid areas for flooding greater than 0.4 m, with the exception of a very small area in the north of Work Area 5a. BESS units are generally not located flush to the existing ground and are elevated on corner blocks or a racking frame elevated from the ground, as shown in Plate A9.1.~~34~~15.

Plate A9.1.~~34~~15: Typical Corner Pads and racking on BESS units

~~123~~129 As such, pluvial flooding should not pose a risk to the electrically sensitive aspects of the BESS units.

~~124~~130 Management of surface water runoff from the Development is detailed in Section A9.1.4 of this FRA.

~~125~~131 Based on the design of the Development to avoid placing larger above ground structures (e.g. substations) within the flow paths of surface water and the land management measures described in Section A9.1.3, the risk of pluvial flooding to and from the Development is Low.

A9.1.2.3.6 Work Area 5b: 400 kV Substation

~~126~~132 As shown on ~~Plate~~Figure A9.~~1.32~~6, 2D pluvial modelling shows that the 400 kV substation is not at risk of flooding from pluvial sources.

~~127~~133 As such, the risk of pluvial flooding at Work Area 5b is Negligible.

A9.1.2.3.7 Work Areas 6 and 7

~~128~~134 The existing or consented infrastructure within Work Areas 6 and 7 are shown not to be at risk of pluvial flooding on the EA flood map. Additionally, the infrastructure in these areas will be served by a formal drainage system designed to accommodate intense rainfall.

~~129~~135 As such, the risk of pluvial flooding in Work Areas 6 and 7 is Negligible.

A9.1.2.3.8 Work Area 8: Access Works

~~130~~136 Work Area 8 is principally within existing highways on the road network and is mostly free of pluvial flood risk, principally as a result of highways drainage.

~~131~~137 The areas of Work Area 8 which are outside the existing highways are not shown to be at risk of pluvial flooding.

~~132~~138 As such, the risk of pluvial flooding to Work Area 8 is Negligible.

A9.1.2.4 GROUNDWATER

~~133~~139 Work Area 4, Intermediate Substations, Work Area 5a, BESS, and Work Area 5b, 400 kV Compound, are the main aspects of Development which have the potential to be affected should groundwater emerge at the surface, given that the PV arrays in Work Area 1 are elevated from the ground by at least 0.5 m, and Work Area 2, cables, are in waterproof ducting.

~~134~~140 The EA Long Term Flood Risk service[34] reports “Flooding from groundwater is unlikely in this area”.

~~135~~141 BGS borehole records[35, 36, 37] approximately 30 m southeast of Work Area 5a show groundwater was struck at 3.0 m, 2.7 m and 1.8 m BGL, associated with sand and gravel layers at corresponding depths which overlay mudstone, indicating that the mudstone acts as a low transmissivity rock layer limiting infiltration at shallow depth, rather than the gravels being an extensive groundwater unit.

~~136~~142 Table 4a of the SFRA identifies that Staythorpe Road, near to Work Area 6 and 7, has previously flooded from groundwater sources, however no records of groundwater flooding in the area surrounding Work Area 5a and 5b exist.

~~137~~143 The PV arrays in Work Area 1 will be raised off the ground by at least 0.5 m on a racking system and therefore will not be affected in the event that groundwater emerges at the surface.

~~138~~144 Cabling in Work Area 2 will be within waterproof ducting. The entry point of any cable or ducting into chambers should also be sealed to prevent water ingress.

~~139~~145 Infrastructure in Work Area 5a and 5b will not be flush to ground level, e.g. by concrete feet, elevating the BESS units by approximately 0.3 m AGL, as outlined in the Pluvial Flooding assessment in Section A9.1.2.4. Should

[34] https://check-long-term-flood-risk.service.gov.uk/risk
[35] https://api.bgs.ac.uk/sobi-scans/v1/borehole/scans/items/19366580
[36] https://api.bgs.ac.uk/sobi-scans/v1/borehole/scans/items/239130
[37] https://api.bgs.ac.uk/sobi-scans/v1/borehole/scans/items/238970

groundwater emanate at ground level within Work Area 5, it is likely to spread over a wide area at shallow depth. As such the risk of groundwater interacting with infrastructure within Work Area 5a and 5b is unlikely.

~~140~~146 Infrastructure within Work Area 6 and Work Area 7 consented / operational and will have built in resilience, such as hard standing and impermeable membranes to prevent the upward movement of groundwater interacting with infrastructure within these areas.

~~141~~147 As such the risk of groundwater flooding is Negligible.

A9.1.2.5 RESERVOIRS

~~142~~148 The risk of flooding from the reservoir is reduced through regular maintenance by the operating authority and owner (identified in Table A9.1.2), with reservoirs in the UK having an extremely good safety record with no incidents resulting in the loss of life since 1925.

~~143~~149 Whilst the consequences of flooding from dam failure are potentially high within the eastern and southern sections of the CSA, the Reservoirs Act 1975 requires all large reservoirs to be regularly inspected and supervised by reservoir panel engineers, making the risk of failure low.

~~144~~150 Regarding Work Area 1: Solar PV, the extents would only encroach into one field (Field 182) and the leading edge of the panels would be above ground level by at least 0.5 m. As such, the potential for interaction with the electrically sensitive aspects of Work Area 1 is low.

~~145~~151 The flood resilience measure in Work Areas 6 and 7 for fluvial flooding would minimise any potential impact under a reservoir breach scenario.

~~146~~152 As such, the residual risk of flooding associated with reservoirs is Low.

A9.1.2.6 SEQUENTIAL TEST AND EXCEPTION TEST

A9.1.2.6.1 Sequential Test

~~147~~153 Paragraph 5.8.9 of NPS EN-1 states that "*If, following application of the Sequential Test, it is not possible, (taking into account wider sustainable development objectives), for the project to be located in areas of lower flood risk the Exception Test can be applied … The test provides a method of allowing necessary development to go ahead in situations where suitable sites at lower risk of flooding are not available*".

~~148~~154 Paragraph 172 of the NPPF[10] states that developments located within Flood Zone 3 should apply a risk based sequential test in order to steer proposed development towards areas classed as having a lower probability of flooding. (i.e. in Flood Zone 1). Paragraph 177 of the NPPF does, however, acknowledge that under certain circumstances it may not be possible to locate the development on land identified as having a lower risk of flooding and infrastructure can be located in Flood Zone 2 or 3 for certain infrastructure, subject to passing the Exception Test.

~~149~~155 Utility scale solar farms can only be located where they can connect to the National Grid and the Applicant considered a number of search criteria in identifying suitable sites, as outlined in Chapter 4: Site Selection and Design Evolution [EN010162/APP/6.2.4] and Appendix C – Sequential Test Report,

which consider how alternative sites have been appraised and how the design of the Development has evolved to sequentially developed to avoid placing the most electrically sensitive aspects in Flood Zones 2 and 3.

~~150~~156 For these reasons the Development meets the requirements set out in Table 3 of the Planning Practice Guidance[38] and meets the requirements of the Sequential Test of the NPPF and NPS EN-1.

~~151~~157 Paragraph 5.8.10 of NPS EN-1 outlines the Exception Test "*is only appropriate for use where the Sequential Test alone cannot deliver an acceptable site. It would only be appropriate to move onto the Exception Test when the Sequential Test has identified reasonably available, lower risk sites appropriate for the proposed development where, accounting for wider sustainable development objectives, application of relevant policies would provide a clear reason for refusing development in any alternative locations identified. Examples could include alternative site(s) that are subject to national designations such as landscape, heritage and nature conservation designations, for example Areas of Outstanding Natural Beauty (AONBs), Sites of Special Scientific Interest (SSSIs) and World Heritage Sites (WHS) which would not usually be considered appropriate*".

~~152~~158 Work Area 2: Cables and Work Areas 6: National Grid Substation and connection point and Work Area 7: Consented Staythorpe BESS and Connection is classified as 'essential infrastructure' and is located within Flood Zone 1, 2 and 3 and has a low risk from all other assessed forms of flooding. As such, development that falls into this classification is subject to the exception test.

A9.1.2.6.2 Exception Test

~~153~~159 Paragraph 5.8.11 of NPS EN-1 clarifies that *"Both elements of the Exception Test will have to be satisfied for development to be consented. To pass the Exception Test it should be demonstrated that:*

a. The project would provide wider sustainability benefits to the community that outweigh the flood risk; and

b. the project will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible will reduce flood risk overall".

~~154~~160 Paragraph 5.8.29 of NPS EN-1 also requires a sequential approach to be applied to the layout and design of projects with more vulnerable uses being located on parts of the site at lower probability and residual risk of flooding by using SuDS.

~~155~~161 The two criteria set out in the Exception Test that should be applied to developments are:

a) the development would provide wider sustainability benefits to the community that outweigh the flood risk; and

b) the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

[38] https://www.gov.uk/government/collections/planning-practice-guidance

~~156~~162 The Development will contribute to the decarbonisation of energy supply infrastructure, therefore contributing to wider sustainability aims, including Net Zero.

~~157~~163 The Development is located primarily within Flood Zone 1, with a small footprint of the Work Area 3 located within Flood Zone 2 and 3. Areas of Work Area 3 located in Flood Zone 3 will comprise grassland, scrub, an orchard and scattered trees, which is compatible with the EA's "Working with natural processes to reduce flood risk 2024" FCERM research report.

~~158~~164 Work Area 2 (Cables) will be located entirely below ground and in waterproof ducting, ensuring no loss of floodplain storage or conveyance.

~~159~~165 Work Area 6: National Grid Staythorpe Substation, is located in Flood Zone 2 and, despite modelling showing shallow depth inundation for the 1 % AEP + 30 % CC and 39 % CC (i.e. less than 0.1 m depth), is unlikely to flood due to the presence of private flood defences which serve the operational substation with an elevation of 13.10 m AOD.

~~160~~166 Work Area 7: Consented Staythorpe BESS and Connection has incorporated flood resilient design and the connection point is likely to be in an area modelled to be outside the 1 % AEP + 39% CC.

~~161~~167 The Development will incorporate planting and land management measures (RSuDS) which will reduce the potential for an increase in surface water runoff rates;

~~162~~168 Hardstanding areas will be served by surface water drainage infrastructure (SuDS) to limit surface water runoff to greenfield (baseline) rate up to the 1 % AEP + 40 % CC event.

~~163~~169 The Development is classed as Essential Infrastructure, as per Annex 3: Flood risk vulnerability classification, of the NPPF, which is appropriate in the Flood Zones 1, 2 and 3, in terms of flood risk vulnerability.

A9.1.2.6.3 Conclusion

~~164~~170 The Development is essential energy infrastructure and Critical National Priority infrastructure, as recognised by NPS EN-1 and NPS EN-3.

~~165~~171 The aspects within Work Areas 2, 6 and 7 pertain to the infrastructure required for connecting to the operational National Grid Staythorpe Electricity Substation. Consequently, the positioning of the cable and associated infrastructure has been determined as the optimal route between Work Area 5a and Work Area 6, with no other 'more suitable' locations available.

~~166~~172 The urgent need for renewable energy supply and therefore the need to maximise energy generation where there is available grid capacity, there is therefore strong operational reasons for the inclusion of Work Area 2: Cables and Work Areas 6 and 7 in their locations.

~~167~~173 As such, the Sequential and Exception tests are passed i.e. the Development is located appropriately (Essential Infrastructure in Flood Zone 1, 2 and 3), as per EA Flood Risk and Coastal Change Guidance.

A9.1.3 SOLAR PV SURFACE WATER MANAGEMENT

A9.1.3.1 CONSTRUCTION PHASE

A9.1.3.1.1 Pollution Prevention

~~168~~174 Given the relatively short construction phase and gently sloping land within the OL, it is not anticipated that significant amounts of sediment will be generated. The Development will adhere to a Construction Environmental Management Plan (CEMP), to be secured by DCO Requirement and based on the Outline CEMP provided in ES TA A5.3 [EN010162/APP/6.4.5.3]), which will ensure compliance with the relevant guidance.

A9.1.3.1.2 Run-off Rates

~~169~~175 Rural Sustainable Drainage Systems (RSuDS) are not a new concept, but they are not widespread in the rural environment and can present many opportunities for improving the management of water at source. They are a collection of physical structures used to mimic natural processes. In rural environments, it is an approach for managing the detrimental impact of rainfall on fields where run-off is a major threat to the flora, fauna and chemical status of our surface waters.

~~170~~176 RSuDS slow down or prevent the transport of pollutants to watercourses by breaking the delivery pathway between the pollutant source and the receptor. By intercepting run-off and trapping sediment before it leaves the field they help maintain and manage the provision of good water quality by preventing the loss of soil, chemicals, nutrients, and faecal organisms. A further benefit is their ability to temporarily capture water and slow down flow. This can reduce localised flooding and provide valuable aquatic habitats in the form of micro-wetlands for farmland wildlife and will encourage the downward movement of water to recharge aquifers.

~~171~~177 Research in the United States by Cook & McCuen (2013) meta-analysis outlines that solar panels do not have a significant effect on runoff volumes or peak flows, however where ground beneath panels is bare there may be an increase in peak discharge.

~~172~~178 Milazzo et al. (2023)[39] reviews the role of grassland for erosion and flood mitigation in Europe and provides quantification that permanent grassland mitigates better runoff than arable land.

~~173~~179 Whilst the Natural England Technical Information Note 101 (TIN101) "*Solar Parks: maximising environmental benefits*" has been archived, the principles relating to solar parks, their siting, their potential impacts and mitigation requirements for the safeguarding of the natural environment are still relevant.

~~174~~180 TIN101 states:

> "*The key to avoiding increased run-off and soil into watercourses is to maintain soil permeability and vegetative cover. Permeable land surfaces*

[39] The role of grassland for erosion and flood mitigation in Europe: A meta-analysis. Agriculture, Ecosystems & Environment Volume 348, 1 June 2023, 108443 https://doi.org/10.1016/j.agee.2023.108443

underneath and between panels should be able to absorb rainfall as long as they are not compacted and there is some vegetation to bind the soil surface".

~~175~~181 As such, a suitable grassland sward will be developed in areas underneath the PV arrays before the construction phase.

A9.1.3.1.3 PV Array Installation

~~176~~182 Whilst the PV arrays and racking system does not involve the installation of hardstanding, the installation methods could lead to soil compaction if not managed properly.

~~177~~183 Installation of the racking system (mounting frame) should only occur when soil conditions are suitable, e.g., dry enough that tyre imprints are not deeper than a specified depth when tracking across land. The Construction Contractor will be responsible for monitoring conditions, in consultation with the Ecological Clerk of Works, in accordance with a Soil Management Plan (an outline SMP is provided as TA A17.2 EN010162/APP/6.4.17.2).

~~178~~184 The mounting framework is likely to be delivered by a vehicle with a trailer and is unlikely to cause soil compaction.

~~179~~185 The racking system will then be pile driven into the ground to a depth of typically 1 to 2 m, depending on ground conditions using similar tracked mini pile driver machinery, as shown in Plate A9.1.~~35~~16.

Plate A9.1.~~35~~16: Mini pile driver examples

~~180~~186 The PV modules are likely to be secured to the racking system by hand and therefore soil compaction is unlikely to occur during this stage, as shown in Plate A9.1.~~36~~17.

Plate A9.1.~~36~~17: PV module installation[40]

~~181~~187 Should vehicles cause compaction during the installation of the PV arrays then this will be ameliorated using typical small-scale horticultural machinery, as outlined in Section 5 of the oSMP (TA A17.2 EN010162/APP/6.4.17.2)

A9.1.3.2 OPERATIONAL PHASE

~~182~~188 RSuDS components from the construction phase (grassland) will remain in place for the operational phase of the Development.

~~183~~189 The raised nature of PV Arrays will not prevent soil from absorbing rainwater as the panels will not be placed directly on the ground and each PV Row will be separated, with the same area of soil / grassland available for infiltration as per the baseline scenario.

~~184~~190 Once rainfall has fallen off a PV Array, the water will be able to spread and flow along the ground under the PV Arrays evenly into the rain-shadow of the row below, so as to mobilise the same percentage of the ground for infiltration as was available prior to the installation of PV Arrays.

~~185~~191 The PV Array will comprise rows of solar panel modules mounted on metal frames and pile driven into the ground to limit the footprint of PV array units.

~~186~~192 The panels would be mounted at approximately 0.5 m from the ground at the lowest point, depending on modelled flood depths, there will be a requirement to raise the leading edge of the PV arrays in some areas.

~~187~~193 Installation of the PV arrays does not involve the introduction of hardstanding at ground level meaning the superficial cover for the majority of the Site will remain the same as the baseline.

[40] Keele University

~~188~~194 As the baseline vegetation is arable crops the establishment of grassland will be beneficial in terms of vegetation cover and soil stabilisation, as the land will not be tilled.

~~189~~195 Additionally, the PV array tables will have regular rainwater gaps to prevent water being concentrated along a single drip line. As such, rainfall landing on the solar panels will drain through rainwater gaps and infiltrate into the ground beneath and between each row of panels, as shown in Plate A9.1.~~37~~18.

Plate A9.1.~~37~~18: Rainwater gaps on PV array table

~~190~~196 Control of run-off from the PV Arrays will be implemented through the land management techniques based upon RSuDS methods that will be implemented before the construction phase, in accordance with the EA's guidance[41], shown in Plate A9.1.~~38~~19.

~~191~~197 The limited installation of impermeable surfaces will prevent a significant increase in surface water run-off.

[41] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/291508/scho0612buwh-e-e.pdf

Plate A9.1.~~38~~19: Established grassland and vegetation cover at Solar Farm

~~192~~198 The exact grass seed mix will be determined, as outlined in the Outline LEMP (TA A5.1 [EN010162/APP/6.4.5.1]).

~~193~~199 The grassland will be managed through an initial and long-term management plan and should be secured through the LEMP.

~~194~~200 The promotion of managed grassland will prevent surface water from the drip line from compacting the ground and therefore limit the potential for rilling and soil mobilisation.

~~195~~201 As outlined in Section A5.5.4.5 of the oOEMP [EN010162/APP/6.4.5.5], maintenance of solar farm equipment and other regular equipment used onsite, such as any operational vehicles, tools and machinery will be carried out by the relevant operational staff. The maintenance will be carried out based on specific guidance and method statements by appropriately trained staff, in line with the required maintenance schedules. This will minimise the risk of compaction of soils and pollution of watercourses.

~~196~~202 It should also be noted that large woodland strips will be established along with wildflower meadow, which will be largely outside the fence, as shown on the masterplan (Figure 5.2 [EN010162/APP/6.3.5.2]) and Outline LEMP [EN010162/APP/6.4.5.1]. These measures will also help to slow surface water before entering the wider hydrological network.

~~197~~203 As discussed in Section A9.1.1.7, several communities surrounding the Development suffer from pluvial flooding as a result existing runoff pathways concentrating flows to urban areas during heavy or prolonged precipitation events.

~~198~~204 Maplebeck has a history of pluvial flooding as run-off cascades from the elevated agricultural land to the west, north and south.

~~199~~205 A 2D direct rainfall model was established to model the baseline flood routes and depths and model the effect of the introduction of grassland under the PV arrays and woodland planting.

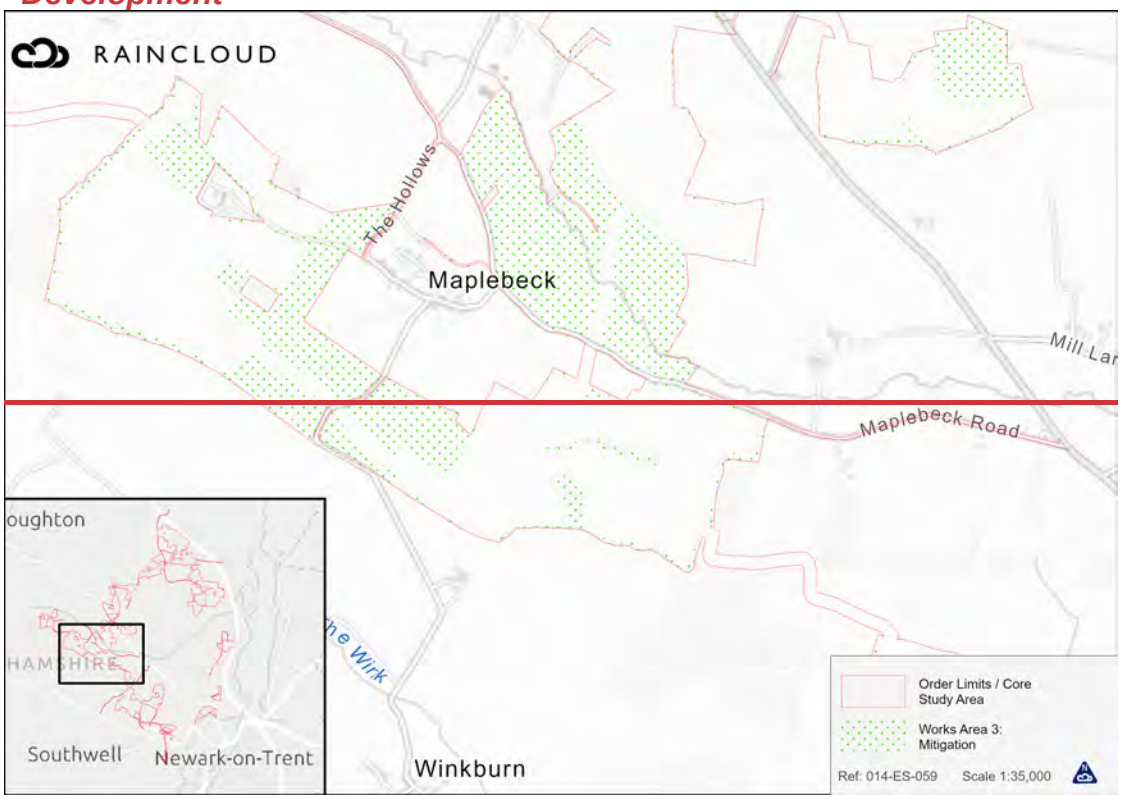
~~200~~206 Areas of woodland and grassland were attributed a Manning's N roughness value and added to the model as polygons.

~~201~~207 The OS buildings and roads layers were also stamped into the LIDAR data to ensure flow pathways were accurately represented.

~~202~~208 Mass balance error for all simulations was 0.0 %.

~~203~~209 ~~Plate~~Figure A9.~~1.39~~22 in Appendix D shows the location of RSuDS measures within the Development in relation to Maplebeck.

~~Plate~~Figures A9.~~1.39: RSuDS / enhancement areas associated with the Development~~



~~204~~210 ~~Plates A9.1.40~~23 and A9.~~1.41~~24 in Appendix D show the maximum flood depth for the 1 % AEP for the baseline 1 % AEP and 1 % AEP with wildflower / grass mix under the PV array scenarios.

Plate A9.1.40: Maplebeck 1 % AEP – Baseline

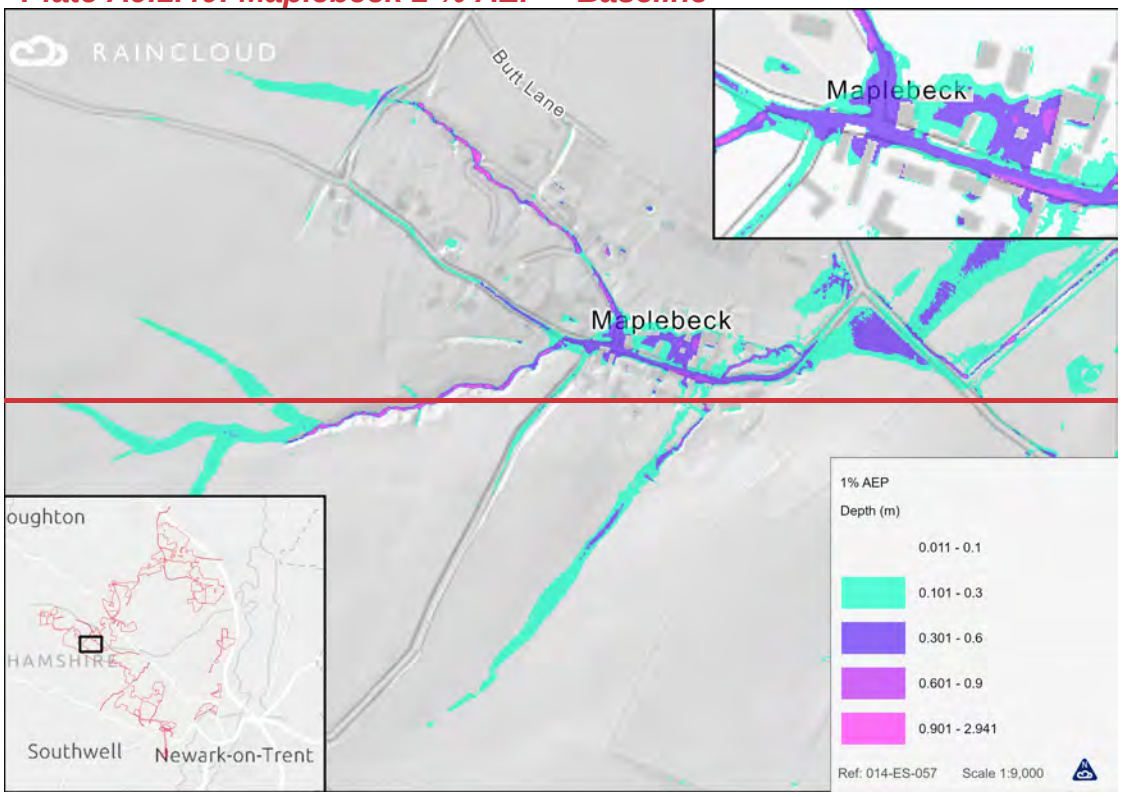


Plate A9.1.41: 1 % AEP – Grass Mix under PV Arrays

~~205~~211 Grassland has a marginal benefit in reducing maximum flood depths for the 1 % AEP event compared to the baseline scenario.

~~206~~212 There is an opportunity to provide additional natural flood management (NFM) measures within the CSA which have a positive effect on the

downstream environment, without necessarily improving the flooding situation within the CSA and the measures will be brought forward as part of a separate Town and Country planning application.

~~207~~213 The cumulative effect of the Development and the NG+ NFM schemes is assessed in ES Chapter 9: Water Resources [EN010162/APP/6.2.9].

A9.1.3.2.1 Steeper Slopes

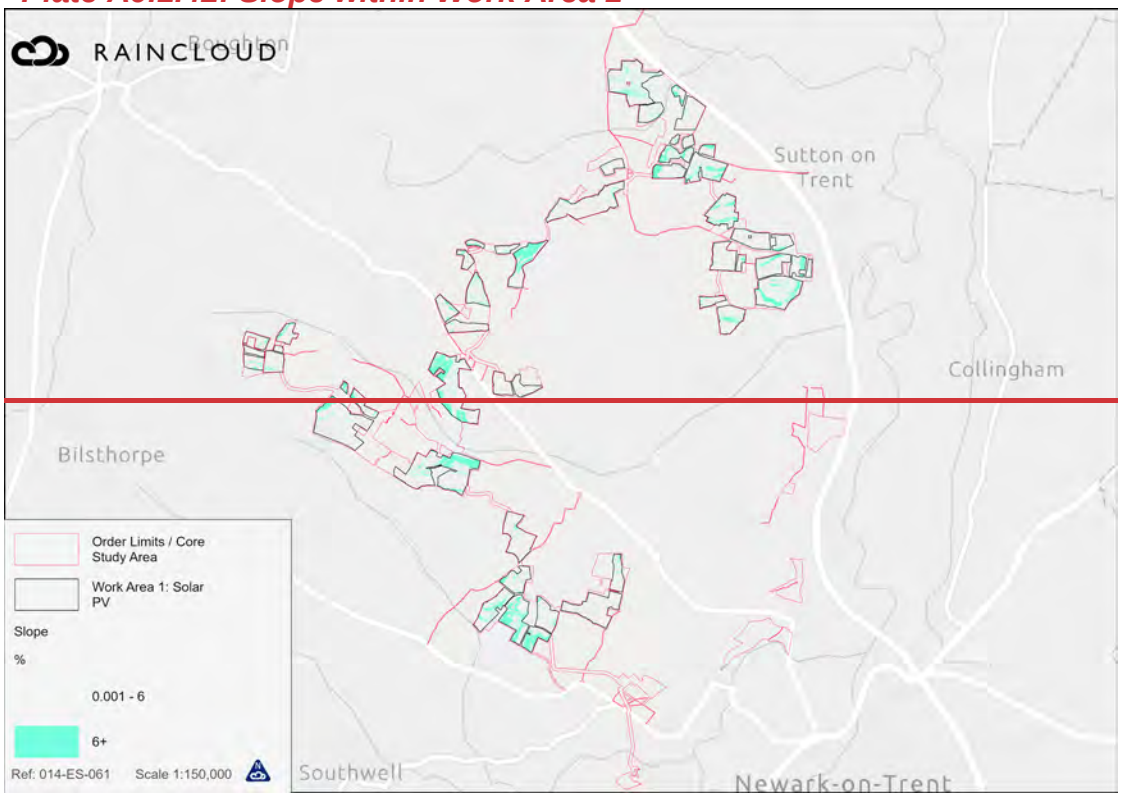
~~208~~214 It is reported in Schwyter & Vaughan (Soil Science Laboratory Manual)[42] that the amount of soil erosion is directly related to the amount of surface water run-off, which depends on the water infiltration rate and the percentage of the slope. The steeper the slope and the less rapid the water infiltration rate, the more rapid the water run-off rate for a given soil.

~~209~~215 It is noted within the Soil Science Laboratory Manual that most soils will generate rapid or very rapid surface water run-off with slopes between 6 to 12 %, regardless of soil type.

~~210~~216 80 % of Work Area 1: Solar PV is on slopes of less than 6 %.

~~211~~217 Work Area 1: Solar PV is mostly shallow sloping with steeper slopes confined to the banks of drainage ditches and isolated areas, as shown in ~~Plate~~Figure A9.~~1.42~~25 in Appendix D.

~~Plate A9.1.42: Slope within Work Area 1~~



~~212~~218 In areas where PV Arrays run parallel to a slope of 6 % or greater, active measures such as berms, stone filter drains (as shown in Plate A9.1.~~43~~20) and swales will be incorporated to slow the flow of surface water run-off as part of construction SuDS, which could be retained for the operational phase of the Development. Filter drains would measure 200 mm

[42] Introduction to Soil Science Laboratory Manual

width and 300 mm depth in the form of a linear scrape which is backfilled with clean, uncompacted Type 2 or 3 aggregate.

Plate A9.1.~~43~~20: Example filter drains at solar farms

A9.1.4 WORK AREA 5A: BESS SURFACE WATER MANAGEMENT

~~213~~219 This section outlines how the Development will be designed to meet the requirements of:

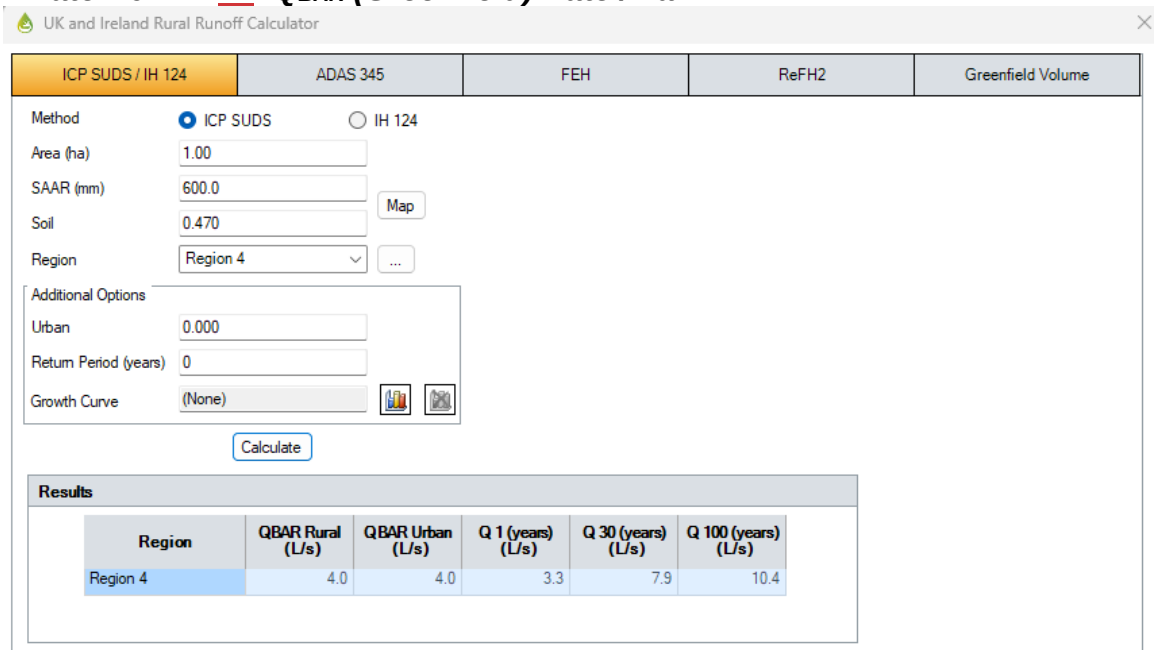
- National Planning Practice Guidance (2014) (as amended 2022);
- The revised NPPF (as amended 2024);
- The Environment Act (2021);
- Non-Statutory Technical Standards for Sustainable Drainage Systems (2015);
- Environment Agency (EA) - Rural Sustainable Drainage Systems (RSuDS)[43];
- EA - Pollution Prevention Guidelines (PPG) Controlled Burn: PPG28 (archived but still relevant);
- CIRIA - Containment systems for the prevention of pollution. Secondary, tertiary and other measures for industrial and commercial premises (C736);
- National Fire Chiefs Council (NFCC) – Grid Scale Battery Energy Storage System planning – Guidance for FRS;
- NFCC – Grid Scale Battery Energy Storage System planning – Guidance for FRS - July 2024 Draft Revision[44];
- NFPA 855 Standard for the Installation of Stationary Energy Storage Systems[45];
- Department for Business and Trade - UK Battery Strategy (2023)[46];
- Newark & Sherwood District Council Strategic Flood Risk Assessment Update (2016)[47]; and
- Nottinghamshire Local Flood Risk Management Strategy (LFRMS) 2021-2027[48].

~~214~~220 Runoff from the Site shall, in principle, replicate the quality and quantity of the runoff from the Site in its “greenfield” state, in so far as it is reasonable and practicable.

~~215~~221 The existing greenfield average annual flood (Q_{BAR}) runoff was calculated as 4 l/s/ha, using the Interim Code of Practice for Sustainable Drainage Systems (ICP SuDS) Mean Annual Flood and Institute of Hydrology (IoH) 124 methods using Info Drainage software, as shown in Plate A9.1.~~44.~~21

[43] https://assets.publishing.service.gov.uk/media/5a7b956b40f0b645ba3c541b/scho0612buwh-e-e.pdf
[44] https://nfcc.org.uk/consultation/draft-grid-scale-energy-storage-system-planning-guidance/
[45] https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=855
[46] https://www.gov.uk/government/publications/uk-battery-strategy
[47] https://www.newark-sherwooddc.gov.uk/sfraupdate/
[48] https://www.nottinghamshire.gov.uk/media/4346719/nottinghamshire-local-flood-risk-mangement-stategy-2021-27.pdf

Plate A9.1.~~44~~21: Q_{BAR} (Greenfield) Rate / ha



~~216~~222 A SuDS option which will utilise a piped network to drain the BESS Compound to lined / compacted clay layer detention basins is proposed as a way of attenuating the increase in surface water run-off rates at the Development, with a positive discharge to the existing drainage ditch network onsite.

~~217~~223 In the rare event of a battery unit fire the NFCC guidance recommends the ability to capture firewater and not have uncontained releases to the hydrological environment.

~~218~~224 Discharge will be throttled using a Hydro-Brake or similar flow restriction device.

~~219~~225 It will be the responsibility of the Development operator to maintain effective drainage measures and rectify drainage measures that are not functioning adequately. A nominated person will also have responsibility for reporting on the functionality of drainage measures. This is secured through the Outline Operational Environmental Management Plan (oOEMP, TA A5.5 [EN010162/APP/6.4.5.5]).

~~220~~226 Where areas remain positively drained through the lifetime of the Development, the SuDS measures serving these areas will be checked on a regular basis. Should drainage measures require dredging or unblocking, this will be undertaken as soon as practicable by a local contractor engaged by the management company.

A9.1.4.1 FIRE SUPPRESSION

A9.1.4.1.1 Procedure

~~221~~227 In the rare event of a battery fire, the procedure outlined in the Outline Fire Safety Management Plan (included in the ES as TA A5.4 [EN010162/APP/6.4.5.4]) will be followed.

222228 The Development operator will follow the accepted strategy of allowing a battery related fire to self-consume, reducing unnecessary risk of injury to site and firefighting personnel.

223229 Should a fire occur, the effected enclosure will be allowed to self-consume until the fire is extinguished through consumption of the combustible materials within the battery container / enclosure. The firefighting procedure will be to apply water for fire suppression to adjacent BESS enclosures as a way of reducing the temperature of the adjacent containers.

224230 As water will not be directly applied to affected BESS container, there is limited potential for suppression water to become contaminated.

A9.1.4.2 FIRE SUPPRESSANT VOLUME

225231 Based on recommendations in NFPA 855 Standard for the Installation of Stationary Energy Storage Systems and NFCC – Grid Scale Battery Energy Storage System planning – Guidance for FRS, a burn time of 2 hours and a requirement of 1,900 l/min of fire suppression water has been used to calculate the volume of fire suppressant water required to be stored onsite in the event of a container fire.

226232 This equates to 228 m^3 of storage.

227233 The SuDS structures serving each catchment of the BESS compound will be sized to accommodate the 1 % AEP + 40 % CC or 228 m^3, and this will be sufficient for storing the full fire suppressant volume.

228234 A penstock will be placed on the outlet of the SuDS structure and would be shut off in the event of a fire suppression event. It would remain closed until testing of the captured water has taken place. Water will then either be removed offsite by tankers to a licenced facility or discharged to the unnamed field drain (subject to agreement with the EA).

229235 There will also be a lined (clay or synthetic liner) holding basin available for spent firefighting water to be pumped to in the event of a battery fire during heavy rainfall. As such, the SuDS system will not reach capacity during such an event.

230236 It is recommended that the BESS Compound has a shallow bund or cut-off permitter drain to limit the potential for run-off to leave the Development and drain to the cellular storage.

A9.1.5 WORK AREA 5B: 400 KV SUBSTATION

231237 Surface water for Work Area 5b: Substations will also be managed in a similar manner to Work Area 5a: BESS, i.e. will have a drainage system designed to attenuate the 1 % AEP + 40 % CC.

232238 The SuDS system will discharge at greenfield rate to a watercourse / field drain, in accordance with the hierarchy of disposal options outline in the SuDS Manual.

A9.1.6 WORK AREA 4: SUBSTATIONS SURFACE WATER MANAGEMENT

~~233~~239 Surface water for Work Area 4: Substations will also be managed in a similar manner to Work Area 5a: BESS, i.e. will have a drainage system designed to attenuate the 1 % AEP + 40 % CC.

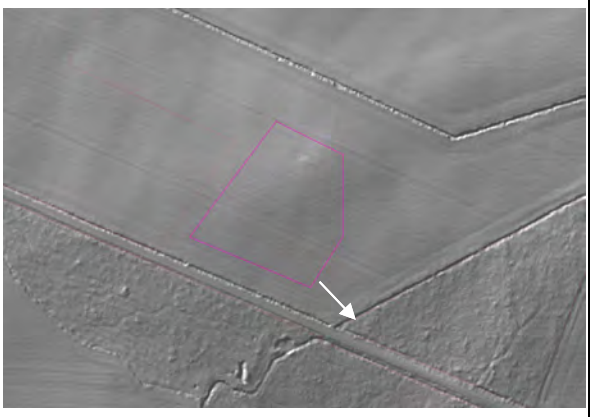
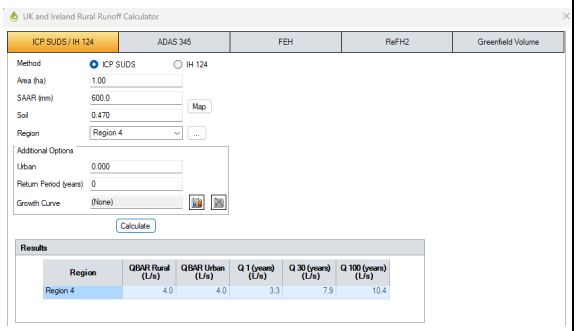
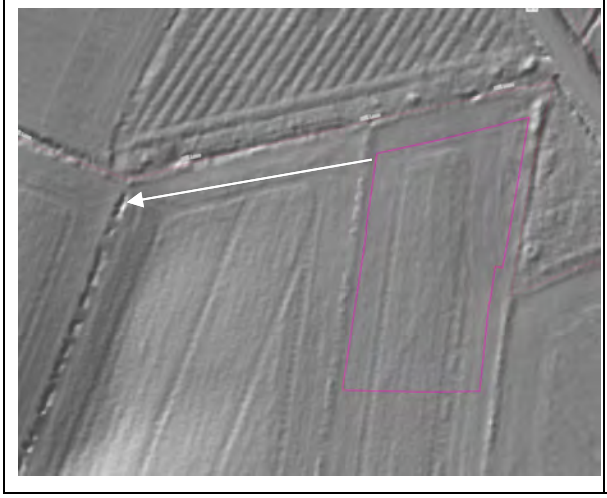
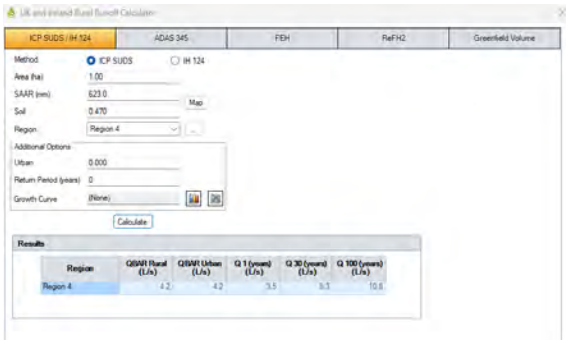
~~234~~240 Infiltration testing at each substation compound within Work Area 4 was undertaken in March to April 2025 and concluded that infiltration is not a viable disposal option due to the presence of clays and mudstone, which is essentially impermeable.

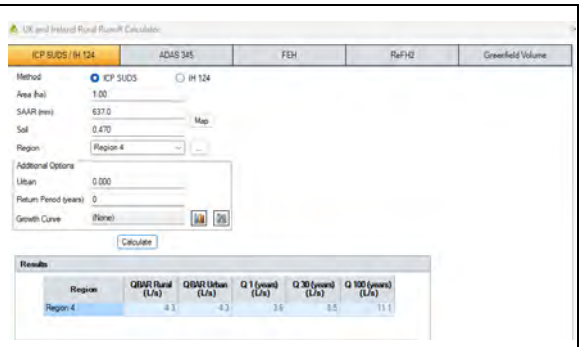
~~235~~241 Infiltration testing results are provided in Appendix B of this FRA.

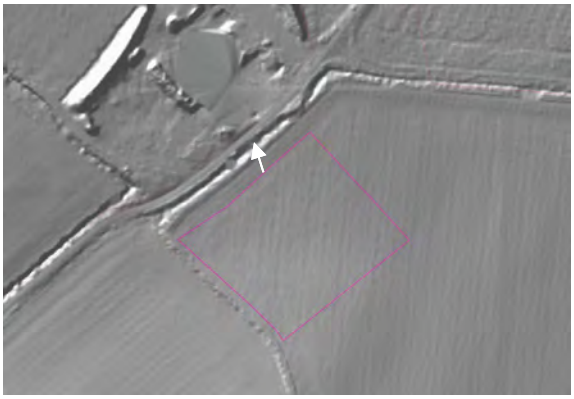
~~236~~242 The SuDS system will discharge at Q_{BAR} to a watercourse / field drain, in accordance with the hierarchy of disposal options outline in the SuDS Manual.

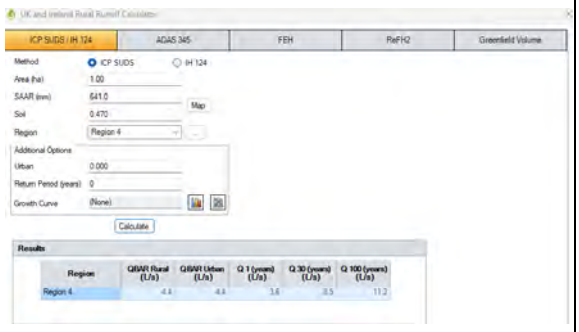
~~237~~243 Discharge rates per hectare (ha), derived from the IH124 method, and likely discharge destinations are provided in Table A9.1.6.

Table A9.1.6: Work Area 4 runoff destinations and rates

Work Area 4 Discharge Location	Rate (l/s/ha)
	
	


ICP SUDS / IH 124
ADAS 345
FEH
ReFH2
Greenfield Volume
Method
ICP SUDS
IH 124
Area (ha)
1.00
SAAR (mm)
637.0
Soil
0.470
Region
Region 4
Map
Additional Options
Urban
0.000
Return Period (years)
0
Growth Curve
(None)
Calculate
Results
Region
QBAR Rural (L/s)
QBAR Urban (L/s)
Q 1 (years) (L/s)
Q 30 (years) (L/s)
Q 100 (years) (L/s)
Region 4
4.3
4.3
3.6
8.5
11.1




ICP SUDS / IH 124
ADAS 345
FEH
ReFH2
Greenfield Volume
Method
ICP SUDS
IH 124
Area (ha)
1.00
SAAR (mm)
641.0
Soil
0.470
Region
Region 4
Map
Additional Options
Urban
0.000
Return Period (years)
0
Growth Curve
(None)
Calculate
Results
Region
QBAR Rural (L/s)
QBAR Urban (L/s)
Q 1 (years) (L/s)
Q 30 (years) (L/s)
Q 100 (years) (L/s)
Region 4
4.4
4.4
3.6
8.5
11.2

A9.1.7 CONCLUSIONS & RECOMMENDATIONS

~~238~~244 The Order Limits are mostly located in Flood Zone 1 (89.99 %).

~~239~~245 All new aboveground infrastructure within Work Areas 1, 4 and 5 are located in Flood Zone 1.

~~240~~246 Infrastructure within all Work Areas will be located outside the 2076 and 2098 0.5 % AEP River Trent tidal breach event.

~~241~~247 No built aspects in Work Area 1: Solar PV, Work Area 4: Substations, Work Area 5a: BESS or Work Area 5b: 400 kV substation are located within the extent of the 1 % AEP + 23 % CC (30 % CC used as a proxy) or 1 % AEP + 39 % CC events.

~~242~~248 Work Area 6: National Grid Staythorpe Substation is located within the 1 % AEP + 23 % CC extent (30 % CC used as proxy) and is modelled to flood to depths of less than 0.1 m (i.e. within the main platform area).

~~243~~249 Similarly, using the 39 % CC allowance as a sense check, Work Area 6 could flood to a nominal depth of less than 0.1 m (i.e. within the main platform area).

~~244~~250 The National Grid Staythorpe Substation has private hard (walls) and soft (embankments) defences to a level of 13.10 m AOD. As such, Work Area 6 is unlikely to be inundated during the 1 % AEP + 30 % CC and 39 % CC events, should the Development operate marginally into the 2080s epoch.

~~245~~251 Work Area 7 will utilise the existing infrastructure associated with the Staythorpe BESS (currently under construction). The Staythorpe BESS design included flood resilience measures and the critical aspects of the scheme are located outside the 1 % AEP + 30 % CC and 39 % CC extents. As such, connecting the Development in Work Area 7 to the existing 400 kV infrastructure will be within an area not modelled to flood during the 1 % AEP + 30 % CC and 39 % CC event.

~~246~~252 All electrically sensitive infrastructure associated with the Development will be located above the modelled depths for the 1 % AEP + climate change pluvial flood event.

~~247~~253 The extent of reservoir flooding (Wet Day scenario) which interacts with the Development largely follows the corridor of the River Trent and presents a residual risk to the Development.

~~248~~254 The Development is classified as Essential Infrastructure and is therefore compatible with Flood Zones 1, 2 and 3.

~~249~~255 Groundwater levels are likely to be variable across the CSA, and were struck at 1. 8 to 3 m BGL within Work Area 5a: BESS. BESS units will not be flush to the ground and will be elevated from the ground by approximately 300 mm. As such the Development will remain safe and operational should groundwater emerge at ground level.

~~250~~256 Surface water run off from Work Area 1: Solar PV will be managed through RSuDS techniques such as grassland / wildflower, which will act to bind soils, slow surface water and increase water quality compared to the baseline scenario. Where Solar PV in Work Area 1 is located on slopes of 6

% or greater, then additional measures to slow runoff, such as filter drains and berms, will be implemented.

~~251~~257 In respect of flood risk matters, the Development is compliant with the NPS EN-1, EN-3, EN-5, NPPF and local planning policy, including Core Policy 10 Climate Change of the Amended core strategy DPD.

APPENDIX A: EA CORRESPONDENCE

[redacted]
Via Email

Our Ref: EMD-331357

Previous Ref: EMD-307955

Date: 30 November 2023

Dear [redacted],

Enquiry regarding - Product 6- Missing data near Averham.

Thank you for your enquiry which was received on 24 October 2023.

We respond to requests under the Freedom of Information Act 2000 and Environmental Information Regulations 2004.

The JFLOW has been used to create flood zone 3 in this area, along with the older version of the River Greet model from 2008.

You can download the JFLOW model results using the link below and will need to look at grid square SK75:

Defra Data Services Platform

Please refer to Open Government Licence which explains the permitted use of this information.

Please get in touch if you have any further queries or contact us within two months if you'd like us to review the information we have sent.

Yours sincerely

[redacted]
Customers & Engagement Officer
East Midlands

For further information please contact the Customers & Engagement Team on 02084 747770

Direct e-mail:- EMDenquiries@environment-agency.gov.uk

[redacted]
Via Email

Our Ref: EMD-339002

Your Ref:

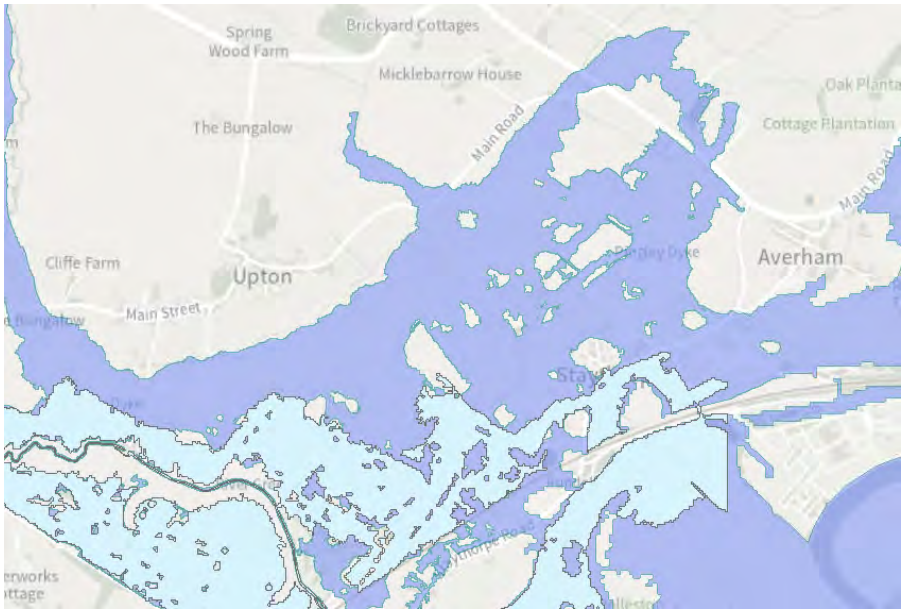
Date: 16 January 2024

Dear [redacted]

Enquiry regarding – flood data around Averham

Thank you for your enquiry which was received on 14 December 2023. Please see the response from our technical team below:

We are sorry that we cannot explain why Flood Zone 3 is of a lesser extent than the 2004 1 % AEP JFLOW outline to the north west of Averham. Flood Zone 3 in the wider area has utilised part of the River Greet 2008 model but this is of a smaller extent than the current Flood Zone 3 as shown below (Flood Zone 3 in darker blue and the 1% AEP 2008 River Greet model in lighter blue). The Flood Zone outline does not align to a modelled outline or recorded flood outline. The Flood Zones in this area were last updated in 2014 and unfortunately our records do not answer your question.



We will be updating our flood risk map products: Flood Zones (on Flood Map for Planning), Risk of Flooding from Rivers & Sea (RoFRS) and Risk of Flooding from Surface Water (RoFSW) in 2024/5 as part of the new National Flood Risk Assessment (NaFRA2). This should result in improvements to our mapping products, especially where we do not currently have any detailed local modelling. This may address the query you have with our flood risk products. Our new National Flood Risk Assessment

will bring many improvements to our flood risk information, including updated national modelling (which uses a better representation of topography and finer level of detail) as well as incorporating local detailed modelling where we have it. Therefore, we would advise waiting until after these are published to check our new flood risk information. In preparation for these changes, there is currently a pause on updates to these mapping products until NaFRA2 is released.

Our technical team are also happy to speak with you further on this matter, if you'd like to schedule a call.

We respond to requests under the Freedom of Information Act 2000 and Environmental Information Regulations 2004.

Please refer to Open Government Licence which explains the permitted use of this information.

Please get in touch if you have any further queries or contact us within two months if you'd like us to review the information we have sent.

Yours sincerely

[redacted]

Customers & Engagement Officer
East Midlands

For further information please contact the Customers & Engagement Team on 02084 747770

Direct e-mail:- EMDenquiries@environment-agency.gov.uk

APPENDIX B: INFILTRATION TESTING - Soakaway Testing 1: Land off Caunton Road

Environmental
Geotechnical
Specialists

SOAKAWAY
LETTER
REPORT

job number	C4946/25/E/7542
date	10.04.2025
site address	Land off Caunton Road, Newark, Nottinghamshire, NG22 0BH
written by	S. Hale
checked by	I. Sakoor
issued by	S. Hale

Please consider the environment before printing this report.

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Rogers Geotechnical Services Ltd
Offices 1 & 2 Barncliffe Business Park, Near Bank, Shelley, Huddersfield, HD8 8LU
01484 604354 Company No. 5130864

Contents

Appendices

Report on Soakaway Testing

Location:	Land off Caunton Road Newark, Nottinghamshire, NG22 0BH		
For:	Elements Green Trent Ltd		
Report No.	C4946/25/E/7542	Report Date:	May 2025

For and on behalf of **Rogers Geotechnical Services Ltd**

[redacted]	[redacted]
Steven Hale BSc FGS Geo-environmental Technician	**Imran Sakoor** BEng FGS Geo-environmental Engineer

Report Summary[1]

Item	Comments	Section
Geology	Superficial Geology – none. Solid Geology – Mercia Mudstone Group.	4.
Strata Conditions	Nominal thickness of topsoil overlaying clay representative	5.
Groundwater	No water strikes noted during investigation.	5.
Suitability of Soakaways	Not recommended.	7.

[1] This summary should not be relied upon to provide a comprehensive review. All of the information contained in this document should be considered.

1. Introduction

i. We thank you for your request to undertake percolation testing at the above-mentioned site and take pleasure in enclosing the results of this work. The investigation was undertaken on the 8th April 2025 in accordance with your instruction to proceed. The site is centred on grid reference 472060, 362046. This report describes the work undertaken, presents the data obtained and discusses the results of the tests

2. Limitations

ii. The recommendations made and opinions expressed in this report are based on the ground conditions revealed by the site works, together with an assessment of the site. Whilst opinions may be expressed relating to sub-soil conditions in parts of the site not investigated, for example between trial pit positions, these are for guidance only and no liability can be accepted for their accuracy.

iii. This report has been prepared in accordance with our understanding of current best practice. However, new information or legislation, or changes to best practice may necessitate revision of the report after the date of issue.

3. Fieldworks

iv. Three trial pits were excavated in order to undertake soakaway testing, the positions of which are shown in Appendix 1. The soakaway tests were undertaken at the base of the pit at depths rational to the construction of soakaways. The soils exposed in the trial pits were logged on site in general accordance with BS5930: 2015 +A1: 2020, and full descriptions are given on the trial pit records which are presented in Appendix 2. Photographs of the trial pits are included within Appendix 3.

v. Once excavations were completed, the trial pits were carefully re-instated with the arisings. Whilst every care was taken during the infilling process, including compacting of the infill at regular intervals with the arm of the excavator, it should be appreciated that some mounding of the surface may have resulted. Moreover, the infilled soils may be subjected to settlement over time, such that a depression in the surface may also occur. Therefore, the locations of any pits undertaken in this investigation should be conveyed to the current site user, as the mounds or depressions associated with the pits may present a risk to current site operations. Furthermore, it must be realised that the infilled pits represent an area of disturbance within the site soils, thus the soils at the pit locations may vary characteristically compared to the undisturbed ground.

4. Geology

vi. The available published geological data for the site has been examined and the following table presents the anticipated geology.

Table 1: Geological Data for the Site

Strata Type	Strata Name[2]	Previous Name[3]	Description[3]
Superficial Geology	-	-	None indicated beneath the site.
Solid Geology	Mercia Mudstone Group	Red Marl	Dominantly red, less commonly green-grey, mudstones and subordinate siltstones with thick halite-bearing units in some basinal areas.

5. Strata Conditions

vii. In accordance with the geology of the area, the succession has been shown to include the following:

Table 2: Generalised Strata Profile

Depth m below ground level to underside of layer	**Strata Type**	**Positions Layer Revealed**	**Groundwater Strikes** m below ground level
0.30 – 0.35	TOPSOIL (Soft, dark brown, slightly sandy, slightly gravelly, clayey SILT)	All	None
0.75 – +1.60	Firm, reddish brown, slightly gravelly, silty CLAY [WEATHERED MERCIA MUDSTONE GROUP]	All	None
+1.25	Firm, grey occasionally mottled reddish brown, very gravelly, silty CLAY. [WEATHERED MERCIA MUDSTONE GROUP]	SA01	None

'+' denotes that the strata extended below the termination depth of the investigated positions, thus the extent of the deposit is only proven to the depths indicated.

6. Insitu Testing

6.1 Soakaway Test

viii. On reaching the elected soakaway test depth, the pit was trimmed and squared as much as practicable. Water was then introduced into the pit at a controlled rate to prevent collapse of the sides and the level monitored at time intervals relative to a reference bar at ground level. The results obtained from the soakaway tests are presented at Appendix 4 and are summarised below:

[2] Sources: British Geological Survey (NERC) Map Sheets 113; Ollerton; Solid and Drift Edition, and Onshore Geoindex [*online resource from www.bgs.ac.uk*]
[3] Sources: British Geological Survey (NERC) Lexicon of Named Rock Units [*online resource from www.bgs.ac.uk*]

Table 3: Soakaway Test Results					
Location	**Soakage Area Dimensions (average) (m)**	**Depths of soaked strata (m)**	**Soil Description (of soaked strata)**	**Infiltration Rate (m/s)**	***Drainage Characteristics**
SA01	0.30 x 1.60	0.97 to 1.25	Side – Very gravelly, silty CLAY Base – Presumed MUDSTONE bedrock	-	Practically impermeable
SA02	0.30 x 1.60	0.91 to 1.60	Side – Slightly gravelly, silty CLAY Base – As above	-	Practically impermeable
SA03	0.30 x 1.70	0.99 to 1.60	Side – Slightly gravelly, silty CLAY Base – As above	-	Practically impermeable

ix. During the soakaway tests the water level did not achieve a fall from 75% to 25% of the effective depth of the storage volume in all three trial pits. In all tests, the water level did not move, as such, the tests could not be completed within the scope of the method provided in BRE Digest 365 due to the poor soakage rate of the exposed soils. Due to the negligible water movement it was not possbile to extrapolate the results obtained in order to obtain a soil infiltration rate.

7. Discussion

x. The soils encountered beneath the topsoil were found to be typical of the weathered fraction of the underlying Mercia Mudstone Group. The strata conditions and subsequent drainage characteristics appear to be comparable across the site. In this instance, the infiltration testing has revealed that the soils have practically impermeable drainage characteristics. Therefore, soakaways cannot be recommended at this site and an alternative form of drainage should be adopted.

8. References

- Building Research Establishment (BRE) Digest 365, *Soakaway Design*, September 1991.
- British Standards Institution (2015 +A1: 2020) BS 5930: *Code of practice for ground investigations*, B.S.I., London.
- Barnes, G. (2000). *Soil Mechanics Principle and Practice.* 2nd ed. London: Macmillan Press Ltd, p.47.

Appendix 1

Site Plan

Notes:

RGS Environmental Geotechnical Specialists

Rogers Geotechnical Services Ltd

Offices 1 & 2, Barncliffe Business Park,
Near Bank,
Shelley,
Huddersfield,
HD8 8LU

Telephone: 0843 50 66 87
www.rogersgeotech.co.uk

Client:

Elements Green Trust Ltd

Job Number:

C4946/25/E/7542

Project Details:

Land off Caunton Road, Newark, Nottinghamshire, NG23 6BA

Scale:	Not to scale - reference only

Appendix 2

Trial Pit Records

Trial Pit Log

Trialpit No **SA01**

Sheet 1 of 1

Project Name:	Land off Caunton Road	Project No. C4946/25/E/7542	Co-ords: - Level:	Date 08/04/2025
Location:	Newark, Nottinghamshire, NG23 6BA	Dimensions (m): Depth 1.25	1.6 × 0.3	Scale 1:25
Client:	Elements Green Trent Ltd			Logged SH

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.30			TOPSOIL (Soft, brown, slightly sandy, slightly gravelly, clayey SILT. Sand is fine to medium. Gravel is sub-angular to rounded and fine to coarse of various lithologies).
				0.75			Firm, reddish brown, slightly gravelly, silty CLAY. Gravel is tabular, sub-angular and fine to coarse of mudstone and siltstone. [WEATHERED MERCIA MUDSTONE GROUP]
				1.25			Firm, grey occasionally mottled reddish brown, very gravelly, silty CLAY. Gravel is tabular, sub-angular and fine to coarse of mudstone. [WEATHERED MERCIA MUDSTONE GROUP]
				1.26			Extremely weak, weathered, grey MUDSTONE recovered as gravel. [MERCIA MUDSTONE GROUP]
							End of pit at 1.25 m

Remarks: 1. Position scanned for services using CAT and Genny. 2. Trial pit refused on presumed bedrock.

Stability: Stable

Trial Pit Log

Trialpit No **SA02**

Sheet 1 of 1

Project Name:	Land off Caunton Road	Project No. C4946/25/E/7542	Co-ords: - Level:	Date 08/04/2025
Location:	Newark, Nottinghamshire, NG23 6BA	Dimensions (m): Depth 1.60	1.6 / 0.3	Scale 1:25
Client:	Elements Green Trent Ltd			Logged SH

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.35			TOPSOIL (Soft, brown, slightly sandy, slightly gravelly, clayey SILT. Sand is fine to medium. Gravel is sub-angular to rounded and fine to coarse of various lithologies).
							Firm, reddish brown, slightly gravelly, silty CLAY. Gravel is tabular, sub-angular and fine to coarse of mudstone and siltstone. [WEATHERED MERCIA MUDSTONE GROUP]
				1.60			End of pit at 1.60 m

Remarks: 1. Position scanned for services using CAT and Genny.

Stability: Stable

Trial Pit Log

Trialpit No **SA03**

Sheet 1 of 1

Project Name:	Land off Caunton Road	Project No. C4946/25/E/7542	Co-ords: - Level:	Date 08/04/2025
Location:	Newark, Nottinghamshire, NG23 6BA	Dimensions (m): Depth 1.60	1.7 × 0.3	Scale 1:25
Client:	Elements Green Trent Ltd			Logged SH

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.35			TOPSOIL (Soft, brown, slightly sandy, slightly gravelly, clayey SILT. Sand is fine to medium. Gravel is sub-angular to rounded and fine to coarse of various lithologies).
							Firm, reddish brown, slightly gravelly, silty CLAY. Gravel is tabular, sub-angular and fine to coarse of mudstone and siltstone. [WEATHERED MERCIA MUDSTONE GROUP]
				1.60			End of pit at 1.60 m

Remarks: 1. Position scanned for services using CAT and Genny.

Stability: Stable

Appendix 3

Trial Pit Photographs

Photo 1: SA01

Photo 2: SA01 backfilled

RGS Environmental Geotechnical Specialists

Site Name:

Land off Caunton Road

Job No:

C4946/25/E/7542

t. 0843 50 666 87
www.rogersgeotech.co.uk

Photo 1: SA02

Photo 2: SA02 backfilled

RGS Environmental Geotechnical Specialists

Site Name:

Land off Caunton Road

Job No:

C4946/25/E/7542

t. 0843 50 666 87
www.rogersgeotech.co.uk

Photo 1: SA03

Photo 2: SA03 backfilled

RGS Environmental Geotechnical Specialists

Site Name:

Land off Caunton Road

Job No:

C4946/25/E/7542

t. 0843 50 666 87
www.rogersgeotech.co.uk

Appendix 4

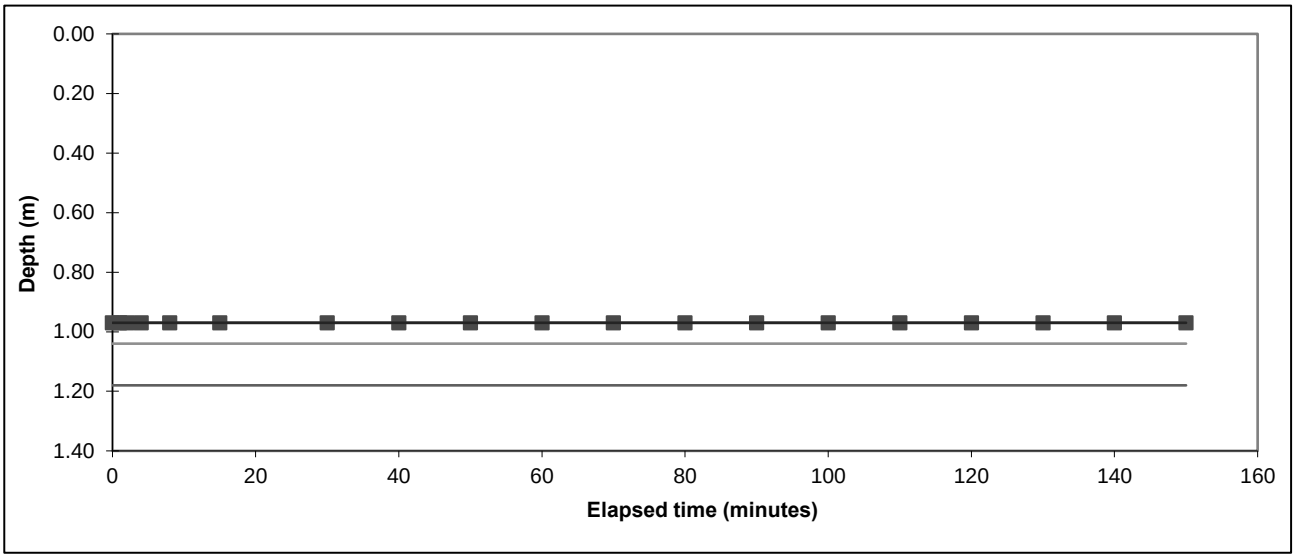
Soakaway Results

Rogers Geotechnical Services L

Soakaway Test

Trial Pit No:	SA01	Test No:	1	Date:	08.04.2025
Length (m):	1.600		Datum Height:	0.00	m agl
Width (m):	0.30		Granular infill:	None	
Depth (m):	1.25		Porosity of infill:	1	(assumed)

Elapsed time (minutes)	Water Depth (m below datum)	Elapsed time (minutes)	Water Depth (m below datum)
0	0.970	110	0.970
1	0.970	120	0.970
2	0.970	130	0.970
4	0.970	140	0.970
8	0.970	150	0.970
15	0.970		
30	0.970		
40	0.970		
50	0.970		
60	0.970		
70	0.970		
80	0.970		
90	0.970		
100	0.970		



Start water depth for analysis (mbgl):	0.97		
75% effective depth (mbgl):	1.04	Elapsed time (mins):	#N/A
50% effective depth (mbgl):	1.11		
25% effective depth (mbgl):	1.18	Elapsed time (mins):	#N/A
Base of soakage zone (mbgl):	1.25		
Volume outflow between 75% and 25% effective depth (m^3):			
Mean surface area of outflow (m^2):			1.01
(side area at 50% effective depth + base area)			
Time for outflow between 75% and 25% effective depth (mins):			

Soil infiltration rate (m/s):	**Test incomplete as 25% effective depth not achieved. Unable to reliably determine soil infiltration rate.**

Remarks	Results processed following BRE 365 (2007). Soil appears to be practically impermeable.

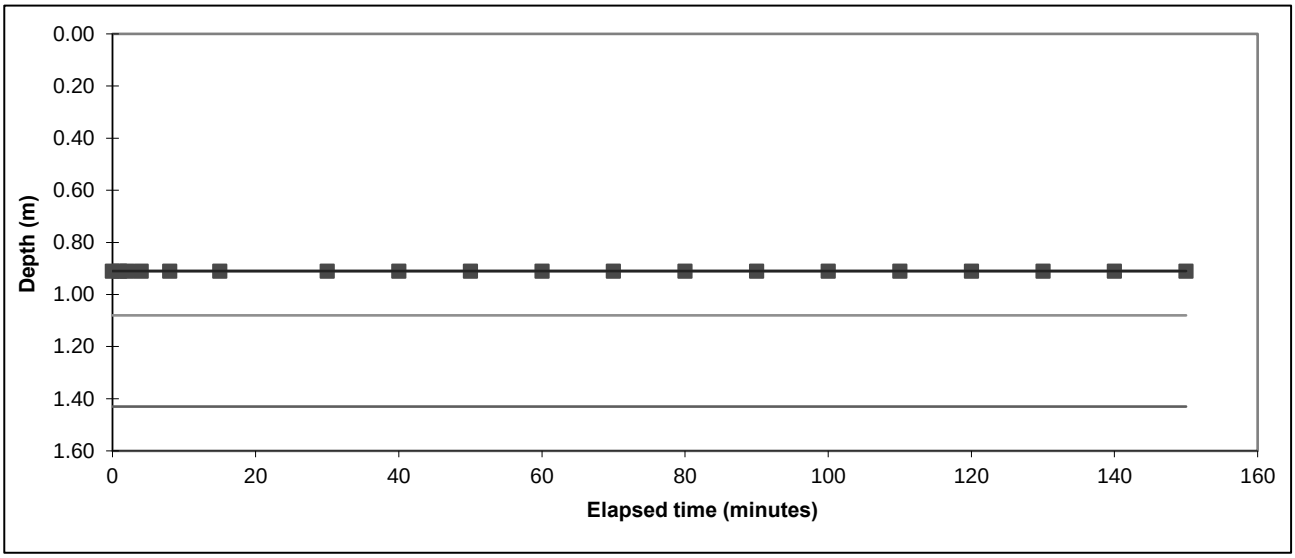
Client:	Elements Green Trent Ltd	**Job No:**
Site:	Land off Caunton Road, Kersall, Newark, Nottinghamshire, NG23 6BA	C4946/25/E/7542

Rogers Geotechnical Services L

Soakaway Test

Trial Pit No:	SA02	Test No:	1	Date:	08.04.2025
Length (m):	1.600		Datum Height:	0.00	m agl
Width (m):	0.30		Granular infill:	None	
Depth (m):	1.60		Porosity of infill:	1	(assumed)

Elapsed time (minutes)	Water Depth (m below datum)	Elapsed time (minutes)	Water Depth (m below datum)
0	0.910	110	0.910
1	0.910	120	0.910
2	0.910	130	0.910
4	0.910	140	0.910
8	0.910	150	0.910
15	0.910		
30	0.910		
40	0.910		
50	0.910		
60	0.910		
70	0.910		
80	0.910		
90	0.910		
100	0.910		



Start water depth for analysis (mbgl):	0.91		
75% effective depth (mbgl):	1.08	Elapsed time (mins):	#N/A
50% effective depth (mbgl):	1.26		
25% effective depth (mbgl):	1.43	Elapsed time (mins):	#N/A
Base of soakage zone (mbgl):	1.60		
Volume outflow between 75% and 25% effective depth (m^3):			
Mean surface area of outflow (m^2):			1.77
(side area at 50% effective depth + base area)			
Time for outflow between 75% and 25% effective depth (mins):			

Soil infiltration rate (m/s):	**Test incomplete as 25% effective depth not achieved. Unable to reliably determine soil infiltration rate.**

Remarks	Results processed following BRE 365 (2007). Soil appears to be practically impermeable.

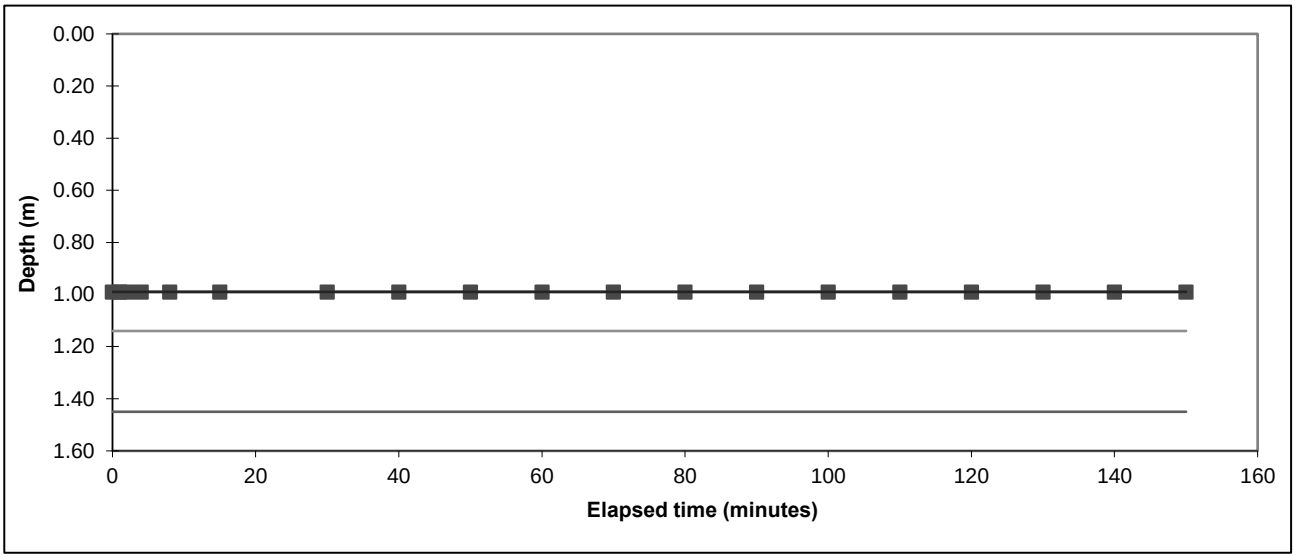
Client:	Elements Green Trent Ltd	**Job No:**
Site:	Land off Caunton Road, Kersall, Newark, Nottinghamshire, NG23 6BA	C4946/25/E/7542

Rogers Geotechnical Services L

Soakaway Test

Trial Pit No:	SA03	Test No:	1	Date:	08.04.2025
Length (m):	1.700		Datum Height:	0.00	m agl
Width (m):	0.30		Granular infill:	None	
Depth (m):	1.60		Porosity of infill:	1	(assumed)

Elapsed time (minutes)	Water Depth (m below datum)	Elapsed time (minutes)	Water Depth (m below datum)
0	0.990	110	0.990
1	0.990	120	0.990
2	0.990	130	0.990
4	0.990	140	0.990
8	0.990	150	0.990
15	0.990		
30	0.990		
40	0.990		
50	0.990		
60	0.990		
70	0.990		
80	0.990		
90	0.990		
100	0.990		



Start water depth for analysis (mbgl):	0.99		
75% effective depth (mbgl):	1.14	Elapsed time (mins):	#N/A
50% effective depth (mbgl):	1.30		
25% effective depth (mbgl):	1.45	Elapsed time (mins):	#N/A
Base of soakage zone (mbgl):	1.60		
Volume outflow between 75% and 25% effective depth (m^3):			
Mean surface area of outflow (m^2):			1.71
(side area at 50% effective depth + base area)			
Time for outflow between 75% and 25% effective depth (mins):			

Soil infiltration rate (m/s):	**Test incomplete as 25% effective depth not achieved. Unable to reliably determine soil infiltration rate.**

Remarks	Results processed following BRE 365 (2007). Soil appears to be practically impermeable.

Client:	Elements Green Trent Ltd	**Job No:**
Site:	Land off Caunton Road, Kersall, Newark, Nottinghamshire, NG23 6BA	C4946/25/E/7542

APPENDIX B: INFILTRATION TESTING - Soakaway Testing 2: Land Adjacent Ossington Lane

Environmental
Geotechnical
Specialists

RGS

SOAKAWAY
LETTER
REPORT

job number	C4947/25/E/7544
date	19.05.2025
site address	Land Adjacent Ossington Lane, Ossington Lane, Newark, Nottinghamshire, NG23 6NY
written by	S. Hale
checked by	R. Palmer
issued by	S. Hale

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<ENVIRONMENTAL><GEOTECHNICAL>

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Report on Soakaway Testing

Location:	Land Adjacent Ossington Lane Ossington Lane, Newark, Nottinghamshire, NG23 6NY
For:	Elements Green Trent Ltd
Report No.	C4947/25/E/7544 Report Date: May 2025

For and on behalf of **Rogers Geotechnical Services Ltd**

[redacted]	[redacted] H
Steven Hale BSc FGS Geo-environmental Technician	Engineering Director

Report Summary[1]

Item	Comments	Section
Geology	Superficial Geology – none. Solid Geology – Mercia Mudstone Group.	4.
Strata Conditions	Nominal thickness of topsoil overlaying clay representative of the weathered Mercia Mudstone	5.
Groundwater	No water strikes noted during investigation.	5.
Suitability of Soakaways	Not recommended.	7.

[1] This summary should not be relied upon to provide a comprehensive review. All of the information contained in this document should be considered.

1. Introduction

i. We thank you for your request to undertake percolation testing at the above-mentioned site and take pleasure in enclosing the results of this work. The investigation was undertaken on the 28th April 2025 in accordance with your instruction to proceed. The site is centred on grid reference 477350, 364723. This report describes the work undertaken, presents the data obtained and discusses the results of the tests.

2. Limitations

ii. The recommendations made and opinions expressed in this report are based on the ground conditions revealed by the site works, together with an assessment of the site. Whilst opinions may be expressed relating to sub-soil conditions in parts of the site not investigated, for example between trial pit positions, these are for guidance only and no liability can be accepted for their accuracy.

iii. This report has been prepared in accordance with our understanding of current best practice. However, new information or legislation, or changes to best practice may necessitate revision of the report after the date of issue.

3. Fieldworks

iv. Three trial pits were excavated in order to undertake soakaway testing, the positions of which are shown in Appendix 1. The soakaway tests were undertaken at the base of the pit at depths rational to the construction of soakaways. The soils exposed in the trial pits were logged on site in general accordance with BS5930: 2015 +A1: 2020, and full descriptions are given on the trial pit records which are presented in Appendix 2. Photographs of the trial pits are included within Appendix 3.

v. Once excavations were completed, the trial pits were carefully re-instated with the arisings. Whilst every care was taken during the infilling process, including compacting of the infill at regular intervals with the arm of the excavator, it should be appreciated that some mounding of the surface may have resulted. Moreover, the infilled soils may be subjected to settlement over time, such that a depression in the surface may also occur. Therefore, the locations of any pits undertaken in this investigation should be conveyed to the current site user, as the mounds or depressions associated with the pits may present a risk to current site operations. Furthermore, it must be realised that the infilled pits represent an area of disturbance within the site soils, thus the soils at the pit locations may vary characteristically compared to the undisturbed ground.

4. Geology

vi. The available published geological data for the site has been examined and the following table presents the anticipated geology.

Table 1: Geological Data for the Site

Strata Type	Strata Name[2]	Previous Name[3]	Description[3]
Superficial Geology	-	-	None indicated beneath the site.
Solid Geology	Mercia Mudstone Group	Red Marl	Dominantly red, less commonly green-grey, mudstones and subordinate siltstones with thick halite-bearing units in some basinal areas.

5. Strata Conditions

vii. In accordance with the geology of the area, the succession has been shown to include the following:

Table 2: Generalised Strata Profile

Depth m below ground level to underside of layer	**Strata Type**	**Positions Layer Revealed**	**Groundwater Strikes** m below ground level
0.25 – 0.30	TOPSOIL (Soft, dark brown, sandy, slightly gravelly, silty CLAY)	All	None
+1.60 – +1.65	Firm, reddish brown, slightly sandy, slightly gravelly, silty CLAY. [WEATHERED MERCIA MUDSTONE GROUP]	All	None

'+' denotes that the strata extended below the termination depth of the investigated positions, thus the extent of the deposit is only proven to the depths indicated.

6. Insitu Testing

6.1 Soakaway Test

viii. On reaching the elected soakaway test depth, the pit was trimmed and squared as much as practicable. Water was then introduced into the pit at a controlled rate to prevent collapse of the sides and the level monitored at time intervals relative to a reference bar at ground level. The results obtained from the soakaway tests are presented at Appendix 4 and are summarised below:

[2] Sources: British Geological Survey (NERC) Map Sheets 113; Ollerton; Solid and Drift Edition, and Onshore Geoindex [*online resource from www.bgs.ac.uk*]
[3] Sources: British Geological Survey (NERC) Lexicon of Named Rock Units [*online resource from www.bgs.ac.uk*]

Table 3: Soakaway Test Results					
Location	**Soakage Area Dimensions (average) (m)**	**Depths of soaked strata (m)**	**Soil Description (of soaked strata)**	**Infiltration Rate (m/s)**	***Drainage Characteristics**
SA01	0.30 x 1.60	1.01 to 1.60	Side – Slightly sandy, slightly gravelly, silty CLAY Base – As above	-	Practically impermeable
SA02	0.30 x 1.55	0.92 to 1.60	Side – Slightly sandy, slightly gravelly, silty CLAY Base – As above	-	Practically impermeable
SA03	0.30 x 1.55	0.99 to 1.65	Side – Slightly sandy, slightly gravelly, silty CLAY Base – As above	-	Practically impermeable

ix. During the soakaway tests the water level did not achieve a fall from 75% to 25% of the effective depth of the storage volume in all three trial pits. In all tests, the water level did not move, as such, the tests could not be completed within the scope of the method provided in BRE Digest 365 due to the poor soakage rate of the exposed soils. Due to the negligible water movement it was not possbile to extrapolate the results obtained in order to obtain a soil infiltration rate.

7. Discussion

x. The soils encountered beneath the topsoil were found to be typical of the weathered fraction of the underlying Mercia Mudstone Group. The strata conditions and subsequent drainage characteristics appear to be comparable across the site. In this instance, the infiltration testing has revealed that the soils have practically impermeable drainage characteristics. Therefore, soakaways cannot be recommended at this site and an alternative form of drainage should be adopted.

8. References

- Building Research Establishment (BRE) Digest 365, *Soakaway Design*, September 1991.
- British Standards Institution (2015 +A1: 2020) BS 5930: *Code of practice for ground investigations*, B.S.I., London.
- Barnes, G. (2000). *Soil Mechanics Principle and Practice.* 2nd ed. London: Macmillan Press Ltd, p.47.

Appendix 1

Site Plan

Notes:

RGS Environmental Geotechnical Specialists

Rogers Geotechnical Services Ltd

Offices 1 & 2, Barncliffe Business Park,
Near Bank,
Shelley,
Huddersfield,
HD8 8LU

Telephone: 0843 50 66 87
www.rogersgeotech.co.uk

Client:

Elements Green Trust Ltd

Job Number:

C4946/25/E/7542

Project Details:

Land off Caunton Road, Newark, Nottinghamshire, NG23 6BA

Scale:	Not to scale - reference only

Appendix 2

Trial Pit Records

Trial Pit Log

Trialpit No **SA01**

Sheet 1 of 1

Project Name:	Land off Caunton Road	Project No. C4946/25/E/7542	Co-ords: - Level:	Date 08/04/2025
Location:	Newark, Nottinghamshire, NG23 6BA	Dimensions (m): Depth 1.25	1.6 × 0.3	Scale 1:25
Client:	Elements Green Trent Ltd			Logged SH

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.30			TOPSOIL (Soft, brown, slightly sandy, slightly gravelly, clayey SILT. Sand is fine to medium. Gravel is sub-angular to rounded and fine to coarse of various lithologies).
				0.75			Firm, reddish brown, slightly gravelly, silty CLAY. Gravel is tabular, sub-angular and fine to coarse of mudstone and siltstone. [WEATHERED MERCIA MUDSTONE GROUP]
				1.25			Firm, grey occasionally mottled reddish brown, very gravelly, silty CLAY. Gravel is tabular, sub-angular and fine to coarse of mudstone. [WEATHERED MERCIA MUDSTONE GROUP]
				1.26			Extremely weak, weathered, grey MUDSTONE recovered as gravel. [MERCIA MUDSTONE GROUP]
							End of pit at 1.25 m

Remarks: 1. Position scanned for services using CAT and Genny. 2. Trial pit refused on presumed bedrock.

Stability: Stable

Trial Pit Log

Trialpit No **SA02**

Sheet 1 of 1

Project Name:	Land off Caunton Road	Project No. C4946/25/E/7542	Co-ords: - Level:	Date 08/04/2025
Location:	Newark, Nottinghamshire, NG23 6BA	Dimensions (m): Depth 1.60	1.6 / 0.3	Scale 1:25
Client:	Elements Green Trent Ltd			Logged SH

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.35			TOPSOIL (Soft, brown, slightly sandy, slightly gravelly, clayey SILT. Sand is fine to medium. Gravel is sub-angular to rounded and fine to coarse of various lithologies).
							Firm, reddish brown, slightly gravelly, silty CLAY. Gravel is tabular, sub-angular and fine to coarse of mudstone and siltstone. [WEATHERED MERCIA MUDSTONE GROUP]
				1.60			End of pit at 1.60 m

Remarks: 1. Position scanned for services using CAT and Genny.

Stability: Stable

Trial Pit Log

Trialpit No **SA03**

Sheet 1 of 1

Project Name:	Land off Caunton Road	Project No. C4946/25/E/7542	Co-ords: - Level:	Date 08/04/2025
Location:	Newark, Nottinghamshire, NG23 6BA	Dimensions (m): Depth 1.60	1.7 × 0.3	Scale 1:25
Client:	Elements Green Trent Ltd			Logged SH

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.35			TOPSOIL (Soft, brown, slightly sandy, slightly gravelly, clayey SILT. Sand is fine to medium. Gravel is sub-angular to rounded and fine to coarse of various lithologies).
							Firm, reddish brown, slightly gravelly, silty CLAY. Gravel is tabular, sub-angular and fine to coarse of mudstone and siltstone. [WEATHERED MERCIA MUDSTONE GROUP]
				1.60			End of pit at 1.60 m

Remarks: 1. Position scanned for services using CAT and Genny.

Stability: Stable

Appendix 3

Trial Pit Photographs

Photo 1: SA01

Photo 2: SA01 backfilled

RGS Environmental Geotechnical Specialists

Site Name:

Land off Caunton Road

Job No:

C4946/25/E/7542

t. 0843 50 666 87
www.rogersgeotech.co.uk

Photo 1: SA02

Photo 2: SA02 backfilled

RGS Environmental Geotechnical Specialists

Site Name:

Land off Caunton Road

Job No:

C4946/25/E/7542

t. 0843 50 666 87
www.rogersgeotech.co.uk

Photo 1: SA03

Photo 2: SA03 backfilled

RGS Environmental Geotechnical Specialists

Site Name:

Land off Caunton Road

Job No:

C4946/25/E/7542

t. 0843 50 666 87
www.rogersgeotech.co.uk

Appendix 4

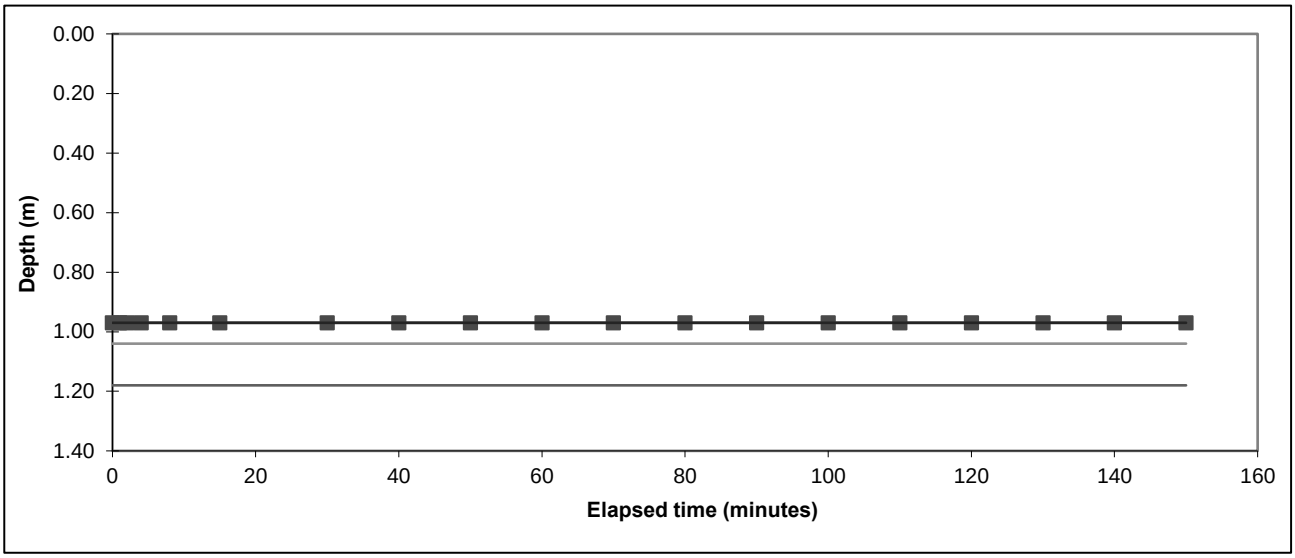
Soakaway Results

Rogers Geotechnical Services L

Soakaway Test

Trial Pit No:	SA01	Test No:	1	Date:	08.04.2025
Length (m):	1.600		Datum Height:	0.00	m agl
Width (m):	0.30		Granular infill:	None	
Depth (m):	1.25		Porosity of infill:	1	(assumed)

Elapsed time (minutes)	Water Depth (m below datum)	Elapsed time (minutes)	Water Depth (m below datum)
0	0.970	110	0.970
1	0.970	120	0.970
2	0.970	130	0.970
4	0.970	140	0.970
8	0.970	150	0.970
15	0.970		
30	0.970		
40	0.970		
50	0.970		
60	0.970		
70	0.970		
80	0.970		
90	0.970		
100	0.970		



Start water depth for analysis (mbgl):	0.97		
75% effective depth (mbgl):	1.04	Elapsed time (mins):	#N/A
50% effective depth (mbgl):	1.11		
25% effective depth (mbgl):	1.18	Elapsed time (mins):	#N/A
Base of soakage zone (mbgl):	1.25		
Volume outflow between 75% and 25% effective depth (m^3):			
Mean surface area of outflow (m^2):			1.01
(side area at 50% effective depth + base area)			
Time for outflow between 75% and 25% effective depth (mins):			

Soil infiltration rate (m/s):	**Test incomplete as 25% effective depth not achieved. Unable to reliably determine soil infiltration rate.**

Remarks	Results processed following BRE 365 (2007). Soil appears to be practically impermeable.

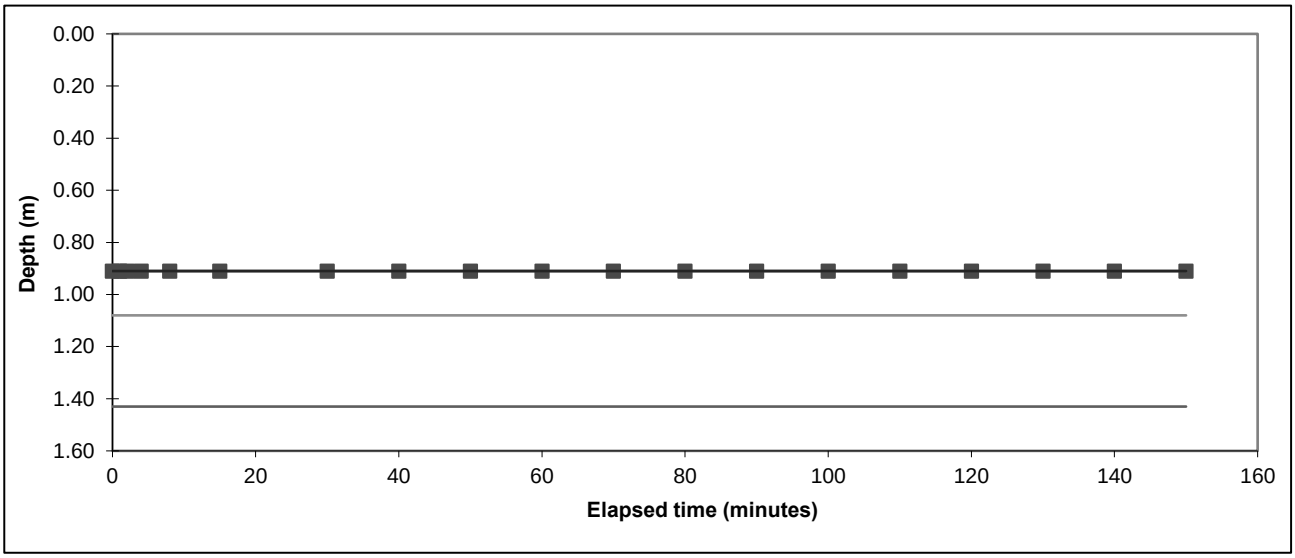
Client:	Elements Green Trent Ltd	**Job No:**
Site:	Land off Caunton Road, Kersall, Newark, Nottinghamshire, NG23 6BA	C4946/25/E/7542

Rogers Geotechnical Services L

Soakaway Test

Trial Pit No:	SA02	Test No:	1	Date:	08.04.2025
Length (m):	1.600		Datum Height:	0.00	m agl
Width (m):	0.30		Granular infill:	None	
Depth (m):	1.60		Porosity of infill:	1	(assumed)

Elapsed time (minutes)	Water Depth (m below datum)	Elapsed time (minutes)	Water Depth (m below datum)
0	0.910	110	0.910
1	0.910	120	0.910
2	0.910	130	0.910
4	0.910	140	0.910
8	0.910	150	0.910
15	0.910		
30	0.910		
40	0.910		
50	0.910		
60	0.910		
70	0.910		
80	0.910		
90	0.910		
100	0.910		



Start water depth for analysis (mbgl):	0.91		
75% effective depth (mbgl):	1.08	Elapsed time (mins):	#N/A
50% effective depth (mbgl):	1.26		
25% effective depth (mbgl):	1.43	Elapsed time (mins):	#N/A
Base of soakage zone (mbgl):	1.60		
Volume outflow between 75% and 25% effective depth (m^3):			
Mean surface area of outflow (m^2):			1.77
(side area at 50% effective depth + base area)			
Time for outflow between 75% and 25% effective depth (mins):			

Soil infiltration rate (m/s):	**Test incomplete as 25% effective depth not achieved. Unable to reliably determine soil infiltration rate.**

Remarks	Results processed following BRE 365 (2007). Soil appears to be practically impermeable.

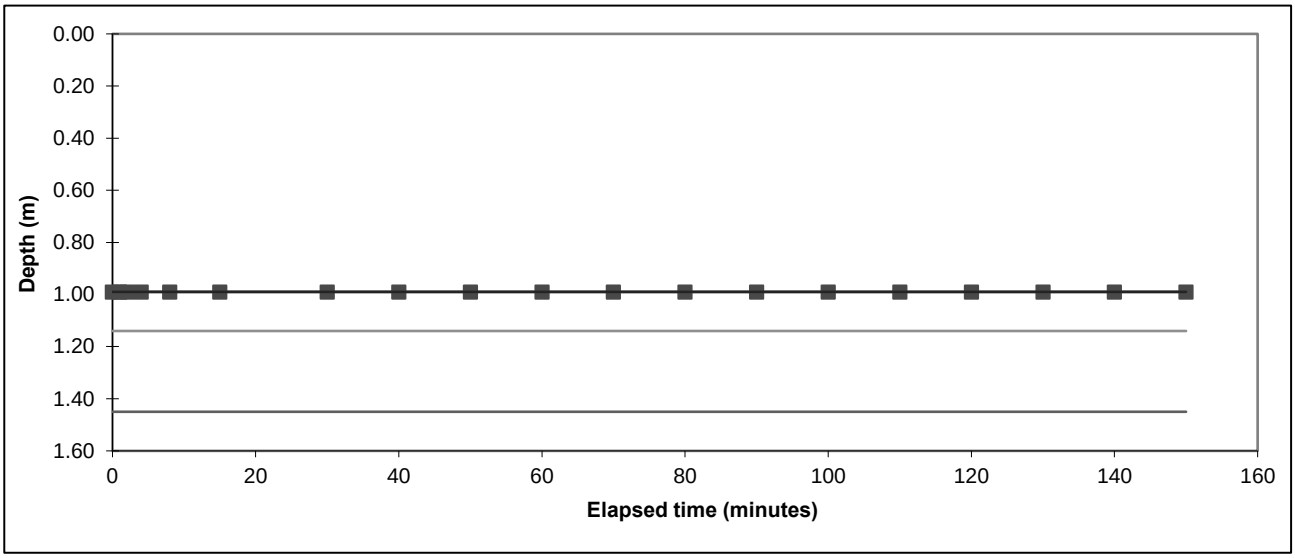
Client:	Elements Green Trent Ltd	**Job No:**
Site:	Land off Caunton Road, Kersall, Newark, Nottinghamshire, NG23 6BA	C4946/25/E/7542

Rogers Geotechnical Services L

Soakaway Test

Trial Pit No:	SA03	Test No:	1	Date:	08.04.2025
Length (m):	1.700		Datum Height:	0.00	m agl
Width (m):	0.30		Granular infill:	None	
Depth (m):	1.60		Porosity of infill:	1	(assumed)

Elapsed time (minutes)	Water Depth (m below datum)	Elapsed time (minutes)	Water Depth (m below datum)
0	0.990	110	0.990
1	0.990	120	0.990
2	0.990	130	0.990
4	0.990	140	0.990
8	0.990	150	0.990
15	0.990		
30	0.990		
40	0.990		
50	0.990		
60	0.990		
70	0.990		
80	0.990		
90	0.990		
100	0.990		



Start water depth for analysis (mbgl):	0.99		
75% effective depth (mbgl):	1.14	Elapsed time (mins):	#N/A
50% effective depth (mbgl):	1.30		
25% effective depth (mbgl):	1.45	Elapsed time (mins):	#N/A
Base of soakage zone (mbgl):	1.60		
Volume outflow between 75% and 25% effective depth (m^3):			
Mean surface area of outflow (m^2):			1.71
(side area at 50% effective depth + base area)			
Time for outflow between 75% and 25% effective depth (mins):			

Soil infiltration rate (m/s):	**Test incomplete as 25% effective depth not achieved. Unable to reliably determine soil infiltration rate.**

Remarks	Results processed following BRE 365 (2007). Soil appears to be practically impermeable.

Client:	Elements Green Trent Ltd	**Job No:**
Site:	Land off Caunton Road, Kersall, Newark, Nottinghamshire, NG23 6BA	C4946/25/E/7542

APPENDIX B: INFILTRATION TESTING - Soakaway Testing 3: Land at Maplebeck Road

Environmental
Geotechnical
Specialists

RGS

SOAKAWAY
LETTER
REPORT

job number	C4948/25E/75
date	19.05.2025
site address	Land at Maplebeck Road, Maplebeck, Newark, Nottinghamshire, NG22 0BS
written by	S. Hale
checked by	R. Palmer
issued by	S. Hale

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Report on Soakaway Testing

Location:	Land at Maplebeck Road Maplebeck, Newark, Nottinghamshire, NG22 0BS		
For:	Elements Green Trent Ltd		
Report No.	C4948/25/E/7546	Report Date:	May 2025

For and on behalf of **Rogers Geotechnical Services Ltd**

[redacted]
Steven Hale BSc FGS
Geo-environmental Technician

[redacted]
Rob Palmer MSc FGS ACIEH
Engineering Director

Report Summary[1]

Item	Comments	Section
Geology	Solid Geology – Mercia Mudstone Group.	4.
Strata Conditions	Significant thickness of cohesive and granular made ground overlying silty clay (weathered fraction of the underlying rock).	5.
Groundwater	No water strikes noted during investigation.	5.
Suitability of Soakaways	Not recommended.	7.

[1] This summary should not be relied upon to provide a comprehensive review. All of the information contained in this document should be considered.

1. Introduction

i. We thank you for your request to undertake percolation testing at the above-mentioned site and take pleasure in enclosing the results of this work. The investigation was undertaken on the 26th March 2025 in accordance with your instruction to proceed. The site is centred on grid reference 471807, 359946. This report describes the work undertaken, presents the data obtained and discusses the results of the tests.

2. Limitations

ii. The recommendations made and opinions expressed in this report are based on the ground conditions revealed by the site works, together with an assessment of the site. Whilst opinions may be expressed relating to sub-soil conditions in parts of the site not investigated, for example between trial pit positions, these are for guidance only and no liability can be accepted for their accuracy.

iii. This report has been prepared in accordance with our understanding of current best practice. However, new information or legislation, or changes to best practice may necessitate revision of the report after the date of issue.

3. Fieldworks

iv. Three trial pits were excavated in order to undertake soakaway testing, the positions of which are shown in Appendix 1. The soakaway tests were undertaken at the base of the pit at depths rational to the construction of soakaways. The soils exposed in the trial pits were logged on site in general accordance with BS5930: 2015 +A1: 2020, and full descriptions are given on the trial pit records which are presented in Appendix 2. Photographs of the trial pits are included within Appendix 3.

v. Once excavations were completed, the trial pits were carefully re-instated with the arisings. Whilst every care was taken during the infilling process, including compacting of the infill at regular intervals with the arm of the excavator, it should be appreciated that some mounding of the surface may have resulted. Moreover, the infilled soils may be subjected to settlement over time, such that a depression in the surface may also occur. Therefore, the locations of any pits undertaken in this investigation should be conveyed to the current site user, as the mounds or depressions associated with the pits may present a risk to current site operations. Furthermore, it must be realised that the infilled pits represent an area of disturbance within the site soils, thus the soils at the pit locations may vary characteristically compared to the undisturbed ground.

4. Geology

vi. The available published geological data for the site has been examined and the following table presents the anticipated geology.

Table 1: Geological Data for the Site

Strata Type	Strata Name[2]	Previous Name[3]	Description[3]
Superficial Geology	-	-	None indicated beneath the site.
Solid Geology	Mercia Mudstone Group	Red Marl	Dominantly red, less commonly green-grey, mudstones and subordinate siltstones with thick halite-bearing units in some basinal areas.

5. Strata Conditions

vii. In accordance with the geology of the area, the succession has been shown to include the following:

Table 2: Generalised Strata Profile

Depth m below ground level to underside of layer	**Strata Type**	**Positions Layer Revealed**	**Groundwater Strikes** m below ground level
0.25 – 0.30	TOPSOIL (Soft, dark brown, slightly sandy, slightly gravelly, silty CLAY)	All	None
+1.50	Firm, reddish brown mottled greenish, slightly gravelly, silty CLAY [WEATHERED MERCIA MUDSTONE GROUP]	SA01	None
0.70	Firm, greenish grey mottled reddish brown, gravelly, silty CLAY [WEATHERED MERCIA MUDSTONE GROUP]	SA02	None
+1.30 – +1.40	Firm to stiff, reddish brown, slightly gravelly, silty CLAY [WEATHERED MERCIA MUDSTONE GROUP]	SA02 & SA03	None

'+' denotes that the strata extended below the termination depth of the investigated positions, thus the extent of the deposit is only proven to the depths indicated.

6. Insitu Testing

6.1 Soakaway Test

viii. On reaching the elected soakaway test depth, the pit was trimmed and squared as much as practicable. Water was then I ntroduced into the pit at a controlled rate to prevent collapse of the sides and the level monitored at time intervals relative to a

[2] Sources: British Geological Survey (NERC) Map Sheets 113; Ollerton; Solid and Drift Edition, and Onshore Geoindex [*online resource from www.bgs.ac.uk*]
[3] Sources: British Geological Survey (NERC) Lexicon of Named Rock Units [*online resource from www.bgs.ac.uk*]

reference bar at ground level. The results obtained from the soakaway tests are presented at Appendix 4 and are summarised below:

Table 3: Soakaway Test Results

Location	Soakage Area Dimensions (average) (m)	Depths of soaked strata (m)	Soil Description (of soaked strata)	Infiltration Rate (m/sec)	*Drainage Characteristics
SA01	0.30 x 1.30	0.94 to 1.50	Side – Slightly gravelly, silty CLAY Base – As above	-	Practically impermeable
SA02	0.30 x 1.00	0.86 to 1.30	Side – Slightly gravelly, silty CLAY Base – As above	-	Practically impermeable
SA03	0.30 x 1.20	0.94 to 1.40	Side – Slightly gravelly, silty CLAY Base – As above	-	Practically impermeable

*Based on the most onerous results for each test.

ix. During the soakaway tests the water level did not achieve a fall from 75% to 25% of the effective depth of the storage volume in all three trial pits. In all tests, the water level either did not move or moved at a negligible rate. It is considered that the initial movement was observed as water filled any gaps and fissures within the ground at the sides of the pits. On this basis, the tests could not be completed within the scope of the method provided in BRE Digest 365 due to the poor soakage rate of the exposed soils. Due to the negligible water movement it was not possbile to extrapolate the results obtained in order to obtain a soil infiltration rate.

7. Discussion

x. The soils encountered beneath the topsoil were found to be typical of the weathered fraction of the underlying Mercia Mudstone Group. The strata conditions and subsequent drainage characteristics appear to be comparable across the site. In this instance, the infiltration testing has revealed that the soils have practically impermeable drainage characteristics. Therefore, soakaways cannot be recommended at this site and an alternative form of drainage should be adopted.

8. References

- Building Research Establishment (BRE) Digest 365, *Soakaway Design*, September 1991.
- British Standards Institution (2015 +A1: 2020) BS 5930: *Code of practice for ground investigations*, B.S.I., London.
- Barnes, G. (2000). *Soil Mechanics Principle and Practice.* 2nd ed. London: Macmillan Press Ltd, p.47.

Appendix 1

Site Plan

Notes:

RGS Environmental Geotechnical Specialists

Rogers Geotechnical Services Ltd

Offices 1 & 2, Barncliffe
Business Park,
Near Bank,
Shelley,
Huddersfield,
HD8 8LU

Telephone: 0843 50 66 87
www.rogersgeotech.co.uk

Client:

Elements Green Trent Ltd

Job Number:

C4948/25/E/7545

Project Details:

Land at Maplebeck Road, Newark

Scale:	Not to scale - reference only

Appendix 2

Trial Pit Records

Trial Pit Log

Trialpit No **SA01**

Sheet 1 of 1

Project Name:	Land at Maplebeck Road	Project No. C4948/25/E/7545	Co-ords: - Level:	Date 26/03/2025
Location:	Maplebeck Road, Maplebeck, Nottinghamshire, NG22 0BS	Dimensions (m): Depth 1.50	1.3 × 0.3	Scale 1:25
Client:	Elements Green Trent Ltd			Logged SH

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.25			TOPSOIL (Soft, dark brown, slightly sandy, slightly gravelly, silty CLAY. Sand is fine to medium. Gravel is sub-angular to sub-rounded and fine to coarse mudstone and siltstone).
							Firm, reddish brown mottled greenish grey, slightly gravelly, silty CLAY. Gravel is sub-angular and fine to medium mudstone. [WEATHERED MERCIA MUDSTONE GROUP]
				1.50			End of pit at 1.50 m

1 2 3 4 5

Remarks: 1. Position cleared of services using CAT and Genny.

Stability: Stable

Trial Pit Log

Trialpit No **SA02**

Sheet 1 of 1

Project Name:	Land at Maplebeck Road	Project No. C4948/25/E/7545	Co-ords: - Level:	Date 26/03/2025
Location:	Maplebeck Road, Maplebeck, Nottinghamshire, NG22 0BS		Dimensions (m): Depth 1.30 — 1 × 0.3	Scale 1:25
Client:	Elements Green Trent Ltd			Logged SH

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.30			TOPSOIL (Soft, dark brown, slightly sandy, slightly gravelly, silty CLAY. Sand is fine to medium. Gravel is sub-angular to sub-rounded and fine to coarse mudstone and siltstone).
				0.70			Firm, greenish grey mottled reddish brown, gravelly, silty CLAY. Gravel is sub-angular and fine to coarse mudstone. [WEATHERED MERCIA MUDSTONE GROUP]
				1.30			Stiff, reddish brown, slightly gravelly, silty CLAY. Gravel is sub-angular and fine to medium of mudstone. [WEATHERED MERCIA MUDSTOEN GROUP]
							End of pit at 1.30 m

Remarks: 1. Position cleared of services using CAT and Genny.

Stability: Stable

Trial Pit Log

Trialpit No **SA03**

Sheet 1 of 1

Project Name:	Land at Maplebeck Road	Project No. C4948/25/E/7545	Co-ords: - Level:	Date 26/03/2025
Location:	Maplebeck Road, Maplebeck, Nottinghamshire, NG22 0BS	Dimensions (m): Depth 1.40	1.2 × 0.3	Scale 1:25
Client:	Elements Green Trent Ltd			Logged SH

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.30			TOPSOIL (Soft, dark brown, slightly sandy, slightly gravelly, silty CLAY. Sand is fine to medium. Gravel is sub-angular to sub-rounded and fine to coarse mudstone and siltstone).
							Stiff, reddish brown, slightly gravelly, silty CLAY. Gravel is sub-angular and fine to medium of mudstone. [WEATHERED MERCIA MUDSTONE GROUP]
				1.40			End of pit at 1.40 m

Remarks: 1. Position cleared of services using CAT and Genny.

Stability: Stable

Appendix 3

Trial Pit Photographs

Photo 1: SA01

Photo 2: SA01 backfilled

RGS Environmental Geotechnical Specialists	Site Name: **Land at Maplebeck Road**	Job No: **C4948/25/E/7545**	**t. 0843 50 666 87** **www.rogersgeotech.co.uk**

Photo 3: SA02

Photo 4: SA02 backfilled

RGS Environmental Geotechnical Specialists	Site Name: **Land at Maplebeck Road**	Job No: **C4948/25/E/7545**	**t. 0843 50 666 87** **www.rogersgeotech.co.uk**

Photo 5: SA03

Photo 6: SA03 backfilled

RGS Environmental Geotechnical Specialists

Site Name:

Land at Maplebeck Road

Job No:

C4948/25/E/7545

t. 0843 50 666 87
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Appendix 4

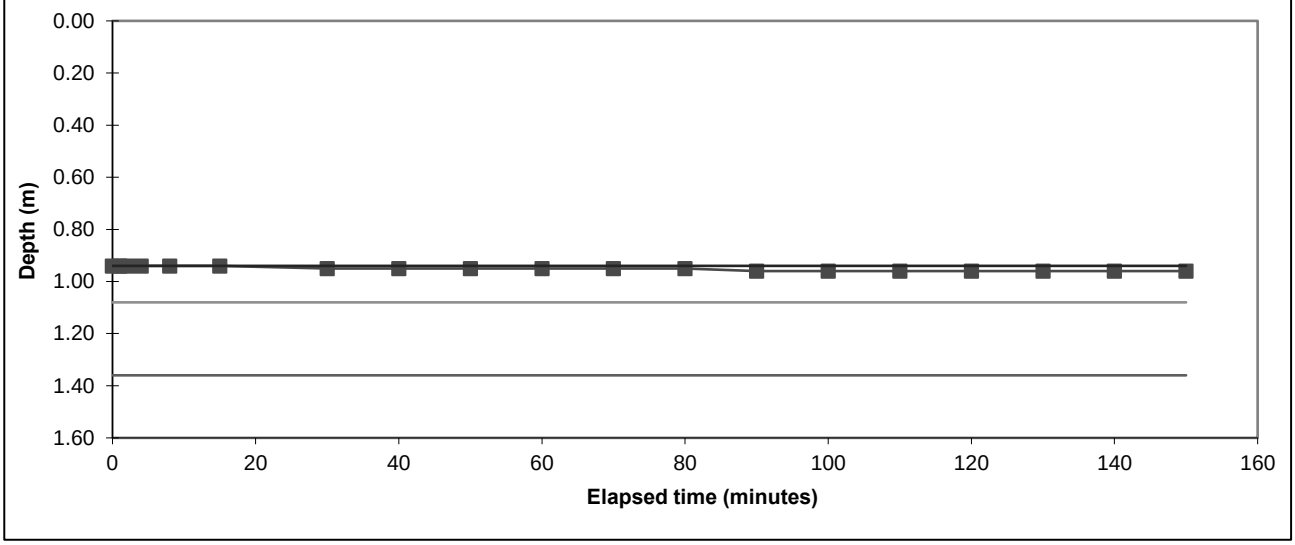
Soakaway Results

Rogers Geotechnical Services L

Soakaway Test

Trial Pit No:	SA01	Test No:	1	Date:	26.03.2025
Length (m):	1.300		Datum Height:	0.00	m agl
Width (m):	0.30		Granular infill:	None	
Depth (m):	1.50		Porosity of infill:	1	(assumed)

Elapsed time (minutes)	Water Depth (m below datum)	Elapsed time (minutes)	Water Depth (m below datum)
0	0.940	110	0.960
1	0.940	120	0.960
2	0.940	130	0.960
4	0.940	140	0.960
8	0.940	150	0.960
15	0.940		
30	0.950		
40	0.950		
50	0.950		
60	0.950		
70	0.950		
80	0.950		
90	0.960		
100	0.960		



Start water depth for analysis (mbgl):	0.94		
75% effective depth (mbgl):	1.08	Elapsed time (mins):	#N/A
50% effective depth (mbgl):	1.22		
25% effective depth (mbgl):	1.36	Elapsed time (mins):	#N/A
Base of soakage zone (mbgl):	1.50		
Volume outflow between 75% and 25% effective depth (m^3):			
Mean surface area of outflow (m^2):			1.29
(side area at 50% effective depth + base area)			
Time for outflow between 75% and 25% effective depth (mins):			

Soil infiltration rate (m/s):	**Test incomplete as 25% effective depth not achieved. Unable to reliably determine soil infiltration rate.**

Remarks Results processed following BRE 365 (2007).

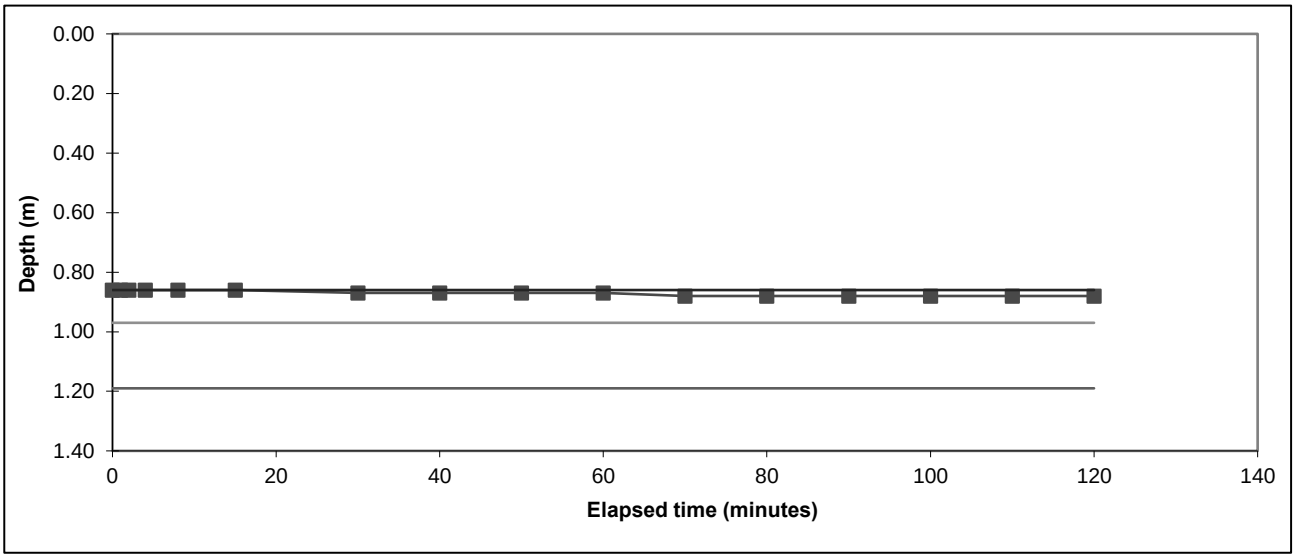
Client:	Elements Green Trent Ltd	**Job No:**
Site:	Land at Maplebeck Road	C4948/25/E/7545

Rogers Geotechnical Services L

Soakaway Test

Trial Pit No:	SA02	Test No:	1	Date:	26.03.2025
Length (m):	1.000		Datum Height:	0.00	m agl
Width (m):	0.30		Granular infill:	None	
Depth (m):	1.30		Porosity of infill:	1	(assumed)

Elapsed time (minutes)	Water Depth (m below datum)	Elapsed time (minutes)	Water Depth (m below datum)
0	0.860	110	0.880
1	0.860	120	0.880
2	0.860		
4	0.860		
8	0.860		
15	0.860		
30	0.870		
40	0.870		
50	0.870		
60	0.870		
70	0.880		
80	0.880		
90	0.880		
100	0.880		



Start water depth for analysis (mbgl):	0.86		
75% effective depth (mbgl):	0.97	Elapsed time (mins):	#N/A
50% effective depth (mbgl):	1.08		
25% effective depth (mbgl):	1.19	Elapsed time (mins):	#N/A
Base of soakage zone (mbgl):	1.30		
Volume outflow between 75% and 25% effective depth (m^3):			
Mean surface area of outflow (m^2):			0.87
(side area at 50% effective depth + base area)			
Time for outflow between 75% and 25% effective depth (mins):			

Soil infiltration rate (m/s):	**Test incomplete as 25% effective depth not achieved. Unable to reliably determine soil infiltration rate.**

Remarks Results processed following BRE 365 (2007).

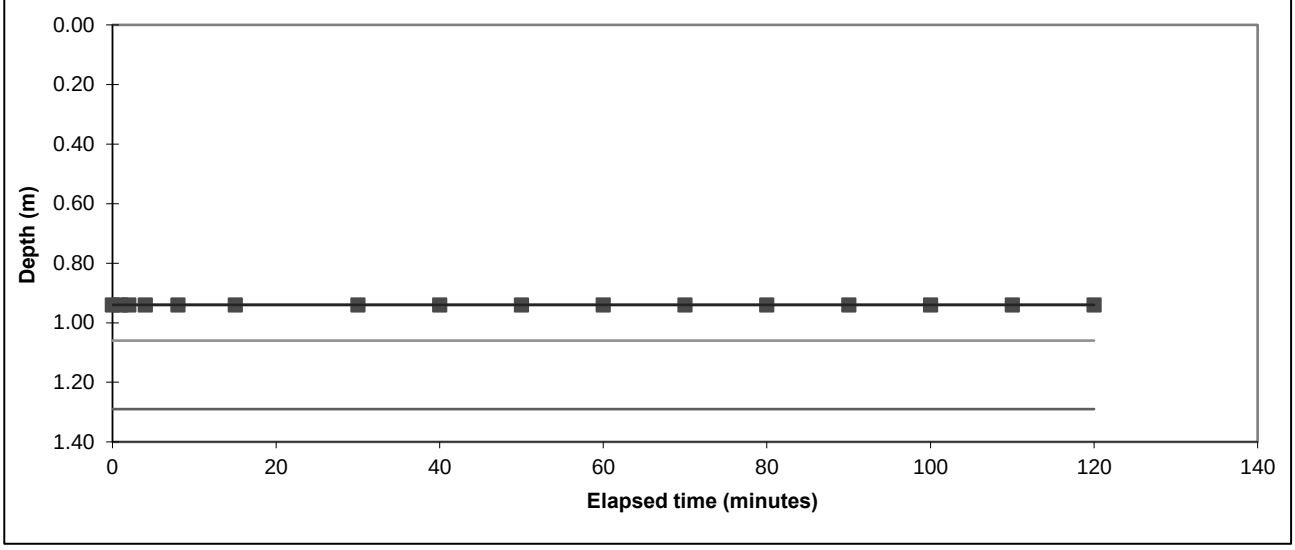
Client:	Elements Green Trent Ltd	**Job No:**
Site:	Land at Maplebeck Road	C4948/25/E/7545

Rogers Geotechnical Services L

Soakaway Test

Trial Pit No:	SA01	Test No:	1	Date:	26.03.2025
Length (m):	1.200		Datum Height:	0.00	m agl
Width (m):	0.30		Granular infill:	None	
Depth (m):	1.40		Porosity of infill:	1	(assumed)

Elapsed time (minutes)	Water Depth (m below datum)	Elapsed time (minutes)	Water Depth (m below datum)
0	0.940	110	0.940
1	0.940	120	0.940
2	0.940		
4	0.940		
8	0.940		
15	0.940		
30	0.940		
40	0.940		
50	0.940		
60	0.940		
70	0.940		
80	0.940		
90	0.940		
100	0.940		



Start water depth for analysis (mbgl):	0.94		
75% effective depth (mbgl):	1.06	Elapsed time (mins):	#N/A
50% effective depth (mbgl):	1.17		
25% effective depth (mbgl):	1.29	Elapsed time (mins):	#N/A
Base of soakage zone (mbgl):	1.40		
Volume outflow between 75% and 25% effective depth (m^3):			
Mean surface area of outflow (m^2):			1.05
(side area at 50% effective depth + base area)			
Time for outflow between 75% and 25% effective depth (mins):			

Soil infiltration rate (m/s):	**Test incomplete as 25% effective depth not achieved. Unable to reliably determine soil infiltration rate.**

Remarks Results processed following BRE 365 (2007).

Client:	Elements Green Trent Ltd	**Job No:**
Site:	Land at Maplebeck Road	C4948/25/E/7545

APPENDIX B: INFILTRATION TESTING - Soakaway Testing 4: Land off Mill Lane

Environmental
Geotechnical
Specialists

RGS

SOAKAWAY
LETTER
REPORT

job number	C4949/25E/7546
date	19.05.2025
site address	Land off Mill Lane, Kersall Newark, Nottinghamshire, NG22 0BH
written by	S. Hale
checked by	S. Alexander
issued by	S. Hale

Please consider the environment before printing this report.

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<ENVIRONMENTAL><GEOTECHNICAL>

Contents

Appendices

Report on Soakaway Testing

Location:	Land off Mill Lane Kersall, Newark, Nottinghamshire, NG22 0BH		
For:	Elements Green Trent Ltd		
Report No.	C4949/25/E/7546	Report Date:	May 2025

For and on behalf of **Rogers Geotechnical Services Ltd**

[redacted]	[redacted]
Steven Hale BSc FGS Geo-environmental Technician	Senior Geo-environmental Engineer

Report Summary[1]

Item	Comments	Section
Geology	Superficial Geology – none. Solid Geology – Mercia Mudstone Group.	4.
Strata Conditions	Nominal thickness of topsoil overlaying clay representative	5.
Groundwater	No water strikes noted during investigation.	5.
Suitability of Soakaways	Not recommended.	7.

[1] This summary should not be relied upon to provide a comprehensive review. All of the information contained in this document should be considered.

1. Introduction

i. We thank you for your request to undertake percolation testing at the above-mentioned site and take pleasure in enclosing the results of this work. The investigation was undertaken on the 7th April 2025 in accordance with your instruction to proceed. The site is centred on grid reference 472200, 362150. This report describes the work undertaken, presents the data obtained and discusses the results of the tests

2. Limitations

ii. The recommendations made and opinions expressed in this report are based on the ground conditions revealed by the site works, together with an assessment of the site. Whilst opinions may be expressed relating to sub-soil conditions in parts of the site not investigated, for example between trial pit positions, these are for guidance only and no liability can be accepted for their accuracy.

iii. This report has been prepared in accordance with our understanding of current best practice. However, new information or legislation, or changes to best practice may necessitate revision of the report after the date of issue.

3. Fieldworks

iv. Three trial pits were excavated in order to undertake soakaway testing, the positions of which are shown in Appendix 1. The soakaway tests were undertaken at the base of the pit at depths rational to the construction of soakaways. The soils exposed in the trial pits were logged on site in general accordance with BS5930: 2015 +A1: 2020, and full descriptions are given on the trial pit records which are presented in Appendix 2. Photographs of the trial pits are included within Appendix 3.

v. Once excavations were completed, the trial pits were carefully re-instated with the arisings. Whilst every care was taken during the infilling process, including compacting of the infill at regular intervals with the arm of the excavator, it should be appreciated that some mounding of the surface may have resulted. Moreover, the infilled soils may be subjected to settlement over time, such that a depression in the surface may also occur. Therefore, the locations of any pits undertaken in this investigation should be conveyed to the current site user, as the mounds or depressions associated with the pits may present a risk to current site operations. Furthermore, it must be realised that the infilled pits represent an area of disturbance within the site soils, thus the soils at the pit locations may vary characteristically compared to the undisturbed ground.

4. Geology

vi. The available published geological data for the site has been examined and the following table presents the anticipated geology.

Table 1: Geological Data for the Site

Strata Type	Strata Name[2]	Previous Name[3]	Description[3]
Superficial Geology	-	-	None indicated beneath the site.
Solid Geology	Mercia Mudstone Group	Red Marl	Dominantly red, less commonly green-grey, mudstones and subordinate siltstones with thick halite-bearing units in some basinal areas.

5. Strata Conditions

vii. In accordance with the geology of the area, the succession has been shown to include the following:

Table 2: Generalised Strata Profile

Depth m below ground level to underside of layer	Strata Type	Positions Layer Revealed	Groundwater Strikes m below ground level
0.20	TOPSOIL (Soft, dark brown, slightly sandy, slightly gravelly, clayey SILT)	All	None
+1.45 – +1.50	Firm, reddish brown, slightly sandy, slightly gravelly becoming gravelly, silty CLAY [WEATHERED MERCIA MUDSTONE GROUP]	All	None

'+' denotes that the strata extended below the termination depth of the investigated positions, thus the extent of the deposit is only proven to the depths indicated.

6. Insitu Testing

6.1 Soakaway Test

viii. On reaching the elected soakaway test depth, the pit was trimmed and squared as much as practicable. Water was then introduced into the pit at a controlled rate to prevent collapse of the sides and the level monitored at time intervals relative to a reference bar at ground level. The results obtained from the soakaway tests are presented at Appendix 4 and are summarised below:

[2] Sources: British Geological Survey (NERC) Map Sheets 113; Ollerton; Solid and Drift Edition, and Onshore Geoindex [*online resource from www.bgs.ac.uk*]
[3] Sources: British Geological Survey (NERC) Lexicon of Named Rock Units [*online resource from www.bgs.ac.uk*]

Table 3: Soakaway Test Results					
Location	**Soakage Area Dimensions (average) (m)**	**Depths of soaked strata (m)**	**Soil Description (of soaked strata)**	**Infiltration Rate (m/sec)**	***Drainage Characteristics**
SA01	0.30 x 1.70	0.93 to 1.45	Side – Slightly gravelly, silty CLAY Base – As above	-	Practically impermeable
SA02	0.30 x 1.50	0.95 to 1.50	Side – Slightly gravelly, silty CLAY Base – As above	-	Practically impermeable
SA03	0.30 x 1.70	1.05 to 1.50	Side – Slightly gravelly, silty CLAY Base – As above	-	Practically impermeable

*Based on the most onerous results for each test.

ix. During the soakaway tests the water level did not achieve a fall from 75% to 25% of the effective depth of the storage volume in all three trial pits. In all tests, the water level did not move, as such, the tests could not be completed within the scope of the method provided in BRE Digest 365 due to the poor soakage rate of the exposed soils. Due to the negligible water movement it was not possbile to extrapolate the results obtained in order to obtain a soil infiltration rate.

7. Discussion

x. The soils encountered beneath the topsoil were found to be typical of the weathered fraction of the underlying Mercia Mudstone Group. The strata conditions and subsequent drainage characteristics appear to be comparable across the site. In this instance, the infiltration testing has revealed that the soils have practically impermeable drainage characteristics. Therefore, soakaways cannot be recommended at this site and an alternative form of drainage should be adopted.

8. References

- Building Research Establishment (BRE) Digest 365, *Soakaway Design*, September 1991.
- British Standards Institution (2015 +A1: 2020) BS 5930: *Code of practice for ground investigations*, B.S.I., London.
- Barnes, G. (2000). *Soil Mechanics Principle and Practice.* 2nd ed. London: Macmillan Press Ltd, p.47.

Appendix 1

Site Plan

Notes:

RGS Environmental Geotechnical Specialists

Rogers Geotechnical Services Ltd

Offices 1 & 2, Barncliffe Business Park,
Near Bank,
Shelley,
Huddersfield,
HD8 8LU

Telephone: 0843 50 66 87
www.rogersgeotech.co.uk

Client:

Elements Green Trent Ltd

Job Number:

C4949/25/E/7546

Project Details:

Land off Mill Lane, Kersall, Newark, Nottinghamshire, NG22 0BH

Scale:	Not to scale - reference only

ground investigation | drilling & excavation | insitu testing
laboratory testing & gas monitoring | engineering consultancy
surveying & flood risk assessments | training, CPD & expert witness
... delivered using our own drilling rigs / crews / soils lab / engineers

Appendix 2

Trial Pit Records

Trial Pit Log

Trialpit No **SA01**

Sheet 1 of 1

Project Name:	Land off Mill Lane	Project No. C4949/25/E/7546	Co-ords: - Level:	Date 07/04/2025
Location:	Kersall, Newark, Nottinghamshire, NG22 0BH	Dimensions (m): Depth 1.45	1.7 / 0.3	Scale 1:25
Client:	Elements Green Trent Ltd			Logged SH

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.20			TOPSOIL (Soft, dark brown, slightly sandy, slightly gravelly, clayey SILT. Sand is fine to medium. Gravel is subangular to rounded and fine to coarse of various lithologies).
							Firm, reddish brown, slightly sandy, slightly gravelly becoming gravelly, silty CLAY. Sand is fine to medium. Gravel is tabular, sub-angular and fine to coarse of mudstone and siltstone. [WEATHERED MERCIA MUDSTONE GROUP]
				1.45			End of pit at 1.45 m

1 2 3 4 5

Remarks: 1. Position scanned for services using CAT and Genny.

Stability: Stable

Trial Pit Log

Trialpit No **SA02**
Sheet 1 of 1

Project Name: Land off Mill Lane	Project No. C4949/25/E/7546	Co-ords: - Level:	Date 07/04/2025
Location: Kersall, Newark, Nottinghamshire, NG22 0BH		Dimensions (m): Depth 1.50 — 1.5 × 0.3	Scale 1:25
Client: Elements Green Trent Ltd			Logged SH

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.20			TOPSOIL (Soft, dark brown, slightly sandy, slightly gravelly, clayey SILT. Sand is fine to medium. Gravel is subangular to rounded and fine to coarse of various lithologies).
							Firm, reddish brown, slightly sandy, slightly gravelly becoming gravelly, silty CLAY. Sand is fine to medium. Gravel is tabular, sub-angular and fine to coarse of mudstone and siltstone. [WEATHERED MERCIA MUDSTONE GROUP]
				1.50			End of pit at 1.50 m

Remarks: 1. Position scanned for services using CAT and Genny.

Stability: Stable

Trial Pit Log

Trialpit No **SA03**

Sheet 1 of 1

Project Name:	Land off Mill Lane	Project No. C4949/25/E/7546	Co-ords: - Level:	Date 07/04/2025
Location:	Kersall, Newark, Nottinghamshire, NG22 0BH	Dimensions (m): Depth 1.50	1.7 / 0.3	Scale 1:25
Client:	Elements Green Trent Ltd			Logged SH

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.20			TOPSOIL (Soft, dark brown, slightly sandy, slightly gravelly, clayey SILT. Sand is fine to medium. Gravel is subangular to rounded and fine to coarse of various lithologies).
							Firm, reddish brown, slightly sandy, slightly gravelly becoming gravelly, silty CLAY. Sand is fine to medium. Gravel is tabular, sub-angular and fine to coarse of mudstone and siltstone. [WEATHERED MERCIA MUDSTONE GROUP]
				1.50			End of pit at 1.50 m

Remarks: 1. Position scanned for services using CAT and Genny.

Stability: Stable

Appendix 3

Trial Pit Photographs

Photo 1: SA01

Photo 2: SA01 backfilled

RGS Environmental Geotechnical Specialists

Site Name:

Land off Mill Lane

Job No:

C4949/25/E/7546

t. 0843 50 666 87
www.rogersgeotech.co.uk

Photo 1: SA02

Photo 2: SA02 backfilled

RGS Environmental Geotechnical Specialists	Site Name: **Land off Mill Lane**	Job No: **C4949/25/E/7546**	**t. 0843 50 666 87** **www.rogersgeotech.co.uk**

Photo 1: SA03

Photo 2: SA03 backfilled

RGS Environmental Geotechnical Specialists

Site Name:

Land off Mill Lane

Job No:

C4949/25/E/7546

t. 0843 50 666 87
www.rogersgeotech.co.uk

Appendix 4

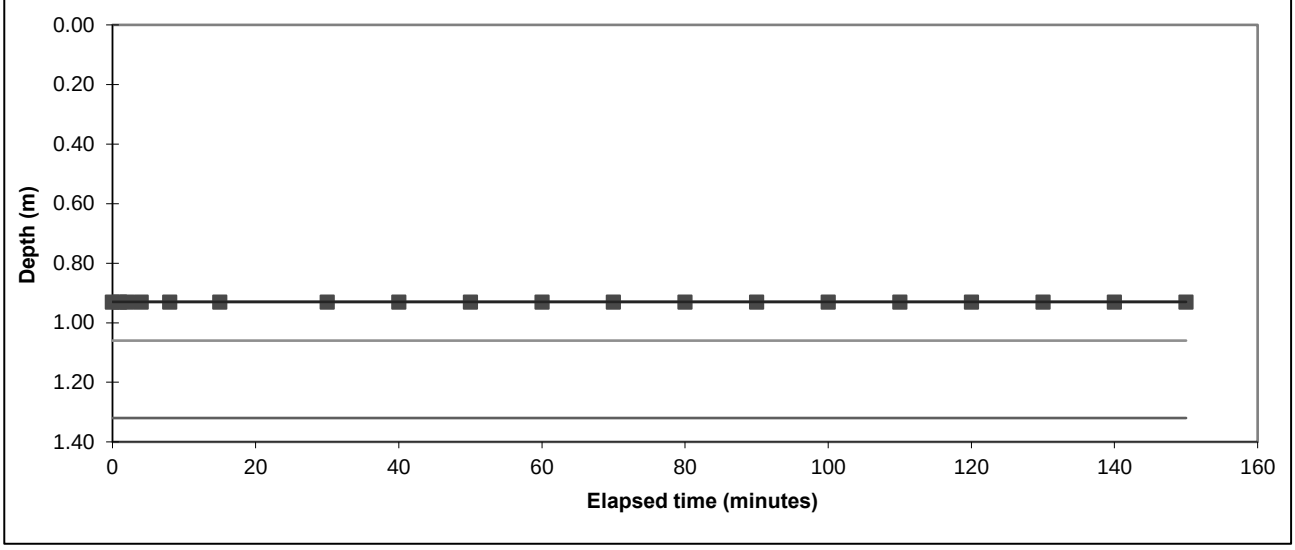
Soakaway Results

Rogers Geotechnical Services L

Soakaway Test

Trial Pit No:	SA01	Test No:	1	Date:	07.04.2025
Length (m):	1.700		Datum Height:	0.00	m agl
Width (m):	0.30		Granular infill:	None	
Depth (m):	1.45		Porosity of infill:	1	(assumed)

Elapsed time (minutes)	Water Depth (m below datum)	Elapsed time (minutes)	Water Depth (m below datum)
0	0.930	110	0.930
1	0.930	120	0.930
2	0.930	130	0.930
4	0.930	140	0.930
8	0.930	150	0.930
15	0.930		
30	0.930		
40	0.930		
50	0.930		
60	0.930		
70	0.930		
80	0.930		
90	0.930		
100	0.930		



Start water depth for analysis (mbgl):	0.93		
75% effective depth (mbgl):	1.06	Elapsed time (mins):	#N/A
50% effective depth (mbgl):	1.19		
25% effective depth (mbgl):	1.32	Elapsed time (mins):	#N/A
Base of soakage zone (mbgl):	1.45		
Volume outflow between 75% and 25% effective depth (m^3):			
Mean surface area of outflow (m^2):			1.55
(side area at 50% effective depth + base area)			
Time for outflow between 75% and 25% effective depth (mins):			

Soil infiltration rate (m/s):	**Test incomplete as 25% effective depth not achieved. Unable to reliably determine soil infiltration rate.**

Remarks	Results processed following BRE 365 (2007). Soil appears to be practically impermeable.

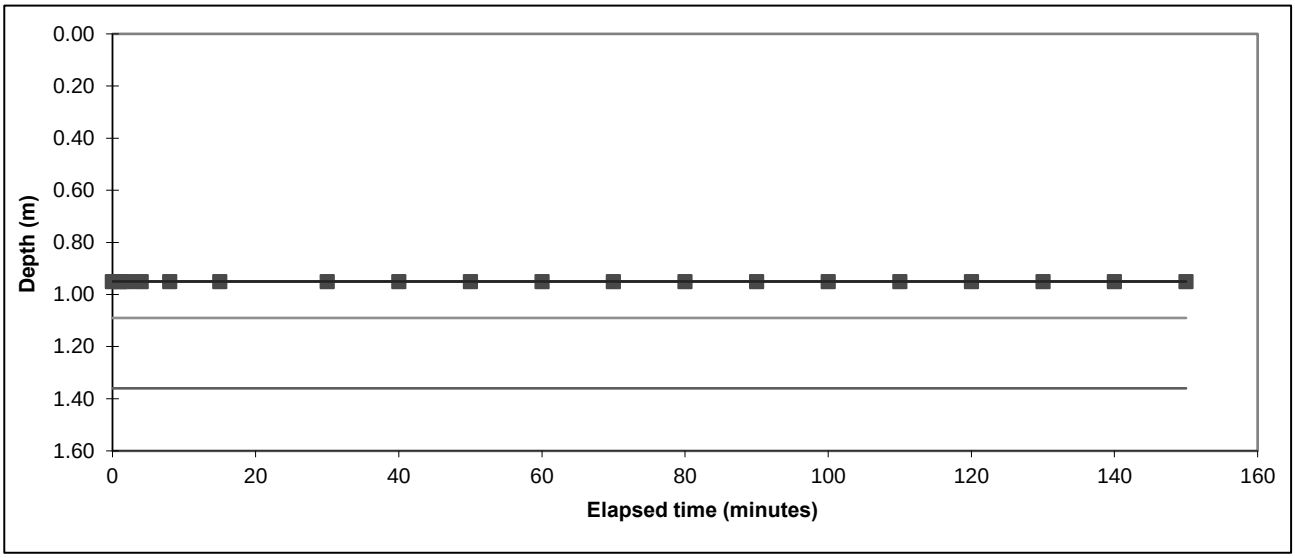
Client:	Elements Green Trent Ltd	**Job No:**
Site:	Land off Mill Lane, Kersall, Newark, Nottinghamshire, NG22 0BH	C4949/25/E/7546

Rogers Geotechnical Services L

Soakaway Test

Trial Pit No:	SA02	Test No:	1	Date:	07.04.2025
Length (m):	1.500		Datum Height:	0.00	m agl
Width (m):	0.30		Granular infill:	None	
Depth (m):	1.50		Porosity of infill:	1	(assumed)

Elapsed time (minutes)	Water Depth (m below datum)	Elapsed time (minutes)	Water Depth (m below datum)
0	0.950	110	0.950
1	0.950	120	0.950
2	0.950	130	0.950
4	0.950	140	0.950
8	0.950	150	0.950
15	0.950		
30	0.950		
40	0.950		
50	0.950		
60	0.950		
70	0.950		
80	0.950		
90	0.950		
100	0.950		



Start water depth for analysis (mbgl):	0.95		
75% effective depth (mbgl):	1.09	Elapsed time (mins):	#N/A
50% effective depth (mbgl):	1.23		
25% effective depth (mbgl):	1.36	Elapsed time (mins):	#N/A
Base of soakage zone (mbgl):	1.50		
Volume outflow between 75% and 25% effective depth (m^3):			
Mean surface area of outflow (m^2):			1.42
(side area at 50% effective depth + base area)			
Time for outflow between 75% and 25% effective depth (mins):			

Soil infiltration rate (m/s):	**Test incomplete as 25% effective depth not achieved. Unable to reliably determine soil infiltration rate.**

Remarks	Results processed following BRE 365 (2007). Soil appears to be practically impermeable.

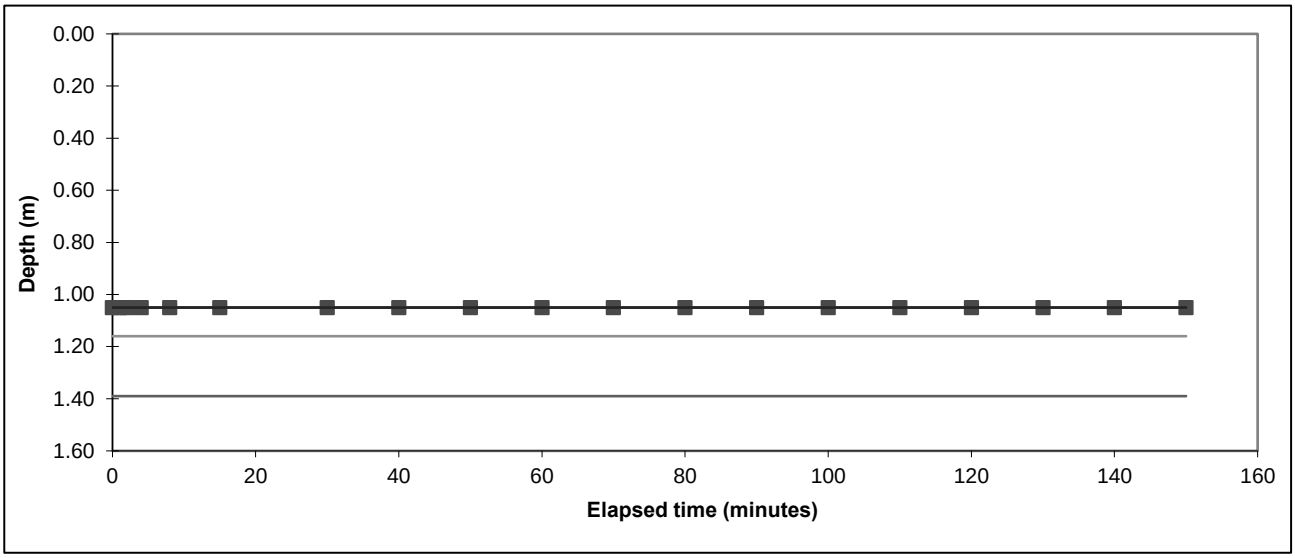
Client:	Elements Green Trent Ltd	**Job No:**
Site:	Land off Mill Lane, Kersall, Newark, Nottinghamshire, NG22 0BH	C4949/25/E/7546

Rogers Geotechnical Services L

Soakaway Test

Trial Pit No:	SA03	Test No:	1	Date:	07.04.2025
Length (m):	1.700		Datum Height:	0.00	m agl
Width (m):	0.30		Granular infill:	None	
Depth (m):	1.50		Porosity of infill:	1	(assumed)

Elapsed time (minutes)	Water Depth (m below datum)	Elapsed time (minutes)	Water Depth (m below datum)
0	1.050	110	1.050
1	1.050	120	1.050
2	1.050	130	1.050
4	1.050	140	1.050
8	1.050	150	1.050
15	1.050		
30	1.050		
40	1.050		
50	1.050		
60	1.050		
70	1.050		
80	1.050		
90	1.050		
100	1.050		



Start water depth for analysis (mbgl):	1.05		
75% effective depth (mbgl):	1.16	Elapsed time (mins):	#N/A
50% effective depth (mbgl):	1.28		
25% effective depth (mbgl):	1.39	Elapsed time (mins):	#N/A
Base of soakage zone (mbgl):	1.50		
Volume outflow between 75% and 25% effective depth (m^3):			
Mean surface area of outflow (m^2):			1.39
(side area at 50% effective depth + base area)			
Time for outflow between 75% and 25% effective depth (mins):			

Soil infiltration rate (m/s):	**Test incomplete as 25% effective depth not achieved. Unable to reliably determine soil infiltration rate.**

Remarks	Results processed following BRE 365 (2007). Soil appears to be practically impermeable.

Client:	Elements Green Trent Ltd	**Job No:**
Site:	Land off Mill Lane, Kersall, Newark, Nottinghamshire, NG22 0BH	C4949/25/E/7546

APPENDIX C: SEQUENTIAL TEST

Contents

1.1 OVERVIEW

1 This document applies the Sequential and Exception tests of the National Policy Statements (NPS) & National Planning Policy Framework (NPPF) for the entire site boundary. The NPS and NPPF requires the Local Authority to apply the Sequential and Exception Test in consideration of new development.

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

3 Further details on the Development can be found in Chapter 5 ‘Development Description’ of the Environmental Statement [EN010162/APP/6.2.5].

4 This document should be read in conjunction with the Technical Appendix A9.1 ‘Flood Risk Assessment’ of the Environmental Statement [EN010162/APP/6.4.9.1].

Sequential Test

5 Paragraph 5.8.9 of NPS EN-1 states that *“If, following application of the Sequential Test, it is not possible, (taking into account wider sustainable development objectives), for the project to be located in areas of lower flood risk the Exception Test can be applied … The test provides a method of allowing necessary development to go ahead in situations where suitable sites at lower risk of flooding are not available”.*

6 The NPPF requires the Local Authority to demonstrate a sequential, risk-based approach is applied to steer new development to the lowest areas of flood risk. Where it is not possible to locate development in low-risk areas of the site it is required to compare reasonably available sites in the wider area. The aim of the test is to steer new development to areas at the lowest probability of flooding.

7 Paragraphs 172 of the NPPF state that developments known to be in areas of flood risk should apply a risk based sequential test in order to steer proposed development towards areas classed as having a lower probability of flooding. (i.e. in Flood Zone 1). Paragraph 177 of the NPPF does, however, acknowledge that under certain circumstances it may not be possible to locate development on land identified as having a lower risk of flooding and certain infrastructure can be located in Flood Zone 2 or 3, subject to passing the Exception Test.

8 According to Appendix 3: Flood risk vulnerability classification of the NPPF, the Development is classified as ‘Essential infrastructure’ and as such is

acceptable within Flood Zones 1 and 2. The exception test is required if development is proposed within Flood Zone 3.

Exception Test

9 Paragraph 5.8.10 of NPS EN-1 outlines the Exception Test:

"*is only appropriate for use where the Sequential Test alone cannot deliver an acceptable site. It would only be appropriate to move onto the Exception Test when the Sequential Test has identified reasonably available, lower risk sites appropriate for the proposed development where, accounting for wider sustainable development objectives, application of relevant policies would provide a clear reason for refusing development in any alternative locations identified. Examples could include alternative site(s) that are subject to national designations such as landscape, heritage and nature conservation designations, for example Areas of Outstanding Natural Beauty (AONBs), Sites of Special Scientific Interest (SSSIs) and World Heritage Sites (WHS) which would not usually be considered appropriate*."

10 As previously stated, the Development is considered 'essential infrastructure', meaning this is acceptable in Flood Zones 1 and 2. However, application of the exception test is required for Development within Flood Zone 3.

11 The PPG advises that essential infrastructure development can be considered appropriate in Flood Zone 3a and 3b, following satisfactory application of the Exception Test. The Exception Test aims to ensure that more vulnerable property types are not allocated to areas at high risk of flooding.

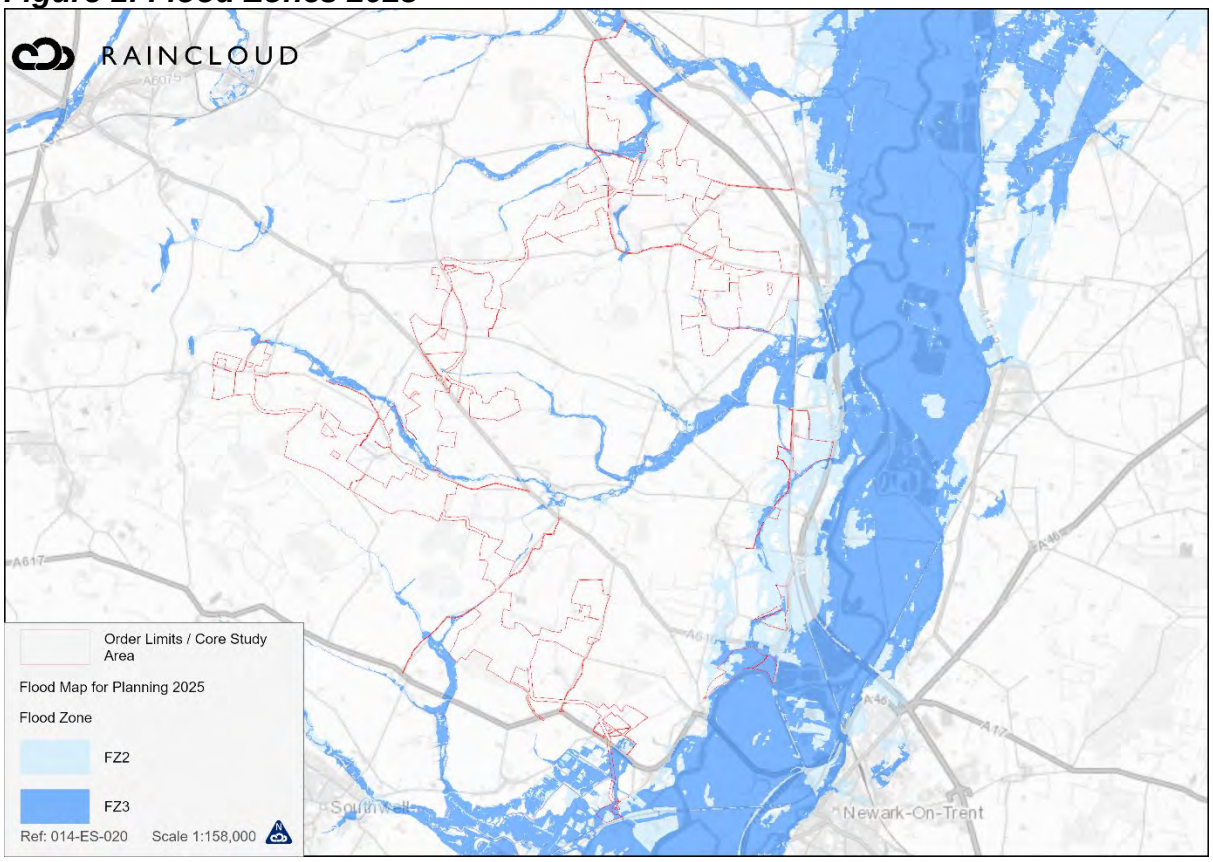
1.2 SEQUENTIAL TEST

12 The work areas are defined as follows:

- Work Area 1: Solar PV;
- Work Area 2: Cable Route;
- Work Area 3: Mitigation/enhancement;
- Work Area 4: Intermediate substations;
- Work Area 5a: BESS;
- Work Area 5b: 400kV Substation;
- Work Area 6: National Grid Staythorpe Substation and connection point;
- Work Area 7: Consented Staythorpe BESS and Connection; and
- Work Area 8: Access Works.

13 The EA Flood Map for Planning shows that the Development is mostly located in Flood Zone 1 (89.99%), whilst 10.01% lies in Flood Zone 2 and Flood Zone 3, as shown in Figure 1.

Figure 1: Flood Zones 2025



14 The electrical infrastructure within Work Area 1, and Work Areas. 4, 5a & 5b are located outside Flood Zone 2, Flood Zone 3 and the future floodplain.

15 As established within Environmental Statement Chapter 4: Alternatives [EN010162/APP/6.2.4], the Development was directed to this area owing to it being the most favourable location considering all factors in the selection process. Section 4.3 of the Alternatives Chapter shows that the Development has been sited taking account of multiple planning and environmental considerations, and discounting less favourable alternatives. Flood Zones 2 and 3 have been a key consideration. Figure 4.1a Environmental and Planning Designations [EN010162/APP/6.3.4.1.1] and 4.7 Hydrology, Ecology and Geology Considerations show that Flood Zones 2 and 3 have been avoided [EN010162/APP/6.3.4.7] as much as possible on balance with other considerations as set out in section 4.3 of the Alternatives Chapter.

16 Throughout the design evolution, it is evident that Flood Zones 2 and 3 have been further avoided as set out in Section 4.4 Design Evolution in the Alternatives Chapter. Post Preliminary Environmental Information Report (PEIR) publication, two new datasets relating to the impact of climate change on flooding from the Environment Agency became available (Trent and Tributaries 100-year plus Climate Change event, and the Flood Map for Planning Present Day Extents), which show a 1 in 100 chance flood extent for rivers. Using this and existing flooding data, all proposals for solar PV were removed from flood zones 2 and 3. The design evolution between PEIR and ES is shown on Figure 4.9. Design Evolution Changes from Preliminary Environmental Information Report to Environmental Statement

[EN010162/APP/6.3.4.9.2] with areas to along the easter extent of the Development removed.

17 The Applicant has secured a Grid Connection at Staythorpe National Grid Substation (NGET), which is located within Flood Zone 2 and adjoined by Flood Zone 3 on the western side. With the connection point, which is the western bay at NGET substation, the optimal technical design for the cables are to cross Flood Zone 3 to establish connection with the rest of the Development's infrastructure.

18 Two alternative options are proposed to connect the Development's infrastructure via a 400 kV cable to the National Grid Staythorpe Substation:

- Connect via the substation associated with a consented grid support BESS on land immediately to the west of the existing National Grid Staythorpe Substation. This grid support BESS has been granted planning consent (Newark and Sherwood District Council, planning reference 22/01840/FULM) (Work Area 7); or
- Connect the 400 kV cable to connect directly to the National Grid Staythorpe Substation (Work Area 6).

19 Both of these options associated with Work Areas 6 and 7 are located within Flood Zones 2, 3a and 3b. Whilst the site selection and design evolution have sought to avoid Flood Zones 2 and 3, both options for points of connections are located within Flood Zone 2 and 3. Therefore it is not possible for the Development to completely avoid Flood Zones 2 and 3, and there are no other more suitable alternatives.

20 The Development is classed as Essential Infrastructure, as per Annex 3: Flood risk vulnerability classification: of the NPPF, which is appropriate in the Flood Zones 1, 2 and 3, in terms of flood risk vulnerability.

21 For these reasons, the Development meets the requirements set out in Table 3 of the Planning Practice Guidance and meets the requirements of the Sequential Test of the NPPF and NPS.

22 Paragraph 5.8.10 of NPS EN-1 outlines the Exception Test *"is only appropriate for use where the Sequential Test alone cannot deliver an acceptable site. It would only be appropriate to move onto the Exception Test when the Sequential Test has identified reasonably available, lower risk sites appropriate for the proposed development where, accounting for wider sustainable development objectives, application of relevant policies would provide a clear reason for refusing development in any alternative locations identified. Examples could include alternative site(s) that are subject to national designations such as landscape, heritage and nature conservation designations, for example Areas of Outstanding Natural Beauty (AONBs), Sites of Special Scientific Interest (SSSIs) and World Heritage Sites (WHS) which would not usually be considered appropriate".*

1.3 EXCEPTION TEST

23 Paragraph 5.8.11 of NPS EN-1 confirms both elements of the Exception Test need to be satisfied for development to be consented. In line with Paragraph 5.8.29 of NPS EN-1, the two criteria set out in the Exception Test should be applied to developments are:

a) the development would provide wider sustainability benefits to the community that outweigh the flood risk; and

b) the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

24 Environmental Statement Chapter 9: Water Resources [EN010162/APP/6.2.9] and Technical Appendix A9.1 Flood Risk Assessment and Outline Drainage Strategy [EN010162/APP/6.4.9.1] demonstrates that the Development will be safe, without increasing flood risk elsewhere, and will reduce flood risk overall given the reduction in surface water runoff following redevelopment.

25 Fundamentally, the Development will contribute to the decarbonisation of energy supply infrastructure, therefore contributing to wider sustainability aims, including Net Zero.

26 The Development is located primarily within Flood Zone 1, with a small footprint of the Work Area 3 located within Flood Zone 2 and 3. Work Area 3 will comprise grassland, scrub and scattered trees, which compatible with the EA's "Working with natural processes to reduce flood risk 2024" Flood and Coastal Erosion Risk Management (FCERM) research report.

27 Work Area 2 will be located entirely below ground and in waterproof ducting, ensuring no loss of floodplain storage or conveyance.

28 Work Area 6 is located primarily in Flood Zone 2 and, despite modelling showing shallow depth inundation for the 1 % AEP + 30 % Climate Change and 39 % CC (i.e. less than 0.1 m depth), is unlikely to flood due to the presence of private flood defences which serve the operational substation with an elevation of 13.10 m AOD.

29 Work Area 7 has incorporated flood resilient design, and the connection point is likely to be in an area modelled to be outside the 1 % AEP + 39% Climate Change.

30 The Development will incorporate planting and land management measures (RSuDS) which will reduce the potential for an increase in surface water runoff rates;

31 Hardstanding areas will be served by surface water drainage infrastructure (SuDS) to limit surface water runoff to greenfield (baseline) rate up to the 1 % AEP + 40 % Climate Change event.

32 The Development is classed as Essential Infrastructure, as per Annex 3: Flood risk vulnerability classification: of the NPPF, which is appropriate in the Flood Zones 1, 2 and 3, in terms of flood risk vulnerability.

33 As such, the Sequential and Exception tests are passed i.e. the Development is located appropriately (Essential Infrastructure in Flood Zone 3 and 2), as per EA Flood Risk and Coastal Change Guidance.

1.4 CONCLUSIONS

34 Overall, the Development is in accordance with the purpose and requirements of the Sequential Test, taking account of the flood risk vulnerability classification.

35 Regarding the Exception Test, Environmental Statement Chapter 9: Water Resources [EN010162/APP/6.2.9] and Technical Appendix A9.1 Flood Risk Assessment and Outline Drainage Strategy [EN010162/APP/6.4.9.1] demonstrates that the Development will be safe for its lifetime, taking into account the vulnerability, without increasing flood risk elsewhere and, where possible, will reduce flood risk overall. Therefore, the Development is considered to be in compliance with the Exception Test.

APPENDIX C: SEQUENTIAL TEST

APPENDIX D : FIGURES

LIST OF FIGURES

Drawing Number	*Revision*	*Drawing Title*	*Scale*
014-ES-020-Rev02	02	Figure A9.1 Flood Zones 2025	1:30,000 @ A1
014-ES-021-Rev02	02	Figure A9.2 Flood Zone 3b (reproduced from SFRA)	1:20,000@A1
014-ES-021a-Rev02	02	Figure A9.3 3.33% AEP Defended CCP1 Extents	1:20,000@A1
014-ES-008-Rev02	02	Figure A9.4 Existing Flood Defences	1:30,000@A1
014-ES-028-Rev02	02	Figure A9.5 1 % AEP Pluvial Flood Extents	1:30,000@A1
014-ES-022-Rev02	02	Figure A9.6 1 % AEP Flood Depths (EA - RoFSW 2025)	1:30,000@A1
014-ES-029-Rev02	02	Figure A9.7 1 % AEP Flood Depths (Raincloud 2D Modelling)	1:30,000@A1
014-ES-007-Rev02	02	Figure A9.8 Reservoir Flood Extents	1:30,000@A1
014-ES-012-Rev02	02	Figure A9.9 Reservoir Flood Extents - Dry Day Scenario	1:20,000@A1
014-ES-009-Rev02	02	Figure A9.10 Historic Flood Outlines	1:30,000@A1
014-ES-010-Rev02	02	Figure A9.11 Recent Flood Outlines	1:30,000@A1
014-ES-065-Rev02	02	Figure A9.12 Flood Studies Catchments	1:30,000@A1
014-ES-014-Rev02	02	Figure A9.13 Tidally Dominated 0.5 % AEP 2121 (Upper End) Scenario	1:30,000@A1
014-ES-013-Rev02	02	Figure A9.14 Fluvially Dominated 1 % AEP + 62 % CC Scenario	1:30,000@A1
014-ES-015-Rev02	02	Figure A9.15 Combined Tidal Breach Outline	1:20,000@A1
014-ES-016-Rev02	02	Figure A9.16 1 % AEP - River Trent	1:20,000@A1
014-ES-017-Rev02	02	Figure A9.17 1 % AEP + 30 % CC - River Trent	1:30,000@A1
014-ES-031a-Rev02	02	Figure A9.18 1 % AEP Defended Extents (CCP1)	1:30,000@A1
014-ES-047-Rev02	02	Figure A9.19 1%AEP+30% CC and + 39% CC scenarios	1:30,000@A1
014-ES-049b-Rev02	02	Figure A9.20 1% Undefended CCP1	1:1000@A1
014-ES-048-Rev02	02	Figure A9.21 Moorhouse Beck – Flood Zones	1:10,000@A1
014-ES-059-Rev02	02	Figure A9.22 RSuDS enhancement areas	1:30,000@A1

Drawing Number	Revision	Drawing Title	Scale
		associated with the Development	
014-ES-057-Rev02	02	Figure A9.23 Maplebeck 1 % AEP - Baseline	1:5,000@A1
014-ES-058-Rev02	02	Figure A9.24 1 % AEP - Grass Mix under PV Arrays	1:5,000@A1
014-ES-061-Rev02	02	Figure A9.25 Slope within Work Area 1	1:30,000@A1

RAINCLOUD

Solar & Biodiversity Park

Order Limits / Core Study Area

Works Area 1: Solar PV

Flood Map for Planning 2025

Flood Zone

FZ2

FZ3

1:30,000 Scale @ A1

0 0.5 1 2 km

Ref: 014-ES-020-Rev02 | Date: 13/08/2025

Flood Zones 2025
Figure A9.1

Great North Road Solar and Biodiversity Park
Flood Risk Assessment

RAINCLOUD

Solar & Biodiversity Park

- Order Limits / Core Study Area
- Works Area 1: Solar PV
- Works Area 3: Mitigation
- Works Area 6: National Grid Substation
- Works Area 7: Staythorpe BESS Connection
- Flood Zone 3b (5% AEP from SFRA)

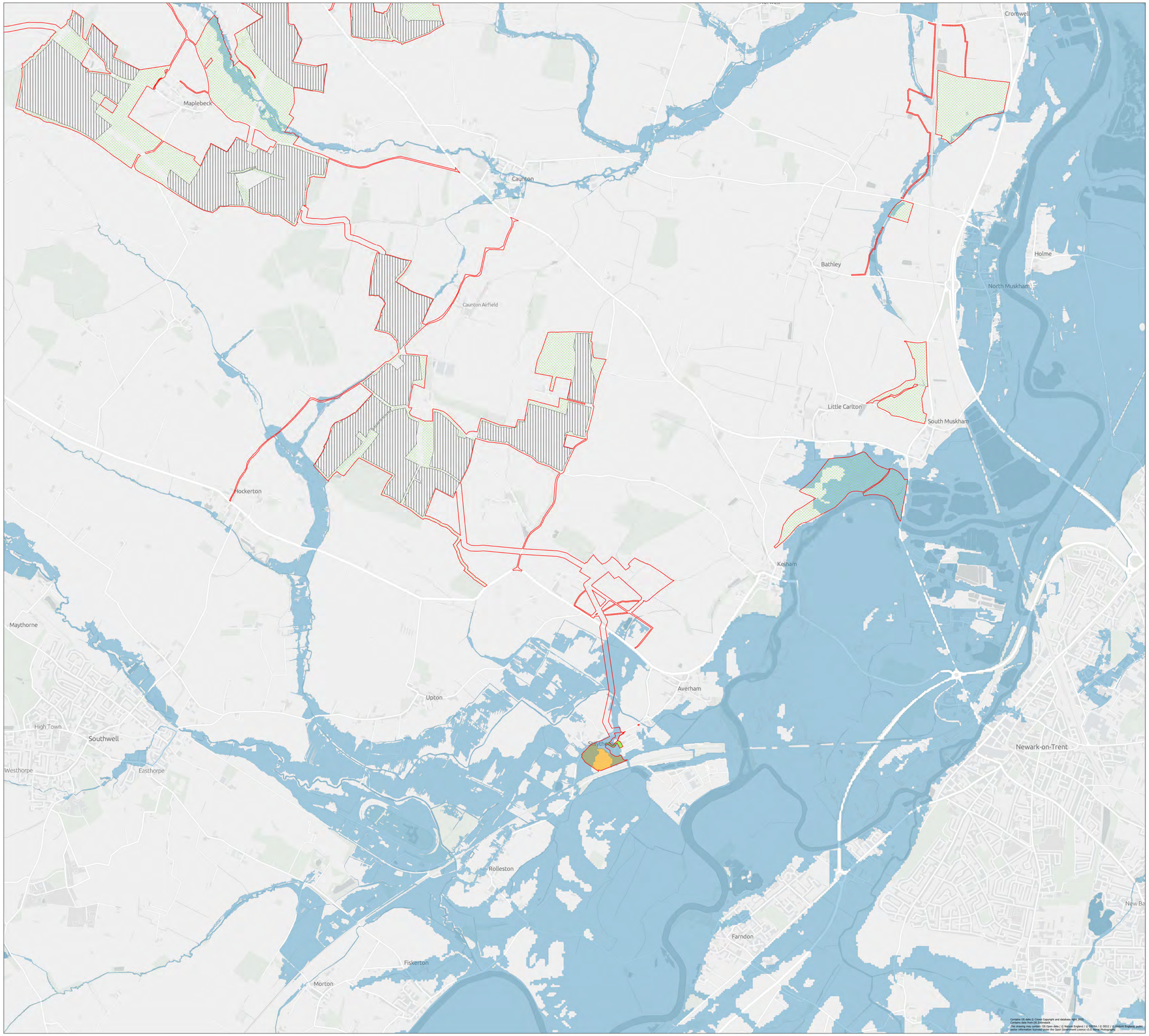
1:20,000 Scale @ A1

0 0.25 0.5 1 km

Ref: 014-ES-021-Rev02 | Date: 13/08/2025

Flood Zone 3b (reproduced from SFRA) Figure A9.2

Great North Road Solar and Biodiversity Park Flood Risk Assessment



RAINCLOUD

Solar & Biodiversity Park

- Order Limits / Core Study Area
- Works Area 1: Solar PV
- Works Area 3: Mitigation
- Works Area 6: National Grid Substation
- Works Area 7: Staythorpe BESS Connection
- 3.33 % AEP Defended CCP1

1:20,000 Scale @ A1

0 0.25 0.5 1 km

Ref: 014-ES-021a-Rev02	Date: 13/08/2025

3.33 % AEP Defended CCP1 Extents Figure A9.3

Great North Road Solar and Biodiversity Park Flood Risk Assessment

RAINCLOUD

Solar & Biodiversity Park

Order Limits / Core Study Area

Flood Defence

- Demountable Defence
- Embankment
- Engineered High Ground
- Flood Gate
- Natural High Ground
- Wall

1:30,000 Scale @ A1

0 0.5 1 2 km

Ref: 014-ES-008-Rev02 | Date: 12/08/2025

Existing Flood Defences
Figure A9.4

Great North Road Solar and Biodiversity Park
Flood Risk Assessment

RAINCLOUD

Solar & Biodiversity Park

Order Limits / Core Study Area

RoFSW

Risk Band

Medium

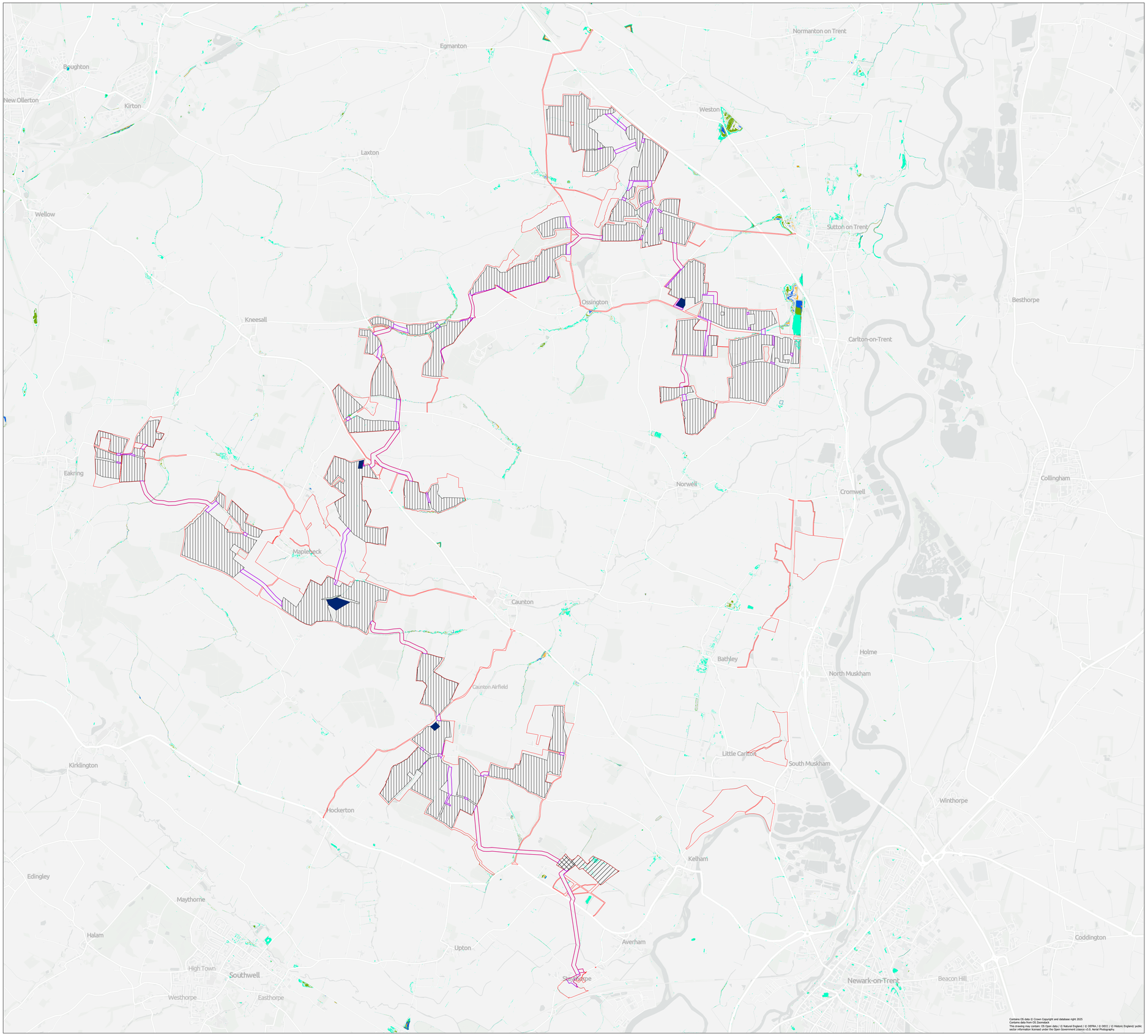
1:30,000 Scale @ A1

0 0.5 1 2 km

Ref: 014-ES-028-Rev02 | Date: 12/08/2025

1 % AEP Pluvial Flood Extents
Figure A9.5

Great North Road Solar and Biodiversity Park
Flood Risk Assessment



RAINCLOUD

Solar & Biodiversity Park

- Order Limits / Core Study Area
- Works Area 1: Solar PV
- Worka Area 2: Cable
- Works Area 4: Substations
- Works Area 5a: BESS
- Works Area 5b: 400kV Substation

RoFSW - Medium Risk Depth (m)

- 0-0.2
- 0.3
- 0.6
- 0.9
- 1.2

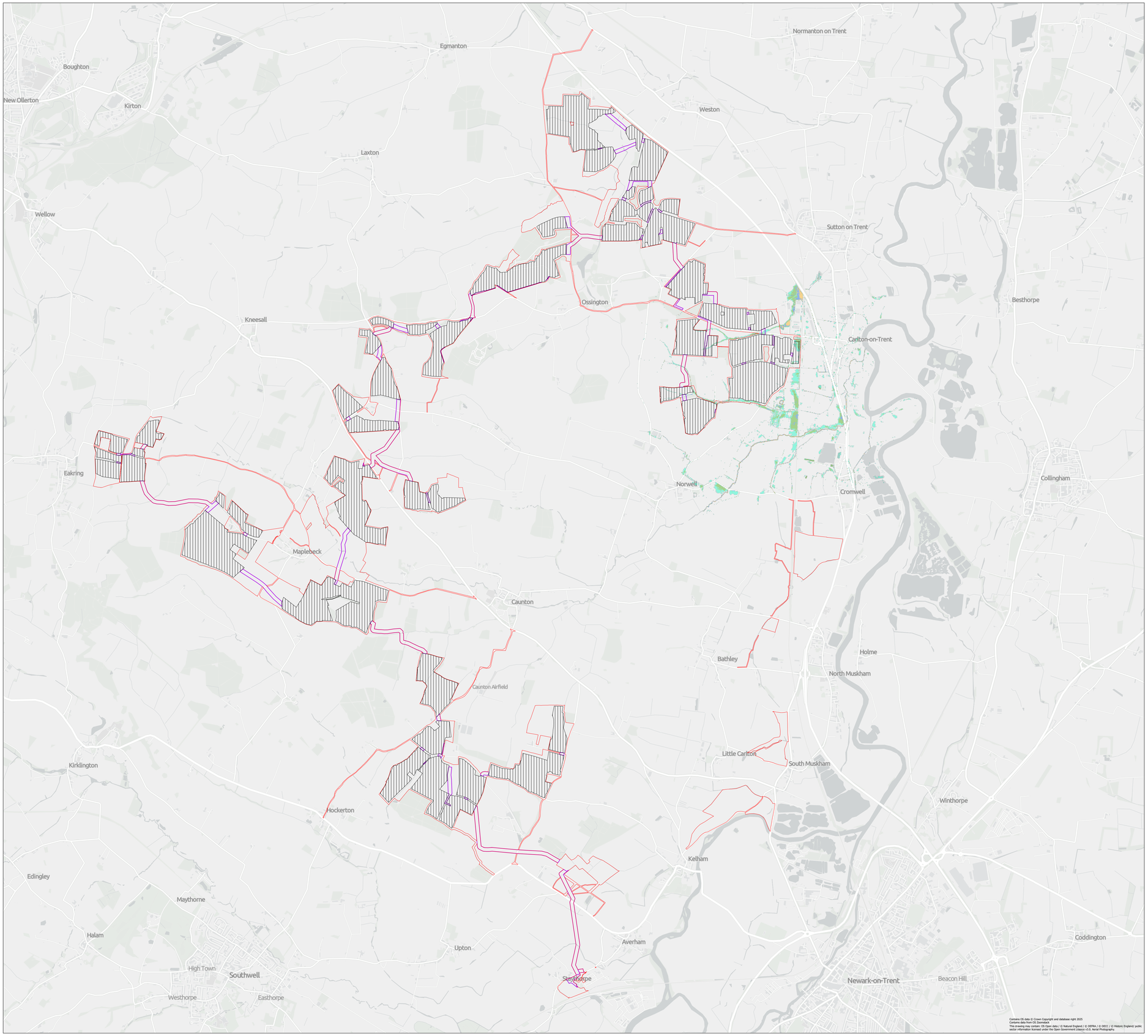
1:30,000 Scale @ A1

0 0.5 1 2 km

Ref: 014-ES-022-Rev02 | Date: 12/08/2025

1 % AEP Flood Depths (EA - RoFSW 2025) Figure A9.6

Great North Road Solar and Biodiversity Park Flood Risk Assessment



RAINCLOUD

Solar & Biodiversity Park

- Order Limits / Core Study Area
- Works Area 1: Solar PV
- Worka Area 2: Cable

1% AEP - 2D Model

Depth (m)

- 0.011 - 0.15
- 0.151 - 0.3
- 0.301 - 0.6
- 0.601 - 0.9
- 0.901 - 2.941

1:30,000 Scale @ A1

0 0.5 1 2 km

Ref: 014-ES-029-Rev02	Date: 12/08/2025

1 % AEP Flood Depths (Raincloud 2D Modelling) Figure A9.7

Great North Road Solar and Biodiversity Park Flood Risk Assessment

RAINCLOUD

Solar & Biodiversity Park

Order Limits / Core Study Area
Extents - Fluvial Contribution
Extents - Wet Day

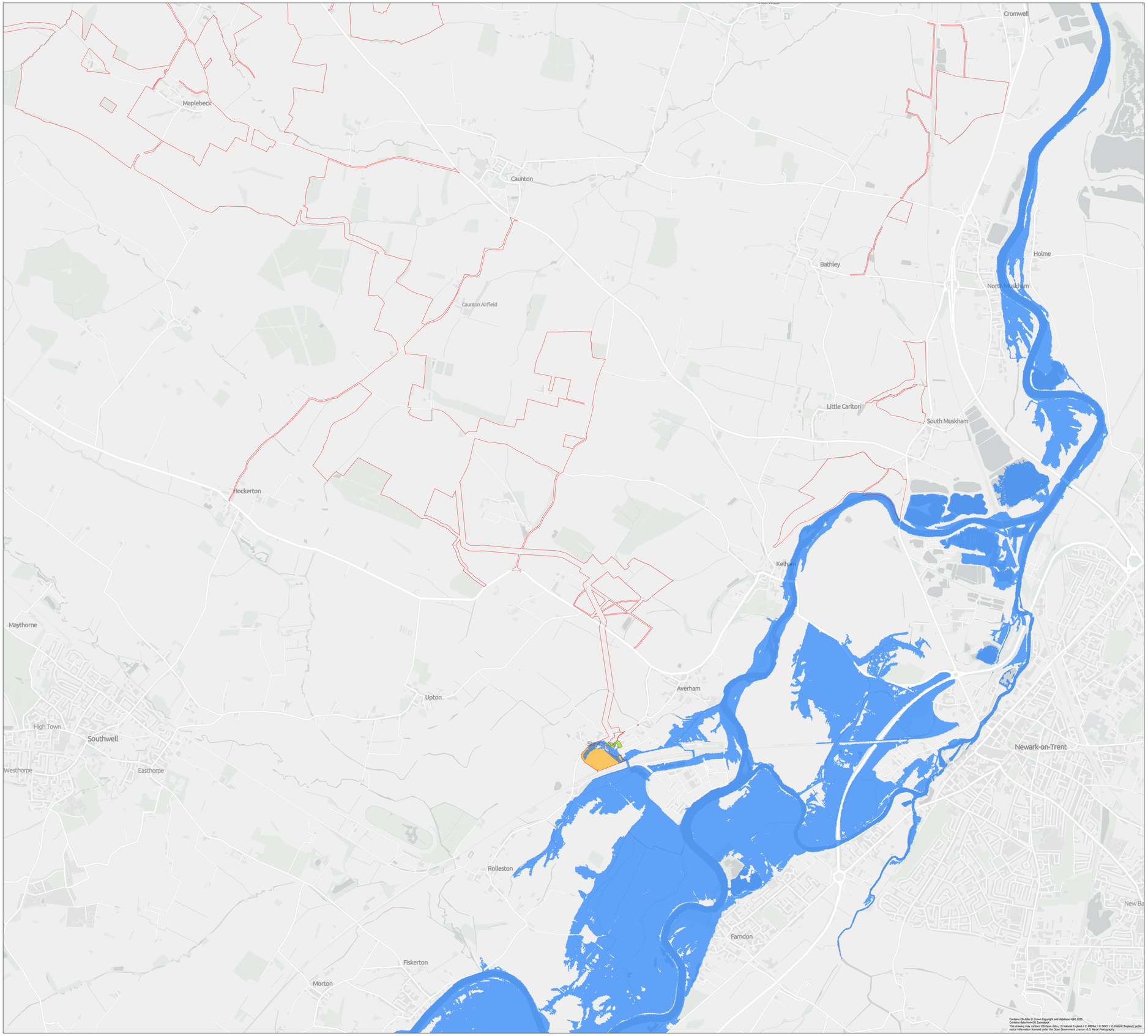
1:30,000 Scale @ A1

0 0.5 1 2 km

Ref: 014-ES-007-Rev02 | Date: 12/08/2025

Reservoir Flood Extents
Figure A9.8

Great North Road Solar and Biodiversity Park
Flood Risk Assessment



RAINCLOUD

Solar & Biodiversity Park

- Order Limits / Core Study Area
- Works Area 6: National Grid Substation
- Works Area 7: Staythorpe BESS Connection
- Flood Extents - Dry Day

1:20,000 Scale @ A1

0 0.25 0.5 1 km

Ref: 014-ES-012-Rev02	Date: 12/08/2025

Reservoir Flood Extents - Dry Day Scenario Figure A9.9

Great North Road Solar and Biodiversity Park Flood Risk Assessment

RAINCLOUD

Solar & Biodiversity Park

Order Limits / Core Study Area

Recorded Flood Outlines

Date

- 01/02/1795
- 01/01/1932
- 01/05/1932
- 01/01/1947
- 01/03/1947
- 01/01/1950
- 01/01/1977
- 01/02/1977
- 26/02/1977
- 29/12/1978
- 01/01/1979
- 31/10/2000
- 08/11/2000
- 10/11/2000
- 12/11/2000
- 22/06/2007
- 25/06/2007
- 01/11/2012
- 16/02/2020
- 20/10/2023
- 02/01/2024

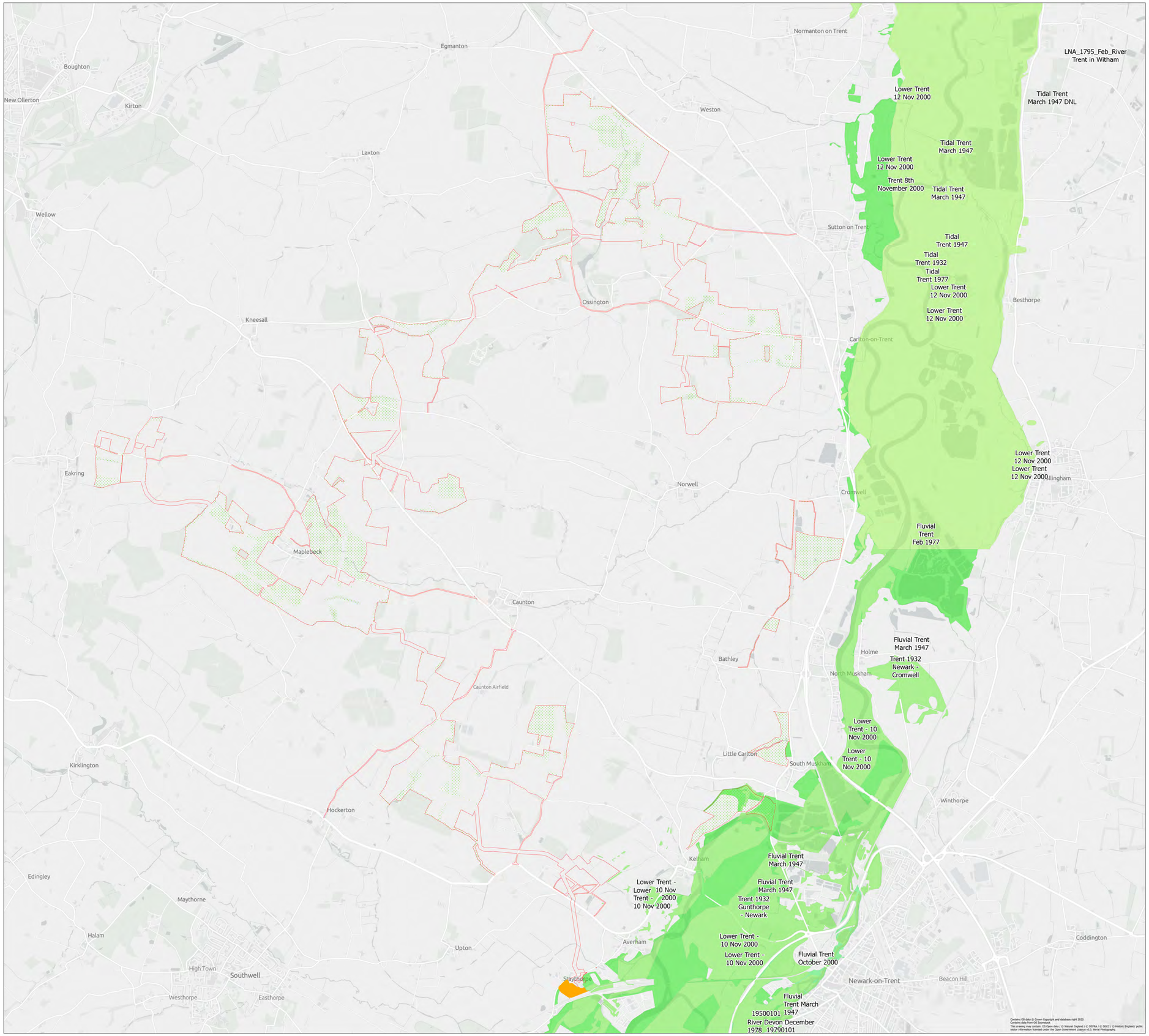
1:30,000 Scale @ A1

0 0.5 1 2 km

Ref: 014-ES-009-Rev02	Date: 12/08/2025

Historic Flood Outlines
Figure A9.10

Great North Road Solar and Biodiversity Park
Flood Risk Assessment



RAINCLOUD

Solar & Biodiversity Park

Order Limits / Core Study Area

Works Area 3: Mitigation

Works Area 7: Staythorpe BESS Connection

Recorded Flood Outlines >2000

Date

- 31/10/2000
- 08/11/2000
- 10/11/2000
- 12/11/2000
- 22/06/2007
- 25/06/2007
- 01/11/2012
- 16/02/2020
- 20/10/2023
- 02/01/2024

1:30,000 Scale @ A1

0 0.5 1 2 km

Ref: 014-ES-010-Rev02	Date: 12/08/2025

Recent Flood Outlines
Figure A9.11

Great North Road Solar and Biodiversity Park
Flood Risk Assessment

RAINCLOUD

Solar & Biodiversity Park

Goosemoor Dyke Catchment

Moorhouse Beck (Trib of Goosemoor Dyke)

Trent Catchment

The Beck Catchment (trib of Trent)

Pingley/Rundell Dyke/ Car Dyke/ The Wink

Greet Catchment (trib of Trent)

Order Limits / Core Study Area

Water Body Catchments

wb_name

- Goosemoor Dyke Catchment
- Greet Catchment (trib of Trent)
- Moorhouse Beck (Trib of Goosemoor Dyke)
- Pingley/ Rundell Dyke
- The Beck Catchment (trib of Trent)
- Trent Catchment

Catchment Name	Flood Study
The Beck Catchment (trib of Trent)	NaFRa2 data
Greet Catchment (trib of Trent)	River Greet, Nottingham Tributaries SFRM, JBA (2014)
Moorhouse Beck (Trib of Goosemoor Dyke)	NaFRa2 data
Goosemoor Dyke Catchment	NaFRa2 data
Trent Catchment	Tidal Trent, Jacobs (2023) Trent and tributaries at Newark SFRM2 (2011) Halcrow July 2011 plus the EA climate change (2020 rerun)
Pingley / Rundell Dyke / Car Dyke / The Wink	Trent and tributaries at Newark SFRM2 (2011) Raincloud (2025)

1:60,000 Scale @ A1

0 1 2 4 km

Ref: 014-ES-065-Rev02

Date: 13/08/2025

Flood Studies Catchments
Figure A9.12

Great North Road Solar and Biodiversity Park
Flood Risk Assessment

RAINCLOUD

Solar & Biodiversity Park

Order Limits / Core Study Area
Tidal 0.5% AEP (2071 UE)
Tidal 0.5% AEP (2121 UE)

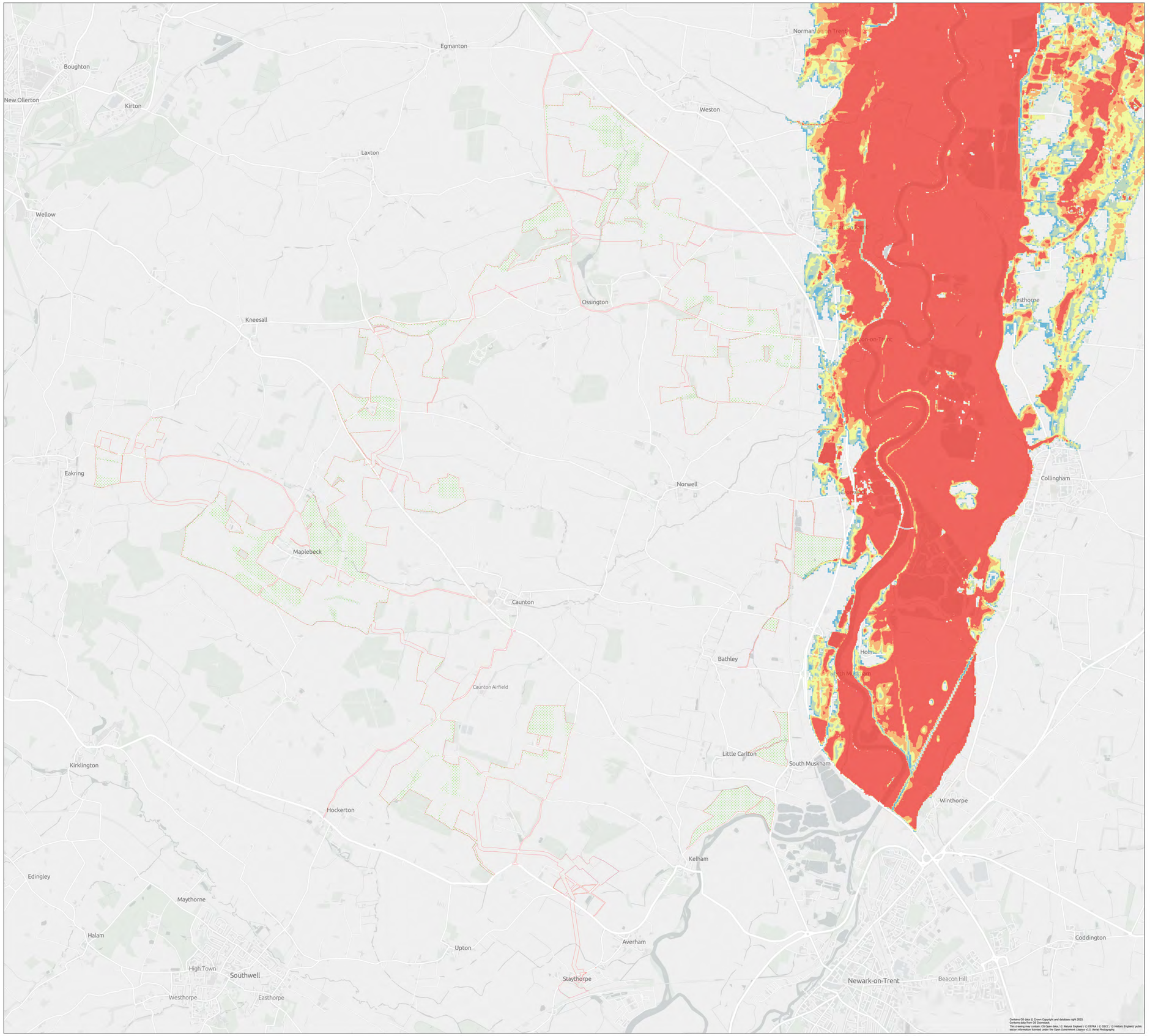
1:30,000 Scale @ A1

0 0.5 1 2 km

Ref: 014-ES-014-Rev02 | Date: 13/08/2025

Tidally Dominated 0.5 % AEP 2121 (Upper End) Scenario Figure A9.13

Great North Road Solar and Biodiversity Park Flood Risk Assessment



RAINCLOUD

Solar & Biodiversity Park

Core Study Area

Works Area 3: Mitigation

Defended Fluvial 1% AEP + 62% cc

Depth (m)

- 0.011 - 0.1
- 0.101 - 0.3
- 0.301 - 0.6
- 0.601 - 0.9
- 0.901 - 2.941

1:30,000 Scale @ A1

0 0.5 1 2 km

Ref: 014-ES-013-Rev02 | Date: 13/08/2025

Fluvially Dominated
1 % AEP + 62 % CC Scenario
Figure A9.14

Great North Road Solar and Biodiversity Park
Flood Risk Assessment

RAINCLOUD

Solar & Biodiversity Park

- Order Limits / Core Study Area
- Works Area 3: Mitigation
- Combined Defence Breach

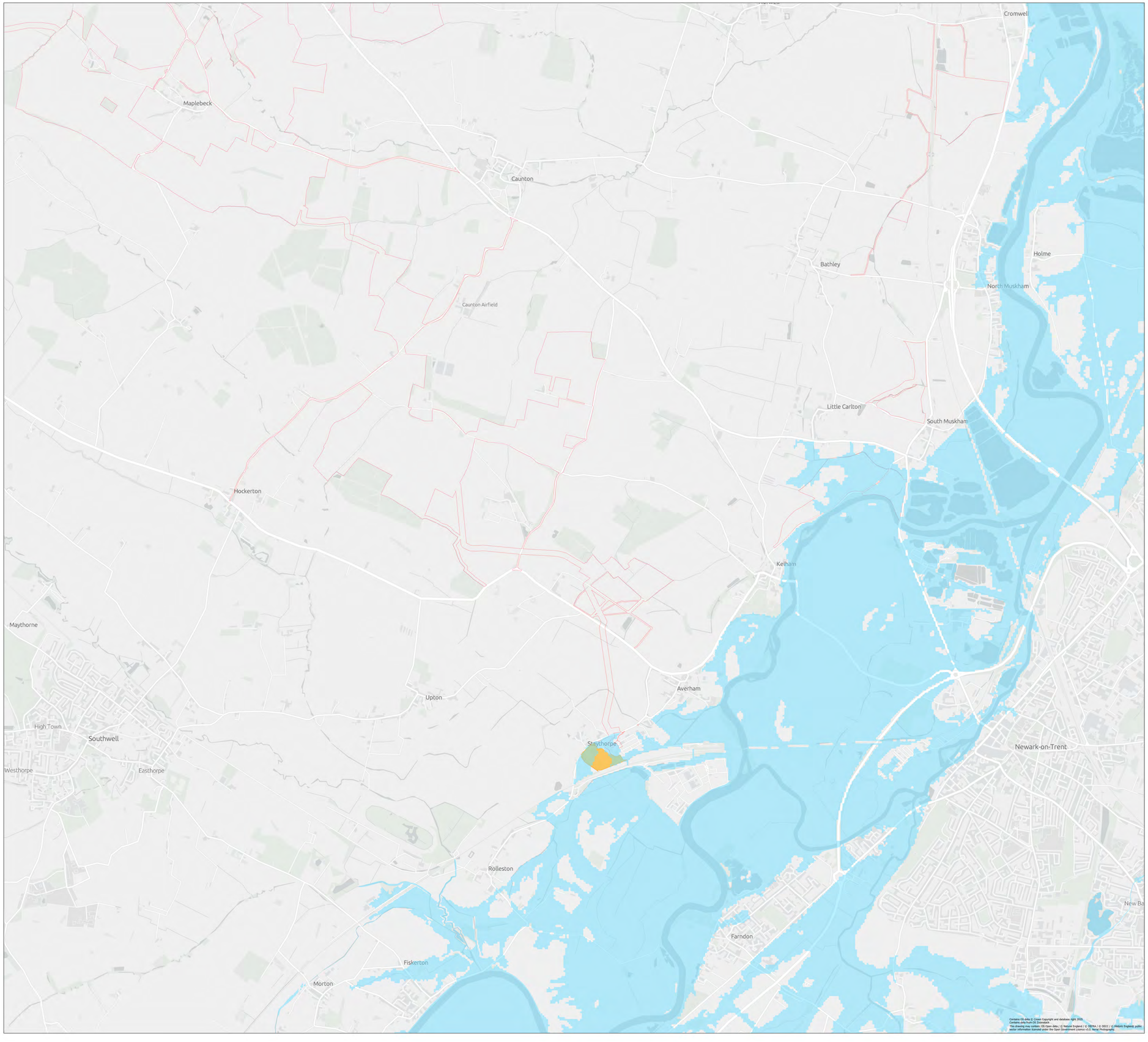
1:30,000 Scale @ A1

0 0.5 1 2 km

Ref: 014-ES-015-Rev02 | Date: 13/08/2025

Combined Tidal Breach Outline
Figure A9.15

Great North Road Solar and Biodiversity Park
Flood Risk Assessment



RAINCLOUD

Solar & Biodiversity Park

Order Limits / Core Study Area

Works Area 7: Staythorpe BESS Connection

1% AEP

1:20,000 Scale @ A1

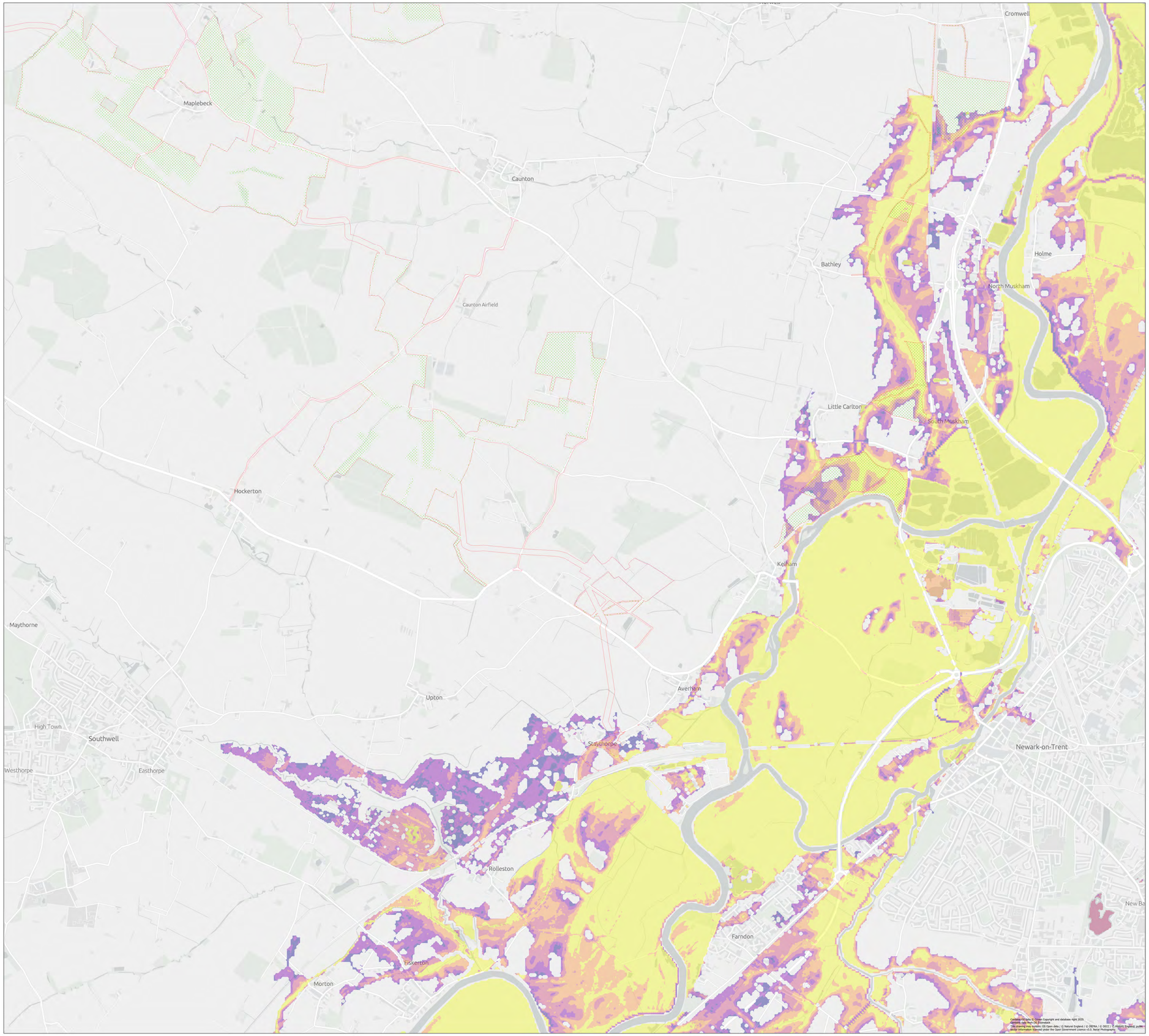
0 0.25 0.5 1 km

Ref: 014-ES-016-Rev02

Date: 13/08/2025

1 % AEP - River Trent
Figure A9.16

Great North Road Solar and Biodiversity Park
Flood Risk Assessment



RAINCLOUD

Solar & Biodiversity Park

Order Limits / Core Study Area

Works Area 3: Mitigation

1% AEP + 30% cc

Depth (m)

- 0.011 - 0.1
- 0.101 - 0.3
- 0.301 - 0.6
- 0.601 - 0.9
- 0.901 - 2.941

1:20,000 Scale @ A1

0 0.25 0.5 1 km

Ref: 014-ES-017-Rev02 | Date: 13/08/2025

1 % AEP + 30 % CC - River Trent
Figure A9.17

Great North Road Solar and Biodiversity Park
Flood Risk Assessment

RAINCLOUD

Solar & Biodiversity Park

- Order Limits / Core Study Area
- Works Area 1: Solar PV
- Works Area 3: Mitigation
- 1 % AEP Defended Extents (CCP1)

1:30,000 Scale @ A1

0 0.5 1 2 km

Ref: 014-ES-031a-Rev02 | Date: 13/08/2025

1 % AEP Defended Extents (CCP1) Figure A9.18

Great North Road Solar and Biodiversity Park Flood Risk Assessment

RAINCLOUD

Solar & Biodiversity Park

Order Limits / Core Study Area

Works Area 3: Mitigation

1% AEP + 30% CC

1 % AEP + 39 % CC

1:30,000 Scale @ A1

0 0.5 1 2 km

Ref: 014-ES-047-Rev02 | Date: 12/08/2025

1 % AEP + 30 % CC and + 39 % CC scenarios Figure A9.19

Great North Road Solar and Biodiversity Park Flood Risk Assessment

RAINCLOUD

Solar & Biodiversity Park

Order Limits / Core Study Area

Works Area: 6 National Grid Substation

1% AEP Undefended Extents (CCP1)

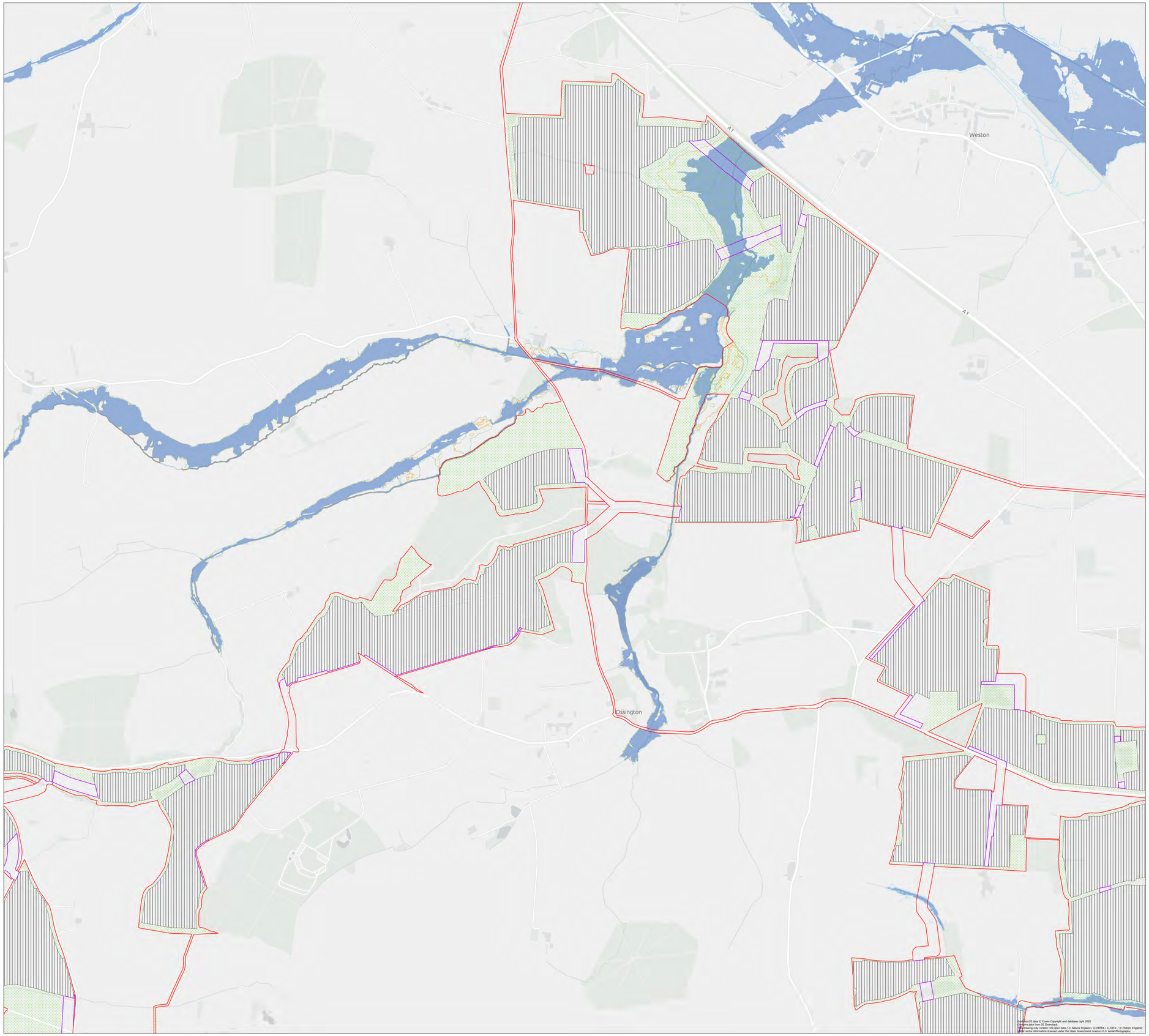
1:1,000 Scale @ A1

0 0.01 0.03 0.06 km

Ref: 014-ES-049b	Date: 13/08/2025

1 % AEP Undefended CCP1
Figure A9.20

Great North Road Solar and Biodiversity Park
Flood Risk Assessment



RAINCLOUD

Solar & Biodiversity Park

- Order Limits / Core Study Area
- Works Area 1: Solar PV
- Works Area 2: Cables
- Works Area 3: Mitigation
- 1% AEP Defended Extents CCP1

Flood Map for Planning 2025

- FZ2
- FZ3

1:10,000 Scale @ A1

0 0.13 0.25 0.5 km

Ref: 014-ES-048-Rev02 | Date: 13/08/2025

Moorhouse Beck - Flood Zones
Figure A9.21

Great North Road Solar and Biodiversity Park
Flood Risk Assessment

RAINCLOUD

Solar & Biodiversity Park

Order Limits / Core Study Area

Works Area 3: Mitigation

1:30,000 Scale @ A1

0 0.5 1 2 km

Ref: 014-ES-059-Rev02 | Date: 12/08/2025

RSuDS enhancement areas associated with the Development Figure A9.22

Great North Road Solar and Biodiversity Park Flood Risk Assessment

RAINCLOUD

Solar & Biodiversity Park

1% AEP

Depth (m)

- 0.011 - 0.1
- 0.101 - 0.3
- 0.301 - 0.6
- 0.601 - 0.9
- 0.901 - 2.941

1:5,000 Scale @ A1

0 0.13 0.25 0.5 km

Ref: 014-ES-057-Rev02	Date: 12/08/2025

Maplebeck 1 % AEP - Baseline
Figure A9.23

Great North Road Solar and Biodiversity Park
Flood Risk Assessment

RAINCLOUD

Solar & Biodiversity Park

1% AEP + Wildflower / Grass
Depth (m)
- 0.011 - 0.1
- 0.101 - 0.3
- 0.301 - 0.6
- 0.601 - 0.9
- 0.901 - 2.941
- Work Area 5: BESS

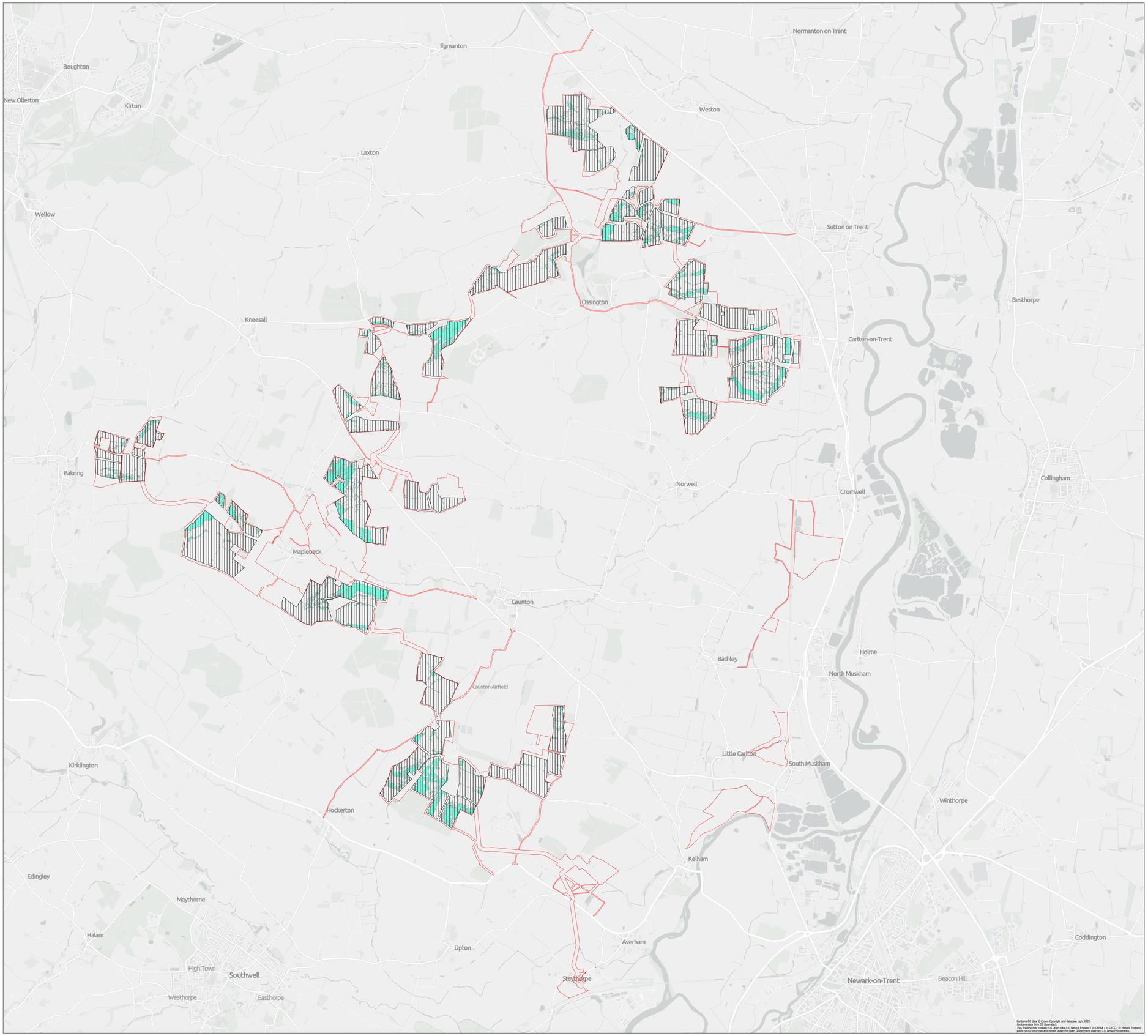
1:5,000 Scale @ A1

0 0.13 0.25 0.5 km

Ref: 014-ES-058-Rev02	Date: 12/08/2025

1 % AEP - Grass Mix under PV Arrays Figure A9.24

Great North Road Solar and Biodiversity Park Flood Risk Assessment



RAINCLOUD

Solar & Biodiversity Park

Order Limits / Core Study Area

Work Area 1: Solar PV

Slope

%

0.001 - 6

6+

1:30,000 Scale @ A1

0 0.5 1 2 km

Ref: 014-ES-061-Rev02	Date: 12/08/2025

Slope within Work Area 1
Figure A9.25

Great North Road Solar and Biodiversity Park
Flood Risk Assessment

APPENDIX E : FRA CONSULTATION

Extracted from the **Consultation Report [EN010162/APP/5.1]** [APP-296].

Respondent	Comment	Applicant response
Nottinghamshire County Council	The Flood Risk Management Team has reviewed the Flood Risk Assessment (Technical Appendix A9.1) and is broadly satisfied with its content.	Noted.
Nottinghamshire County Council	However, the reference to flood alleviation measures to improve the existing flooding pathways to communities such as Maplebeck is somewhat misleading.	The FRA **[EN010162/APP/6.4.9.1]** acknowledges the intention to alleviate existing flooding problems through the NG+ fund and that this will be considered as a cumulative development and not part of the Development.
Nottinghamshire County Council	Whilst it is recognised that these schemes may be delivered within the order limits of this proposal, they would be secured separately through applications made to the LPA under the Town and Country Planning Act and will not be delivered directly as part of this development. Therefore, it is not recommended that these measures form part of the FRA for this application.	The FRA **[EN010162/APP/6.4.9.1]** acknowledges the intention to alleviate existing flooding problems through the NG+ fund and that this will be considered as a cumulative development and not part of the Development.
Environment Agency	Flood risk to the BESS and substation site could be underestimated. The BESS and substation may be at a greater risk of flooding than initially considered. Furthermore, the placement of the BESS and substation could increase flood risk elsewhere if not properly mitigated. The overland flow routes shown in the Risk of Flooding from Surface Water mapping,	Updated 1D-2D modelling has been undertaken to include an existing culvert under the A617, as outlined in the FRA (TA A9.1) **[EN010162/APP/6.4.9.1]**. Updated results for the 1 % annual exceedance probability (AEP) + 39 % uplift for climate change (CC) shows that Works Area 5a and 5b are located

	particularly for the 0.1% (1 in 1000) AEP scenario should be reviewed. It appears the flood risk in this area is not from localised surface water ponding. This could be associated with some of the small ordinary watercourses which run close to the BESS. Any loss of floodplain for the design event should be compensated for on a level for level, and volume for volume basis. The BESS and substation are located in Flood Zone 1. There are small ordinary watercourses which cross the BESS and substation site, these have no associated Flood Zone mapping due to the small size of their respective catchments. The Risk of Flooding from Surface Water (RoFSW) dataset shows the BESS area to be inundated in the 1% (1 in 100) annual exceedance probability scenario (AEP) and the 0.1% (1 in 1000) AEP scenario. In some locations within the BESS area, water depths fall within the 0.30 - 0.60 metre band for the 0.1% (1 in 1000) AEP scenario. Inspection of the RoFSW flow direction dataset, appears to show water flowing south and southeast through the BESS and substation area. It is noted that in section A9.1.2.3 page 41 of Technical Appendix A9.1: Flood Risk Assessment (FRA) that electrically sensitive infrastructure such as inverters will be located outside of the surface water flooding extents. It is also noted that further 2D modelling will be undertaken post-PEIR to confirm the area of pluvial flooding at risk in the 1% AEP plus climate change scenario. This is welcomed.	outside the flood extent. Updated 2D direct rainfall modelling has also been undertaken for Work Area 5a and 5b. Results correlate well with the updated Risk of Flooding Surface Water (2025) dataset.

Environment Agency	This section notes that a sense check for fluvial flows will be undertaken for the credible maximum scenario. There are no details within the FRA, other than the reference to the higher central scenario for the 2080's epoch (plus 39%). It is not clear if the development would remain resilient and operational if upper climate change allowances were to materialise. Provide details within the FRA of the impact of a credible maximum scenario (upper fluvial flows) on the development. It should be demonstrated that the solar panels will remain operational should this scenario materialise. Furthermore, the BESS and substation should remain safe from flooding in this scenario.	Work Area 1: Solar PV is no longer located within the floodplain of the River Trent, including the 1 % AEP plus 39 % CC event. Only Work Area 2: Cables, Work Area 3: Mitigation and connections associated with Work Area 6 and Work Area 7 are located within the floodplain, however the works associated are either below ground (cables) or involve the creation of grassland etc which are compatible with the floodplain, will not result in a loss of storage or a perceptible effect on conveyance and will remain operational.
Environment Agency	The PEIR acknowledges the development will be operational between the 2050s and 2080's epochs. However, the design scenario that is proposed to be adopted for the development is the higher central scenario for the 2050's epoch. This reflects an uplift of 23% for the Lower Trent and Erewash management catchment. The FRA describes how the development would be decommissioned from 2069. Section A9.1.2.2.1.2 paragraph 83 of the FRA describes how given the time-limited nature of the application the use of a 30% climate change scenario is considered conservative and acceptable. The FRA notes that should there be a delay in the completion of construction of the development leading to operation into the 2080's the 39% allowance will be considered. The applicant has obtained model output data which includes the 1%	Paragraph 10 of the FRA **[EN010162/APP/6.4.9.1]** stated "the Development is Essential Infrastructure and will have a lifespan of 40 years (decommissioned from 2069)". The Development has been designed to avoid placing above ground infrastructure within the extent of the 1 % AEP + 39 % CC event i.e. the Higher central climate change allowance for the 2080s epoch. Given that a conservative approach has been adopted for the majority of the epoch in which the Development will operate in and the potential for climate change allowances to change in future, it is considered that the Development has been designed appropriately.

	(1 in 100) annual exceedance probability plus 39% water levels and depths (2080s higher central scenario).A review of this data confirms that water levels for the solar panels are not substantially increased when compared to the 1% (1 in 100) AEP plus 30% climate change scenario. Some difference mapping is presented in Plate A9.1.29 of the FRA. A review of the water level data for these scenarios confirms that water level differences between the 1% (1 in 100) AEP plus 30% and 1% (1 in 100) AEP plus 39% scenarios is small, with the highest increase being 0.25 m for the largest panel area just to the north of Little Carlton.	The commitment in the oEMP **[EN010162/APP/6.4.5.5]** states that should the Development lifetime be anticipated to extend into the 2080s epoch, as a result of delays to the construction programme for example, then modelling will be undertaken in year 2069 using the appropriate climate change allowances at the time, in consultation with the EA (and other regulators). Should modelling results show that the Development has the potential to interact with flood depths then the Development design will be altered accordingly to ensure that flood storage and conveyance is maintained for the River Trent. This could involve raising the PV Arrays (subject to negligible loss of storage and conveyance), the removal of the first row of panels on a PV table or removing the mounting system and associated infrastructure from the modelled extent.
Environment Agency	The FRA has not clarified if the proposed lifetime of the development is the operational lifetime, or if it includes the construction and decommissioning phases. If the lifetime (including construction and decommissioning phase) is longer than proposed in the FRA, the project would extend into the 2080's climate change epoch. This can lead to an inadequate assessment of climate change flood risk. The FRA needs to clarify the timeline of the development and the complete lifetime. Additionally, delays should be factored into this assessment.	Paragraph 10 of the FRA **[EN010162/APP/6.4.9.1]** submitted with the PEIR stated “the Development is Essential Infrastructure and will have a lifespan of 40 years (decommissioned from 2069)”. The Development has been designed to avoid placing above ground infrastructure within the extent of the 1 % AEP + 39 % CC event i.e. the Higher central climate change allowance for the 2080s epoch. Given that a conservative approach has been adopted for the majority of the epoch in which the Development will operate in and the potential for

		climate change allowances to change in future, it is considered that the Development has been designed appropriately. The commitment in the oEMP **[EN010162/APP/6.4.5.5]** states that should the Development lifetime be anticipated to extend into the 2080s epoch, as a result of delays to the construction programme for example, then modelling will be undertaken in year 2069 using the appropriate climate change allowances at the time, in consultation with the EA (and other regulators). Should modelling results show that the Development has the potential to interact with flood depths then the Development design will be altered accordingly to ensure that flood storage and conveyance is maintained for the River Trent. This could involve raising the PV Arrays (subject to negligible loss of storage and conveyance), the removal of the first row of panels on a PV table or removing the mounting system and associated infrastructure from the modelled extent.
Environment Agency	The 1d-2d hydraulic modelling undertaken for the Car and Pingley Dyke suggests the BESS, and substation area, are not at risk from fluvial flooding from these watercourses, and the A617 acts as a barrier to flow. There could be some connectivity underneath the A617 at grid reference 475725, 355050. This could mean flood risk on the northeastern side of the A617, the BESS and substation is underestimated. The Detailed River	Updated 1D-2D modelling has been undertaken to include the existing culvert under the A617, as outlined in the FRA (TA A9.1) **[EN010162/APP/6.4.9.1]**. Updated results for the 1 % AEP + 39 % CC shows that Works Area 5a and 5b are located outside the flood extent of Pingley Dyke.

	Network (DRN) dataset suggests there is a small culvert underneath the A617 at grid reference 475725, 355050. Confirmation is required of any flow routes underneath the A617, and if there is a culvert underneath the A617 at grid reference 475725, 355050. If any culverts are present under the A617, these will need to be included within the 1d-2d linked model of the Car and Pingley Dyke. The outcome of this assessment would be prudent to assess whether the flood flows from the River Greet and can pass under the A617.	
Environment Agency	There is no evidence provided to demonstrate their will be no perceptible loss of flood storage or conveyance during times of flooding, from the solar panel metal support frames. The solar panel support frames could potentially increase flood risk due to loss of floodplain storage and impedance to flow. Where solar panel support frames fall within areas of fluvial flood risk, and specifically the design flood, the impact on flood risk to third parties should be quantified. This can be achieved using several different approaches. Firstly, the volume of floodplain lost could be calculated and presented within the Flood Risk Assessment (FRA). Alternatively, the impact of the solar panel mounting structures could be evaluated within the fluvial Trent hydraulic model. This can be completed using a 2d flow constriction layer or increasing the 2d floodplain roughness values.	Work Area 1: Solar PV has been removed from the floodplain and future floodplain (1 % AEP + 39 % CC), as shown on Plate A9.1.17 of the FRA (TA A9.1) **[EN010162/APP/6.4.9.1]**. As such, there will be no effect on the conveyance of out of channel flows.

Environment Agency	Soffit levels for new crossings are not considered. Potential impediments to flood flows, and therefore increased flood risk elsewhere. Any proposed crossings should be designed so the soffit level of any bridges sits above the design flood level. The design flood level for permanent crossings in this case would be the 1% (1 in 100) annual exceedance probability (AEP) plus higher central climate change scenario. The present day (without climate change) 1% (1 in 100) AEP scenario can be used for temporary crossings during the construction phase of the scheme. Careful consideration will need to be given to how the design flood level will be determined for the proposed crossings. Typically, this would be determined by undertaking hydraulic modelling, or referring to existing detailed hydraulic modelling data (where available). The production of the new Risk of Flooding from Rivers and Sea dataset (at the end of January 2025) may provide some useful information which may help inform crossing soffit levels. If a reliance is being placed on existing flood risk products, such as the mapping to inform soffit levels, then clear justification should be provided as to why this is a suitable proxy for representing fluvial flood risk; taking into consideration the effects of climate change. The proposed crossings should be designed to not increase flood risk elsewhere.	Crossings will be designed following granting of the DCO and the oCEMP (TA A5.3) [**EN010162/APP/6.4.5.3]** has been updated at detailed design stage to commit to the soffit level of any bridges to sit above the design flood level. The design flood level for permanent crossings would be the 1% AEP plus Higher central climate change scenario (39 % CC) and will involve the following parameters: • Soffit height of the crossing will be a minimum of 600 mm above the 1 % AEP + Climate change allowance flood level. • All abutments must be set back a minimum 1 m from the top of bank and as minimal as possible. • Any loss of floodplain due to abutments and ramps will need to be compensated for. All parapets and railings need to be permeable and as open as possible with a minimum 100 mm spacing. The application is not seeking to disapply the EA's Protective Provisions and, therefore, the design of crossings will need to be approved by the EA prior to the constriction phase.

Environment Agency	The development has not assessed the impact it may have on engineered flood defences and assets (engineered high ground). Consideration has not been given for access to maintain the assets and respond to emergency incidents. If assets are adversely impacted, this may lead to degradation and a lower standard of protection. If assets cannot be accessed in times of a flood and/or for maintenance, this can increase flood risk. There must be an assessment of the development's interactions and impacts on all flood defence assets within their site boundary. Additionally, access must be upheld and where possible improved to assets on site	ES Chapter 9, Water Resources **[EN010162/APP/6.2.9]** assessed the potential effects from the Development on flood defences, including those classed as Engineered High Ground and concluded effects of Negligible magnitude. Work Area 2: Cables has been removed from the Order Limits in proximity to asset ID 55462 (Engineered High Ground) and asset ID 46099 (Natural High Ground) on the left bank of the River Trent. As such, the Development will not directly interact with flood defences and access to the assets will remain unaffected. An updated assessment of the potential effects from the Development on flood defences is provided in Section 9.6.1.6 of the ES Chapter.
Trent Valley Internal Drainage Board	The Board will require all watercourses to be crossed by means of an appropriate trenchless method at a depth no less than 2 metres PLUS the safe working distance below the hard bed level of all watercourses (to ODN if EA or IDB maintained). The purpose of this requirement is to allow the IDB to maintain and have the flexibility to improve watercourses in the future due to climate change (works will include deepening & widening of watercourses).	Cable crossings will utilise horizontal directional drilling (HDD) as the default option. Open trench methods will only be utilised on manmade watercourses / ditches and smaller watercourses (less than 2 m width). No pipe flumes will be used. Regarding culverting, clear span bridge crossings will be used where possible and culverts will only be used where a bridging solution is not feasible i.e. field drains / ditches / smaller watercourses (less than 2 m width).

Trent Valley Internal Drainage Board	Any culverting or other works within the bed of any Board maintained watercourse be they temporary or permanent will require consent. It will usually be assumed that these structures will be temporary measures to accommodate haul roads etc.	Regarding culverting, clear span bridge crossings will be used where possible and culverts will only be used where a bridging solution is not feasible i.e. field drains / ditches / smaller watercourses (less than 2 m width).
Trent Valley Internal Drainage Board	It is anticipated that the above requirements would be covered by SOCGs, MOU, and via Protective Provisions within the DCO. This matter should be discussed further and in more detail as the proposed route is refined.	Noted.
Trent Valley Internal Drainage Board	Any culverting or other works within the bed of any riparian watercourse within the Board's district or extended area, be they temporary or permanent will also require consent.	Noted.