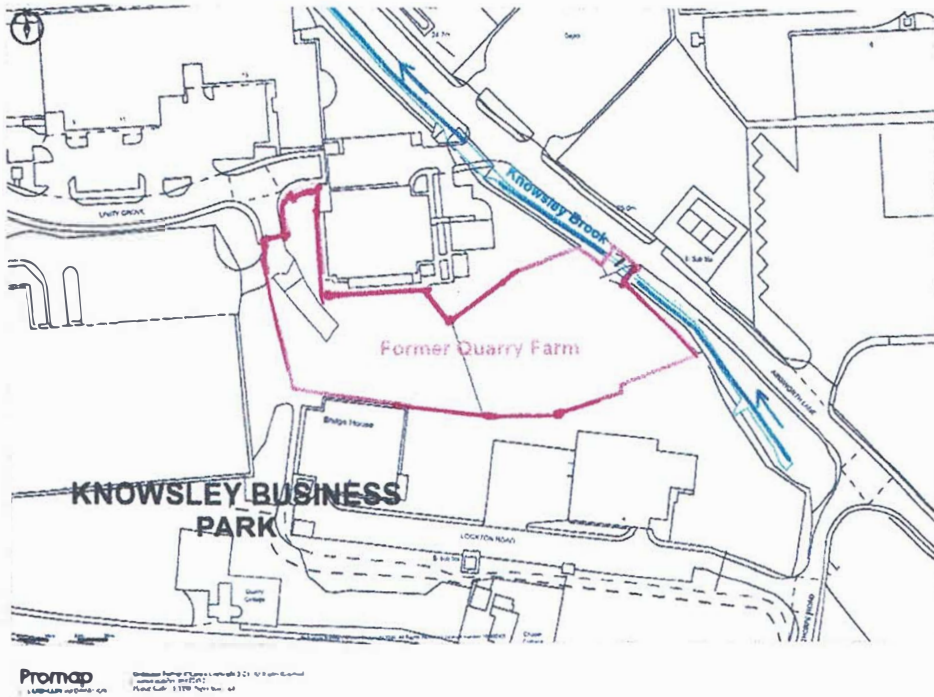


UNITY COMMERCIAL DEVELOPMENTS LTD

FLOOD RISK ASSESSMENT

FORMER QUARRY FARM, AINSWORTH LANE KNOWSLEY BUSINESS PARK



BRIAN KILLINGWORTH

JANUARY 2023

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REFERENCES

Knowsley Brook Study 2017 – Environment Agency

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1	January 23	Final Report	Unity Developments Ltd

Principal Author	Principal Checker	Principal Reviewer
B Killingworth		B Killingworth

In producing this report, BK has relied upon information provided by others. The completeness or accuracy of this information is not guaranteed by BK.

1.0 INTRODUCTION

- 1.1 Unity Developments Ltd, the owner of the Former Quarry Farm Site, has commissioned Brian Killingworth (BK) to carry out a Flood Risk Assessment (FRA) in support of a retrospective application for planning consent for the change of use of the site to a container storage area. The site has already been used to store containers en-route to and away from Liverpool Docks but the client now wishes to formalize this activity by gaining planning consent for a change of use for the site to B8 Storage and Distribution.
- 1.2 The site is already covered by crushed stone and no further engineering works are considered necessary. The site is within the existing Knowsley Business Park. It is accessed from Ainsworth Lane by crossing an existing culvert containing Knowsley Brook which forms the north eastern boundary to the site. The remaining site boundaries all abut existing Units within the Park. A location plan (Drg No 00 1) showing the site is provided as Appendix 1 of the FRA. Knowsley Brook is part of the main river network administered by the Environment Agency.
- 1.3 The site is presently classified by the Environment Agency (EA) as Flood Zone 3. Flood Zones refer to the probability of river and sea flooding ignoring the presence of defences. They are shown on the Environment Agency's Flood Map for Planning (Rivers and Sea), as indicated in the table below.

Flood Zone	Definition
Zone 1 Low Probability	Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3)
Zone 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. (Land shown in light blue on the Flood Map)
Zone 3a High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding. (Land shown in dark blue on the Flood Map)
Zone 3b The Functional Floodplain	This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their Strategic Flood Risk Assessments (SFRA) areas of functional floodplain and its boundaries accordingly, in agreement with the EA. Note – Zone 3b is not separately distinguished from Zone 3a on the Flood Map.

- 1.4 A copy of the EA Flood Map for Planning (FMfP) and Report referring to the site is provided as Appendix 2 to this Assessment.
- 1.5 As can be seen from the FMfP only the area occupied by the access culvert serving the site and carrying Knowsley Brook is actually within Zone 3a. The remainder of the site required for storage of the containers is shown as "clear" and therefore classified as Zone 1.

2.0 EXISTING DRAINAGE PATTERNS

- 2.1 There is no information available concerning the present drainage of the site. The land was part of a farm until the buildings were demolished c2013 and is now topped with crushed stone. The topographical survey (provided as Drg No 003 within Appendix 2) shows that it has an area of some 6,200m² and is predominantly flat at a level of 25.0m AOD. The width of the site west to east is 120m approx. and north to south approx. 50m. This topography plus the proximity of Knowsley Brook with bed levels some 2m below the ground level of the site will enable the site to be easily drained to the watercourse providing there is sufficient downstream capacity.

- 2.2 It is also worth recording at this point that there is no evidence of flooding occurring on the site and there will be no increase in run-off as a result of the change of use of the site, which might otherwise have overloaded the present system.

3.0 FLOOD RISK

- 3.1 Prior consultation with the Environment Agency (EA) has produced data from the Knowsley Brook 2017 Study. This data contains information relating to extreme flood flows within Knowsley Brook at a range of model node points within the watercourse and specific locations throughout the proposed site. It also confirms that this data is the most relevant for the site in question.
- 3.2 The extracts included within Appendix 4 are as follows:
- Location Plan – ref: page 1
 - Modelled Flood Extents for a range of flows including the 1% and 0.1% AEP – ref: page 8.
 - Modelled Flood Extents for a range of flows including the 1% and 0.1% AEP including an allowance for climate change – ref: page 9.
 - Node points within Knowsley Brook taken from the model – ref: page 10.
 - Level (Height) and Flow data for each Node point – ref: page 11.
 - Level (Height) and Flow data containing an allowance for climate change for each Node point – ref: page 13.
 - Specific locations within the site – ref: page 14.
 - Flood Height and Depth data for each Flow at each specific location within the site – ref: pages 15 and 16.
 - Flood Height and Depth data for each Flow enhanced by climate change at each specific location within the site – ref: pages 18 and 19.
- 3.3 The above data indicates that under the most extreme conditions i.e. a 1.0% AEP (+70% climate change allowance) or a 0.1% AEP (+30%) flows, flood levels within Knowsley Brook at the upstream end of the access culvert serving the site (Node point 8) are 23.79m and 23.97m AOD respectively. Comparison with the road levels over the access culvert of 25.22m AOD demonstrates freeboard of $(25.22 - 23.97) = 1.25\text{m}$ before flooding might occur.
- 3.4 Similarly, Node points 9 and 10 upstream of the site provide flood levels of 24.14 and 24.33m AOD. As all ground levels within the site along this upstream reach of the watercourse are above 25m AOD, no flooding is possible. Node point 6 downstream of the site reveals flood levels of 23.52 and 23.70m with ground levels along the perimeter of the site at 25m approx..
- 3.5 The brief analysis above is confirmed by the fact that “no data” is available for any of the specific locations in and around the site. The only data is for specific location 24 within Knowsley Brook downstream of the access culvert to the site.
- 3.6 For ease of reference an extract from the topo survey (Drg No 003) which covers the Knowsley Brook boundary of the site and the access culvert has also been included within Appendix 3.
- 3.7 It has been assumed that the climate change allowances to the extreme flows which have been modelled in the Study in 2017 some 5 years ago, are correct for the Alt and Crossens Management Catchment where Knowsley Brook is situated. In any case, it is anticipated the freeboard available before the site begins to be affected by flooding would be sufficient to absorb any minor change.
- 3.8 As the site does not form part of the watercourse floodplain as demonstrated above there can be no issue regarding loss of flood storage or access to and from the site.

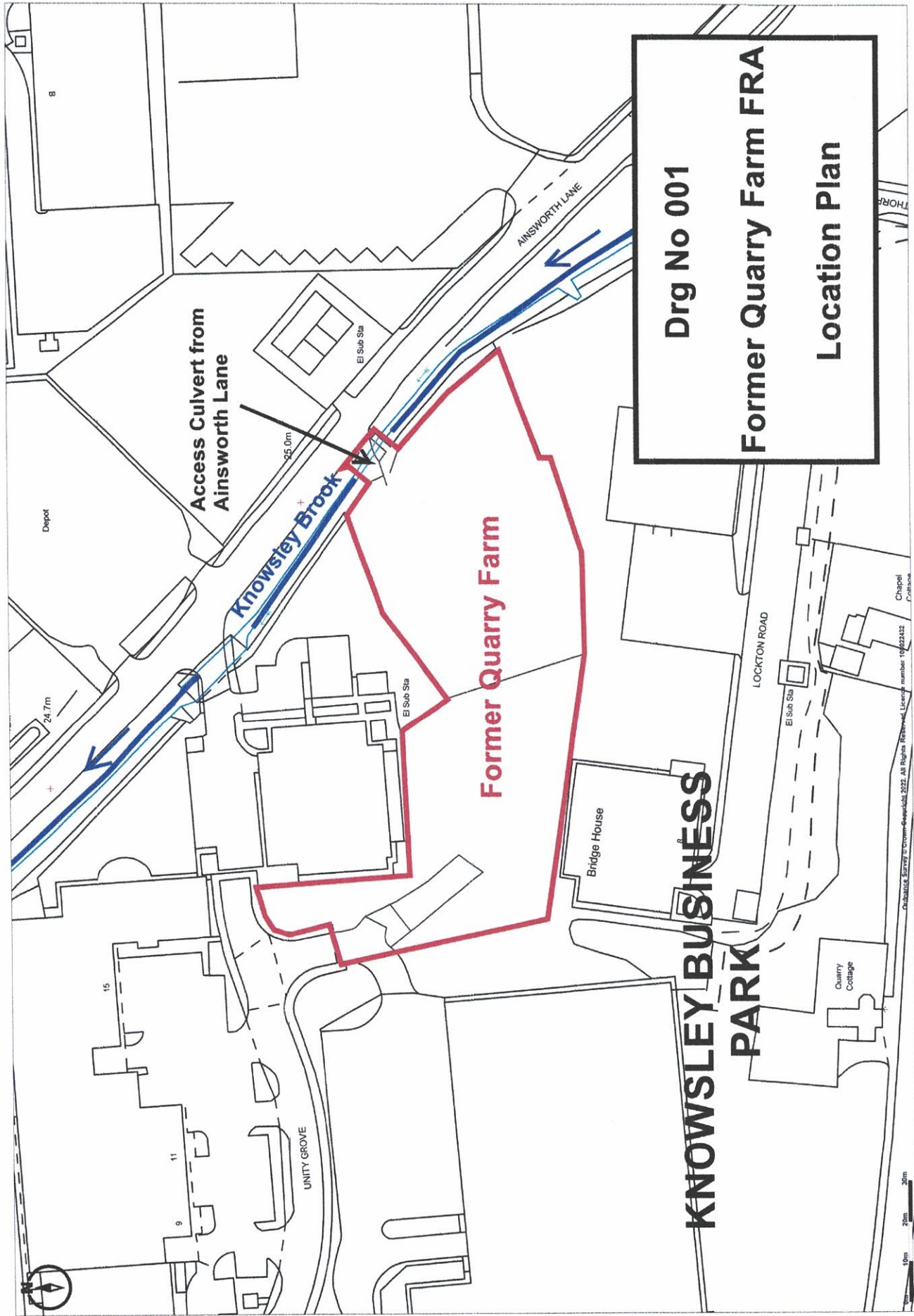
4.0 CONCLUSIONS

- 4.1 This FCA, which has a content proportionate to the nature of the request for a planning consent for change of use to B8 Storage and Distribution, has demonstrated that there is no flood risk to this site from Knowsley Brook.
- 4.2 The site is already surfaced with permeable crushed stone and therefore there will be no increase in run-off to areas downstream.
- 4.3 The site is not within the flood outline of the 0.1 % AEP + climate change flow modelled by the Knowsley Brook Study in 2017. There can therefore be no issues with regard to loss of flood storage resulting from the change of use of the site.

APPENDICES

Appendix 1

Drg No 001 Location Plan



Appendix 2

Environment Agency (EA) Flood Map for Planning

Flood map for planning

Your reference	Location (easting/northing)	Created
Former Quarry Farm Site	342647/396464	29 Dec 2022 13:56

Your selected location is in flood zone 3, an area with a high probability of flooding.

This means:

- you must complete a flood risk assessment for development in this area
- you should follow the Environment Agency's standing advice for carrying out a flood risk assessment (see www.gov.uk/guidance/flood-risk-assessment-standing-advice)

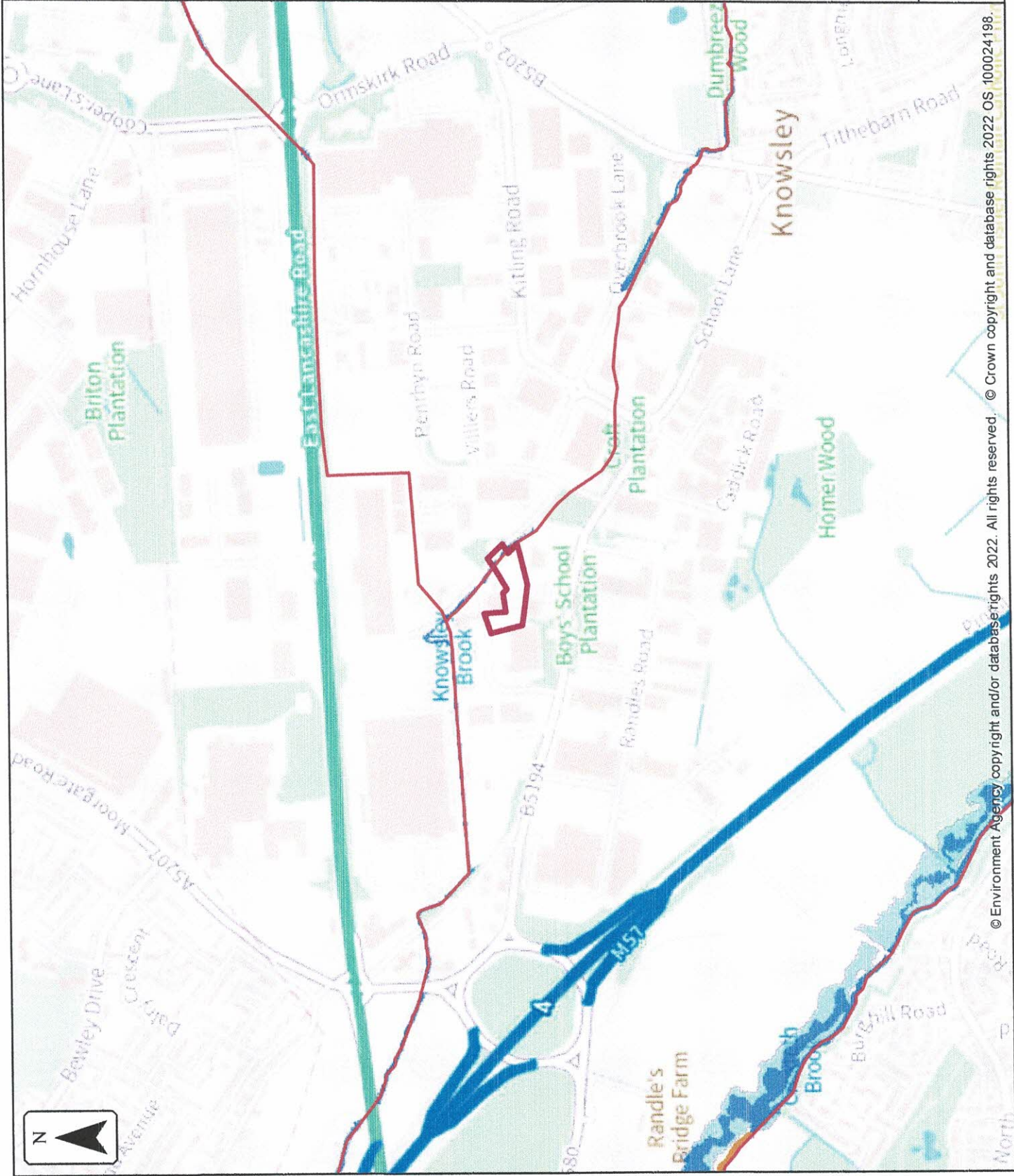
Notes

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.

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

Use of the address and mapping data is subject to Ordnance Survey public viewing terms under Crown copyright and database rights 2022 OS 100024198. <https://flood-map-for-planning.service.gov.uk/os-terms>



Flood map for planning

Location (easting/northing)
342632/396457

Scale
1:10,000

Created
30 Nov 2022

- Selected area
- Main river
- Flood defence
- Flood zone 3
- Flood zone 2





Flood map for planning

Your reference

Former Quarry Farm Site

Location (easting/northing)

342647/396464

Scale

1:2500

Created

29 Dec 2022 13:59

Selected area

Flood zone 3

Flood zone 2

Flood zone 1

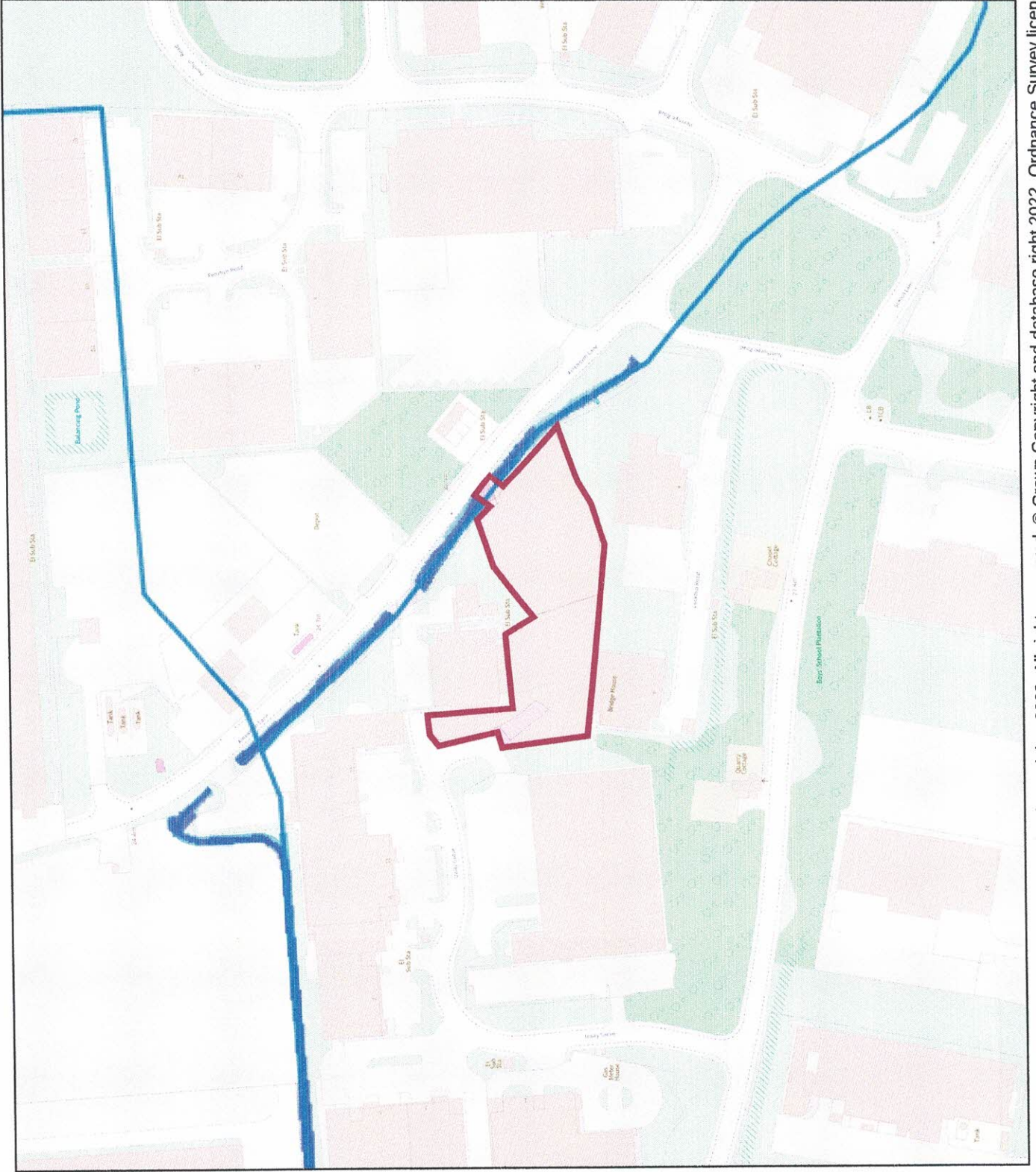
Flood defence

Main river

Water storage area



Page 2 of 2

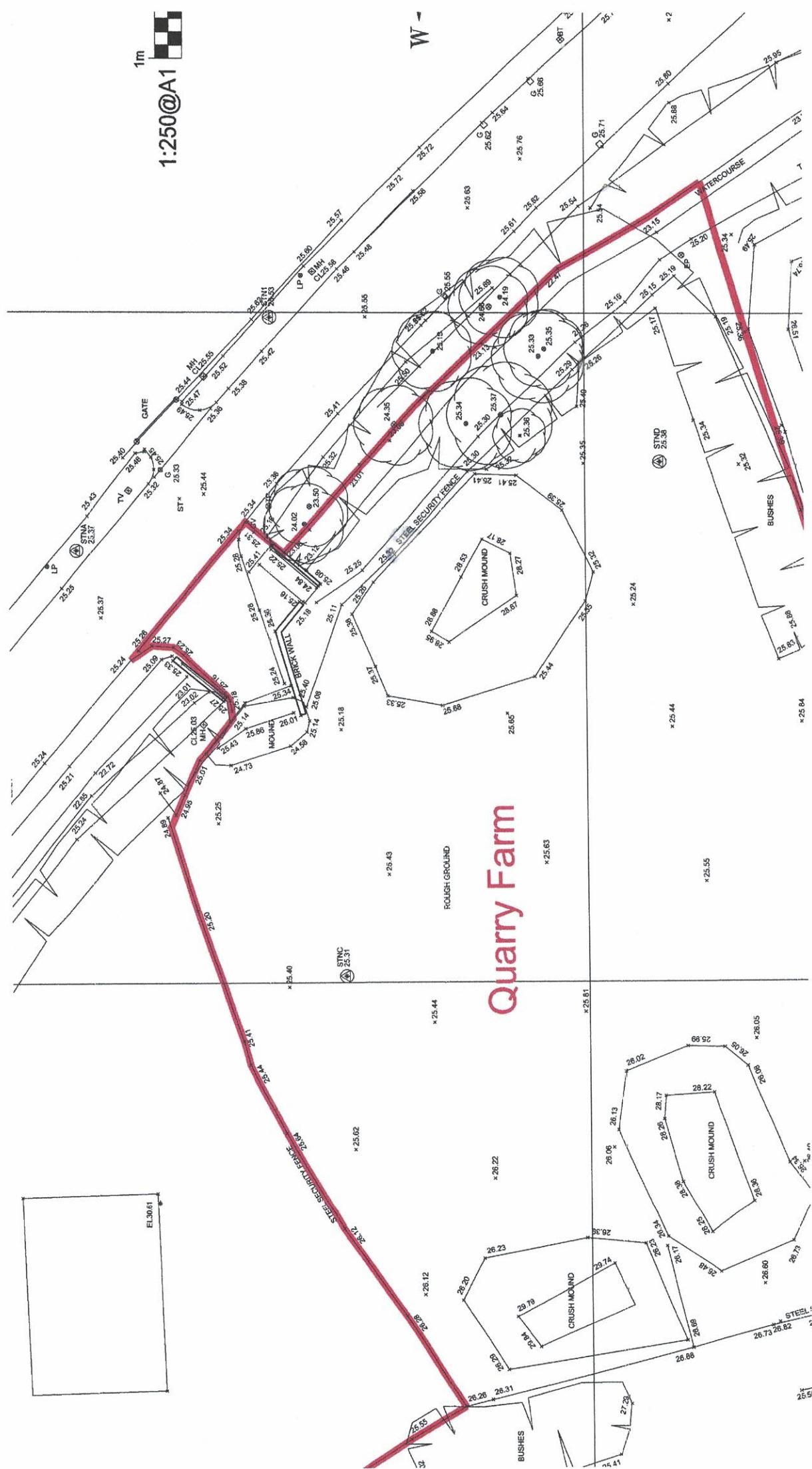


Appendix 3

Drg No 003 Topographic Survey

Extract from Topographic Survey covering boundary with
Knowsley Brook





Appendix 4

Knowsley Brook Study data supplied by EA.

Flood risk assessment data



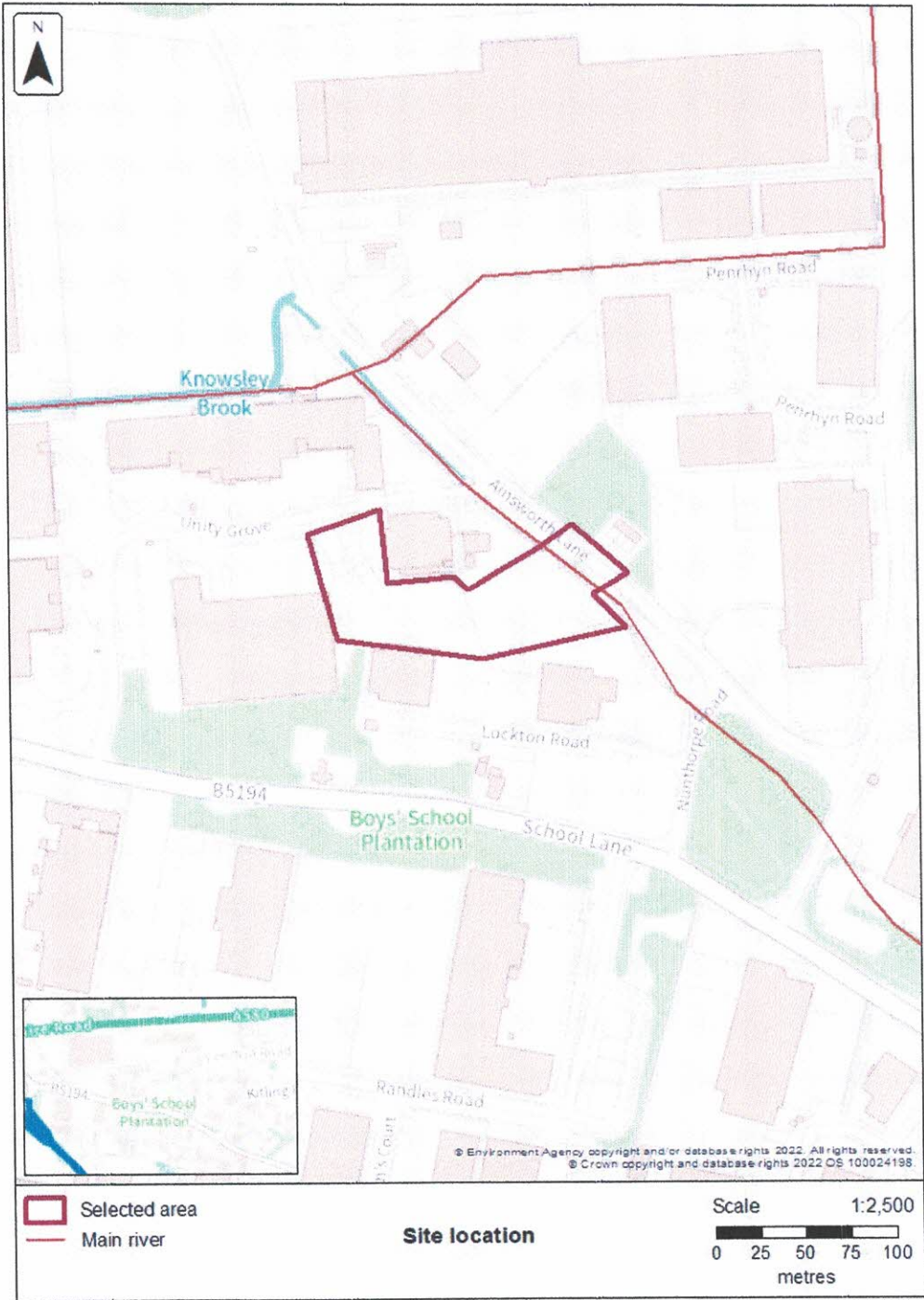
Location of site: 342632 / 396457 (shown as easting and northing coordinates)

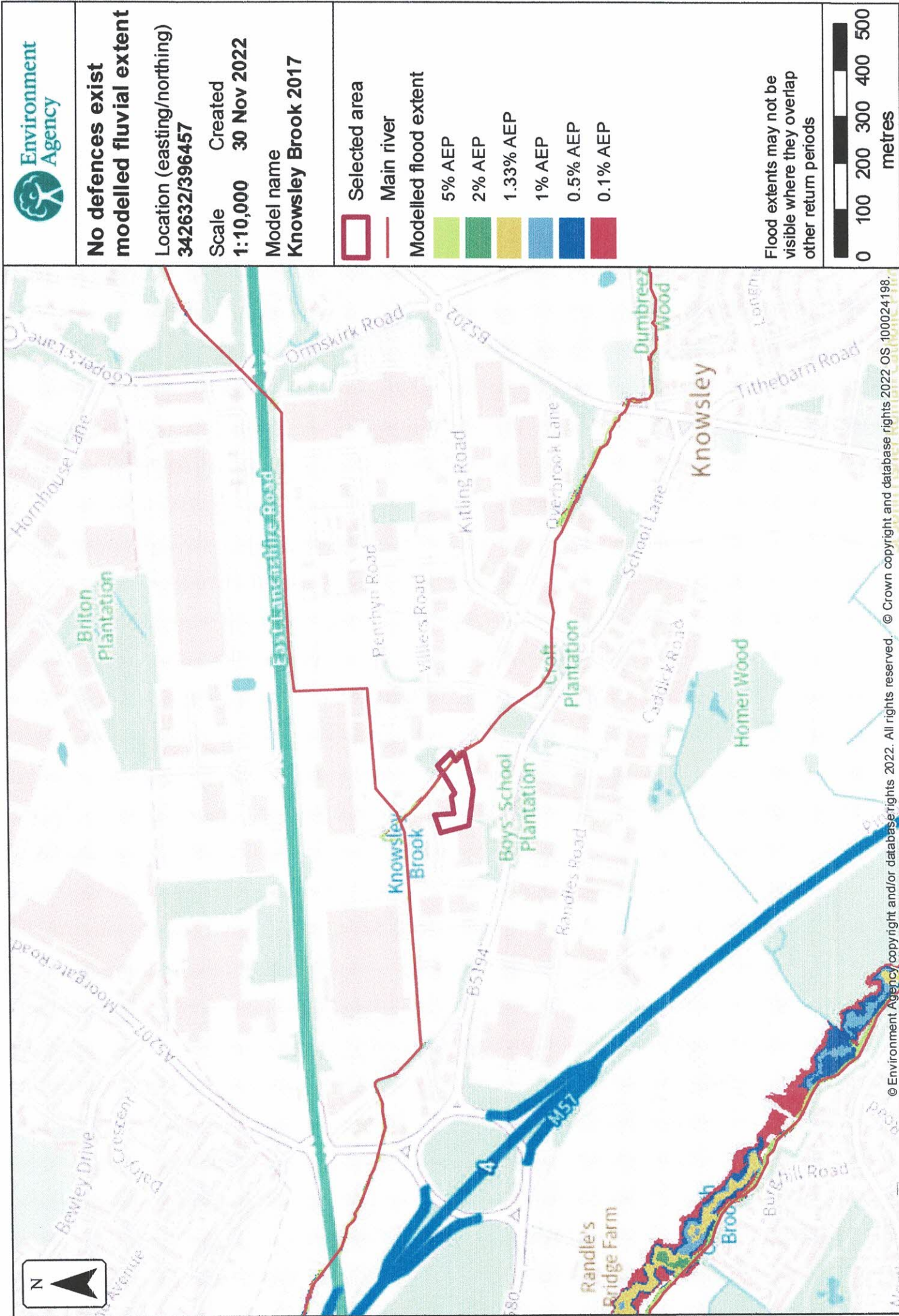
Document created on: 30 November 2022

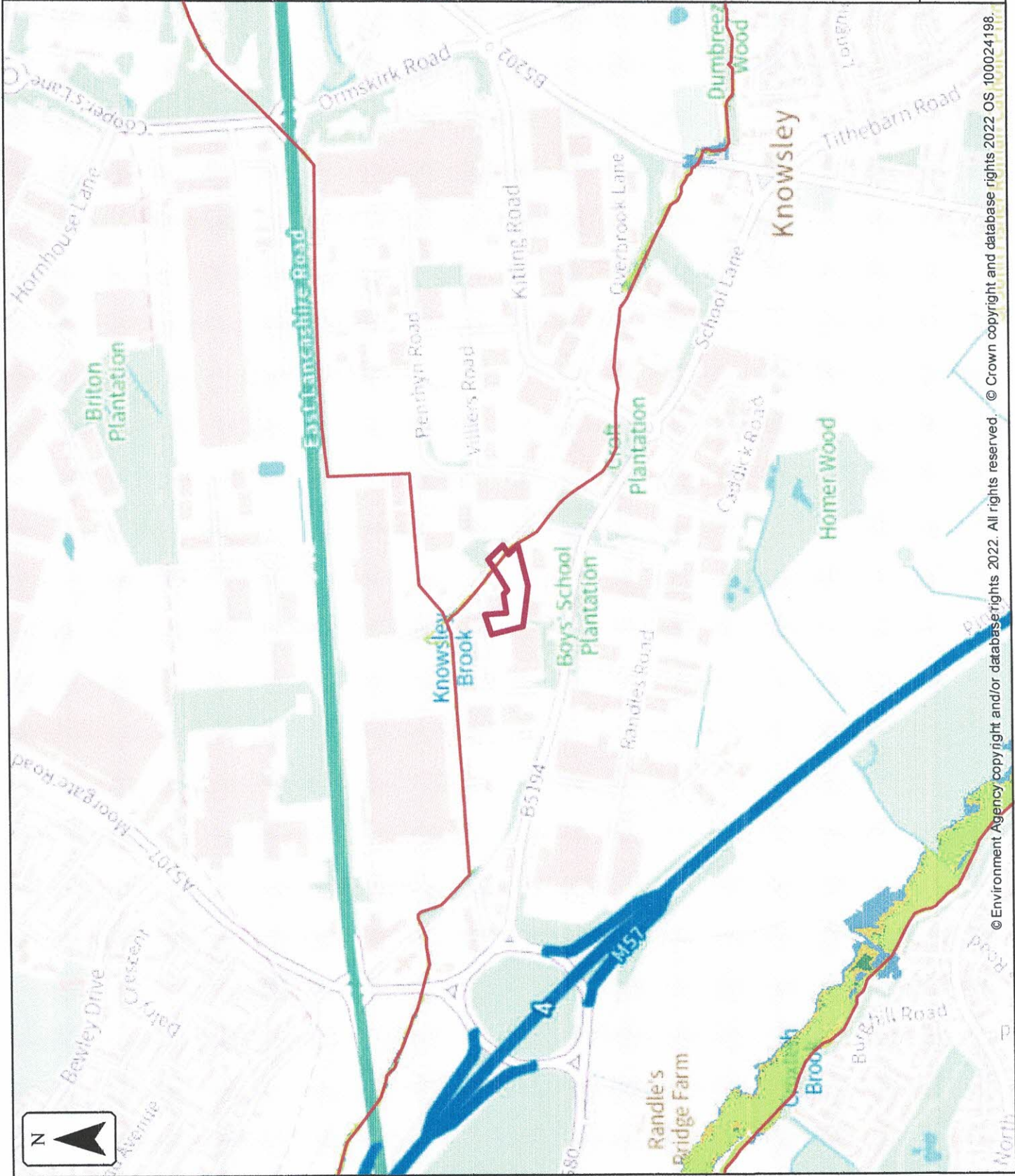
This information was previously known as a product 4.

Customer reference number: TP2XFNKUUY

Map showing the location that flood risk assessment data has been requested for.







No defences exist climate change modelled fluvial extent

Location (easting/northing)
342632/396457

Scale	Created
1:10,000	30 Nov 2022

Model name
Knowsley Brook 2017

Selected area

Main river

Modelled flood extent

1.0% AEP (+30%)

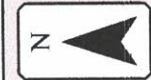
1.0% AEP (+35%)

1.0% AEP (+70%)

0.1% AEP (+30%)

Flood extents may not be visible where they overlap other return periods

0 100 200 300 400 500
metres



**No defences exist
modelled fluvial
node locations**

Location (easting/northing)
342632/396457

Scale
1:2,500

Created
30 Nov 2022

Model name
Knowsley Brook 2017



Selected area



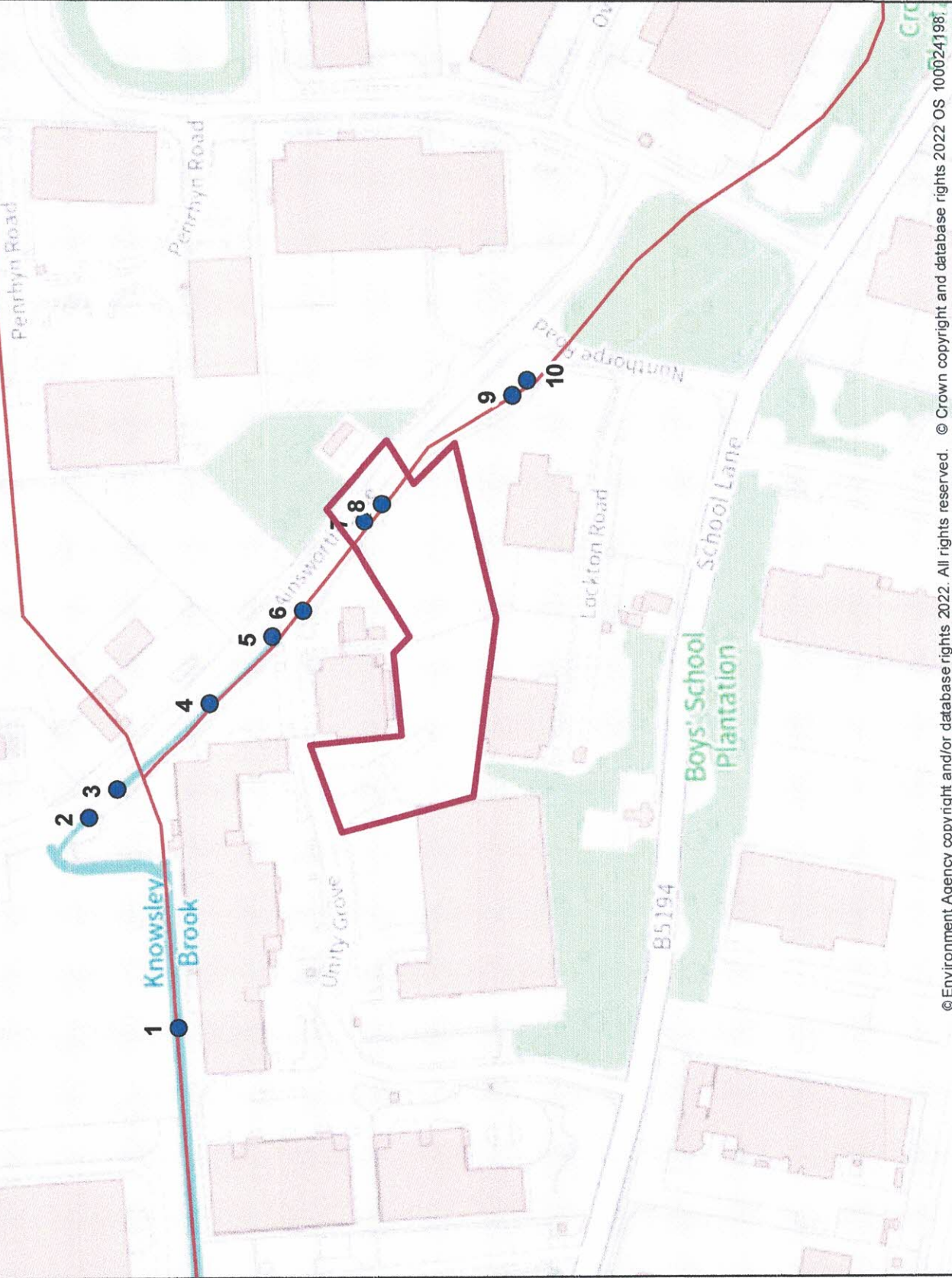
Modelled location



Main river



0 25 50 75 100
metres



Modelled node locations data

No defences exist

Label	Modelled location ID	Easting	Northing	5% AEP		2% AEP		1.33% AEP		1% AEP		0.5% AEP		0.1% AEP	
				Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow
1	992505	342459	396565	21.64	2.15	21.70	2.62	21.73	2.85	21.76	3.04	21.83	3.59	22.04	5.19
2	992564	342555	396604	22.28	1.50	22.34	1.82	22.38	1.99	22.40	2.12	22.47	2.50	22.68	3.76
3	992616	342567	396591	22.60	1.50	22.67	1.82	22.71	1.99	22.74	2.12	22.82	2.50	23.07	3.76
4	992467	342605	396550	22.70	1.46	22.77	1.78	22.80	1.94	22.83	2.06	22.90	2.44	23.13	3.66
5	992589	342635	396521	23.0	1.44	23.04	1.74	23.06	1.90	23.08	2.02	23.13	2.39	23.29	3.60
6	992637	342647	396507	23.19	1.44	23.25	1.74	23.28	1.90	23.30	2.02	23.36	2.39	23.54	3.60
7	992476	342687	396479	23.37	1.40	23.43	1.70	23.45	1.86	23.47	1.98	23.53	2.33	23.70	3.51
8	992605	342695	396471	23.43	1.40	23.50	1.70	23.53	1.86	23.55	1.98	23.62	2.33	23.81	3.51
9	992579	342743	396413	23.68	1.35	23.75	1.64	23.78	1.79	23.80	1.90	23.87	2.25	24.06	3.38
10	992549	342750	396406	23.75	1.34	23.82	1.63	23.86	1.78	23.88	1.90	23.95	2.24	24.16	3.37

Data in this table comes from the Knowsley Brook 2017 model.
Level values are shown in mAOD, and flow values are shown in cubic metres per second.
Any blank cells show where a particular scenario has not been modelled for this location.

Modelled node locations data

No defences exist climate change

Label	Modelled location ID	Easting	Northing	1.0% AEP (+30%)		1.0% AEP (+35%)		1.0% AEP (+70%)		0.1% AEP (+30%)	
				Level	Flow	Level	Flow	Level	Flow	Level	Flow
1	992505	342459	396565	21.88	3.96	21.90	4.10	22.04	5.13	22.27	6.81
2	992564	342555	396604	22.52	2.75	22.54	2.86	22.66	3.59	22.88	4.89
3	992616	342567	396591	22.88	2.75	22.90	2.85	23.04	3.59	23.27	4.89
4	992467	342605	396550	22.95	2.68	22.97	2.78	23.10	3.50	23.32	4.77
5	992589	342635	396521	23.16	2.63	23.17	2.73	23.27	3.43	23.45	4.68
6	992637	342647	396507	23.40	2.63	23.42	2.73	23.52	3.43	23.70	4.68
7	992476	342687	396479	23.56	2.57	23.58	2.67	23.68	3.36	23.83	4.58
8	992605	342695	396471	23.66	2.57	23.67	2.67	23.79	3.36	23.97	4.58
9	992579	342743	396413	23.91	2.48	23.93	2.57	24.04	3.23	24.21	4.41
10	992549	342750	396406	24.0	2.46	24.02	2.56	24.14	3.22	24.33	4.39

Data in this table comes from the Knowsley Brook 2017 model.
Level values are shown in mAOD, and flow values are shown in cubic metres per second.
Any blank cells show where a particular scenario has not been modelled for this location.

**No defences exist
modelled fluvial
extent and height**

Location (easting/northing)
342632/396457

Scale Created
1:2,500 30 Nov 2022

Model name
Knowsley Brook 2017

 Selected area

 Main river

Modelled 2D grid

Water level in mAOD

 0 - 21.0

 21.0 - 21.5

 21.5 - 22.0

 22.0 - 22.5

 22.5 - 23.0

 23.0 - 23.5

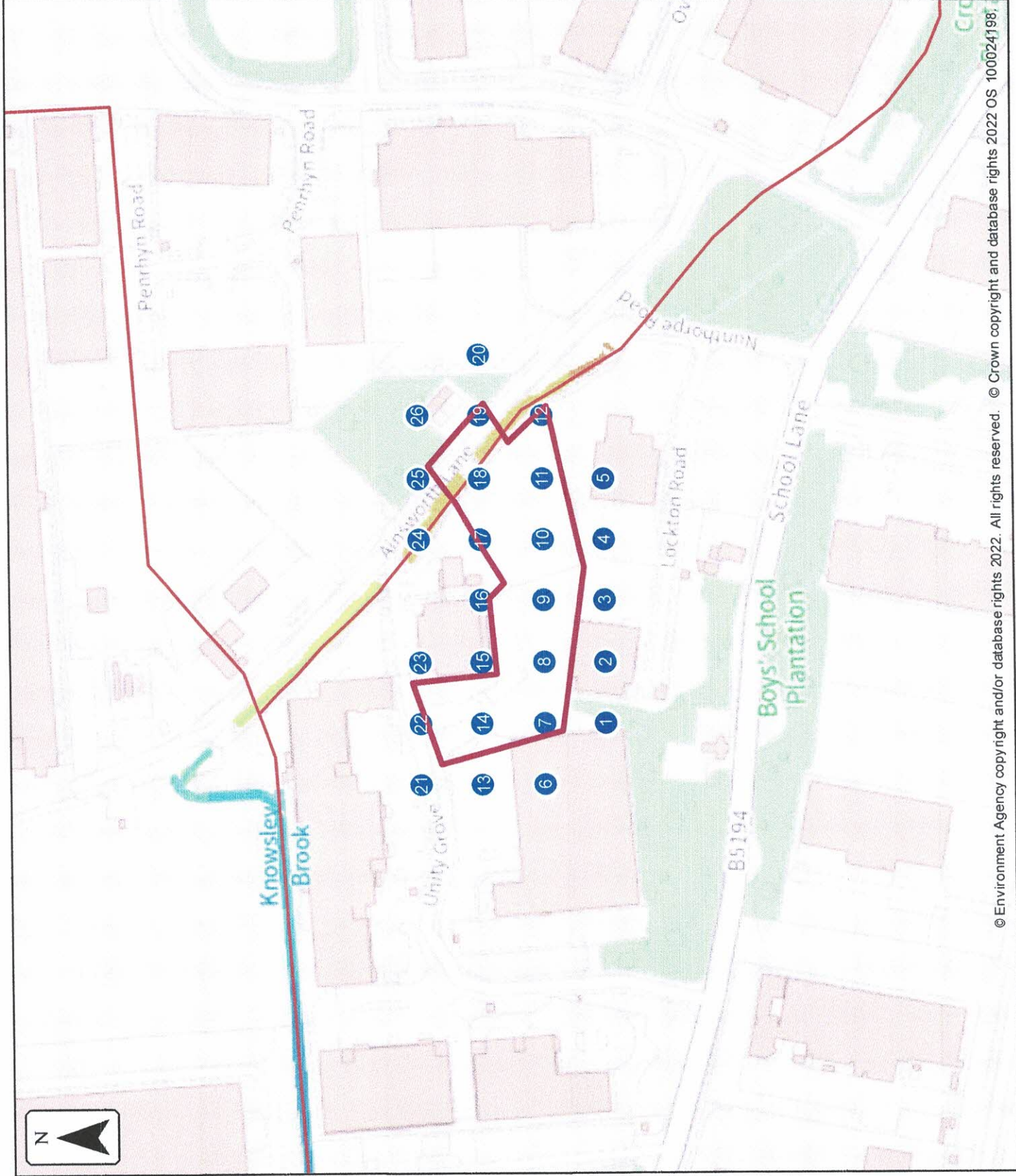
 23.5 - 24.0

 24.0 - 24.5

 24.5 - 25.0

This map shows the
0.1% AEP height data


0 25 50 75 100
metres



Sample point data

No defences exist

Label	Easting	Northing	5% AEP		2% AEP		1.33% AEP		1% AEP		0.5% AEP		0.1% AEP	
			Depth	Height	Depth	Height	Depth	Height	Depth	Height	Depth	Height	Depth	Height
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2	342597	396412	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData
3	342627	396412	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData
4	342657	396412	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData
5	342687	396412	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData
6	342537	396442	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData
7	342567	396442	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData
8	342597	396442	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData
9	342627	396442	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData
10	342657	396442	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData
11	342687	396442	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData
12	342717	396442	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData
13	342537	396472	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData
14	342567	396472	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData
15	342597	396472	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData
16	342627	396472	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData

Label	Easting	Northing	5% AEP		2% AEP		1.33% AEP		1% AEP		0.5% AEP		0.1% AEP	
			Depth	Height	Depth	Height	Depth	Height	Depth	Height	Depth	Height	Depth	Height
17	342657	396472	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData
18	342687	396472	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData
19	342717	396472	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData
20	342747	396472	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData
21	342537	396502	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData
22	342567	396502	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData
23	342597	396502	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData
24	342657	396502	0.44	23.24	0.49	23.30	0.52	23.32	0.54	23.34	0.60	23.40	0.78	23.58
25	342687	396502	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData
26	342717	396502	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData	NoData

Data in this table comes from the Knowsley Brook 2017 model.

Height values are shown in mAOD, and depth values are shown in metres.

Any blank cells show where a particular scenario has not been modelled for this location.

Cells which contain text 'NoData' for a scenario show that return period has been modelled but there is no flood risk for that return period for that location.

Sample point data

No defences exist climate change

Label	Easting	Northing	1% AEP (+30%)			1% AEP (+35%)			1% AEP (+70%)			0.1% AEP (+30%)		
			Depth	Height		Depth	Height		Depth	Height		Depth	Height	
1	342567	396412	NoData	NoData		NoData	NoData		NoData	NoData		NoData	NoData	
2	342597	396412	NoData	NoData		NoData	NoData		NoData	NoData		NoData	NoData	
3	342627	396412	NoData	NoData		NoData	NoData		NoData	NoData		NoData	NoData	
4	342657	396412	NoData	NoData		NoData	NoData		NoData	NoData		NoData	NoData	
5	342687	396412	NoData	NoData		NoData	NoData		NoData	NoData		NoData	NoData	
6	342537	396442	NoData	NoData		NoData	NoData		NoData	NoData		NoData	NoData	
7	342567	396442	NoData	NoData		NoData	NoData		NoData	NoData		NoData	NoData	
8	342597	396442	NoData	NoData		NoData	NoData		NoData	NoData		NoData	NoData	
9	342627	396442	NoData	NoData		NoData	NoData		NoData	NoData		NoData	NoData	
10	342657	396442	NoData	NoData		NoData	NoData		NoData	NoData		NoData	NoData	
11	342687	396442	NoData	NoData		NoData	NoData		NoData	NoData		NoData	NoData	
12	342717	396442	NoData	NoData		NoData	NoData		NoData	NoData		NoData	NoData	
13	342537	396472	NoData	NoData		NoData	NoData		NoData	NoData		NoData	NoData	
14	342567	396472	NoData	NoData		NoData	NoData		NoData	NoData		NoData	NoData	
15	342597	396472	NoData	NoData		NoData	NoData		NoData	NoData		NoData	NoData	
16	342627	396472	NoData	NoData		NoData	NoData		NoData	NoData		NoData	NoData	

Label	Easting	Northing	1% AEP (+30%)			1% AEP (+35%)			1% AEP (+70%)			0.1% AEP (+30%)		
			Depth	Height		Depth	Height		Depth	Height		Depth	Height	
17	342657	396472	NoData	NoData		NoData	NoData		NoData	NoData		NoData	NoData	
18	342687	396472	NoData	NoData		NoData	NoData		NoData	NoData		NoData	NoData	
19	342717	396472	NoData	NoData		NoData	NoData		NoData	NoData		NoData	NoData	
20	342747	396472	NoData	NoData		NoData	NoData		NoData	NoData		NoData	NoData	
21	342537	396502	NoData	NoData		NoData	NoData		NoData	NoData		NoData	NoData	
22	342567	396502	NoData	NoData		NoData	NoData		NoData	NoData		NoData	NoData	
23	342597	396502	NoData	NoData		NoData	NoData		NoData	NoData		NoData	NoData	
24	342657	396502	0.64	23.44		0.65	23.45		0.76	23.56		0.93	23.73	
25	342687	396502	NoData	NoData		NoData	NoData		NoData	NoData		NoData	NoData	
26	342717	396502	NoData	NoData		NoData	NoData		NoData	NoData		NoData	NoData	

Data in this table comes from the Knowsley Brook 2017 model.

Height values are shown in mAOD, and depth values are shown in metres.

Any blank cells show where a particular scenario has not been modelled for this location.

Cells which contain text 'NoData' for a scenario show that return period has been modelled but there is no flood risk for that return period for that location.

This report was prepared by :

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