



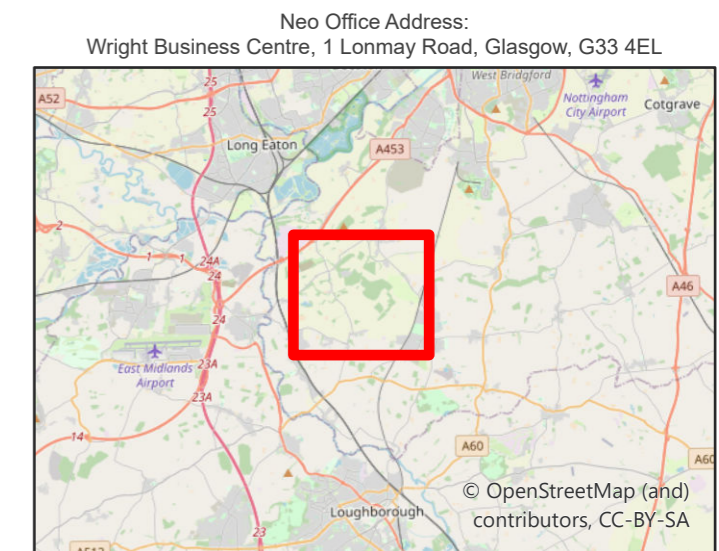
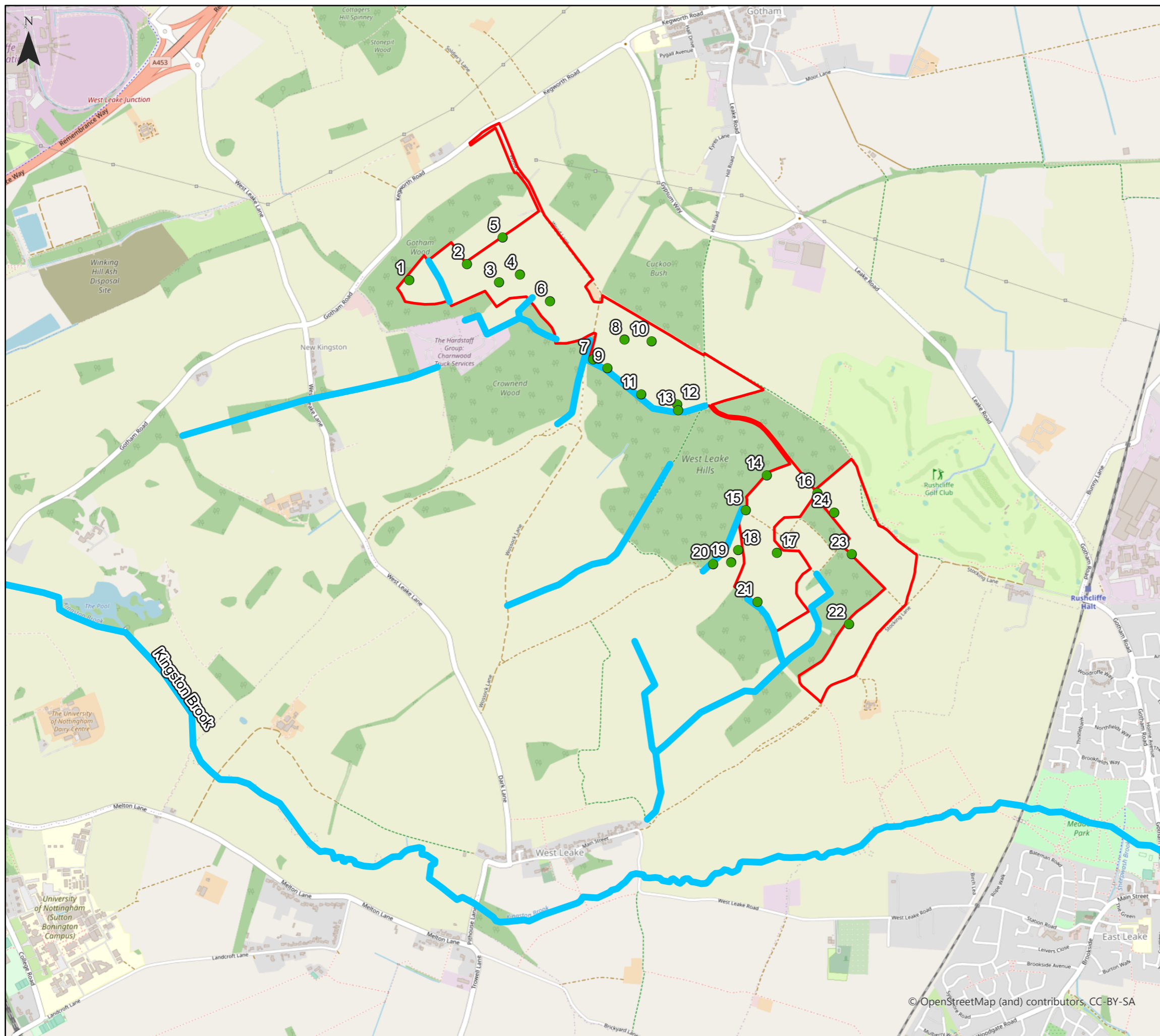
Appendix 4A: Figures



Kingston Solar Farm Watercourses and Photo Locations Figure 4.1

Key

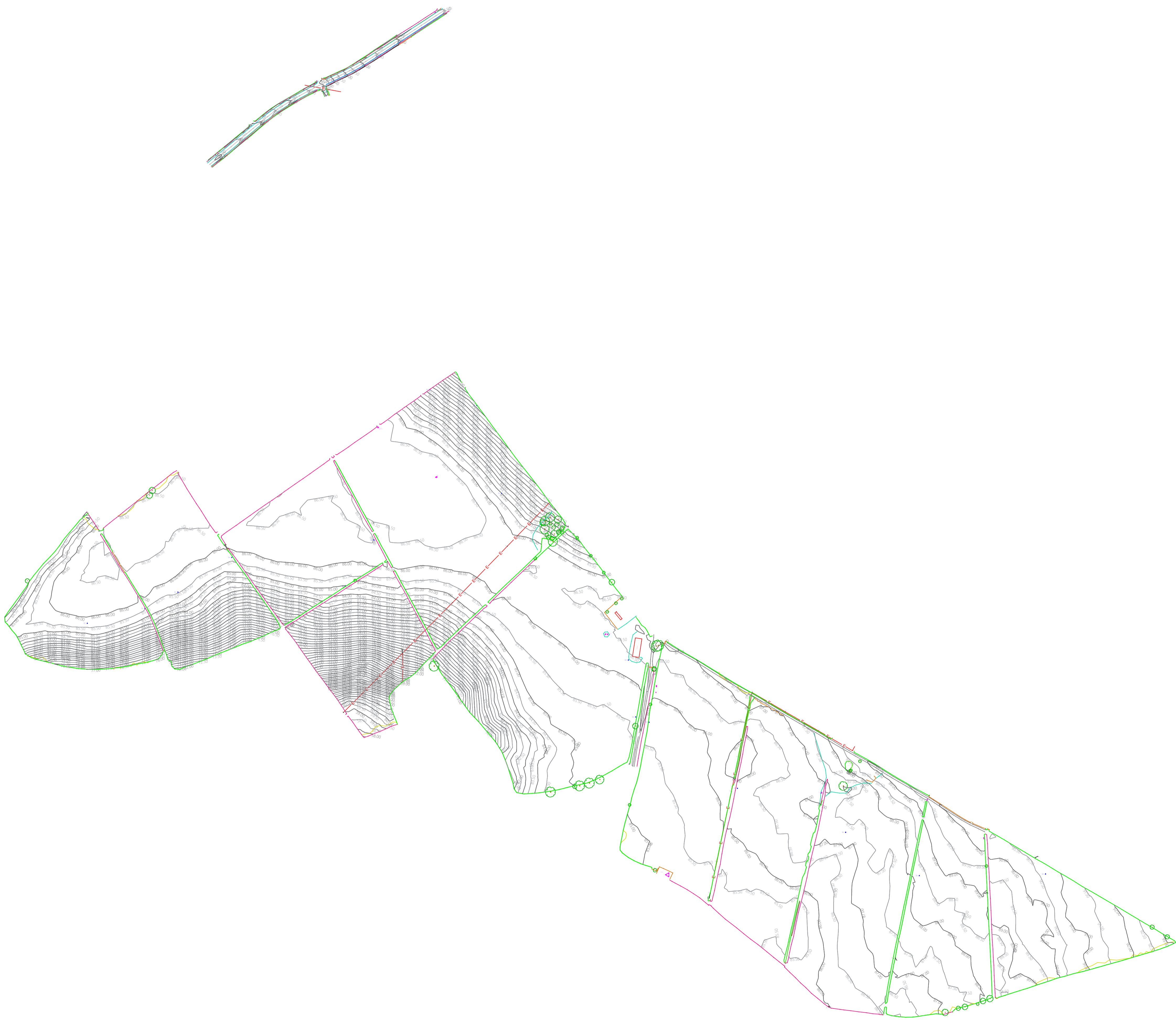
- Photo Locations
- Watercourses
- Development Boundary



© OpenStreetMap (and) contributors, CC-BY-SA

Date: 17/11/2021
 Drawn By: Tom Saddington
 Scale (A3): 1:17,000
 Drawing No: NEO00763/0341/B





Drawn By: Jamie McGhee
Address: Wright Business Centre
1 Lonmay Road
Glasgow
G33 4EL

Ver.	Date	Comments

A 08/12/2021

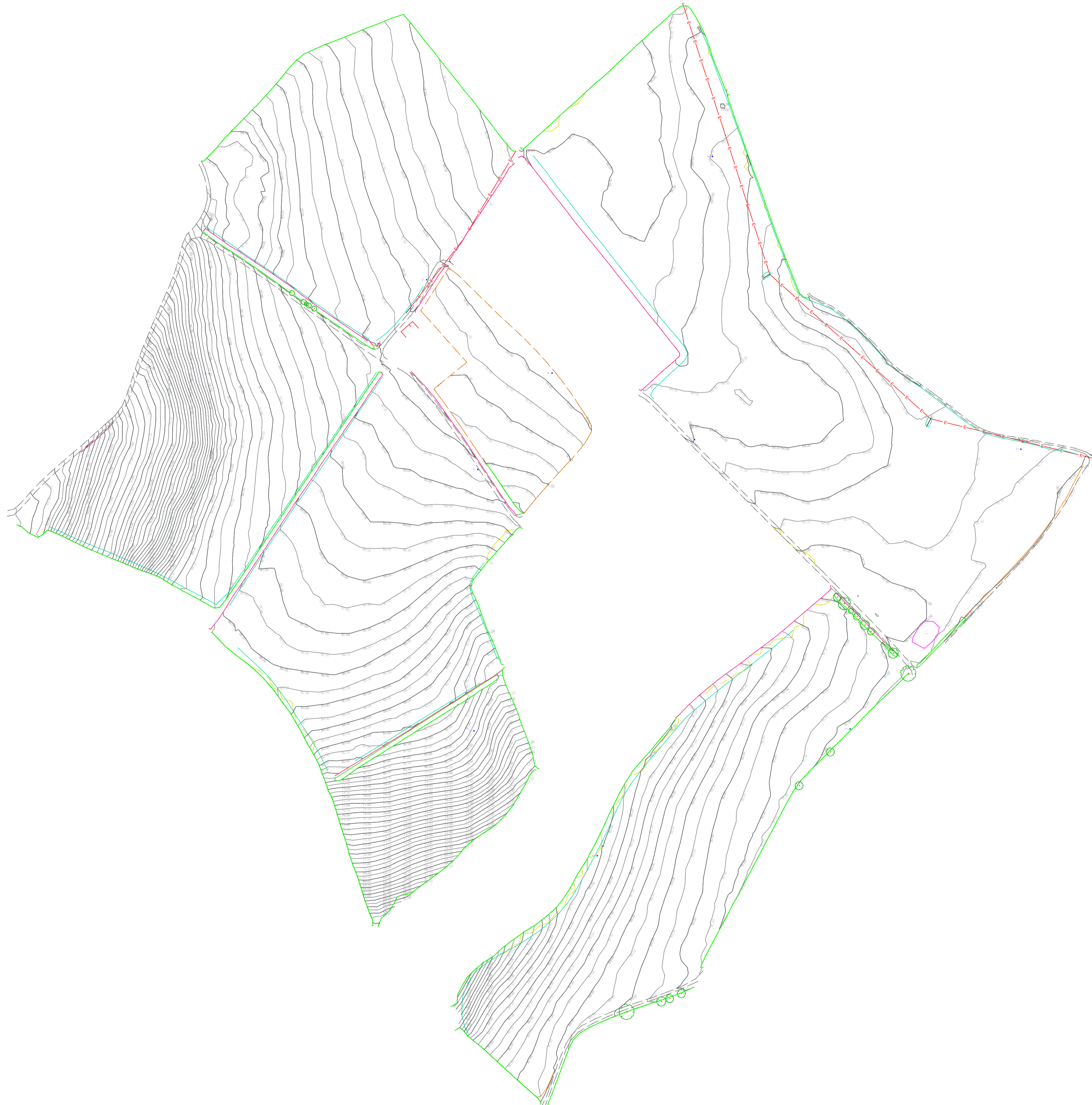
Warrington Office: T: 01925 661 716 E: info@neo-environmental.co.uk

Glasgow Office: T: 0141 773 6262 E: info@neo-environmental.co.uk
Naas Office: T: 00353 (0)45 844250 E: info@neo-environmental.ie
Ballymena Office: T: 0282 565 0413 E: info@neo-environmental.co.uk

Project: Kingston Solar Farm
Client: RES
Drawing: Topographical Survey

Project No.: NEO00763
Drawing No.: NEO00763_045L_A Figure 4.2.1
Drawn: JM **Checked:** MM **Approved:** PN

Scale: 1:3,000 @ A1 **Revision:**
Date: 08 December 2021 **A**



Drawn By: Jamie McGhee
Address: Wright Business Centre
1 Lonmay Road
Glasgow
G33 4EL

Ver.	Date	Comments

A 08/12/2021

Warrington Office: T:01925 661 716 E: info@neo-environmental.co.uk

Glasgow Office: T: 0141 773 6262 E: info@neo-environmental.co.uk
Naas Office: T:00353 (0)45 844250 E: info@neo-environmental.ie
Ballymena Office: T:0282 565 0413 E: info@neo-environmental.co.uk

Project: Kingston Solar Farm
Client: RES
Drawing: Topographical Survey

Project No.: NEO00763
Drawing No.: NEO00763_046L_A Figure 4.2.2
Drawn: JM **Checked:** MM **Approved:** PN

Scale: 1:2,000 @ A1 **Revision:**
Date: 08 December 2021 **A**



Flood map for planning

Your reference
Kingston

Location (easting/northing)
453308/328258

Created
26 Feb 2021 10:24

Your selected location is in flood zone 1, an area with a low probability of flooding.

This means:

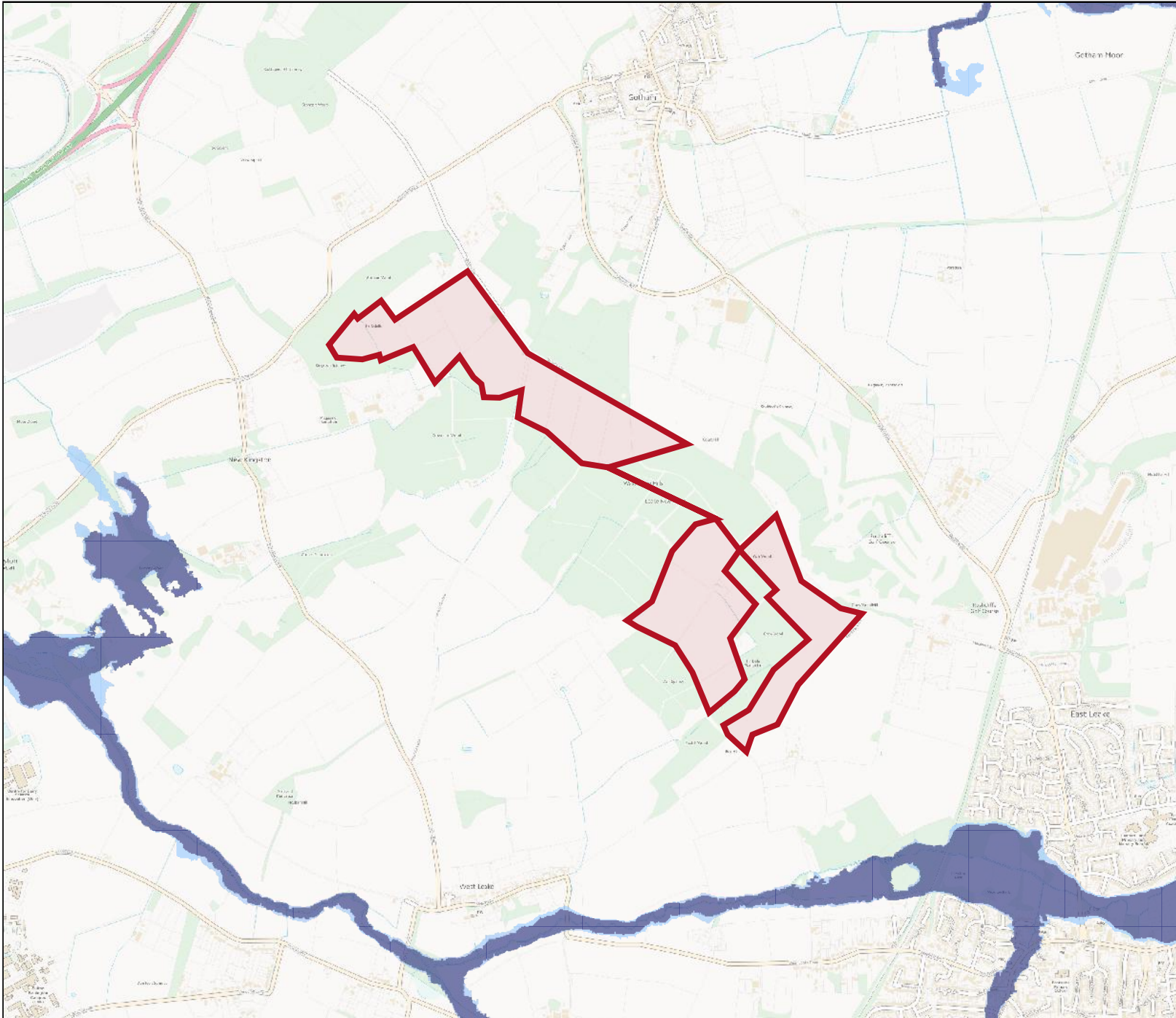
- you don't need to do a flood risk assessment if your development is smaller than 1 hectare and not affected by other sources of flooding
- you may need to do a flood risk assessment if your development is larger than 1 hectare or affected by other sources of flooding or in an area with critical drainage problems

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

The Open Government Licence sets out the terms and conditions for using government data.
<https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>










Flood map for planning


Your reference
Kingston

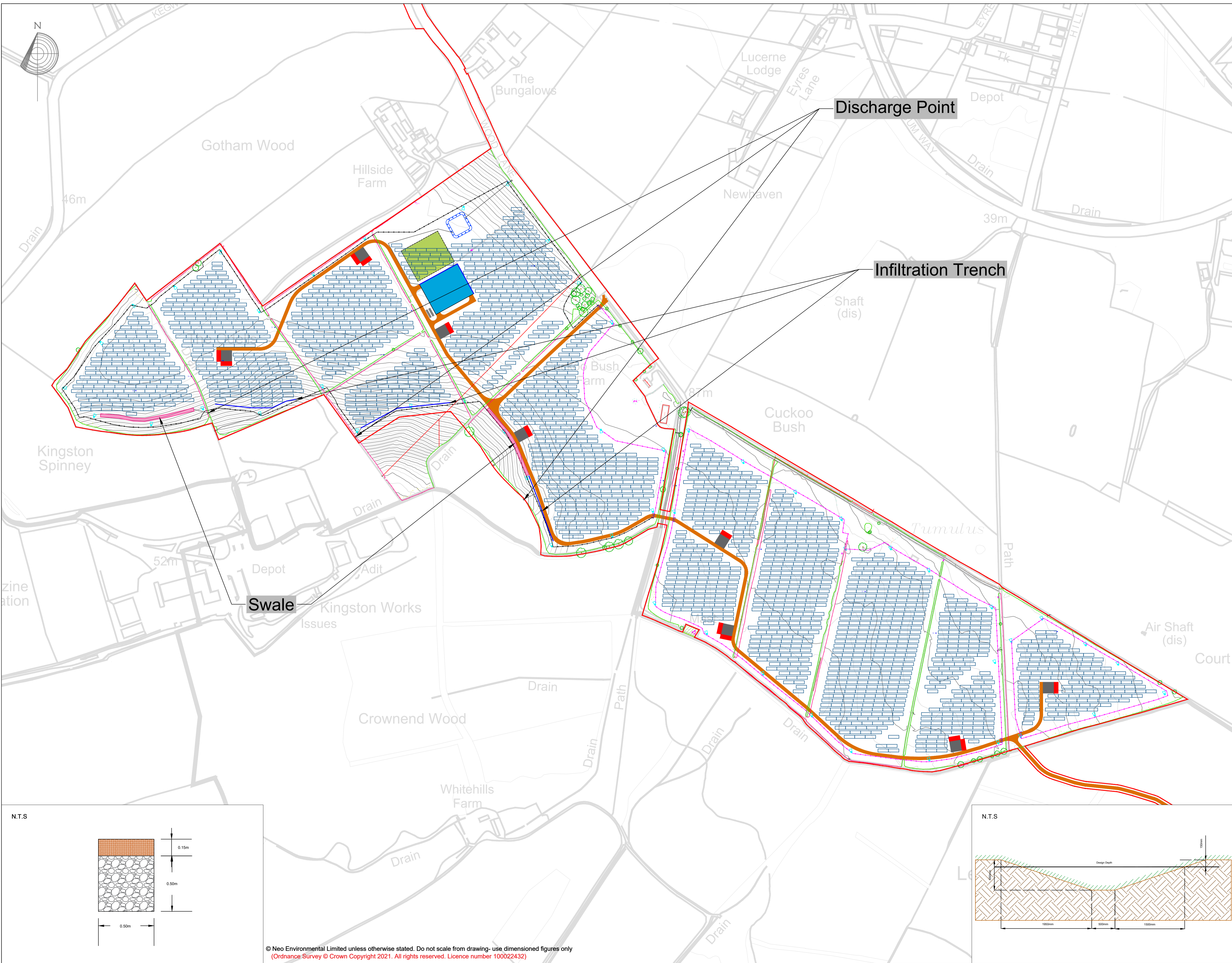
Location (easting/northing)
453308/328258

Scale
1:25000

Created
26 Feb 2021 10:24

-  Selected area
-  Flood zone 3
-  Flood zone 3: areas benefiting from flood defences
-  Flood zone 2
-  Flood zone 1
-  Flood defence
-  Main river
-  Flood storage area


0 200 400 600m

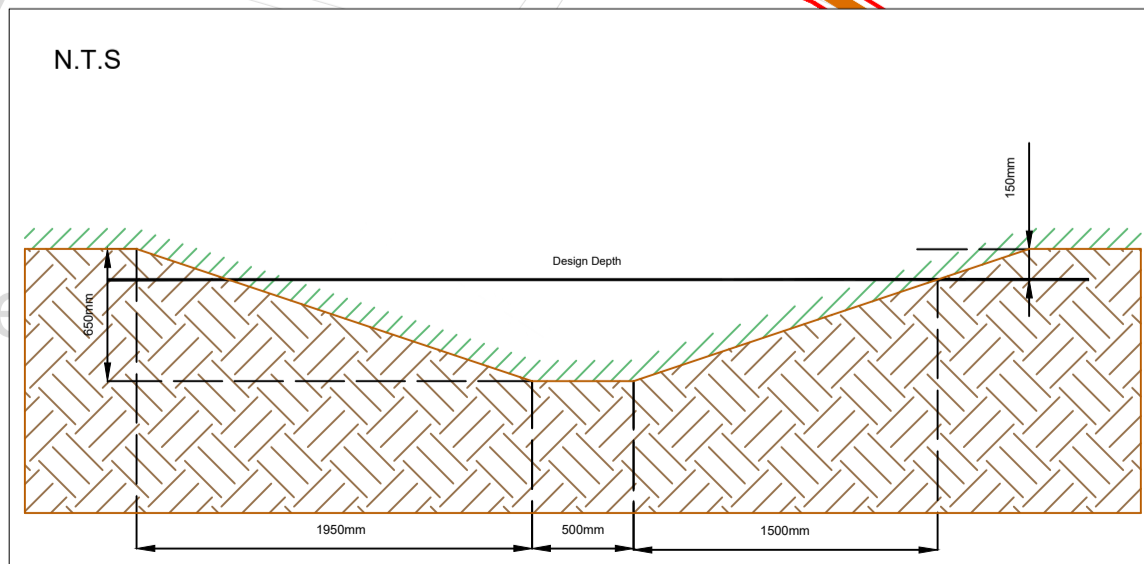
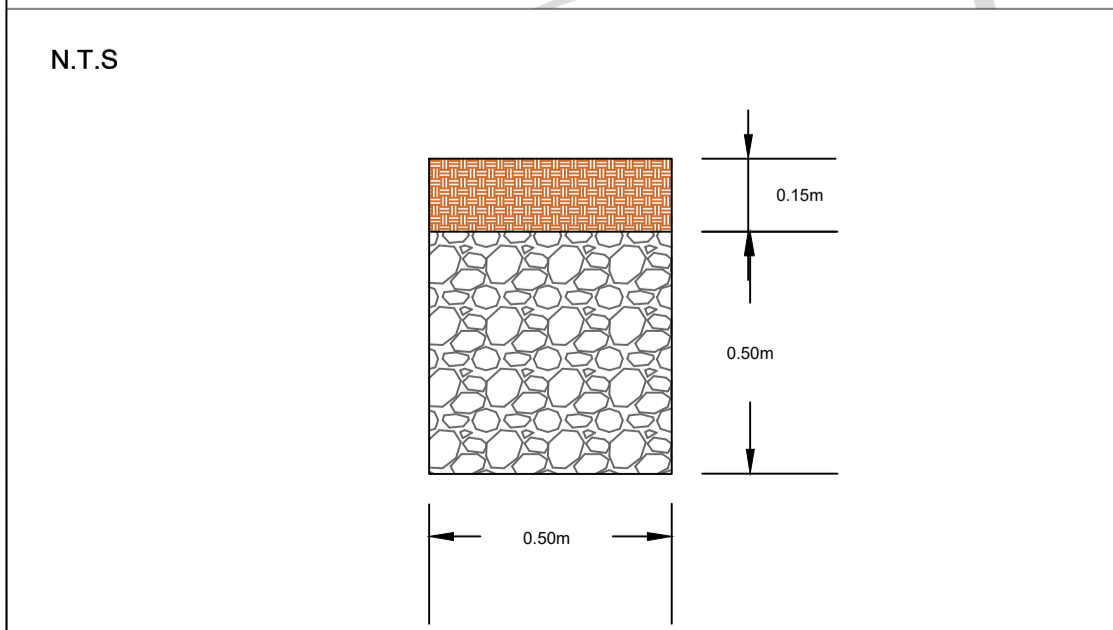


- Key**
- SITE BOUNDARY (CENTRE OF LINE DENOTES BOUNDARY)
 - INDICATIVE SOLAR PV ARRAY
 - NEW ACCESS TRACK
 - HARDSTANDING
 - INVERTER SUBSTATION
 - TEMPORARY CONSTRUCTION COMPOUND
 - STORAGE CONTAINER
 - FENCING
 - CCTV
 - SUBSTATION
 - SWALES
 - FILTER STRIPS/INFILTRATION TRENCHES
 - ATTENUATION STORAGE
 - UNDERGROUND PIPE
 - DISCHARGE POINT

Discharge Point

Infiltration Trench

Swale



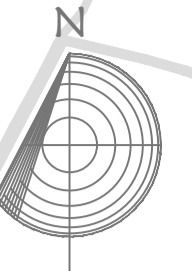
Drawn By: Jamie McGhee
Address: Wright Business Centre
1 Lonmay Road
Glasgow
G33 4EL

Rev	Date	Comments

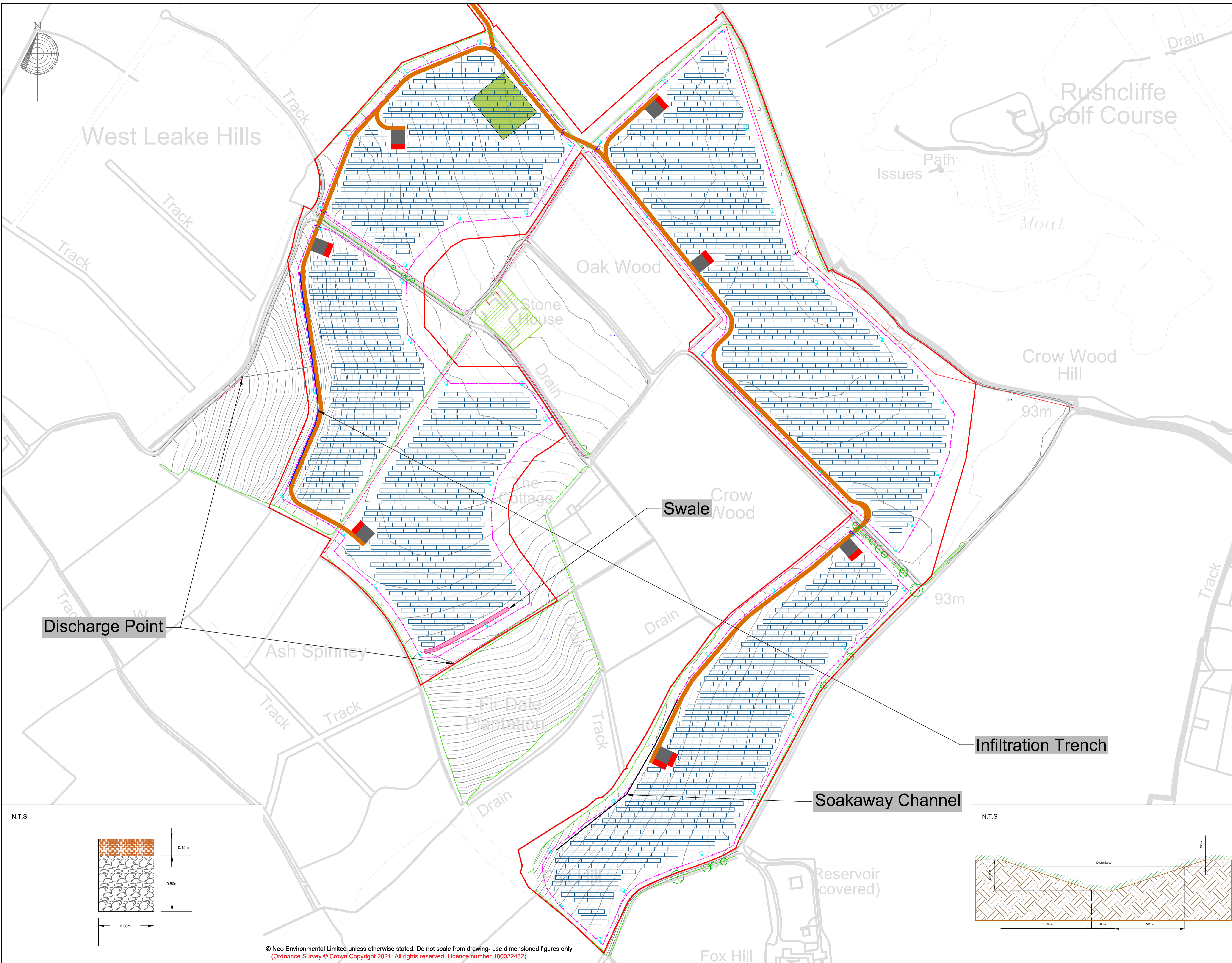
A 19/11/2021

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Glasgow Office: T: 0141 773 6262 E: info@neo-environmental.co.uk
Naas Office: T:00353 (0)45 844250 E: info@neo-environmental.ie
Ballymena Office: T:0282 565 0413 E: info@neo-environmental.co.uk

Project: Kingston Solar Farm
Client: RES
Drawing: Outline Drainage Design (Solar) Area 1
Project No.: NEO00763
Drawing No.: NEO00763_0431_A Figure 4.4
Drawn: JM **Checked:** MM **Approved:** PN
Scale: 1:2,500 @ A1 **Revision:** A
Date: 19 November 2021



- Key**
- SITE BOUNDARY
(CENTRE OF LINE DENOTES BOUNDARY)
 - INDICATIVE SOLAR PV ARRAY
 - NEW ACCESS TRACK
 - HARDSTANDING
 - INVERTER SUBSTATION
 - TEMPORARY CONSTRUCTION COMPOUND
 - FENCING
 - CCTV
 - SWALES
 - FILTER STRIPS/INFILTRATION TRENCHES
 - UNDERGROUND PIPE
 - DISCHARGE POINT
 - SOAKAWAY CHANNEL

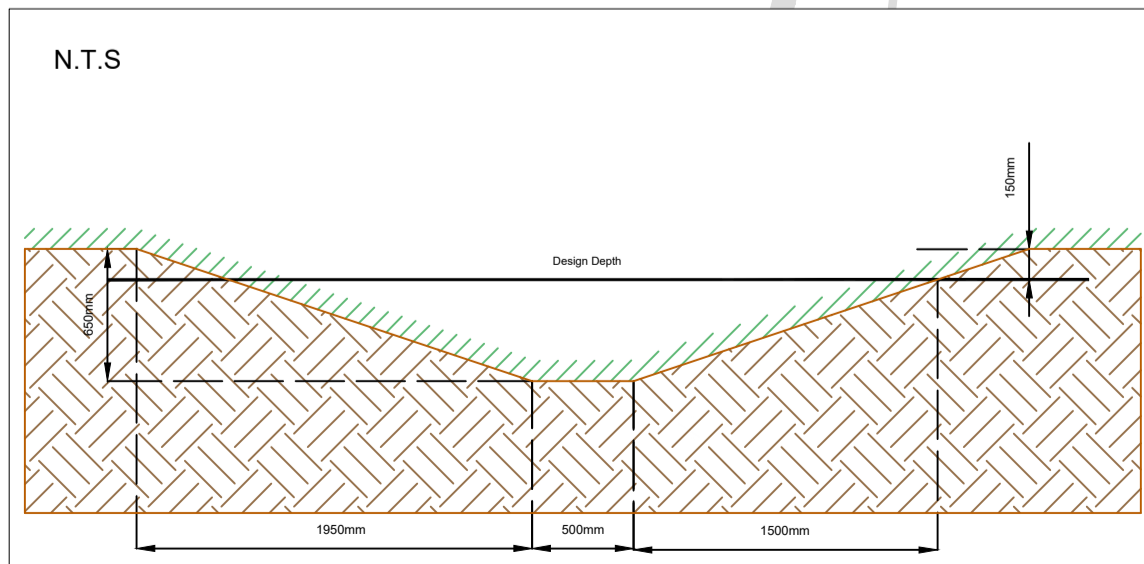
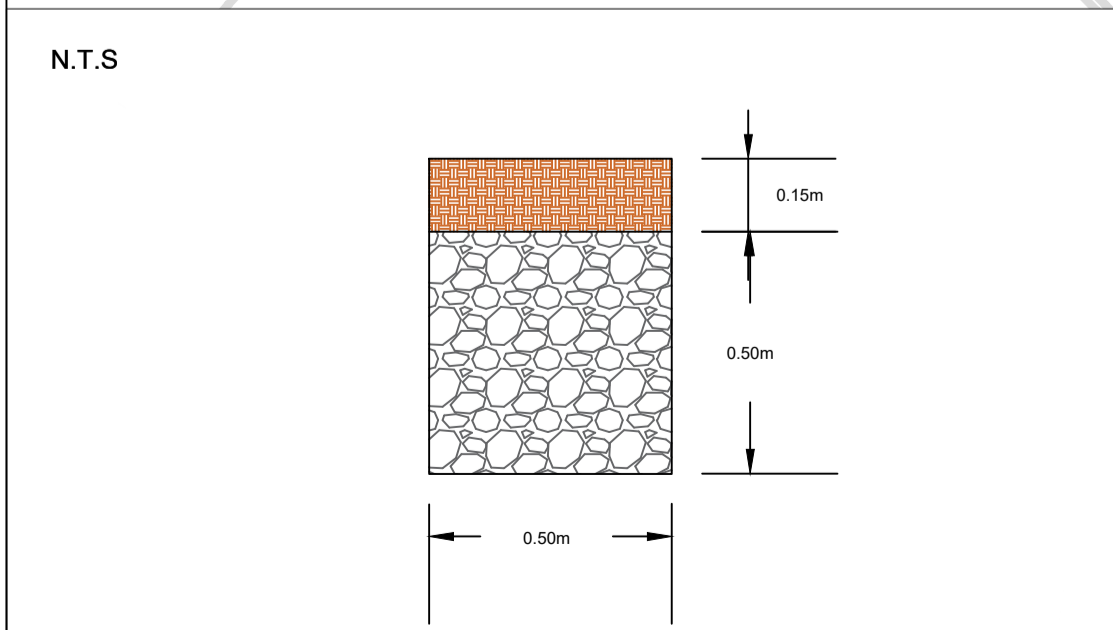


Discharge Point

Swale

Infiltration Trench

Soakaway Channel



Drawn By: Jamie McGhee
 Address: Wright Business Centre
 1 Lonmay Road
 Glasgow
 G33 4EL

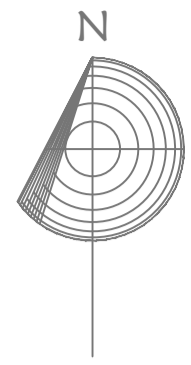
Rev	Date	Comments
A	19/11/2021	

neo
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 Glasgow Office: T: 0141 773 6262 E: info@neo-environmental.co.uk
 Naas Office: T:00353 (0)45 844250 E: info@neo-environmental.ie
 Ballymena Office: T:0282 565 0413 E: info@neo-environmental.co.uk

Project: Kingston Solar Farm
Client: RES
Drawing: Outline Drainage Design (Solar) Area 2
Project No.: NEO00763
Drawing No.: NEO00763_0441_A Figure 4.5
Drawn: JM **Checked:** MM **Approved:** PN
Scale: 1:2,000 @ A1 **Revision:** A
Date: 19 November 2021

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Inside Farm

Underground Pipe

Discharge Point

Infiltration Trench

Key

- SITE BOUNDARY
(CENTRE OF LINE DENOTES BOUNDARY)
- INDICATIVE SOLAR PV ARRAY
- NEW ACCESS TRACK
- HARDSTANDING
- INVERTER SUBSTATION
- TEMPORARY CONSTRUCTION COMPOUND
- STORAGE CONTAINER
- FENCING
- CCTV
- SUBSTATION
- FILTER STRIPS/INFILTRATION TRENCHES
- ATTENUATION STORAGE
- UNDERGROUND PIPE
- DISCHARGE POINT

Drawn By: Jamie McGhee
 Address: Wright Business Centre
 1 Lonmay Road
 Glasgow
 G33 4EL

Rev	Date	Comments

A 19/11/2021



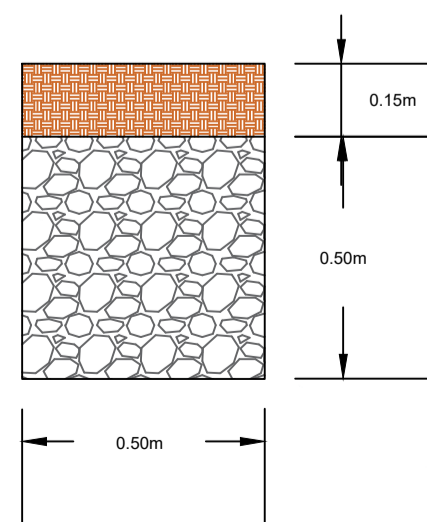
Warrington Office: T: 01925 661716 E: info@neo-environmental.co.uk
 Glasgow Office: T: 0141 773 6282 E: info@neo-environmental.co.uk
 Naas Office: T: 00353 (0)45 844250 E: info@neo-environmental.ie
 Ballymena Office: T: 0282 565 0413 E: info@neo-environmental.co.uk

Project: Kingston Solar Farm
Client: RES
Drawing: Outline Drainage Design (Grid)

Project No.: NEO00763
Drawing No.: NEO00763_0421_A Figure 4.6
Drawn: JM **Checked:** MM **Approved:** PN

Scale: 1:500 @ A1 **Revision:** A
Date: 19 November 2021

N.T.S



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Appendix 4B: Photo Register



Photo 1



Photo 2



Photo 3



Photo 4



Photo 5



Photo 6



Photo 7



Photo 8



Photo 9



Photo 10



Photo 11



Photo 12



Photo 13



Photo 14



Photo 15



Photo 16



Photo 17



Photo 18



Photo 19



Photo 20



Photo 21



Photo 22



Photo 23



Photo 24





Appendix 4C: Flow Output (Solar Farm)



Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	30	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	17.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Simulation Settings

Rainfall Methodology	FSR	Drain Down Time (mins)	240
FSR Region	England and Wales	Additional Storage (m³/ha)	20.0
M5-60 (mm)	17.000	Check Discharge Rate(s)	✓
Ratio-R	0.400	1 year (l/s)	0.7
Summer CV	0.750	30 year (l/s)	1.6
Winter CV	0.840	100 year (l/s)	2.1
Analysis Speed	Normal	Check Discharge Volume	✓
Skip Steady State	x	100 year 360 minute (m³)	47

Storm Durations

15 | 30 | 60 | 120 | 180 | 240 | 360 | 480 | 600 | 720 | 960 | 1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	40	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	1.95
Greenfield Method	IH124	Growth Factor 100 year	2.48
Positively Drained Area (ha)	0.210	Betterment (%)	0
SAAR (mm)	597	QBar	0.8
Soil Index	4	Q 1 year (l/s)	0.7
SPR	0.47	Q 30 year (l/s)	1.6
Region	4	Q 100 year (l/s)	2.1
Growth Factor 1 year	0.85		

Pre-development Discharge Volume

Site Makeup	Greenfield	Return Period (years)	100
Greenfield Method	FSR/FEH	Climate Change (%)	0
Positively Drained Area (ha)	0.210	Storm Duration (mins)	360
Soil Index	4	Betterment (%)	0
SPR	0.47	PR	0.411
CWI	89.926	Runoff Volume (m³)	47



Appendix 4D: Flow Output (Grid Substation)



Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	30	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	17.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Simulation Settings

Rainfall Methodology	FSR	Drain Down Time (mins)	240
FSR Region	England and Wales	Additional Storage (m³/ha)	20.0
M5-60 (mm)	17.000	Check Discharge Rate(s)	✓
Ratio-R	0.400	1 year (l/s)	0.7
Summer CV	0.750	30 year (l/s)	1.6
Winter CV	0.840	100 year (l/s)	2.0
Analysis Speed	Normal	Check Discharge Volume	✓
Skip Steady State	x	100 year 360 minute (m³)	45

Storm Durations

15 | 30 | 60 | 120 | 180 | 240 | 360 | 480 | 600 | 720 | 960 | 1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	40	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	1.95
Greenfield Method	IH124	Growth Factor 100 year	2.48
Positively Drained Area (ha)	0.200	Betterment (%)	0
SAAR (mm)	597	QBar	0.8
Soil Index	4	Q 1 year (l/s)	0.7
SPR	0.47	Q 30 year (l/s)	1.6
Region	4	Q 100 year (l/s)	2.0
Growth Factor 1 year	0.85		

Pre-development Discharge Volume

Site Makeup	Greenfield	Return Period (years)	100
Greenfield Method	FSR/FEH	Climate Change (%)	0
Positively Drained Area (ha)	0.200	Storm Duration (mins)	360
Soil Index	4	Betterment (%)	0
SPR	0.47	PR	0.411
CWI	89.926	Runoff Volume (m³)	45



Appendix 4E: BRE 365 Test and Report



Our Ref: YEX2323

27th August 2021

For the attention of Neo Environmental Ltd,

Ref: Proposed Kingston Solar Farm, Wood Lane, Gotham, NG11 0LF

We thank you for your request to undertake permeability testing at the above mentioned site and take pleasure in enclosing the results of this work. The investigation was undertaken on the 23rd August 2021 in accordance with your instruction to proceed. This letter describes the work undertaken, presents the data obtained and discusses the results of the tests.

Geology

An examination of the available British Geological Survey data of the area for the site has been examined and indicates that the site has no superficial drift deposits recorded, and bedrock deposits recorded as the Barnstone Member (mudstone and limestone).

Fieldworks

The programme of this investigation included the excavation of two trial pits. The locations of the soakaway tests were selected by the client.

During this work, the soils encountered were logged in general accordance with BS 5930: 1990, as amended in 2007, and full descriptions are given on the borehole records, which are also appended to this letter.

Soakaway Tests

During the soakaway tests the water failed to achieve a fall from 75% to 25% of the effective depth of the storage volume in TP01 and TP02. The results obtained from the soakaway tests are summarised below:

Table 1: Soakaway Test Results

WS	Soakage Area Dimensions (m)	Depth (m)	Soil Description (Base of TP)	Infiltration Rate (m/sec)	Drainage Characteristics
TP01 test1	1.60 x 0.30	1.50	Light brown gravelly CLAY. Gravel is coarse, of mixed lithology cobbles.	N/A	Practically Impermeable
TP02 test1	1.60 x 0.30	1.50	Light brown and mottled grey gravelly CLAY. Gravel is coarse, angular of mixed lithology cobbles.	N/A	Practically Impermeable

Discussion

The soils encountered beneath the site were found to be predominantly CLAY. The soakage rates obtained during the investigation were found to be poor to practically impermeable. Given the data from the test, it is considered that soakaways are not suitable for this site.

References

Building Research Establishment (BRE) Digest 365, *Soakaway Design*, September 1991.

British Standards Institution (1999) BS5930: *Code of practice for site investigations*, B.S.I., London.


British Standards Institution (2007), Amendment No 1, BS5930: *Code of practice for site investigations*, B.S.I., London.

We trust that this information is of interest and should you have any other requirements do not hesitate to contact us.

For and on behalf of

YourEnvironment

Yours Faithfully,



Nick Hammond

Geo-Environmental Engineer

Enc.

Appendix A: Site Investigation Plan

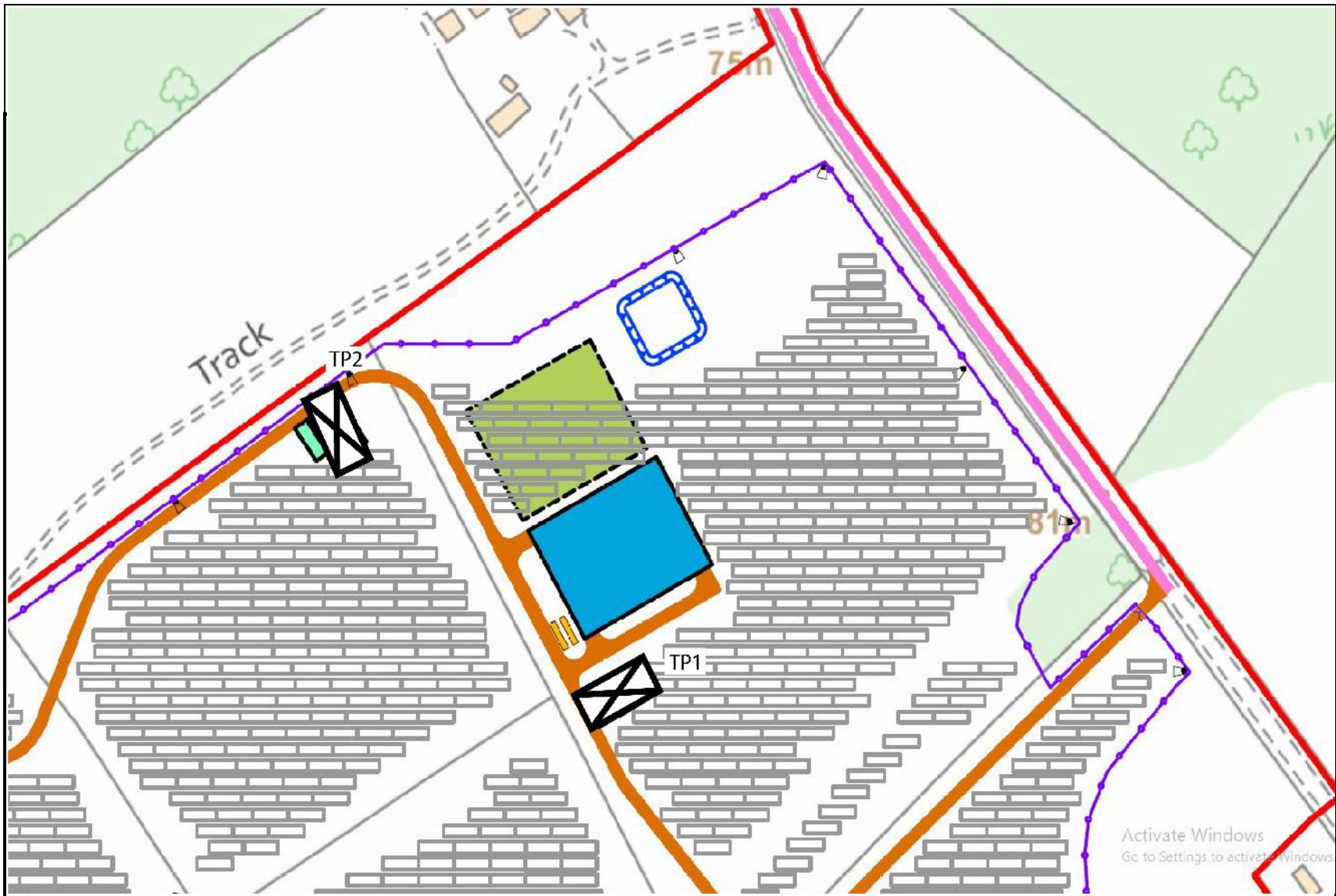
Appendix B: Trial Pit Logs

Appendix C: Soakaway Test Results

Appendix D: Photographs

APPENDIX A: Site Investigation Plan





Ground Investigation Location Plan - Not to Scale

YourEnvironment
 Chilgrove Business Centre, Chilgrove, Nr Chichester, PO18 9HU
 Tel: 01243 787150
 Email: info@yourenvironment.org

Site Name:
 Kingston Solar Farm

Client:
 Neo Environmental Ltd

Date:
 Aug-21

Job No.:
 YEX2323

APPENDIX B: Trial Pit Logs





www.yourenvironment.org
 info@yourenvironment.org
 01243 787150

Log of Boring
 Sheet 1 of

TP1
 1

YE Engineer N. Hammond

Location	Proposed Kingston Solar Farm, Wood Lane, Gotham, NG11 0LF
Date	August 23, 2021
Project Reference	YEX2323

Water level data	
Completion:	Depth <u>NA</u> m Elevation <u>NA</u> m
24 hour:	Depth <u> </u> m Elevation <u> </u> m

Width 0.3 m
 Length 1.6 m
 Depth 1.5 m

Method (Trial pit, window etc) Trial Pit - Machine Excavation

Stratum depth (m)	Sample Depth		Sample Type	GW	Install Details	LITHOLOGY
	From	To				
From	To	m	m			
0.00					NONE	MADE GROUND. Brown gravelly, clayey SAND. Sand is fine - medium. Gravel is medium - coarse, angular of brick fragments.
0.30						Light brown and mottled grey gravelly CLAY. Gravel is medium - coarse, angular of mixed lithology.
1.00						Light brown gravelly CLAY. Gravel is coarse, of mixed lithology cobbles.
1.50						End of TP1

Remarks: .



www.yourenvironment.org
 info@yourenvironment.org
 01243 787150

Log of Boring
 Sheet 1 of

TP2
 1

YE Engineer N. Hammond

Location	Proposed Kingston Solar Farm, Wood Lane, Gotham, NG11 0LF
Date	August 23, 2021
Project Reference	YEX2323

Water level data	
Completion:	Depth <u>NA</u> m Elevation <u>NA</u> m
24 hour:	Depth <u> </u> m Elevation <u> </u> m

Width 0.3 m
 Length 1.6 m
 Depth 1.5 m

Method (Trial pit, window etc) Trial Pit - Machine Excavation

Stratum depth (m)	Sample Depth		Sample Type	GW	Install Details	LITHOLOGY
	From	To				
From To	m	m				
0.00					NONE	MADE GROUND. Brown gravelly, clayey SAND. Sand is fine - medium. Gravel is medium - coarse, angular of brick fragments.
0.40						Light brown and mottled grey gravelly CLAY. Gravel is medium - coarse, angular of mixed lithology.
0.90						Light brown and mottled grey gravelly CLAY. Gravel is coarse, angular of mixed lithology cobbles.
1.50						End of TP2

Remarks: .

APPENDIX C: Soakaway Test Results

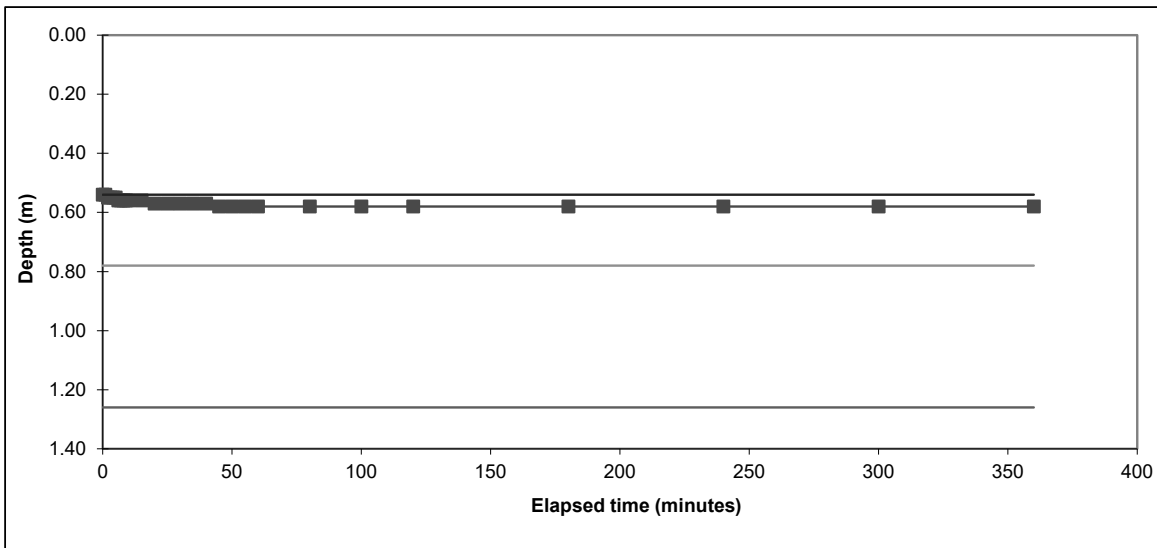


Your Environment

Soakaway Test

Trial Pit No:	TP1	Test No:	1	Date:	23.08.2021
Length (m):	1.600	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	0.540	30	0.570
1	0.540	35	0.570
2	0.550	40	0.570
3	0.550	45	0.580
4	0.550	50	0.580
5	0.550	55	0.580
6	0.560	60	0.580
7	0.560	80	0.580
8	0.560	100	0.580
9	0.560	120	0.580
10	0.560	180	0.580
15	0.560	240	0.580
20	0.570	300	0.580
25	0.570	360	0.580



Start water depth for analysis (mbgl)	0.54		
75% effective depth (mbgl):	0.78	Elapsed time (mins):	#N/A
50% effective depth (mbgl):	1.02		
25% effective depth (mbgl):	1.26	Elapsed time (mins):	#N/A
Base of soakage zone (mbgl):	1.50		

Volume outflow between 75% and 25% effective depth (m³):
 Mean surface area of outflow (m²): 2.30
 (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).

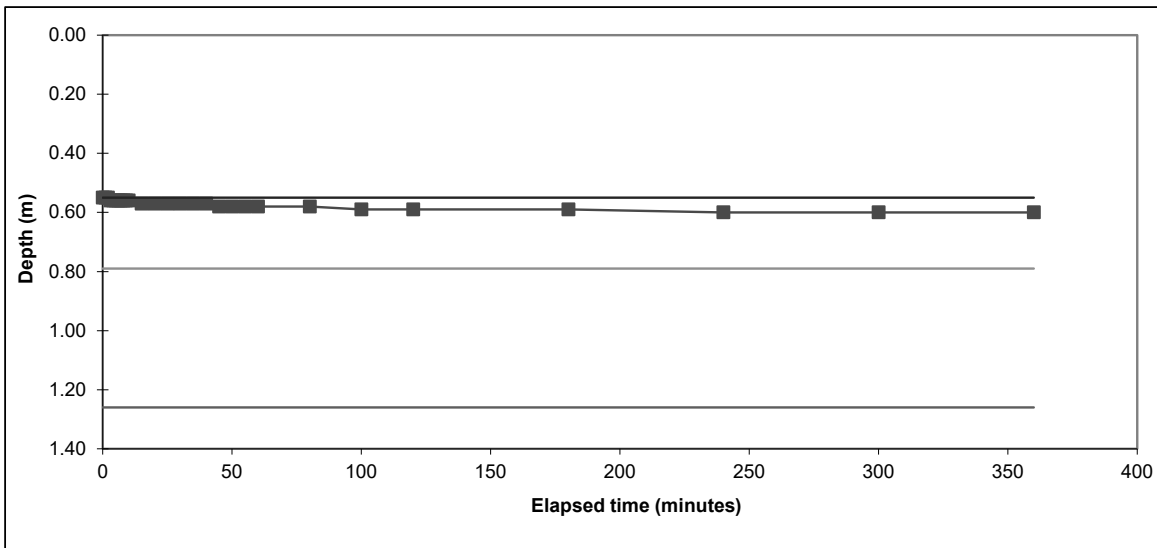
Client:	Neo Environmental Ltd	TP1
Site:	Kingston Solar Farm	

Your Environment

Soakaway Test

Trial Pit No:	TP2	Test No:	1	Date:	23.08.2021
Length (m):	1.600	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	0.550	30	0.570
1	0.550	35	0.570
2	0.550	40	0.570
3	0.560	45	0.580
4	0.560	50	0.580
5	0.560	55	0.580
6	0.560	60	0.580
7	0.560	80	0.580
8	0.560	100	0.590
9	0.560	120	0.590
10	0.560	180	0.590
15	0.570	240	0.600
20	0.570	300	0.600
25	0.570	360	0.600



Start water depth for analysis (mbgl)	0.55		
75% effective depth (mbgl):	0.79	Elapsed time (mins):	#N/A
50% effective depth (mbgl):	1.03		
25% effective depth (mbgl):	1.26	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):			2.27
(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:	Neo Environmental Ltd	TP2
Site:	Kingston Solar Farm	

APPENDIX D: Photographs



A.



B.



C.



D.



Your Environment

A. TP1

B. TP1

C. TP1

D. TP1



E.



F.



G.



H.



Your Environment

E. TP2

F. TP2

G. TP2

H. TP2

