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Hampshire Developments Ltd

Land East of Westergate Aldingbourne

Hydraulic modelling report

March 2026

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Prepared for

Hampshire Developments Ltd

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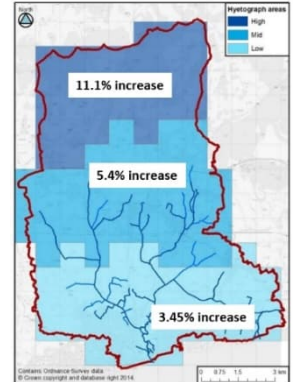
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Appendix A – SEPTEMBER 2023 MODELLING REPORT AND ADDENDUMS

Executive summary

This modelling report informs the Flood risk Assessment for the Land East of Westergate, Aldingbourne planning application. It is based on the hydraulic model that was accepted and considered suitable for use by the Environment Agency. The Environment Agency however advised that the model may need further review should there be design changes, and particularly for the proposed bridge over the Lidsey Rife. Since the acceptance of the model on 4th of April 2025, no design changes have taken for this planning application.



The hydraulic model used for this planning application is originally based on a cut version of the Environment Agency 2015 Infoworks ICM Aldingbourne Model - a direct rainfall 1D-2D catchment fluvial model. The original cut model and this modelling report were updated as addendums, following three external reviews by the Environment Agency.

Since the first modelling report produced in September 2023 for this site, the estimated peak water level just upstream of the proposed bridge on the Lidsey Rife has only changed by 10mm; thus, demonstrating the robustness of the model despite the number of reviews undertaken by the Environment Agency.

This modelling report combines all information provided in previous versions of the modelling report and includes relevant updated local information, updated FEH2022 rainfall and the latest climate change allowances of peak flows.

This modelling report provides the 1 in 100 year plus 36% climate change flood extents; they have assisted in sustainably allocating the following land uses outside of this area of flood risk:

- The residential development;
- The runoff attenuation basins;
- The proposed bridge and its abutments; and
- Compensation storage for the volumes taken by the bridge abutments for the extreme 1 in 100 year plus 64% climate change flood extents, at the crossing over the Lidsey Rife.

This modelling report provides the 1 in 100 year plus climate change level at the proposed free span bridge over the Lidsey Rife, to ensure sufficient freeboard and to minimise compensation storage requirements.

Contact name Bruno Venturini

1. INTRODUCTION

1.1 Background to this modelling report

- 1.1.1 WSP has been commissioned by Hampshire Developments Ltd, to prepare a site-specific Flood Risk Assessment (FRA) and surface water drainage strategy for the Land East of Westergate Aldingbourne, West Sussex (the Site, refer to its location in **Figure 1.1**).
- 1.1.2 This modelling report informs the FRA and it is based on the hydraulic model that was accepted and considered suitable for use on the 4th of April 2025 by the Environment Agency (identified in this report as the Westergate model).
- 1.1.3 The Westergate model is a cut version and with local improvements of the 2015 Environment Agency Aldingbourne model (refer to **Sections 1.2** and **1.3**). The Environment Agency advised that the Westergate model may need further review should there be design changes, and particularly for the proposed bridge over the Lidsey Rife. Since the acceptance of the model there have been, no design changes leading to this planning application.
- 1.1.4 This report combines all information provided in previous versions of the modelling report and includes relevant updated local information, updated FEH2022 rainfall and the latest climate change allowances of peak flows.
- 1.1.5 This modelling report provides the 1 in 100 year plus 36% climate change (peak flow higher allowance) flood extents, which have assisted in sustainably allocating the following land uses outside this area of flood risk:
- The residential development;
 - The proposed bridge and its abutments;
 - The runoff attenuation basins; and
 - Compensation storage for the volumes taken by the bridge abutments for the more extreme 1 in 100 year plus 64% climate change extents, at the crossing over the Lidsey Rife.
- 1.1.6 This modelling report provides the 1 in 100 year plus climate change level at the proposed free span bridge over the Lidsey Rife, to ensure sufficient freeboard and to minimise compensation storage requirements.

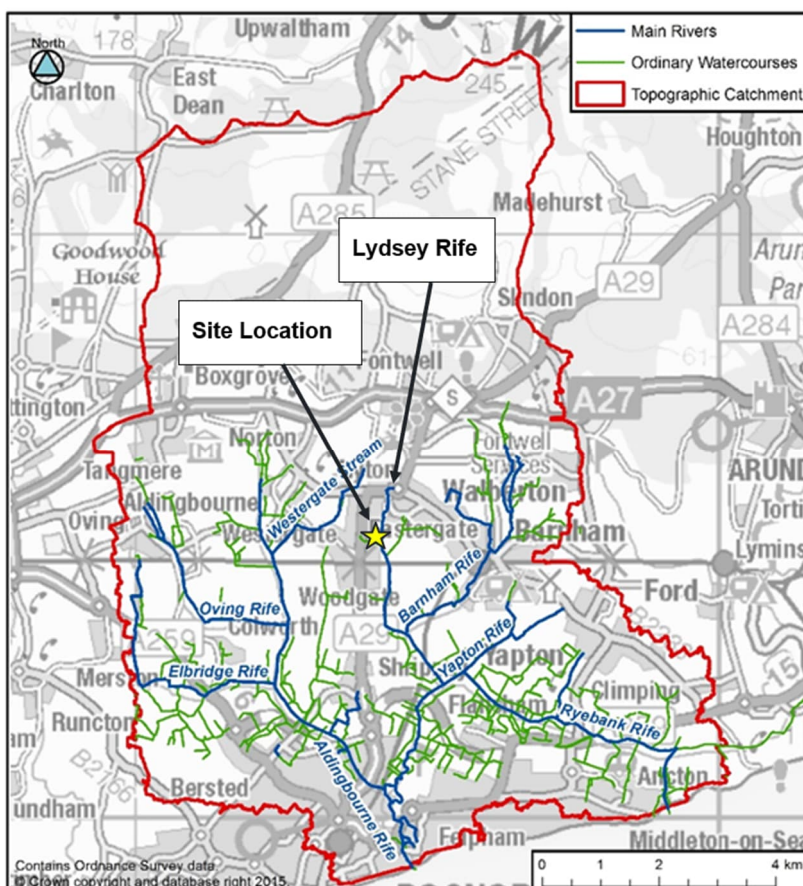
1.2 The environment agency model

- 1.2.1 The Environment Agency model was licensed to WSP on 13 July 2016 (identified as the 2015 Infoworks Aldingbourne Model). This is an integrated direct rainfall fluvial calibrated model, which provided better estimates than that of using inflow hydrographs from the

standard FEH approach (refer to Hydrology Modelling report for the EA Aldingbourne Model).

- 1.2.2 The Environment Agency model was developed as part of their Flood Mapping studies, within the Water and Environmental Management (WEM) Lot 3 framework. The model covers the entire Aldingbourne Rife catchment; at its downstream end, it drains to the sea at Bognor Regis (refer to the topographic catchment or 2D domain and modelled watercourses in **Figure 1.1**).
- 1.2.3 The Environment Agency model was used to produce flood extents, flood depths, flood hazard and flow velocities for a range of return period events and for the update of the Flood Map.
- 1.2.4 The model was simulated for the following return period events (Annual Exceedance Probability percentages): 1 in 2 (50%), 1 in 5 (20%), 1 in 10 (10%), 1 in 20 (5%), 1 in 30 (3.3%), 1 in 50 (2%), 1 in 75 (1.3%), 1 in 100 (1%), 1 in 100 (1%) plus climate change (at the time 20% increases in flows), 1 in 200 (0.5%), 1 in 1000 (0.1%). The hyetographs were generated using Depth-Duration-Frequency descriptors for the catchment. The rainfall losses due to infiltration were calculated in the hydraulic model. These parameters were calibrated during the model verification process.
- 1.2.5 The Environment Agency model and the modelling report were reviewed, and it was concluded that it was suitable to be used as a basis for building the Westergate model.

Figure 1.1 Aldingbourne Rife catchment



1.3 Background to the Westergate model

- 1.3.1 The Westergate model that was accepted by the Environment Agency on 4th of April 2024, is based on a cut version of the original Environment Agency 2015 Infoworks Aldingbourne Model. The model was updated following reviews undertaken by the Environment Agency and takes account of relevant updated local information, the updated FEH2022 rainfall and the latest climate change allowances of peak flows.
- 1.3.2 Since the first modelling report produced in September 2023 for this site, the estimated peak water levels at the proposed bridge on the Lidsey Rife have only changed by 10mm; thus, demonstrating the robustness of the model. The peak water level estimated for the 1 in 100 year plus 64% climate change allowance at cross section 1.019! upstream of the proposed bridge was originally 5.31m AOD (refer to Table 4.1 of the September 2023 modelling report in Appendix A) whereas for the latest update is 5.30m AOD (refer to Table 3 of Addendum 2 of the modelling report in Appendix A).
- 1.3.3 The main parameter that could have significantly changed the results was that of applying 45% increased rainfall to the entire catchment model; however, the model demonstrated that such conservative approach, would have been excessively conservative as it increased peak flows by more than 600% (refer to Table 1 of Addendum 2 of the modelling report in **Appendix A** –) by the proposed development. Such increase is tenfold the current government guidance of 36% and 64% for the higher and upper allowances respectively.
- 1.3.4 The September 2023 modelling report and the three addendums (August 24, February 25 and March 2025), following three external reviews from the Environment Agency are included in **Appendix A** – .

2. The Westergate model

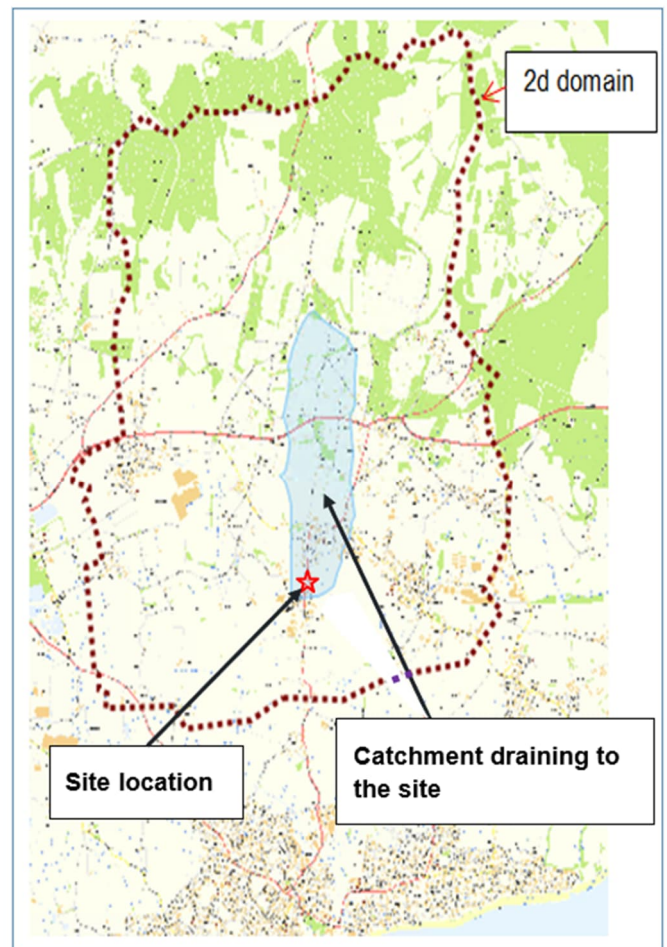
2.1 Summary of original modifications

2.1.1 The main original modification to the Environment Agency Aldingbourne model (prior to the Environment Agency model reviews) for the construction of the Westergate model was to cut the 2D domain, downstream from the Site. This modification ensured that the model could be run for more extreme climate change events (the EA model was run, only for the 20% peak flow increases due to climate change).

2.1.2 While cutting the model, it was important to ensure that the results were still consistent with the larger Environment Agency model. This was achieved by:

- Keeping the same 2D domain extents as for the Environment Agency model to the north of the Site, within the Site and at a sufficient distance south of the Site (refer to Error! Reference source not found. and for further details refer to **Section 2.2**);
- Replacing LiDAR data with a topographic survey of the Site (refer to **Section 2.2**).
- Maintaining the storm duration and winter rainfall profile (refer to **Section 2.3**);
- Increasing the rainfall hyetographs values based on percentage changes to convert the FEH2013 to FEH2022 rainfall (refer to **Section 2.3**);
- Maintaining the same infiltration zones (refer to **Section 2.4**) and not modifying the watercourse layers draining to the sea;
- Maintaining the same mesh zones within the reduced domain 2D (refer to **Section 2.5**) and creating a refined mesh zone within the catchment area (refer to light blue area in Error! Reference source not found. and for further details refer to **Section 2.6**);

Figure 2.1 2D domain of the model

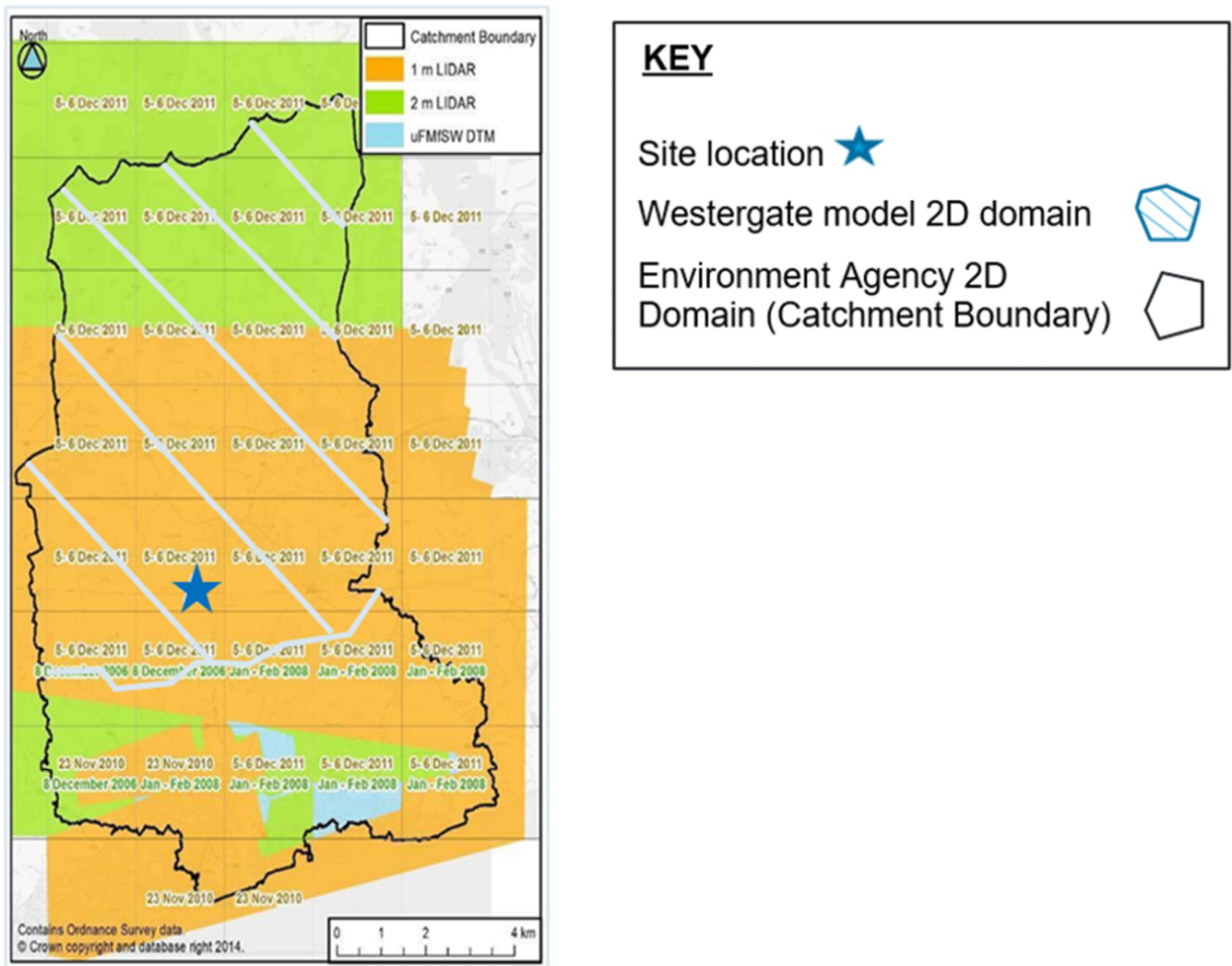


- Removing eleven conduits and one inline bank which were far downstream the Site as it was creating major model instabilities and excessively increasing modelling run times (for further details refer to **Section 2.7** and **2.8**);
- Using the same pipe network system in the model (refer to **Section 2.9**); and
- Using the same model run parameters as for the Environment Agency model.

2.2 DTM and 2D Domain

- 2.2.1 The DTM for the Environment Agency Aldingbourne model is based on the ASCII tiles of 1m and 2m resolution LIDAR data and 5m resolution uFMfSW DTM as shown by the green, orange and blue areas respectively in **Figure 2.2**. All ASCII tiles were mosaicked into one file for the creation of the DTM in the Environment Agency model.
- 2.2.2 The Westergate model utilised the same Environment Agency model DTM however with the exception of: a) the downstream area that was cut (refer to the Westergate mode 2D domain) and b) within the Site, where the topographic survey of the site was used instead.

Figure 2.2 ASCII data used in the EA model DTM and Westergate model DTM



Source : Aldingbourne modelling and mapping report,(v1 September 2015)

2.3 FEH2013 and FEH2022 rainfall

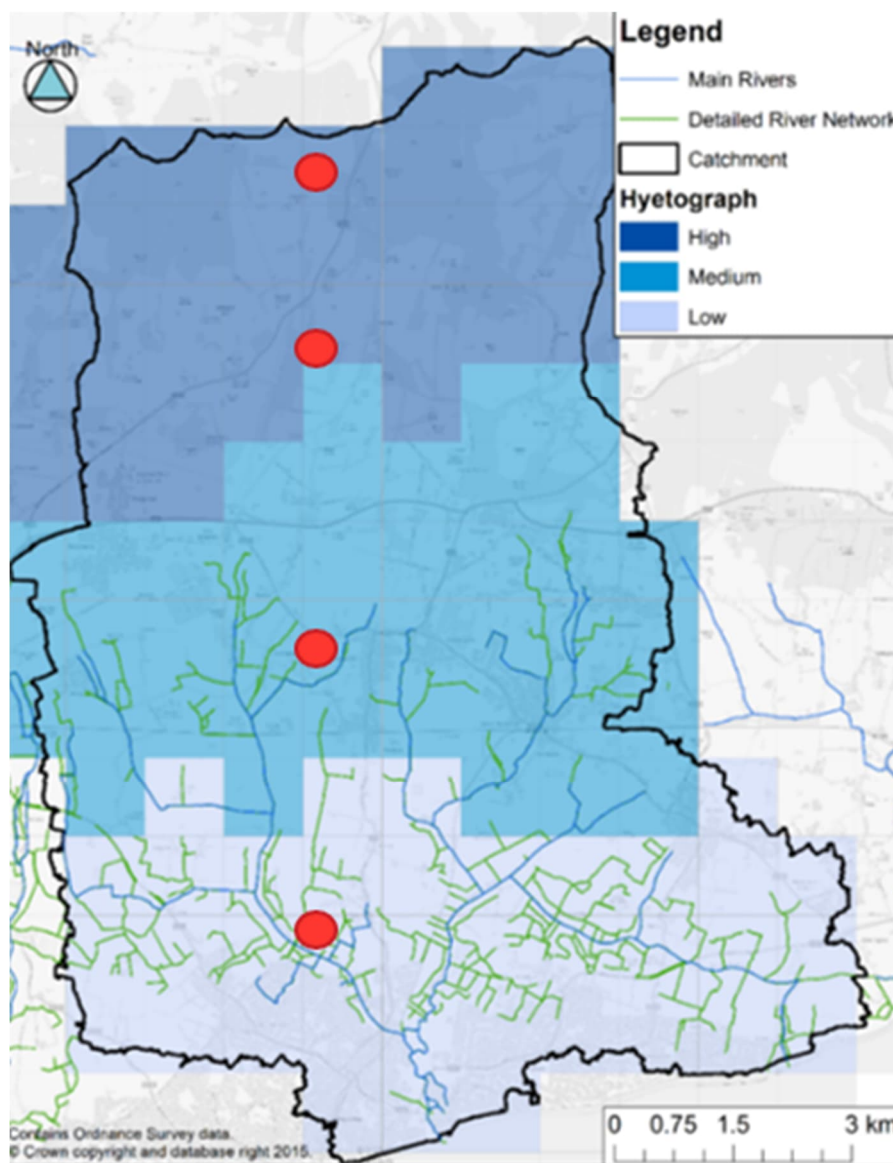
- 2.3.1 Rainfall data was obtained from the Environment Agency model and multiplied by percentage increases to convert FEH2013 to FEH2022 rainfall (see details in **Sections 2.3.7 and 2.3.8** below).
- 2.3.2 A brief summary of the approach undertaken in the Environment Agency model using the FEH2013 rainfall is provided below in italics (refer to **Figure 2.3**).
- 2.3.3 *Design rainfall statistics for each of the 1km grid squares across the catchment were extracted from the FEH CD-ROM (v3) in order to assess the variability in rainfall depths and storm duration across the catchment.*
- 2.3.4 *Higher rainfall depths were generally observed in the upstream part of the catchment and the rainfall totals gradually decrease further downstream. There was a significant difference between the upstream catchment rainfall total (120.5mm in the north-east) and the downstream catchment rainfall total (89mm in the south) for a 1% AEP event. As a*

result, different hyetographs were applied across the catchment in the hydraulic model in order to represent the variability in rainfall depths.

2.3.5

To create a hyetograph specific to these areas, the DDF parameters from the grid squares covering the modelled 2D domain were amalgamated to create average parameters for each hyetograph. Three hyetographs (low, medium and high) were used within the hydraulic model using representative FEH design rainfall statistics applied to each 'hyetograph catchment'.

Figure 2.3 Rainfall Hyetographs



mapping report,(v1 September 2015)

Source :
Aldingbourne modelling and

2.3.6

The average FEH design rainfall parameters derived for each of the three hyetographs are shown in **Table 2.1**. These DDF parameters were used to derive the design rainfall inputs (i.e. without losses) for the suite of AEP events. Only the ARFs and the Seasonal

Correction Factors (SCFs) were applied to the DDF rainfall depth in order to derive the design storm rainfall depth; these factors account for the conversion of point rainfall into spatially averaged rainfall (ARF) and applying the Winter rainfall profile to the DDF rainfall (SCF). These rainfall inputs were used to inform the combined fluvial-surface water model.

Table 2.1 Rainfall statistics for each hyetograph area

Hyetographs based on the FEH2013 rainfall	Area	FEH rainfall parameter					
		C	D1	D2	D3	E	F
LOW	33.75	-0.026	0.397	0.247	0.410	0.309	2.312
MEDIUM	36.73	-0.026	0.414	0.247	0.379	0.309	2.330
HIGH	26.83	-0.027	0.439	0.270	0.361	0.311	2.368

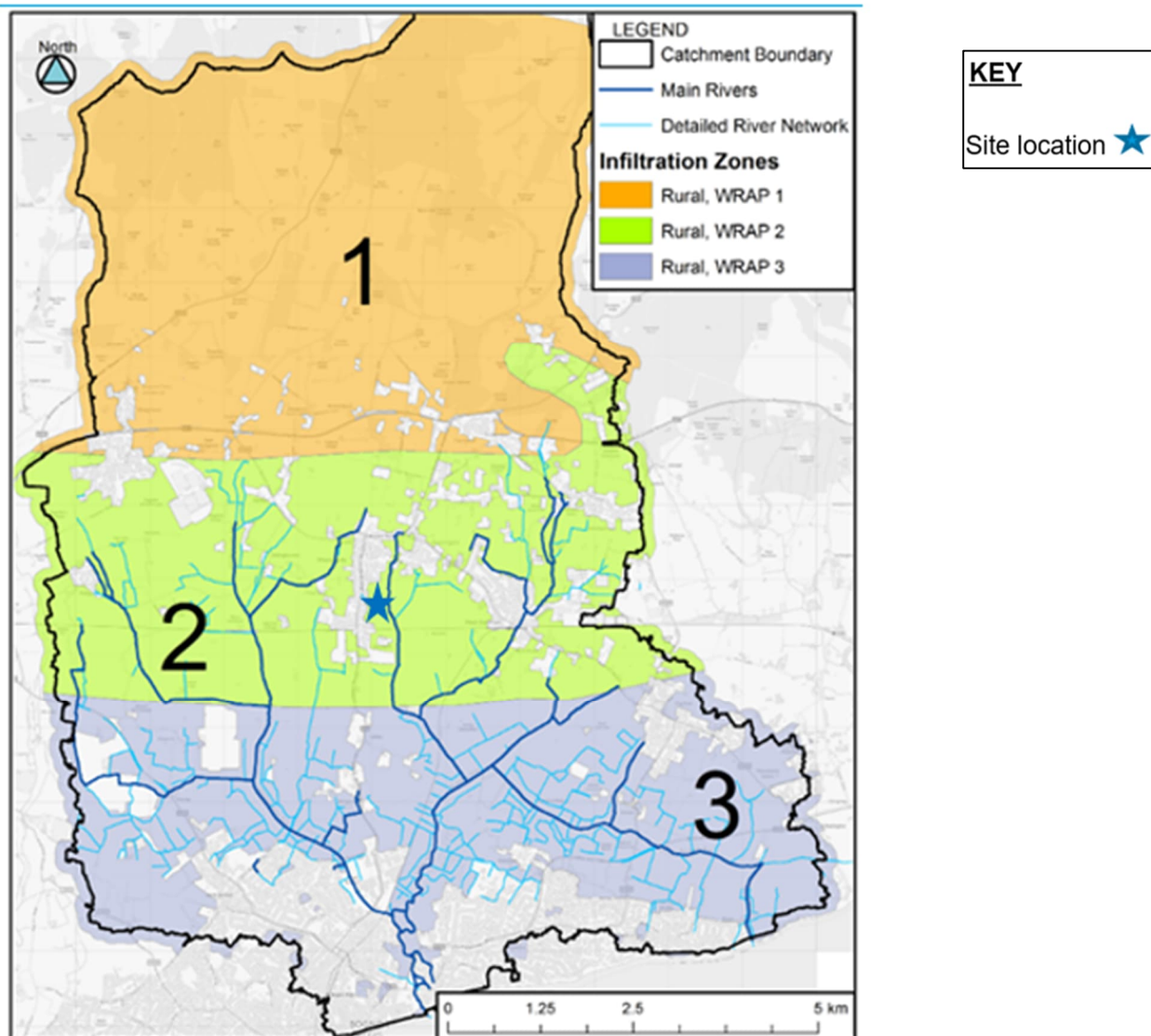
2.3.7 Since the FEH2022 rainfall was made available for use in the REFH2 tool, it was possible to compare FEH2013 rainfall and FEH2022 rainfall at the 4 points identified as red circles in **Figure 2.3**. The comparison indicated that the shape of the hyetographs did not change and therefore a percentage increase could be used to convert from FEH2013 to FEH2022. Using average values from the four points in **Figure 2.3**, it was possible to find the multipliers for the three rainfall regions in **Figure 2.3**, as follows: a) high region: 11.1%, b) medium region: 5.4% and c) lower region: 3.45%.

2.3.8 After the percentage increases, the resulting hyetographs were used as direct rainfall for the three regions in **Figure 2.3**, for a range of return period events.

2.4 Infiltration Zones

2.4.1 The same infiltration zones using the Horton model equations were used as for the Environment Agency model and there was no need to trim them within the Westergate model 2D domain. **Figure 2.4** provides a snapshot of the infiltration zones used in the Environment Agency and the Westergate models.

Figure 2.4 Infiltration zones in the model to represent rural areas of the catchment



Source : Aldingbourne modelling and mapping report,(v1 September 2015)

2.5 Mesh zones

- 2.5.1 Mesh zones were updated and further refined for the Westergate model. A total of 5 mesh zones were removed as they fell outside the Westergate 2D domain. One additional mesh zone was added to cover the catchment area draining to Westergate (refer to light blue area in Error! Reference source not found.), for the purpose of creating a fine computational mesh zone at that location.
- 2.5.2 **Figure 2.5** and **Figure 2.6** show the mesh zones used in the Environment Agency and Westergate models respectively.

Figure 2.5 Mesh zone used in the Environment Agency model

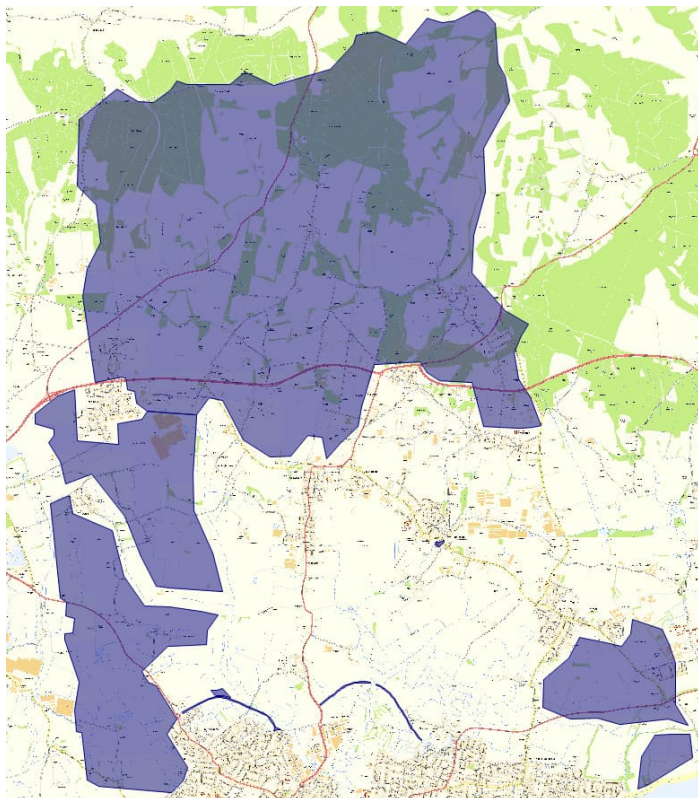
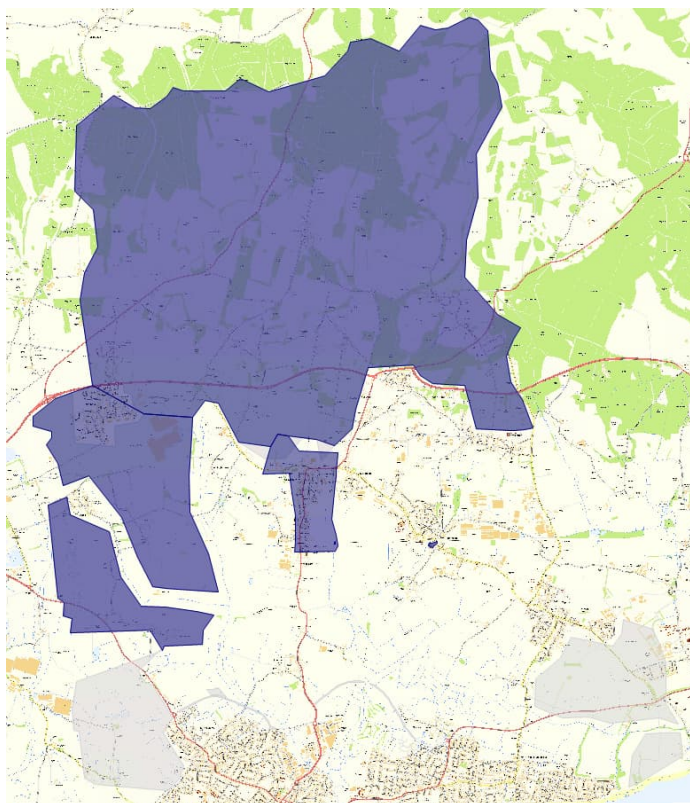


Figure 2.6 Mesh zone used in the Westergate model



2.5.3 Table 2.2 provides details of the mesh zones used in the Environment Agency model.

Table 2.2 Details of mesh zones used in the Environment Agency model

ID	Area (ha)	Maximum triangle area (m2)	Minimum element area (m2)	Ground level modification	Raise by (m)	Level (m AOD)
exceedance_ds	0.001			Level	0	4.06
exceedance_us	0.001			Level	0	4.09
A259_rowan	3.437			Raise or lower	4	0
A259	1.906			Raise or lower	4.835	0
0	2.395			Raise or lower	4.1	0
FP_comp	2.361			Raise or lower	-1	0
Mesh Zone Rural 1	3856.589	1000		None	0	0
Mesh Zone Rural 2	659.642	1000		None	0	0
Mesh Zone Rural 3	49.986	1000		None	0	0
Mesh Zone Rural 4	275.683	1000		None	0	0
Mesh Zone Rural 5	456.885	1000		None	0	0
BRC	0.004	100		Level	0	3.38
Marshall	0.809	50	25	None	0	0
LB	0.017	50	25	Raise or lower	-1	0

2.5.4 Table 2.3 provides details of the mesh zones used in the Westergate model.

Table 2.3 Details of mesh zones used in the Westergate model

ID	Area (ha)	Maximum triangle area (m2)	Minimum element area (m2)	Ground level modification	Raise by (m)	Level (m AD)
Mesh Zone Rural 1	3843.948	1000		None	0	0
Mesh Zone Rural 2	276.11	1000		None	0	0
Mesh Zone Rural 5	534.246	1000		None	0	0
Mesh zone	142.386	50	25	None	0	0
Bridge	0.049	5	4	Level	0	2.45
exceedance_ds	0.001			Level	0	4.06
exceedance_us	0.001			Level	0	4.09
BRC	0.004	100		Level	0	3.38
Marshall	0.809	50	25	None	0	0

ID	Area (ha)	Maximum triangle area (m2)	Minimum element area (m2)	Ground level modification	Raise (m)	by	Level (m AD)
LB	0.017	50	25	Raise or lower	-1		0

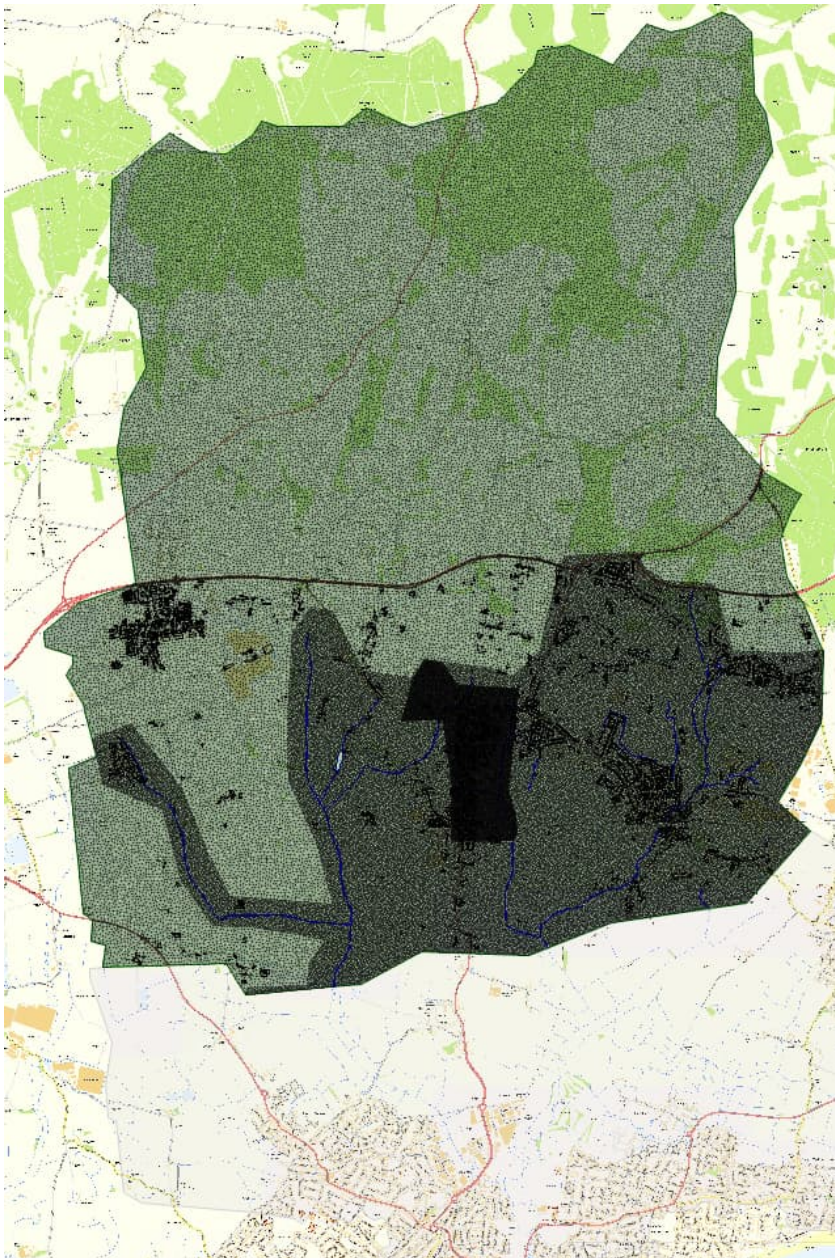
2.6 Computational mesh

2.6.1 The creation of the mesh zones in the Westergate model has allowed the setting of a finer computational mesh in the Westergate and Barham areas. **Figure 2.7** and **Figure 2.8** show graphically the locations where a finer mesh (darker areas) is used in the Environment Agency and Westergate models respectively.

Figure 2.7 2D computational zone and mesh in the Environment Agency model



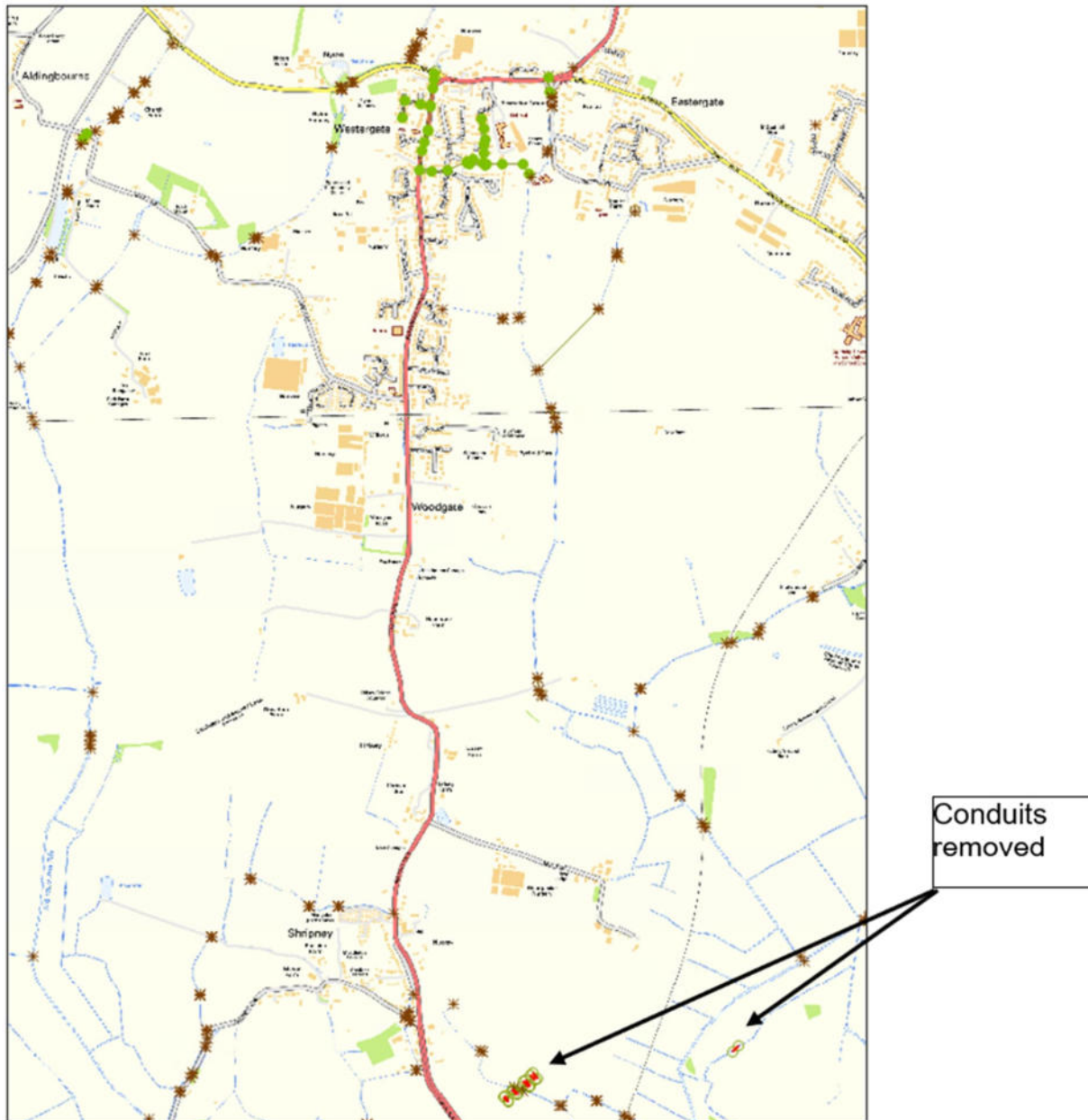
Figure 2.8 2D computational zone and mesh in the Westergate model



2.7 Conduits removed in the model

- 2.7.1 A total of 11 conduits were removed from the Westergate model. These do not affect the results at Westergate as they are located 3.6km downstream from Westergate (refer to **Figure 2.9**).

Figure 2.9 Conduits removed (red lines with red asterisks) from the Westergate Model



2.8 Inline Bank

2.8.1 Inline banks are used as flow inputs along lines. One inline bank was removed in the Westergate model which does not affect the results at Westergate as it is located approximately 4,28km downstream. **Table 2.4** summarises the inline banks in the Environment Agency and Westergate model and identifies the one that was removed for the Westergate model.

Table 2.4 Summary of Inline Banks

US node	DS node	Crest (m aod)	Remarks
7.050_us	7.05	10.9	Used

US node	DS node	Crest (m aod)	Remarks
19.03_us	19.034	10.19	Used
21.018_us	21.018	10.55	Used
20.028_us	20.028	11.77	Used
3.006!_us	3.006!	9.06	Used
2.010_us	2.01	8.37	Used
5.015_us	5.015	12.5	Used
4.004!!_us	4.004!	8.93	Used
3.013_us	3.013	4.38	Used
4.002!!!_us	4.002!!!	4.24	Used
18.008_us	18.008	1.827	This was removed (outside the Westergate topographic catchment)

2.9 Model pipe network within Westergate area

2.9.1 The modelled pipe network in the Westergate area has not changed in the Westergate model. There was no need to model additional small size pipe networks along Westergate Street (refer to blue lines in **Figure 2.10**), as without these the model gives conservative estimates of flood depths along Westergate Street.

Figure 2.10 Modelled pipe network in the Westergate area (blue lines)



2.10 Summary of changes in tabular format

2.10.1 Table 2.5 below provides a list of key model features, summarising the changes that were applied to the Westergate model when compared to the Environment Agency model.

Table 2.5 Summary of changes in the Westergate model

Features	Environment agency model	Westergate model	description	comment
Floodplain	-	-	2D continuous TIN	
Node	1527	1507	As manhole, break and outfall	
Conduit	889	879	As pipe	
2d Zone	1	1		
Subcatchment	3285	3285		
Bridge	11	11		
Banklines	543	543		
Culvert Inlet	158	158		
Culvert Outlet	162	162		
Flap valve	8	8		
Orifice	16	16		
Pump	4	4		
Screen	15	15		
Sluice	14	14		
Weir	1	1		
Irregular Weir	72	72		
Inline Bank	11	10		
River Reach	265	265		
General Line	62	62		
Porous Polygon	13024	13024	As building	
Mesh Zone	14	10		
Roughness Zone	1115	1115		
IC Zone-Infiltration 2D	19	19		
Infiltration Zone	23	23		
Cross-Section Line	1771	1771		
Storage Area	271	271		
Bridge Opening	11	11		
Kerbs	-	-		Not Included
Gully	-	-		Not Included
Area of 2D Domain	9819.867 (ha)	6597.501 (ha)	2D zone	

Features	Environment agency model	Westergate model	description	comment
Resolution of TIN	Minimum element area- 25 m ²	Minimum element area- 100 m ²		Coarse mesh outside the refined mesh zones
	Maximum Triangle Area- 100 m ²	Maximum Triangle Area- 200 m ²		
Hydraulic roughness	Land covers- 0.06	Land covers- 0.06		Standard Manning's "n" value. Individual roughness zones however were set to different values and these are the same for the Environment Agency and Westergate models.
	Pipe- 0.06	Pipe- 0.06		Colebrook-White
	Pipe-0.02	Pipe-0.02		Standard Manning's "n"

3. Modelling updates following Environment agency reviews

3.1 Modelling reviews

- 3.1.1 Questions and responses to third party reviews on behalf of the Environment Agency for the Westergate model are summarised in **Appendix A** – , which are self-explanatory. Following the reviews the model results have not changed much when compared to the original Westergate model described in **Chapter 2**.
- 3.1.2 The final flood extents and modelling results following the reviews by the Environment Agency are included in **Chapter 4**.

4. Model runs and sensitivity tests

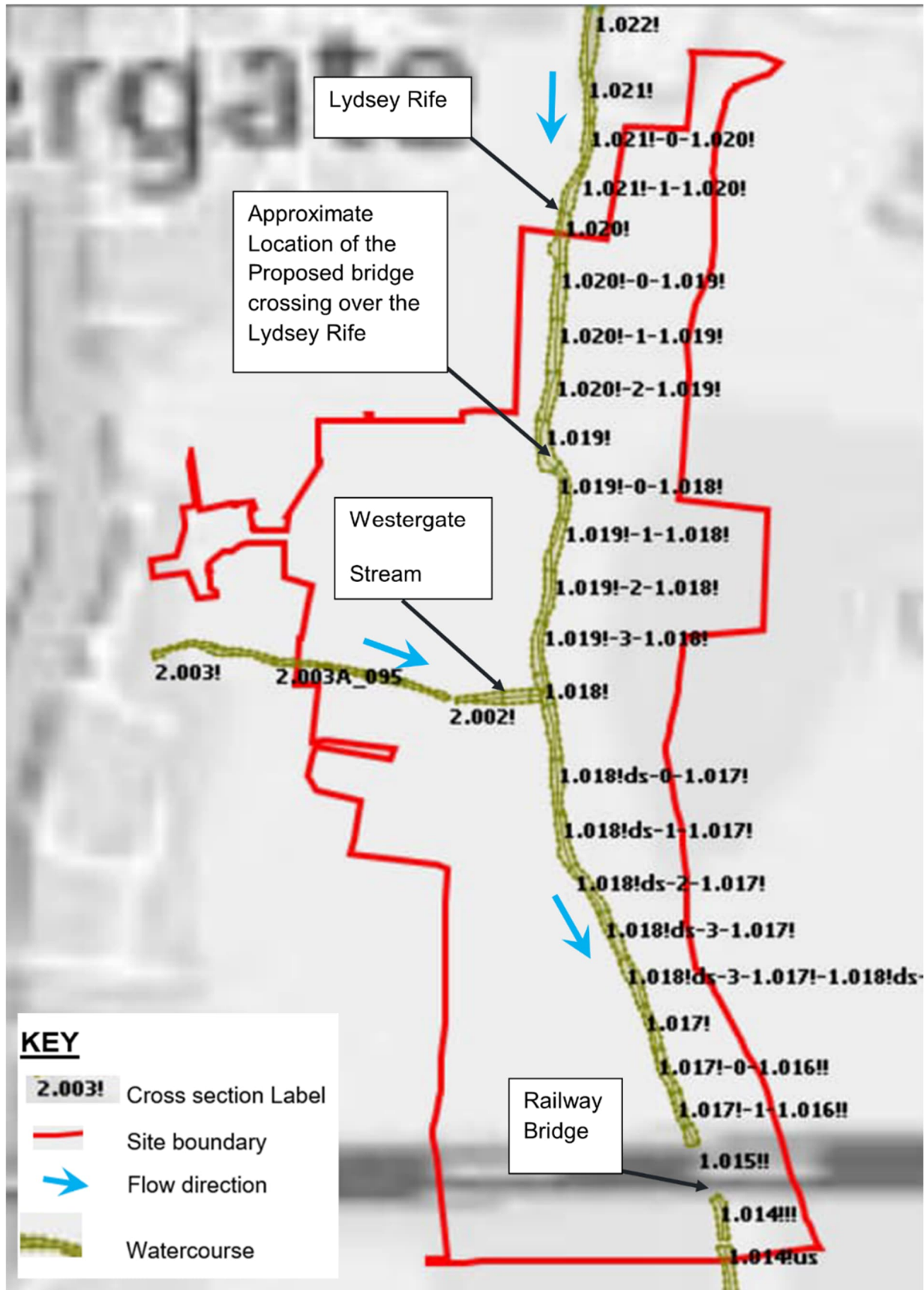
4.1 Baseline and with development model runs and flood maps

- 4.1.1 The final version 96 of the Westergate model has been run for the baseline and proposed development scenarios for the following design events:
- 1% AEP (1 in 100 year return period event);
 - 1% AEP plus 36% Climate change flow increases (higher estimates); and
 - 1% AEP plus 64% Climate change flow increases (upper estimates).
- 4.1.2 As the model is a direct rainfall model, it was found that increasing the rainfall intensities by 20% in the entire model, resulted in increases in peak flows within the Site of more than 36%.
- 4.1.3 **The model results with increases in rainfall by 20% have therefore been conservatively identified as the model results of increasing flows by 36%.**
- 4.1.4 Also increases in rainfall intensities by 25% resulted in increases in peak flows above 64% within the Site.
- 4.1.5 **The model results with increases in rainfall by 25% have therefore been conservatively identified as the model results of increasing flows by 64%.**
- 4.1.6 **Table 4.1** demonstrates this, by comparing peak flows within the Site, at several locations on the Lidsey Rife and the Westergate Stream (refer to **Figure 4.1** for the locations of the modelled cross sections).

Table 4.1 Peak flow increases as a result of rainfall intensity increases for climate change

Name	Cross section label	A Peak Flow (100year)	B Peak Flow (100 year plus 20% rainfall increase)	% Peak flow Increase (B-A)	C Peak Flow (100 year plus 25% rainfall increase)	% Peak flow increase (C-A)
Lidsey Rife	1.022!	2.82	7.34	160	9.99	254
	1.019!	3.04	9.38	208	14.15	365
	1.019!-0-1.018!	2.97	9.49	219	13.55	356
	1.019!-1-1.018!	2.98	9.37	214	13.13	340
	1.018!	4.14	11.06	167	15.17	266
	1.018!ds-0-1.017!	4.38	9.79	124	12.33	182
	1.018!ds-1-1.017!	5.19	9.53	84	11.53	122
	1.015!!	7.04	10.61	51	13.37	90
Westergate Stream	2.003!-0-2.002!	2.01	3.82	91	4.26	112
	2.003!-1-2.002!	2.49	4.20	69	4.63	86
	2.003!-2-2.002!	2.65	4.69	77	5.25	98
	2.003!-3-2.002!	2.64	4.10	55 (which is larger than 36%)	4.52	71 (which is larger than 64%)

Figure 4.1 1D model schematic and Key Locations



- 4.1.7 Flood depth maps for the baseline scenario are shown in **Figure 4.2** to **Figure 4.4** for the three design events (1 in 100year, 1 in 100year + 36%CC and 1 in 100year + 64%CC). These maps only model the baseline and not the proposed development, however they show the proposed development in transparent background, for illustrative purposes only. These maps also show the proposed bridge abutments, for illustrative purposes too.
- 4.1.8 Flood depth maps for the proposed development scenario are shown in **Figure 4.5** to **Figure 4.7** for the three design events (1 in 100year, 1 in 100year + 36%CC and 1 in 100year + 64%CC). The the proposed bridge abutments have been conservatively modelled as infinite wall polygons.
- 4.1.9 A comparison of the peak flood depth maps between the baseline and proposed development scenarios, for each design event return period indicates that there is almost no change in flood extents and peak flood depths. This is because, the following land uses have been placed outside the higher 1 in 100 year plus 36%CC event:
- All residential plots
 - All proposed development runoff attenuation basins;
 - The proposed compensation storage (see below); and
 - The proposed bridge and its abutments.
- 4.1.10 Peak water levels on the Lidsey Rife and the Westergate Stream are provided in **Table 4.1**.

Table 4.2 Peak Water Levels for the 1 in 100 year plus 64%CC

Cross Section	Baseline Scenario (mAOD)	Proposed Development Scenario (mAOD)	Difference
1.022!	7.154	7.159	0.004
1.019!	5.273	5.300	0.027
1.019!-0-1.018!	4.967	4.977	0.010
1.019!-1-1.018!	4.640	4.648	0.008
1.018!	3.820	3.825	0.005
1.018!ds-0-1.017!	3.420	3.430	0.010
1.018!ds-1-1.017!	3.286	3.303	0.017
1.016!!	3.081	3.092	0.011
1.014!us!	2.816	2.821	0.004
2.003!	5.953	5.950	-0.003

Figure 4.2 Flood Depth Map - 1 in 100 year baseline scenario

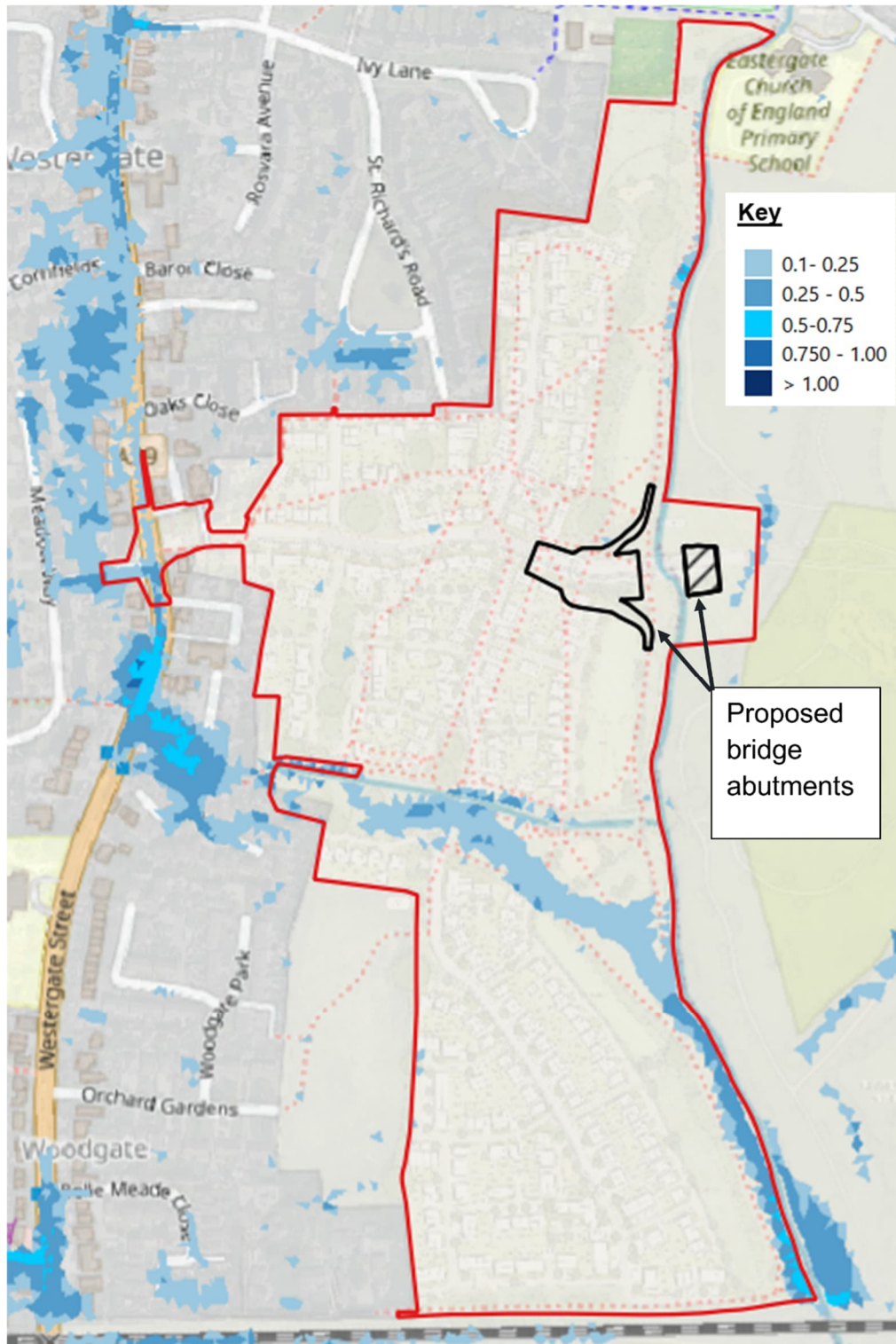


Figure 4.3 Flood Depth Map - 1 in 100 year + 36%CC baseline scenario

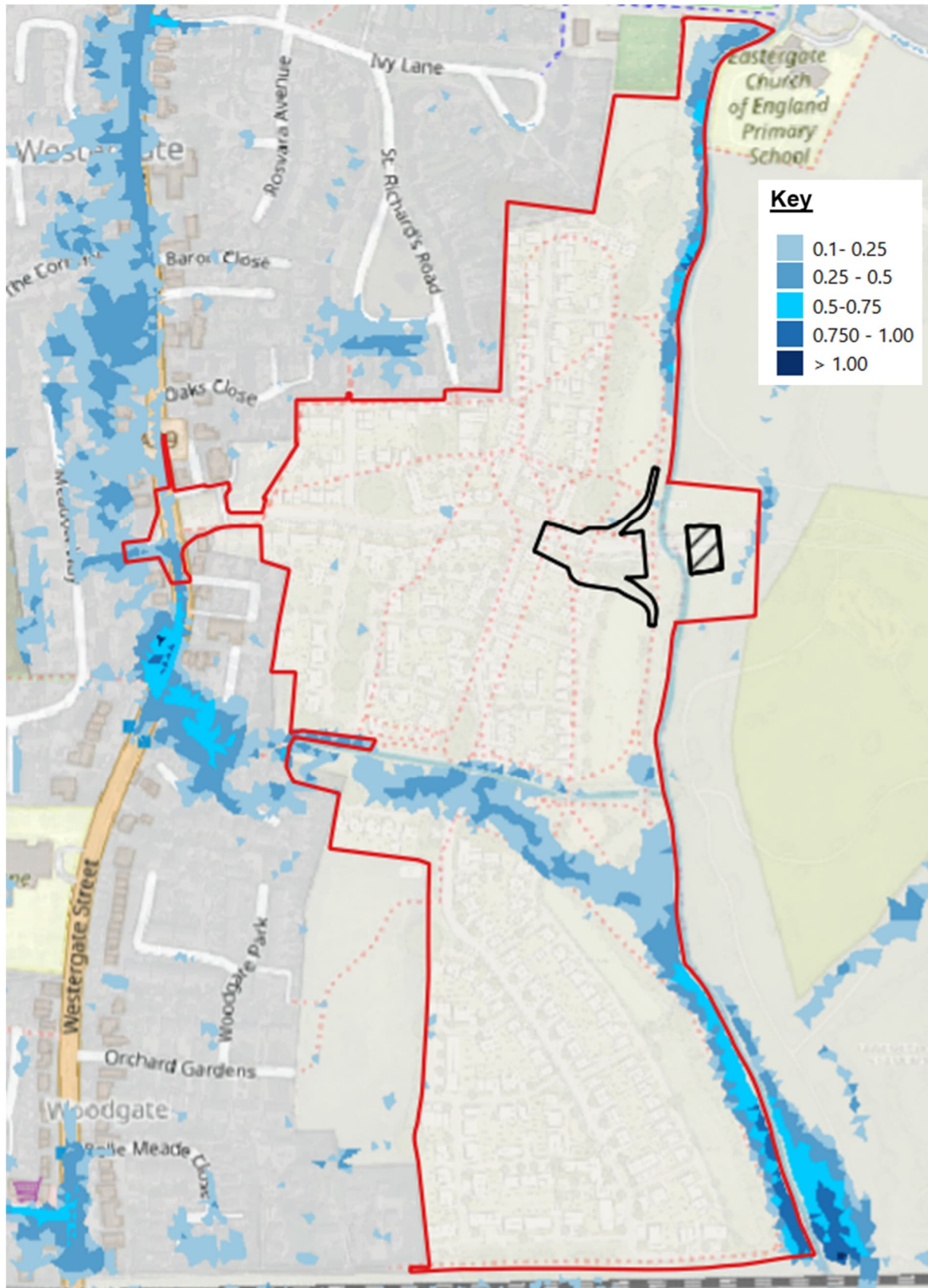


Figure 4.4 Flood Depth Map – 1 in 100 year + 64%CC baseline scenario

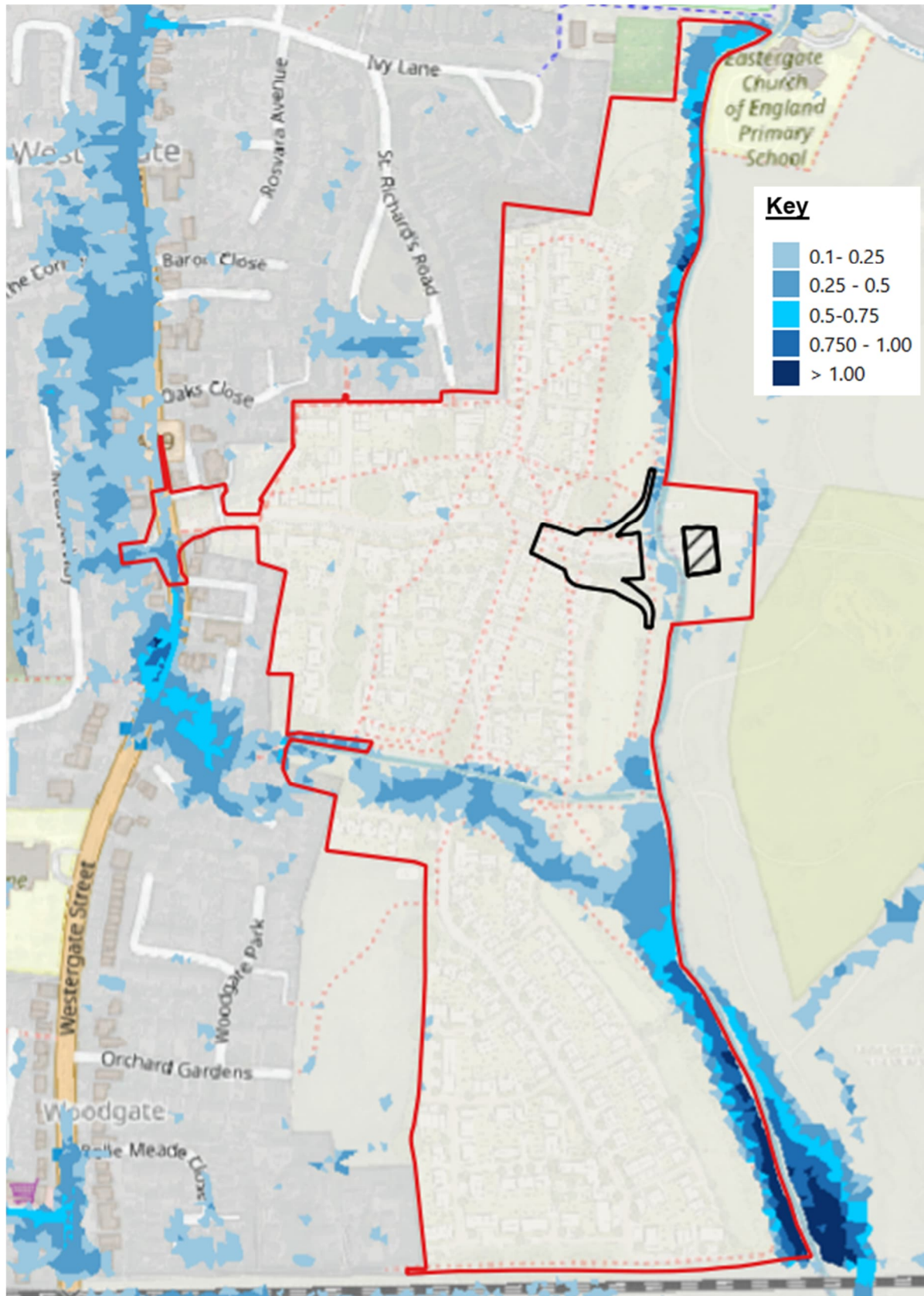


Figure 4.5 Flood Depth Map – 1 in 100 year proposed development scenario

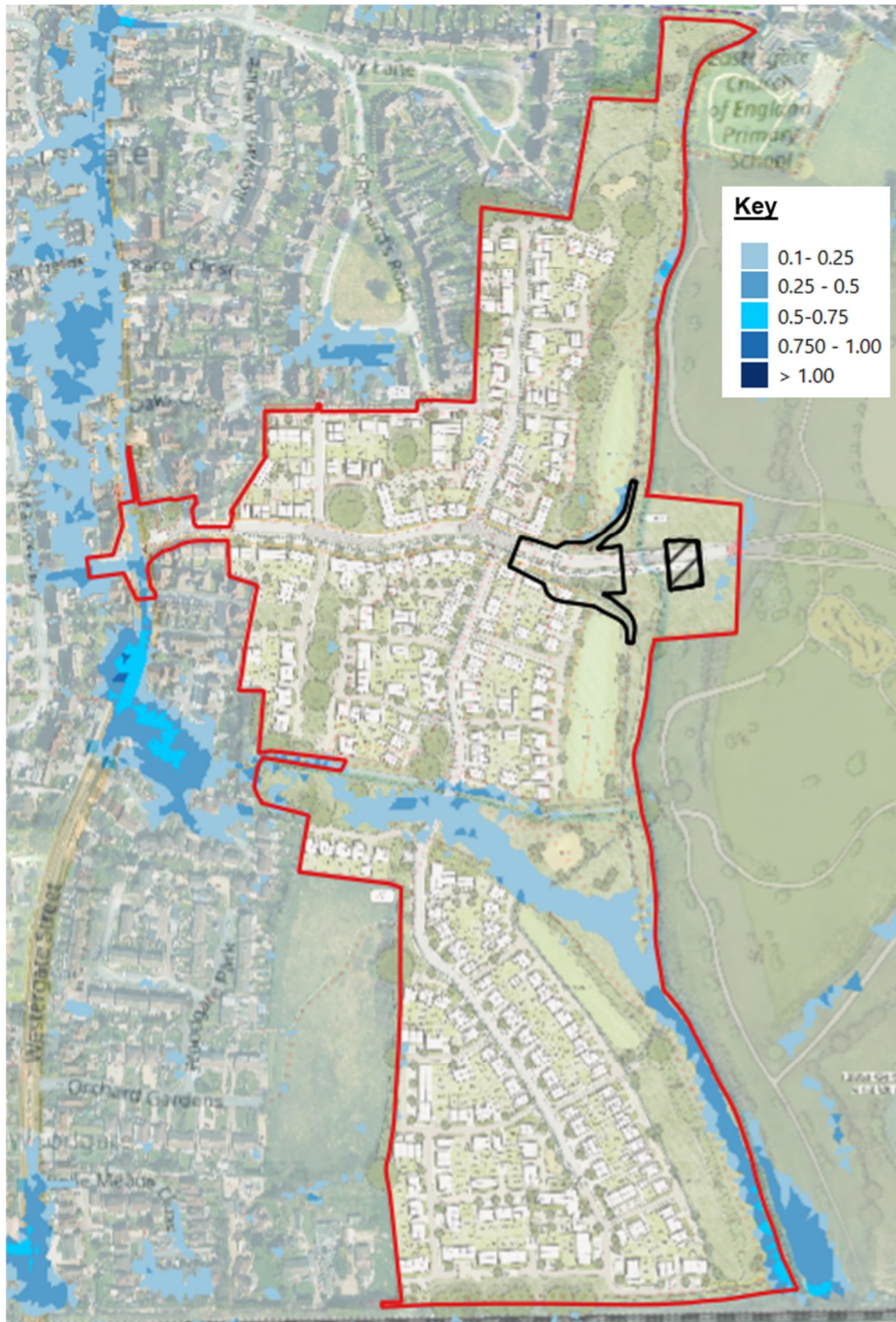


Figure 4.6 Flood Depth Map – 1 in 100 year + 36%CC proposed development scenario

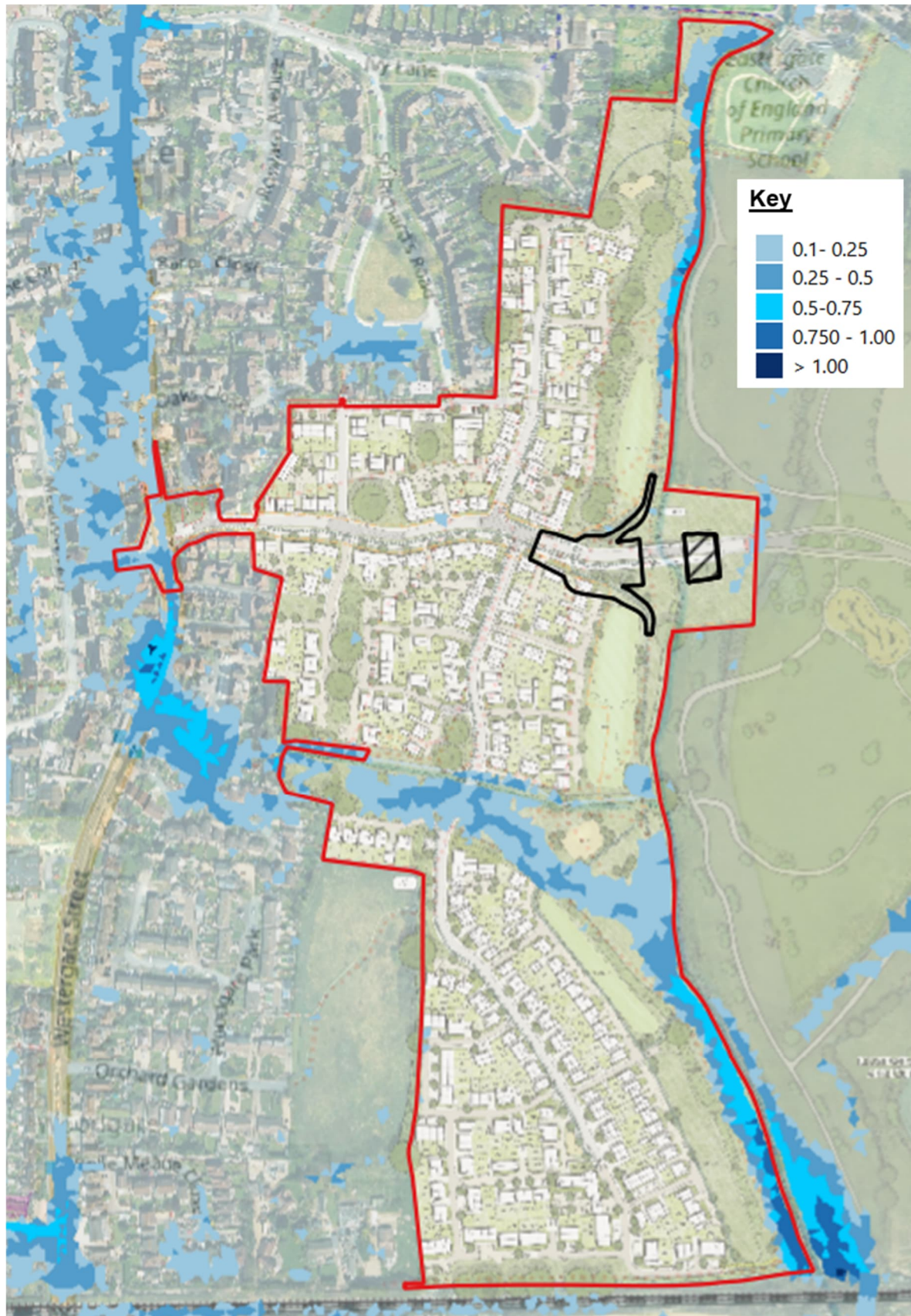
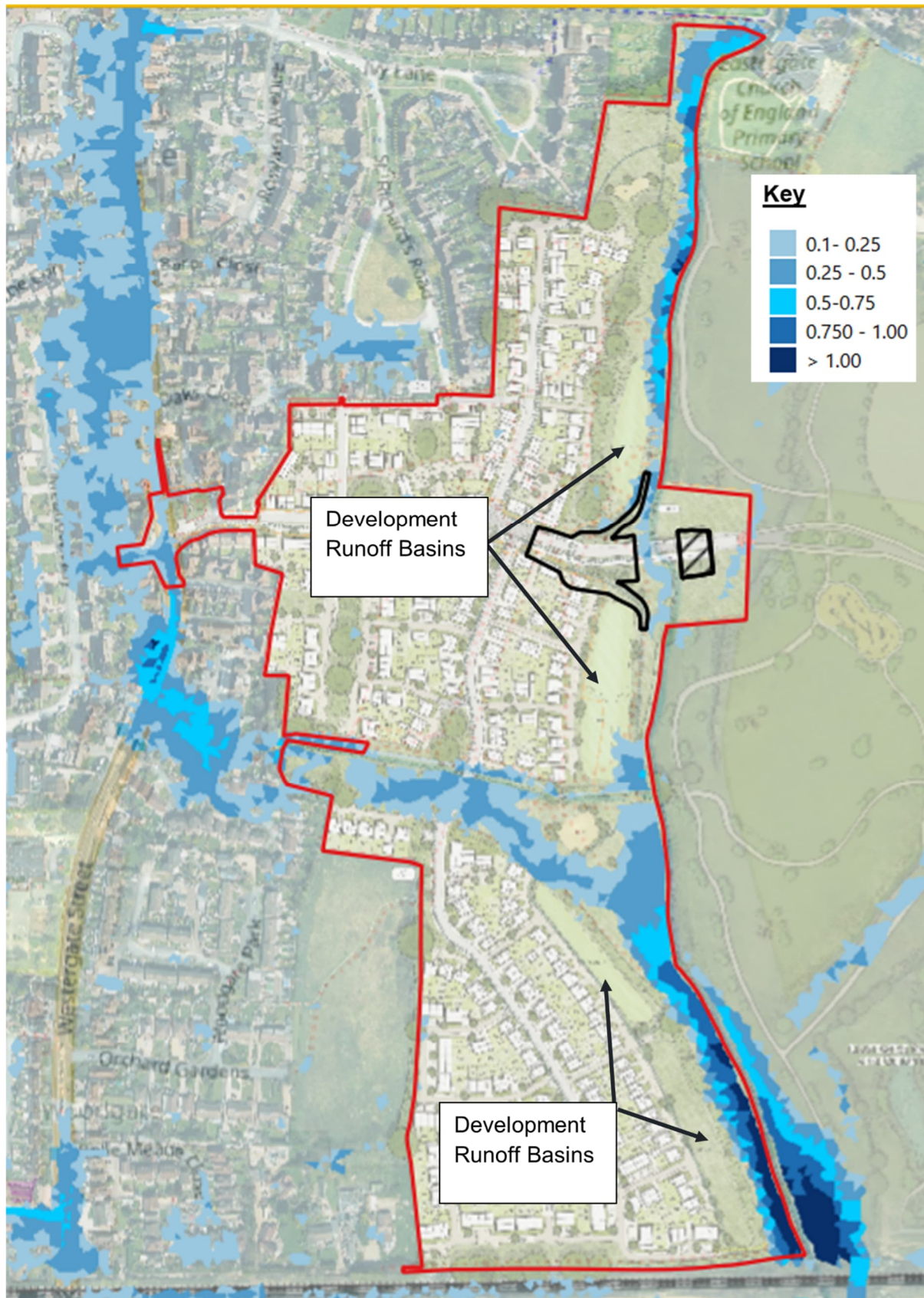


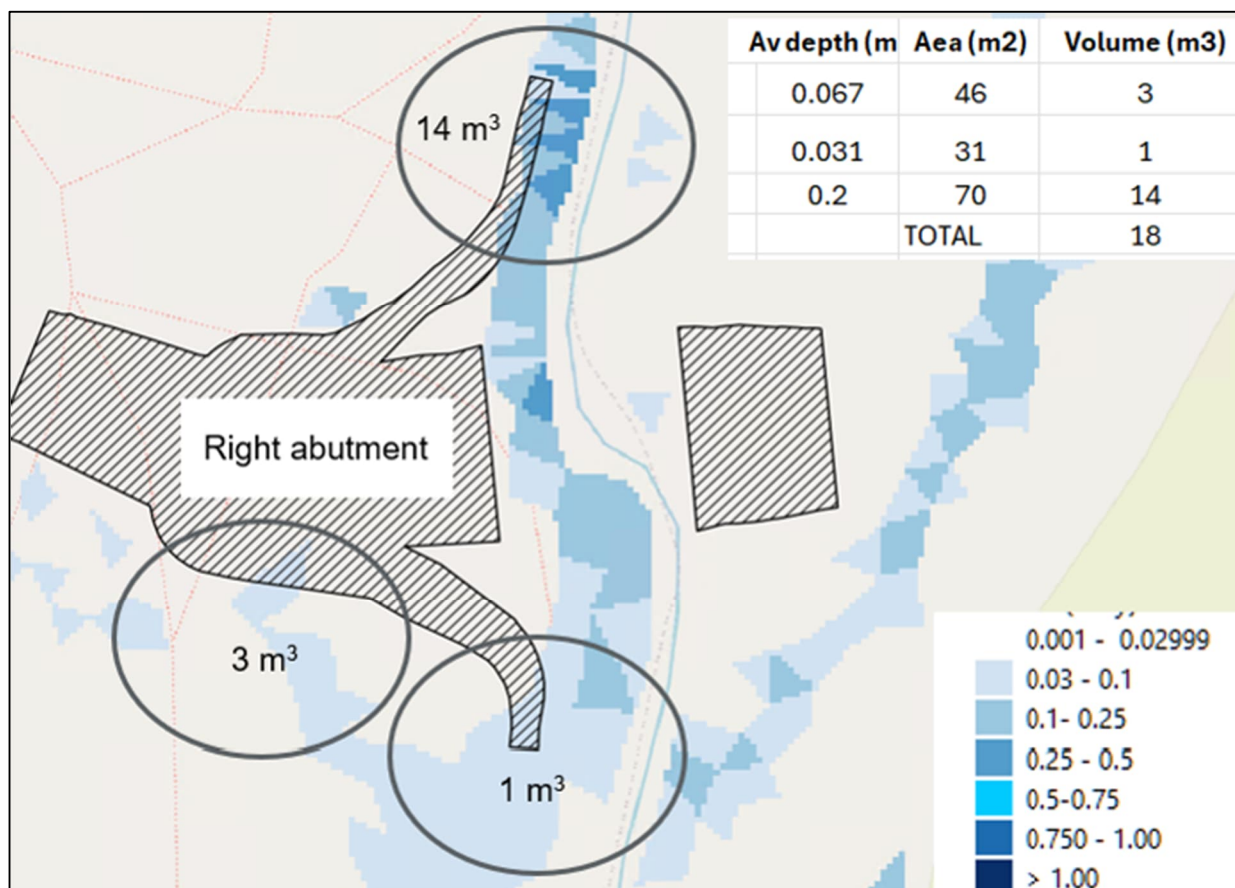
Figure 4.7 Flood Depth Map – 1 in 100 year + 64%CC proposed development scenario



4.2 Compensation storage calculations

- 4.2.1 Due to the proposed bridge been considered as critical infrastructure it is proposed that compensation storage is proposed for the upper 1 in 100 year plus 64% CC extents, as small areas of the bridge abutments encroach these extents.
- 4.2.2 Hand calculations suggest a total volume of compensation storage of 18m³ (refer to volume estimates of floodwater encroaching the right abutment within the black circles in **Figure 4.8**), however the use of the more accurate Saga software has estimated a total volume of 27m³. Thus, 27m³ is proposed as compensation storage. Levels of compensation storage range from 4.5m to 6.0m AOD.

Figure 4.8 Compensation storage based on the 1 in 100 year plus 64% CC flood depth map

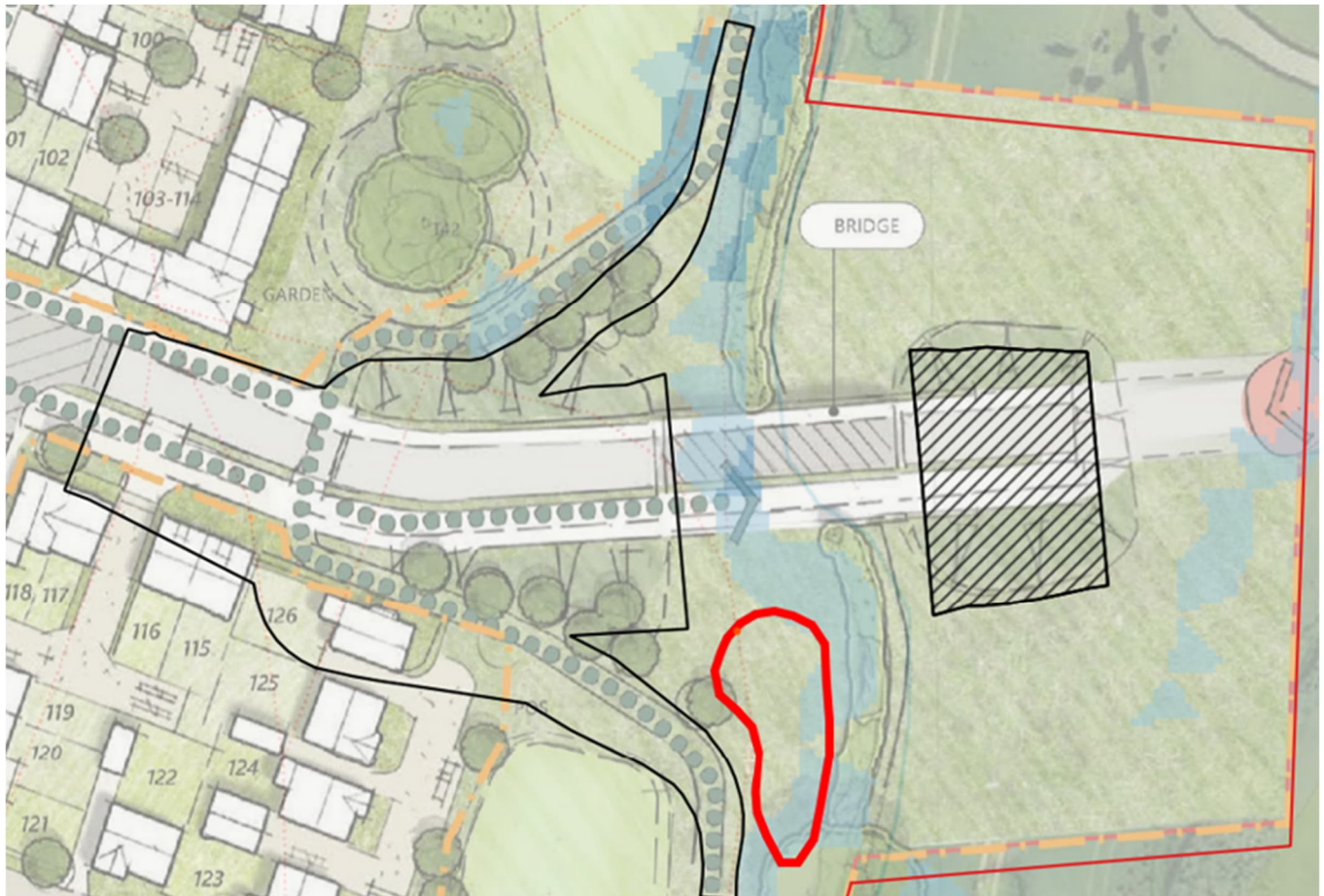


4.3 Proposed Storage compensation

- 4.3.1 Compensation storage is proposed downstream of the bridge crossing by flattening the right bank floodplain by an average of 0.2m (refer to area within the red polygon in **Figure 4.9**) without affecting the main channel and the tree roots along the channel corridor. This approach will provide an additional 60m³ since the approximate area of the polygon is 300m². Levels will be dropped to approximately between 4.5m to 4.9m AOD.

- 4.3.2 No level to level compensation storage could be found in the vicinity of the loss of floodplain volume and thus the reason for proposing double amount of compensation storage.

Figure 4.9 Proposed compensation storage (red polygon)



4.4 Proposed Bridge level

- 4.4.1 The level used for the assessment of freeboard is the upstream cross section 1.019! (refer to **Figure 4.1**) for the 1 in 100 year plus 64% CC event, which gives a peak water level of 5.3m AOD (refer to **Table 4.2**). As the underside of the bridge will be at least 6.5m AOD, it is concluded that there will be at least a 1.2m sufficient freeboard for this bridge.

4.5 Sensitivity Analysis

- 4.5.1 Extensive sensitivity tests were undertaken, and these are presented in the original report and addendums in **Appendix A** – and in the FRA.

5. Conclusions

- 5.1.1 WSP has been commissioned by Hampshire Developments Ltd, to prepare a site-specific Flood Risk Assessment (FRA) and surface water drainage strategy for the Land East of Westergate Aldingbourne, West Sussex.
- 5.1.2 This modelling report informs the FRA, and it is based on the hydraulic model that was accepted and considered suitable for use on the 4th of April 2025 by the Environment Agency (identified in this report as the Westergate model).
- 5.1.3 The Westergate model is a cut version and with local improvements of the 2015 Environment Agency Aldingbourne model.
- 5.1.4 The Environment Agency advised that the Westergate model may need further review should there be design changes, and particularly for the proposed bridge over the Lidsey Rife. Since the acceptance of the model, there have been, no design changes leading to this planning application.
- 5.1.5 This report combines all information provided in previous versions of the report and includes relevant updated local information, updated FEH2022 rainfall and the latest climate change allowances of peak flows.
- 5.1.6 This modelling report provides the 1 in 100 year plus 36% climate change (peak flow higher allowance) flood extents, which have assisted in sustainably allocating the following land uses outside this area:
- The residential development;
 - The proposed bridge and its abutments;
 - The runoff attenuation basins; and
 - Compensation storage for the volumes lost for the 1 in 100 year plus 64% climate change event, at the bridge abutments at the crossing over the Lidsey Rife.
- 5.1.7 This modelling report provides the 1 in 100 year plus climate change level at the proposed free span bridge over the Lidsey Rife, to ensure sufficient freeboard and to minimise compensation storage requirements.



Appendix A

**SEPTEMBER 2023 MODELLING REPORT
AND ADDENDUMS**



Appendix A – SEPTEMBER 2023 MODELLING REPORT AND ADDENDUMS

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