

flood risk assessment

Hurdleditch Road, Orwell,
Cambridgeshire

CCE/ZB471/FRA-02

February 2021

For KB Tebbit Ltd.

Document Review Sheet

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Reference	Date	Author	Checked
CCE/ZA471/FRA-01	February 2021	JH	RT
CCE/ZA471/FRA-02	February 2021	JH	

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Summary Table

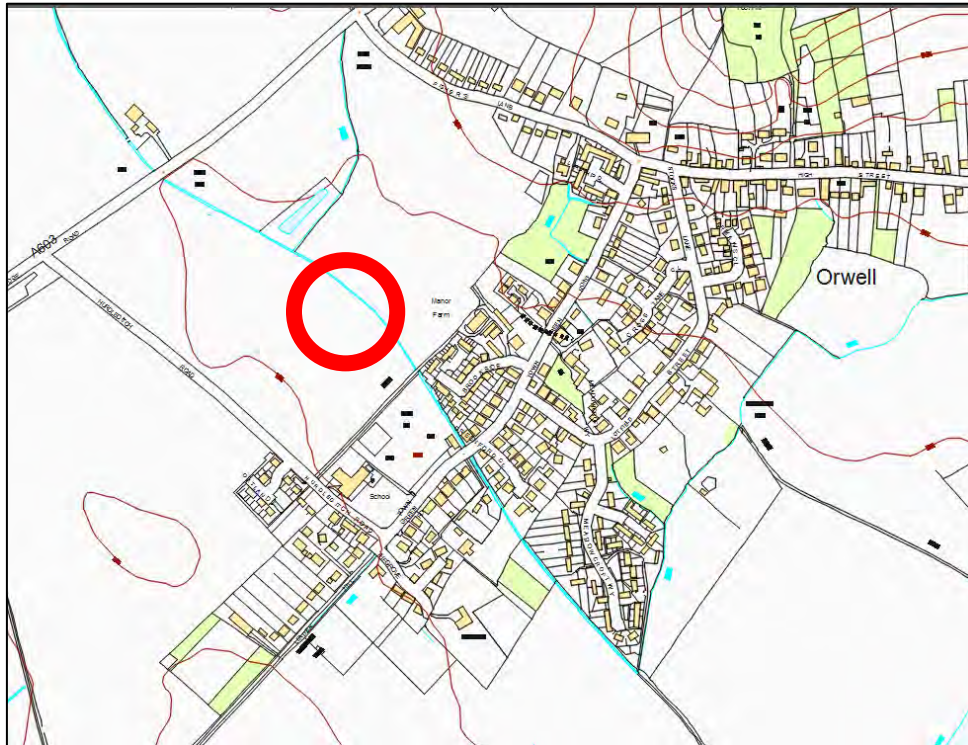
Site location	North of Hurdleditch Road, Orwell, Cambridgeshire, SG8 5TQ. Grid reference 535843, 250179
Planning application	Outline
Existing site	Undeveloped (agricultural)
Site area	Approximately 0.8 ha
Proposed development	Residential
Flood Zone	3
Reservoir Inundation Zone	Low velocity, below 0.5 m/s.
Surface water flooding	Low, Med, and High (superseded by fluvial flood modelling).
Surface water management	On-site treatment and attenuation with restricted discharge to boundary watercourse.

1.0 Introduction

- 1.1 This Flood Risk Assessment (FRA) has been prepared for the use of KB Tebbit Ltd to support an outline planning application for a small residential extension to the 'West Croft development' currently under construction to the east of the site.
- 1.2 The proposed development comprises 5 to 11 residential properties with associated access and hard and soft landscaping. An indicative layout is included in the surface water management plan in Appendix B and on the image below.



- 1.3 This assessment takes account of the National Planning Policy Framework (NPPF) and the definitions of sources of flooding within the Flood and Water Management Act (FWMA) 2010. The report has been prepared following a review of the South Cambridgeshire Strategic FRA. No Section 19 flood reports are published on the Cambridgeshire County Council flood data site.
- 1.4 The site is approximately 0.8 ha and is centred on Ordnance Survey grid reference 535843, 250179 (see image overleaf for an approximate site location). The northern-eastern boundary is formed by a tributary of the River Cam/Rhee which flows south-eastwards past the site, and through Orwell village.



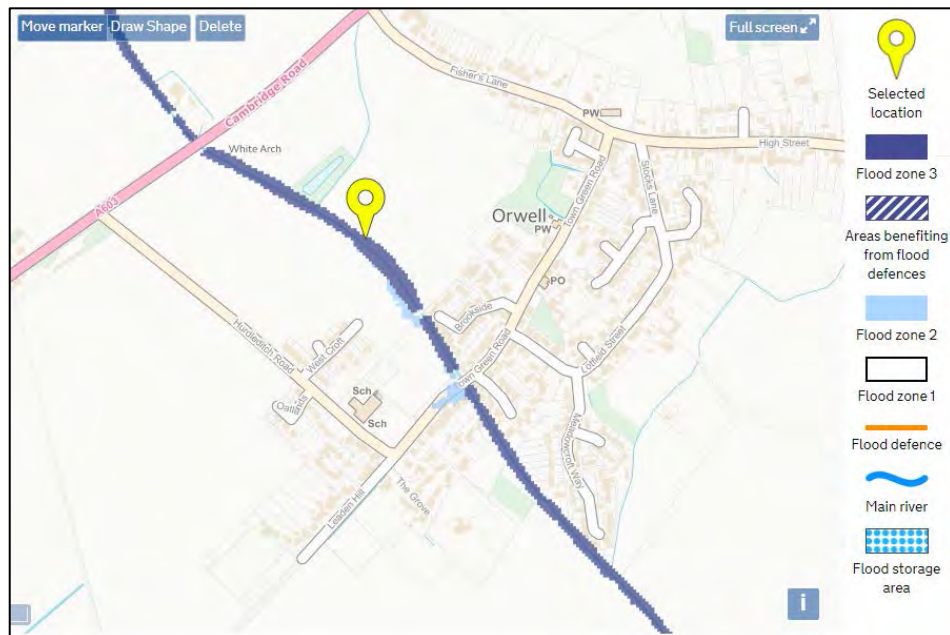
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- 1.5 The site slopes to the east, with levels falling from approximately 24.8 m AOD in the west to approximately 23.0 m AOD in the east.
- 1.6 The site is shown on flood mapping as being partly affected by Flood Zone 3 (the high probability flood area).
- 1.7 British Geological Survey (BGS) shows that the site is underlain by gault (mudstone). The infiltration potential mapping in the SFRA shows the site is in an area with a “low potential for infiltration”.

2.0 Forms of Flooding

Watercourses

- 2.1 A thin band of the north-eastern boundary of the site lies in Flood Zone 3 according to the Flood Map for Planning (see extract below).



Flood map for planning extract © Crown copyright and database rights 2021 Ordnance Survey 100047325

- 2.2 The EA has provided modelled flood data for the watercourse (refer to Appendix A). The outputs from the model do not include current climate change allowances and the data has therefore been extrapolated to generate a level for the 1 in 100 annual probability with a 65 % increase in flow. Extrapolation is appropriate as the proposed development sits in Flood Zone 1.
- 2.3 It is worth noting that the 1 in 1,000 flood event flow is 62 % greater than the 1 in 100 flood event flow (the implication being that the 1 in 1,000 modelled level is effectively the 1 in 100 plus 65 % flood level).
- 2.4 Plotting flow against flood level for the 1 in 100, 1 in 200, and 1 in 1,000 events allows the flood level for the 1 in 100 annual probability flow plus 65 % to be read from the trendline. The information from the EA includes flows and levels for more events, but adding these would result in a less steep trendline and thus lower extrapolated flood level.
- 2.5 The resulting flood level for the 1 in 100 annual probability flood event including 65 % additional flow is 24.12 m AOD. The proposed units are on land which is currently 250 mm higher than the extrapolated flood level (the surface water management plan includes existing topographical levels superimposed on the illustrative layout).

- 2.6 It is currently proposed to set the finished floor levels of the units at or above 24.42 m AOD.

Surface water flooding

- 2.7 Surface water flood mapping (which is shown to effect the site) is effectively a cruder version of fluvial flood modelling. The modelling processes share some common themes but the broad scale surface water flood maps are reasonably considered as relying on more generalised assumptions about hydrology and watercourse morphology, capacity etc. The surface water flood outlines can therefore be considered as superseded by the more detailed flood modelling for the area.



Surface water flood map extract. © Crown copyright and database rights 2021 Ordnance Survey 100047325

Surface Water Sewers

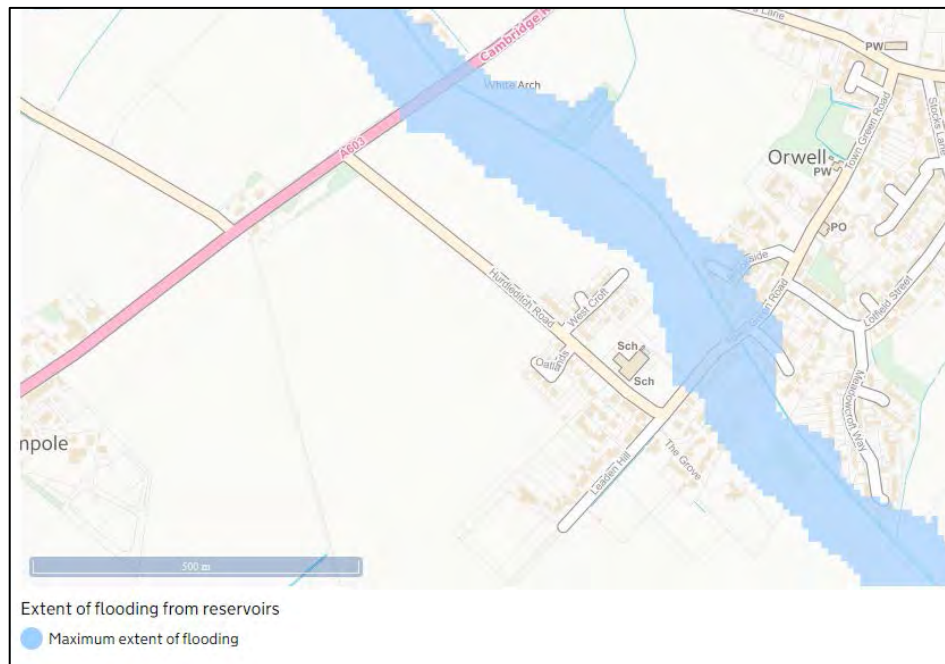
- 2.8 The setting of the site means that it is not considered to be prone to flooding as the result of overloading of a surface water sewer network. Any such flows able to reach the site would tend to follow ground levels and flow past the site and into the boundary watercourse (rather than pooling to a point where it would enter the units).

Groundwater

- 2.9 The topography and low permeability geology (the gault) which underlies the site means that groundwater flooding is not a realistic threat to the proposals.

Reservoirs

- 2.10 The site lies in a reservoir inundation area (see image below). Given the unlikely nature of a reservoir failure this is not considered to be a significant or unmanageable threat to the proposed development.



Reservoir flood map extract. © Crown copyright and database rights 2021 Ordnance Survey 100047325

3.0 Surface Water Management

- 3.1 Given the low permeability of the site geology the proposed surface water management scheme (refer to the drawing and calculations in Appendix B) relies on discharge to the boundary watercourse.
- 3.2 Flow from the proposed drainage scheme will be restricted to the 1.9 l/s/ha, the annual greenfield rate for the area (see Appendix B for the greenfield rates). Applying 1.9 l/s/ha to the illustrative impermeable catchment area of approximately 0.33 ha results in an allowable discharge of approximately 0.6 l/s. The catchment area of 0.33 ha is based on the parcel area of 0.41 ha shown on the illustrative layout (in Appendix B) with a 20 % reduction for permeable cover (back gardens).
- 3.3 The proposed surface water management scheme comprises a 1 m deep grassed attenuation basin with 1 in 3 side slopes. The outlet from the basin will be protected by a filter box to help prevent debris from entering the flow control chamber. Protection for the orifice (a perforated riser/box etc) will be included in the chamber.
- 3.4 All proposals are subject to detailed design and the approval of relevant parties.

Treatment

- 3.5 Based on Table 26.2 in the SuDS Manual the highest pollution hazard level for the site would be low. The proposed basin will therefore provide a suitable level of treatment for site runoff.

Maintenance

- 3.6 The scheme will either be maintained by a communally funded management company or (depending on the number of units) be offered to Anglian Water for adoption.

4.0 Conclusions

- 4.1 The proposed development is not considered to be subject to significant or unmanageable flooding from the sources identified in the Flood and Water Management Act 2010 (FWMA).
- 4.2 The surface water management scheme provides sufficient on-site attenuation to manage the 1 in 100 annual probability storm plus 40 % climate change allowance and relies on a greenfield discharge to the boundary watercourse.
- 4.3 The proposed features provide a suitable level of treatment for the proposed land use.

A. Existing Site

Topographical survey

EA flood data

Extrapolated data

Product 4 Request							
Unique ID (Label)	Easting	Northing	Standard of Protection (Return Period)	Overall Condition Grade	Statutory Defence Level	Upstream Crest Level	Downstream Crest Level
199025							
Cam-Rhee							
159348	535639	247778	1 in 5 (20%)	3	Not Known	Not Known	Not Known

Defended Climate Change Model Flood Outlines centred on Site at Orwell, Cambridgeshire

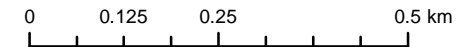
NGR TL3575950138
Ref 199025
Created 26/01/2021

Environment Agency
Bromholme Lane,
Brampton,
Cambridgeshire
PE28 4NE



Legend

- ★ Site
- 1% AEP + 20CC
- Main river



Information

Model Tolerance - Any data included in this product is subject to a standard modelling tolerance of +/- 150mm. The fluvial models used to produce these results are intended for strategic scale use only.

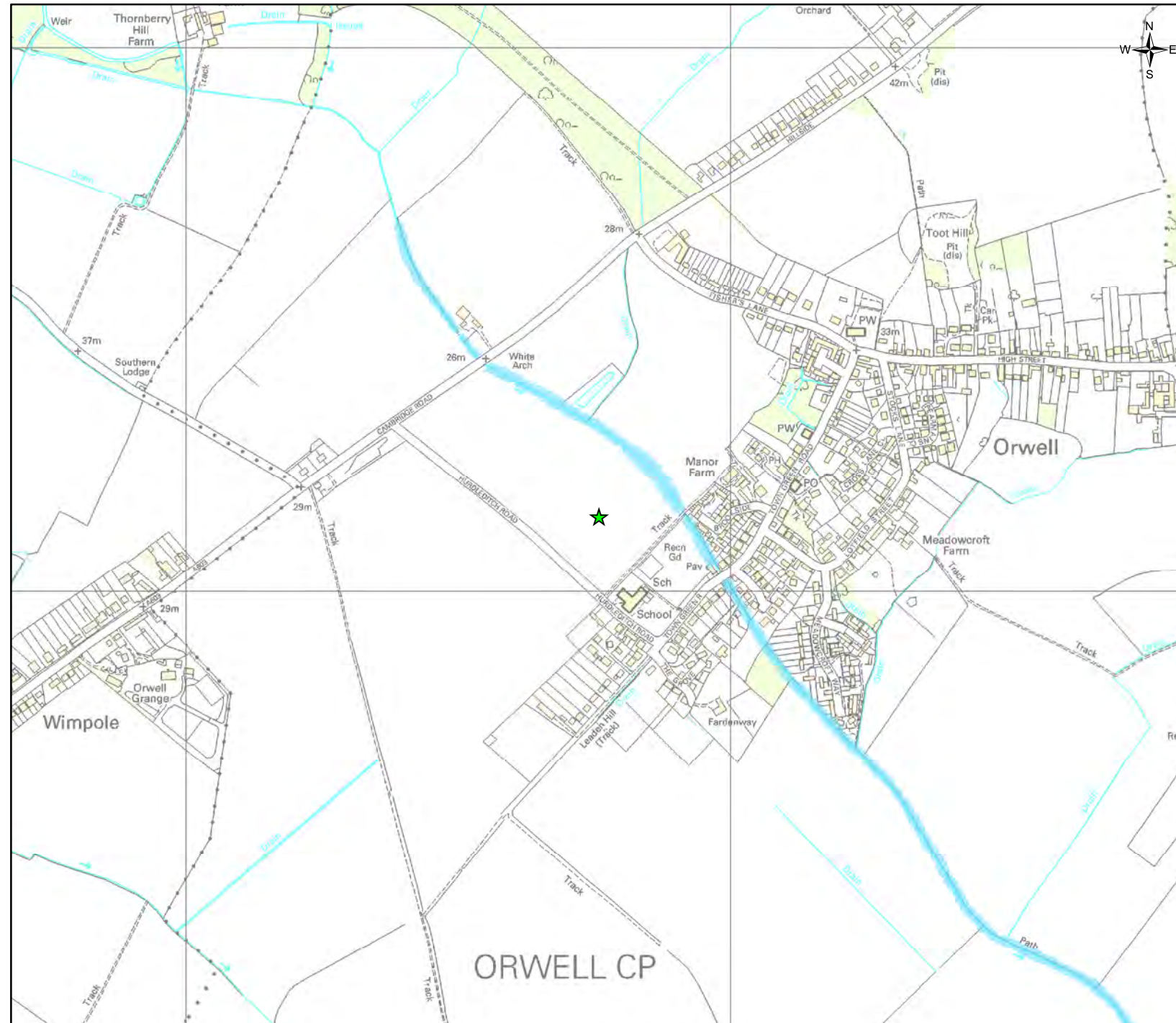
Flood Risk Assessments - The Environment Agency recommends any Flood Risk Assessment should only consider these results in the context of a site specific assessment.

AEP - Annual Exceedance Probability - The probability of a given event occurring in any one year. Please note this is not a return period.

Strategic Scale Model - This model has been designed for catchment wide flood risk mapping. It should be noted that it was not created to produce flood levels for specific development sites within the catchment. Modelled outlines take into account catchment wide defences if present.

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Defended Model Flood Outlines centred on Site at Orwell, Cambridgeshire

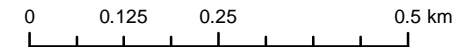
NGR TL3575950138
Ref 199025
Created 26/01/2021

Environment Agency
Bromholme Lane,
Brampton,
Cambridgeshire
PE28 4NE



Legend

- ★ Site
- 1% AEP
- 0.1% AEP
- Main river



Information

Model Tolerance - Any data included in this product is subject to a standard modelling tolerance of +/- 150mm. The fluvial models used to produce these results are intended for strategic scale use only.

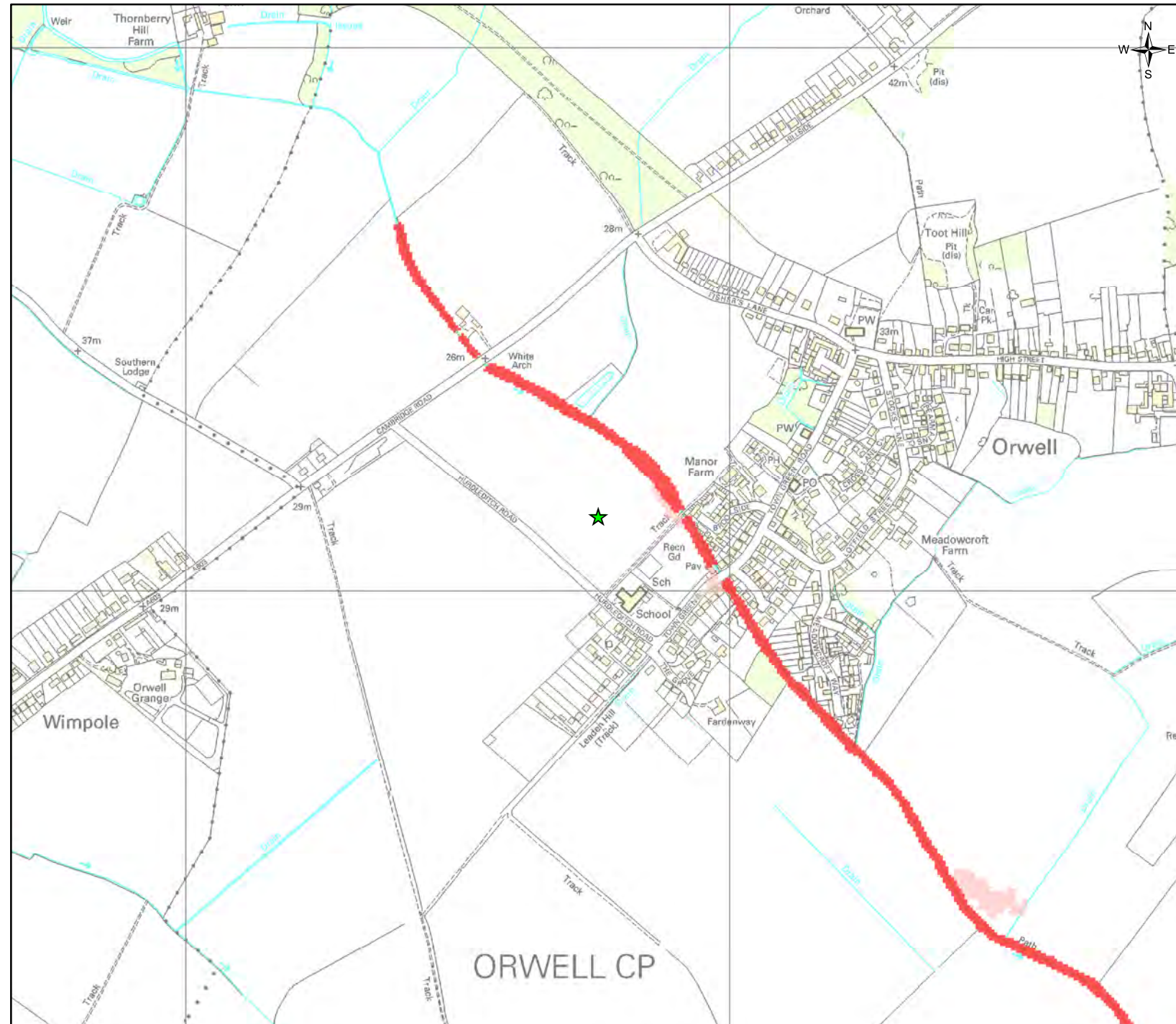
Flood Risk Assessments - The Environment Agency recommends any Flood Risk Assessment should only consider these results in the context of a site specific assessment.

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Modelled Node Point Locations centred on Site at Orwell, Cambridgeshire

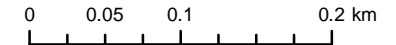
NGR TL3575950138
Ref 199025
Created 26/01/2021

Environment Agency
Bromholme Lane,
Brampton,
Cambridgeshire
PE28 4NE



Legend

- ★ Site
- ▲ Modelled Node Point



Information

Model Tolerance - Any data included in this product is subject to a standard modelling tolerance of +/- 150mm. The fluvial models used to produce these results are intended for strategic scale use only.

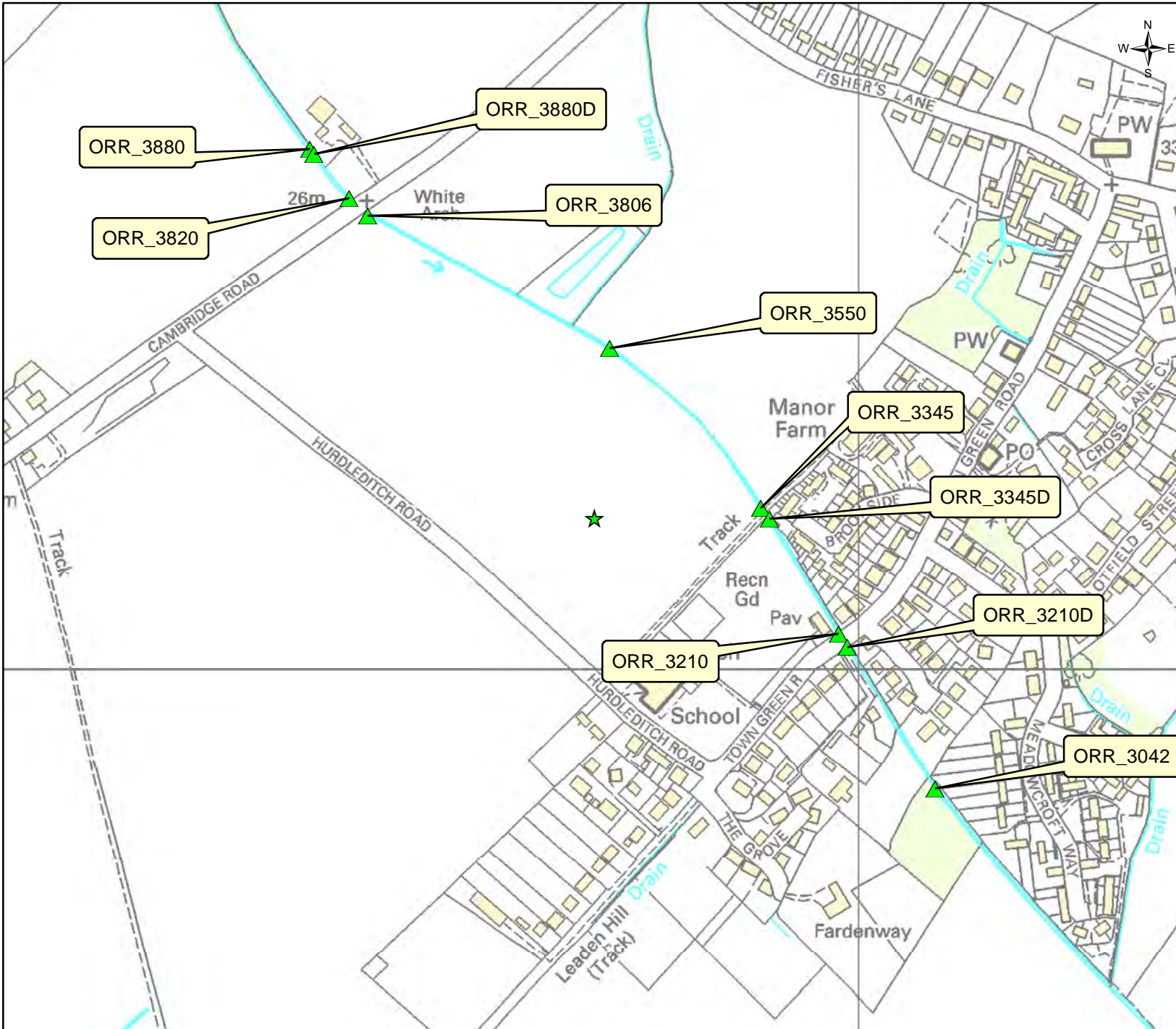
Flood Risk Assessments - The Environment Agency recommends any Flood Risk Assessment should only consider these results in the context of a site specific assessment.

AEP - Annual Exceedance Probability - The probability of a given event occurring in any one year. Please note this is not a return period.

Strategic Scale Model - This model has been designed for catchment wide flood risk mapping. It should be noted that it was not created to produce flood levels for specific development sites within the catchment. Modelled outlines take into account catchment wide defences if present.

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Datasheet - Product 4

26 January 2021

Reference Number	199025
Site	Site - Orwell, Cambridgeshire
Customer	James Howard
NGR	TL3575950138

This datasheet provides supporting information for your Product 4. It will be clearly indicated if we are unable to provide information to fulfil any part of your request.

Model Summary

Model Name	Model Code
Cam Rural	EA052370

Important Information

The following information should be considered when using the material provided to fulfil this request.

Information	
Limited Modelled Extents Provided	We have only provided a limited number of modelled flood extents for clarity. If you require further extents we will be happy to provide them.
Ordinary Watercourses	Some watercourses in this area are Ordinary Watercourses (non main). Please contact the relevant Lead Local Flood Authority (LLFA) or Internal Drainage Board (IDB) for more information on these.
Climate Change Allowances	The 1%+CC AEP flood level in the will be based on the 1% annual probability flood event including an additional 20% increase in peak flows to account for climate change impacts. Guidance on climate change allowances for the purpose of flood risk assessments is available on our website at https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances . You may need to undertake further assessment / modelling of future flood risk using different climate change allowances to ensure your assessment of future flood risk is based on the best available evidence.
No Product 8 Data	Unfortunately we do not have any breach data at this location.

Modelled Water Levels and Flows

The following tables provide modelled in channel water level and flow values. Values are provided for Annual Exceedence Probability (AEP) events, which is the probability of a given event occurring in any one year. This is not a return period.

The fluvial models used to produce these results are intended for strategic scale use only.

If the tables show a value of -9999, this indicates that we have no level or flow data for that particular AEP or node point.

Level Data

Level values are measured in metres above Ordnance Datum (m aOD).

All level data included are subject to standard modelling tolerance of +/-150 millimetres.

Present Day Levels

Node	Model	Easting	Northing	20%	10%	5%	4%	2%	1.33%	1%	0.5%	0.1%
ORR_3042	EA052370	536070	249891	21.85	22.24	-9999	22.06	22.24	22.24	22.24	22.33	22.54
ORR_3210	EA052370	535982	250032	22.27	22.76	-9999	22.51	22.76	22.76	22.76	22.91	23.31
ORR_3210D	EA052370	535990	250020	22.24	22.64	-9999	22.45	22.64	22.64	22.64	22.73	22.94
ORR_3345	EA052370	535911	250147	22.67	23.27	-9999	22.93	23.27	23.27	23.27	23.47	23.85
ORR_3345D	EA052370	535919	250137	22.62	23.03	-9999	22.83	23.03	23.03	23.03	23.14	23.44
ORR_3550	EA052370	535773	250293	23.32	23.73	-9999	23.51	23.73	23.73	23.73	23.84	24.10
ORR_3806	EA052370	535552	250414	24.28	24.63	-9999	24.47	24.63	24.63	24.63	24.70	24.87
ORR_3820	EA052370	535535	250430	24.35	24.77	-9999	24.58	24.77	24.77	24.77	24.87	25.12
ORR_3880	EA052370	535499	250475	24.56	25.03	-9999	24.8	25.03	25.03	25.03	25.16	25.63
ORR_3880D	EA052370	535503	250470	24.51	24.89	-9999	24.71	24.89	24.89	24.89	24.98	25.22

Climate Change Level

Node	Model	Easting	Northing	1%+20%cc	1%+25%cc	1%+35%cc	1%+65%cc	0.5%+20%cc	0.1%+20%cc
ORR_3042	EA052370	536070	249891	22.27	-9999	-9999	-9999	-9999	-9999
ORR_3210	EA052370	535982	250032	22.81	-9999	-9999	-9999	-9999	-9999
ORR_3210D	EA052370	535990	250020	22.67	-9999	-9999	-9999	-9999	-9999
ORR_3345	EA052370	535911	250147	23.33	-9999	-9999	-9999	-9999	-9999
ORR_3345D	EA052370	535919	250137	23.06	-9999	-9999	-9999	-9999	-9999
ORR_3550	EA052370	535773	250293	23.76	-9999	-9999	-9999	-9999	-9999
ORR_3806	EA052370	535552	250414	24.65	-9999	-9999	-9999	-9999	-9999
ORR_3820	EA052370	535535	250430	24.80	-9999	-9999	-9999	-9999	-9999
ORR_3880	EA052370	535499	250475	25.07	-9999	-9999	-9999	-9999	-9999
ORR_3880D	EA052370	535503	250470	24.92	-9999	-9999	-9999	-9999	-9999

Flow Data

Flow values are measured in cubic metres per second (cumecs - m³/s).

Present Day Flows

Node	Model	Easting	Northing	20%	10%	5%	4%	2%	1.33%	1%	0.5%	0.1%
ORR_3042	EA052370	536070	249891	1.502	3.178	-9999	2.316	3.178	3.178	3.178	3.686	5.122
ORR_3210	EA052370	535982	250032	1.502	3.179	-9999	2.316	3.179	3.178	3.178	3.686	4.931
ORR_3210D	EA052370	535990	250020	1.502	3.179	-9999	2.316	3.179	3.178	3.178	3.686	4.931
ORR_3345	EA052370	535911	250147	1.502	3.179	-9999	2.317	3.179	3.179	3.179	3.686	4.299
ORR_3345D	EA052370	535919	250137	1.502	3.179	-9999	2.317	3.179	3.179	3.179	3.686	4.299
ORR_3550	EA052370	535773	250293	1.502	3.179	-9999	2.317	3.18	3.179	3.179	3.688	5.149
ORR_3806	EA052370	535552	250414	1.502	3.18	-9999	2.317	3.18	3.18	3.18	3.689	5.149
ORR_3820	EA052370	535535	250430	1.502	3.18	-9999	2.317	3.18	3.18	3.18	3.689	5.149
ORR_3880	EA052370	535499	250475	1.502	3.18	-9999	2.317	3.18	3.18	3.18	3.689	5.149
ORR_3880D	EA052370	535503	250470	1.502	3.18	-9999	2.317	3.18	3.18	3.18	3.689	5.149

Climate Change Flows

Node	Model	Easting	Northing	1%+20%cc	1%+25%cc	1%+35%cc	1%+65%cc	0.5%+20%cc	0.1%+20%cc
ORR_3042	EA052370	536070	249891	3.333	-9999	-9999	-9999	-9999	-9999
ORR_3210	EA052370	535982	250032	3.333	-9999	-9999	-9999	-9999	-9999
ORR_3210D	EA052370	535990	250020	3.333	-9999	-9999	-9999	-9999	-9999
ORR_3345	EA052370	535911	250147	3.334	-9999	-9999	-9999	-9999	-9999
ORR_3345D	EA052370	535919	250137	3.334	-9999	-9999	-9999	-9999	-9999
ORR_3550	EA052370	535773	250293	3.334	-9999	-9999	-9999	-9999	-9999
ORR_3806	EA052370	535552	250414	3.335	-9999	-9999	-9999	-9999	-9999
ORR_3820	EA052370	535535	250430	3.335	-9999	-9999	-9999	-9999	-9999
ORR_3880	EA052370	535499	250475	3.335	-9999	-9999	-9999	-9999	-9999
ORR_3880D	EA052370	535503	250470	3.335	-9999	-9999	-9999	-9999	-9999

Recorded Flood Events

Where included, the Recorded Flood Event Outlines map provides an indication of areas which have flooded. Not all properties shown to be within the outline will have flooded.

Flood Event	Start	End	Source	Cause
None			N/A	We have no historic flood event information for this area. It is possible that other flooding may have occurred that we do not have records for, and other organisations such as: local authorities or IDBs may have records.

General Information

Flood Map for Planning (Rivers and Sea)

The Flood Map for Planning (Rivers and Sea) indicates the area at risk of flooding for a flood event with a 0.5% chance of occurring in any year for flooding from the sea, or a 1% chance of occurring in any year for fluvial (river) flooding (Flood Zone 3).

It also shows the extent of the Extreme Flood Outlines (Flood Zone 2) which represents the extent of a flood event with a 0.1% chance of occurring in any year, or the highest recorded historic extent if greater. The Flood Zones refer to the land at risk of flooding and do not refer to individual properties.

The Flood Map for Planning (Rivers and Sea) can be viewed and downloaded as a PDF file on GOV.UK by following this link: <https://flood-map-for-planning.service.gov.uk> or downloaded in GIS format under an open data licence from the following address: <https://data.gov.uk/publisher/environment-agency>

The Flood Map is updated on a quarterly basis to account for any amendments required.

Surface Water, Ordinary Watercourses and Groundwater Floodi

Lead Local Flood Authorities (LLFA) are responsible for managing local flood risk from ordinary watercourses, surface water flooding and groundwater flooding. You should check with the LLFA as they may have more up to date information regarding this type of flooding.

The Risk of Flooding from Surface Water Flood Map can be viewed and downloaded as a PDF file on GOV.UK by following this link: <https://flood-warning-information.service.gov.uk/long-term-flood-risk>

Information on how to reduce the impact of flooding from groundwater can be found online by the following link: <https://www.gov.uk/government/publications/flooding-from-groundwater>

Flooding from Reservoirs

The Risk of Flooding from Reservoirs Flood Map can be viewed and downloaded as a PDF file on GOV.UK by following this link: <https://flood-warning-information.service.gov.uk/long-term-flood-risk>

Sewer Flooding

Your local water company may have information on sewage flooding in your area of interest.

Areas Benefitting from Defence

Areas Benefitting from Defences show the area benefiting from defences from a 1 in 100 (1% AEP) year fluvial event or a 1 in 200 (0.5% AEP) tidal/coastal event.

The associated dataset can be downloaded in GIS from the following link: <https://data.gov.uk/dataset/flood-map-for-planning-rivers-and-sea-areas-benefiting-from-defences>

ZB471, Hurdleditch Road, Orwell

EA flood data - climate change extrapolation

Model node	ORR_3550	Easting 535773	Northing 250293
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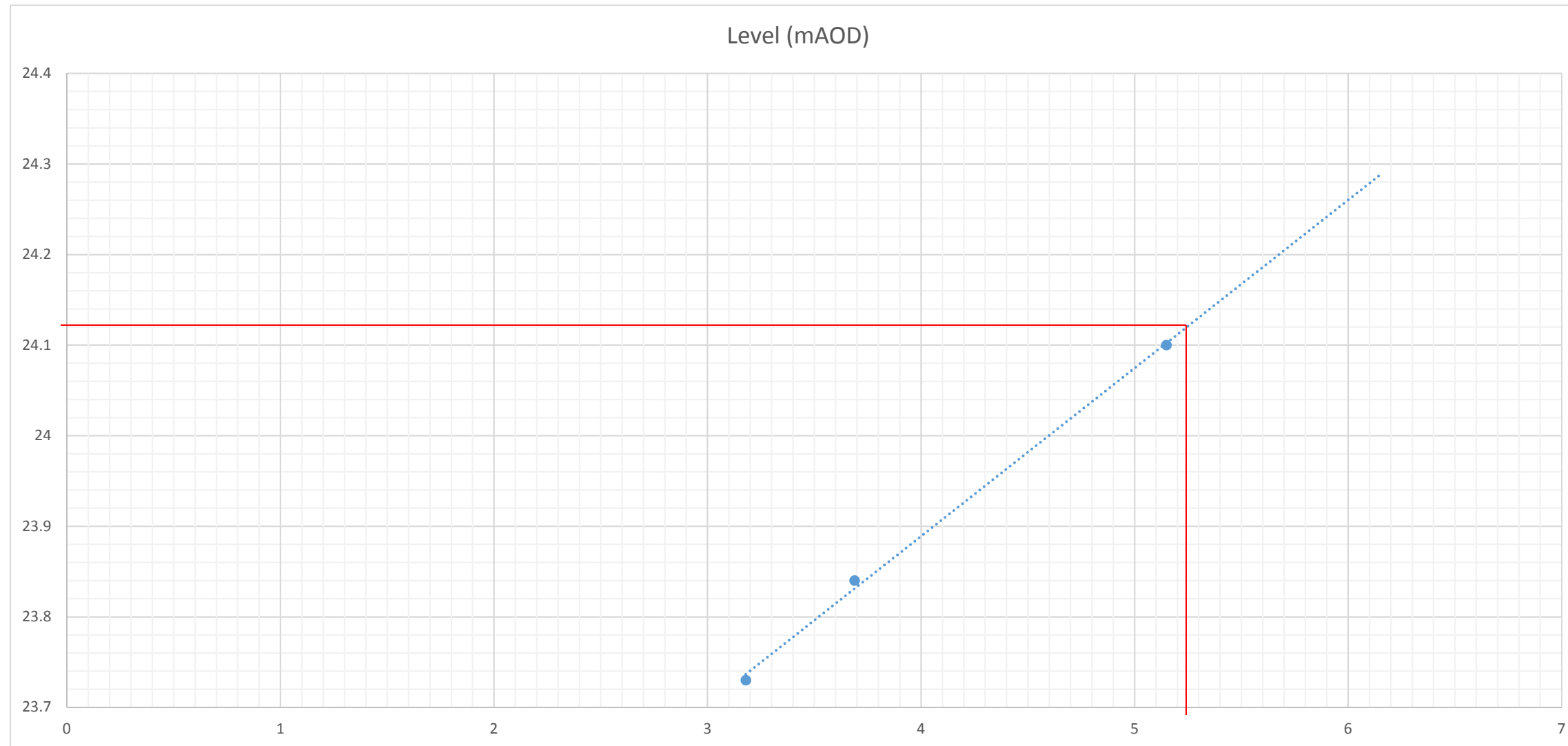
Event (%AEP)	20	10	2	1.33	1	1 + 20% CC	0.5	0.1
Flow (m ³ /s)	1.502	3.179	3.18	3.179	3.179	3.334	3.688	5.149
Level (mAOD)	23.32	23.73	23.73	23.73	23.73	23.76	23.84	24.1

Climate change adjusted flows		
1 % AEP	plus 35%	plus 65%
3.179	4.29165	5.24535

Data for linear extrapolation (data points which would result in a shallower trendline have been removed to provide a worse-case extrapolated level)

Event (% AEP)	1.0	0.5	0.1
Flow (m ³ /s)	3.179	3.688	5.149
Level (mAOD)	23.73	23.84	24.1

Flood level for 5.25 m3/s read from graph = 24.12 m AOD

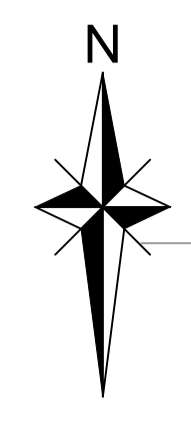


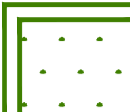

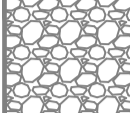
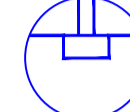
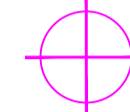
B. Proposed Site

Indicative surface water management strategy

Greenfield rates

Microdrainage calculations



- NOTES**
-  OUTLINE ATTENUATION BASIN 1 M DEEP, 1 in 3 SIDE SLOPES
 -  DRAINED CATCHMENT (0.41 ha less 20 % = 0.33 ha)
 -  FILTER BOX
 -  CONTROL CHAMBER
 -  FLOOD NODE 3550 LOCATION

REV	DESCRIPTION	DE	DR	CH	DATE
DESIGNED BY					
DRAWN BY	JH				
CHECKED BY					
SCALE @ A1 SIZE		DATE			
D.N.S.		17/02/2021			

PROJECT TITLE
LAND AT HURLEDITCH ROAD

DRAWING TITLE
OUTLINE SURFACE WATER MANAGEMENT STRATEGY

CLIENT
K B TEBBIT LTD

CANNON
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DRAWING NUMBER	REV.
ZB471 - PL - SK - 300	-

M:\ZB471 Land at Onwell, Cambs\3 PLANS\DRAWINGS\CURRENT DRGS\ZB471 - PL - SK - 300 - SW STRATEGY

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File

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ICP SUDS Mean Annual Flood

Input

Return Period (years)	1	Soil	0.370
Area (ha)	1.000	Urban	0.000
SAAR (mm)	556	Region Number	Region 5

Results 1/s

QBAR Rural 2.2
QBAR Urban 2.2

Q1 year 1.9

Q1 year 1.9
Q30 years 5.3
Q100 years 7.8

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (1/s)	Max Overflow (1/s)	Max Σ Outflow (1/s)	Max Volume (m³)	Status
15 min Summer	23.554	0.404	0.4	0.0	0.4	118.5	O K
30 min Summer	23.638	0.488	0.4	0.0	0.4	152.8	O K
60 min Summer	23.714	0.564	0.5	0.0	0.5	186.4	O K
120 min Summer	23.814	0.664	0.5	0.0	0.5	235.5	O K
180 min Summer	23.871	0.721	0.5	0.0	0.5	265.5	Flood Risk
240 min Summer	23.908	0.758	0.5	0.0	0.5	285.7	Flood Risk
360 min Summer	23.951	0.801	0.6	0.0	0.6	310.4	Flood Risk
480 min Summer	23.975	0.825	0.6	0.0	0.6	324.7	Flood Risk
600 min Summer	23.991	0.841	0.6	0.0	0.6	333.8	Flood Risk
720 min Summer	24.001	0.851	0.6	0.0	0.6	340.0	Flood Risk
960 min Summer	24.012	0.862	0.6	0.0	0.6	347.0	Flood Risk
1440 min Summer	24.020	0.870	0.6	0.0	0.6	351.8	Flood Risk
2160 min Summer	24.019	0.869	0.6	0.0	0.6	351.0	Flood Risk
2880 min Summer	24.013	0.863	0.6	0.0	0.6	347.5	Flood Risk
4320 min Summer	24.000	0.850	0.6	0.0	0.6	339.7	Flood Risk
5760 min Summer	23.993	0.843	0.6	0.0	0.6	335.4	Flood Risk
7200 min Summer	23.995	0.845	0.6	0.0	0.6	336.4	Flood Risk
8640 min Summer	24.001	0.851	0.6	0.0	0.6	340.1	Flood Risk
10080 min Summer	24.011	0.861	0.6	0.0	0.6	345.9	Flood Risk
15 min Winter	23.554	0.404	0.4	0.0	0.4	118.5	O K
30 min Winter	23.638	0.488	0.4	0.0	0.4	152.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
15 min Summer	151.760	0.0	32.8	0.0	27
30 min Summer	98.000	0.0	36.1	0.0	42
60 min Summer	59.920	0.0	74.6	0.0	72
120 min Summer	38.010	0.0	81.3	0.0	132
180 min Summer	28.679	0.0	84.6	0.0	192
240 min Summer	23.240	0.0	86.6	0.0	252
360 min Summer	16.963	0.0	88.4	0.0	370
480 min Summer	13.413	0.0	89.0	0.0	490
600 min Summer	11.118	0.0	89.0	0.0	610
720 min Summer	9.508	0.0	88.7	0.0	730
960 min Summer	7.390	0.0	87.5	0.0	968
1440 min Summer	5.151	0.0	84.1	0.0	1448
2160 min Summer	3.585	0.0	170.3	0.0	2164
2880 min Summer	2.783	0.0	165.6	0.0	2884
4320 min Summer	1.977	0.0	154.5	0.0	4204
5760 min Summer	1.572	0.0	316.9	0.0	4848
7200 min Summer	1.335	0.0	311.5	0.0	5616
8640 min Summer	1.179	0.0	304.3	0.0	6392
10080 min Summer	1.071	0.0	295.3	0.0	7168
15 min Winter	151.760	0.0	32.8	0.0	27
30 min Winter	98.000	0.0	36.1	0.0	42

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (1/s)	Max Overflow (1/s)	Max Σ Outflow (1/s)	Max Volume (m ³)	Status
60 min Winter	23.714	0.564	0.5	0.0	0.5	186.4	O K
120 min Winter	23.814	0.664	0.5	0.0	0.5	235.5	O K
180 min Winter	23.871	0.721	0.5	0.0	0.5	265.5	Flood Risk
240 min Winter	23.908	0.758	0.5	0.0	0.5	285.8	Flood Risk
360 min Winter	23.951	0.801	0.6	0.0	0.6	310.5	Flood Risk
480 min Winter	23.976	0.826	0.6	0.0	0.6	324.8	Flood Risk
600 min Winter	23.991	0.841	0.6	0.0	0.6	334.0	Flood Risk
720 min Winter	24.001	0.851	0.6	0.0	0.6	340.2	Flood Risk
960 min Winter	24.013	0.863	0.6	0.0	0.6	347.2	Flood Risk
1440 min Winter	24.021	0.871	0.6	0.0	0.6	352.3	Flood Risk
2160 min Winter	24.020	0.870	0.6	0.0	0.6	351.9	Flood Risk
2880 min Winter	24.015	0.865	0.6	0.0	0.6	348.8	Flood Risk
4320 min Winter	24.005	0.855	0.6	0.0	0.6	342.5	Flood Risk
5760 min Winter	23.995	0.845	0.6	0.0	0.6	336.7	Flood Risk
7200 min Winter	23.994	0.844	0.6	0.0	0.6	335.9	Flood Risk
8640 min Winter	23.999	0.849	0.6	0.0	0.6	338.6	Flood Risk
10080 min Winter	24.006	0.856	0.6	0.0	0.6	342.9	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Overflow Volume (m ³)	Time-Peak (mins)
60 min Winter	59.920	0.0	74.6	0.0	72
120 min Winter	38.010	0.0	81.3	0.0	130
180 min Winter	28.679	0.0	84.7	0.0	188
240 min Winter	23.240	0.0	86.6	0.0	248
360 min Winter	16.963	0.0	88.4	0.0	366
480 min Winter	13.413	0.0	89.0	0.0	484
600 min Winter	11.118	0.0	89.0	0.0	602
720 min Winter	9.508	0.0	88.7	0.0	720
960 min Winter	7.390	0.0	87.5	0.0	956
1440 min Winter	5.151	0.0	84.1	0.0	1424
2160 min Winter	3.585	0.0	170.4	0.0	2120
2880 min Winter	2.783	0.0	165.7	0.0	2800
4320 min Winter	1.977	0.0	154.7	0.0	4112
5760 min Winter	1.572	0.0	317.2	0.0	5320
7200 min Winter	1.335	0.0	311.9	0.0	5704
8640 min Winter	1.179	0.0	304.9	0.0	6656
10080 min Winter	1.071	0.0	296.1	0.0	7568

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 535950 250050 TL 35950 50050
Data Type	Catchment
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.950
Cv (Winter)	0.950
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.330

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From: To:	(ha)	From: To:	(ha)	From: To:	(ha)
0 4	0.110	4 8	0.110	8 12	0.110

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Model Details

Storage is Online Cover Level (m) 24.150

Tank or Pond Structure

Invert Level (m) 23.150

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	210.0	0.500	435.0	1.000	690.0

Orifice Outflow Control

Diameter (m) 0.017 Discharge Coefficient 0.600 Invert Level (m) 23.100

Weir Overflow Control

Discharge Coef 0.544 Width (m) 10.000 Invert Level (m) 24.150