Appendix B

HOTSPOT SELECTION TECHNICAL NOTE

TECHNICAL NOTE
HOTSPOT SELECTION

Project	Borough of Dacorum SWMP	
Date	18 March 2015	Revision Date – February 2016
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Checked By	A Smith / C Patmore	
Project Reference	70006808 – TN1	

1 INTRODUCTION

1.1.1 This Technical Note has been prepared to record the approach taken to the hotspot identification and selection process, in order to enable the project stakeholders to make an informed decision as to which hotspots should be taken forward for detailed hydraulic modelling. This Technical Note will be adapted to form part of the Strategic and Intermediate Phase SWMP Report.

1.2 AIMS OF STUDY

- Increase Hertfordshire County Council's (HCC) understanding of the key flooding mechanisms in the Borough of Dacorum in their role as Lead Local Flood Authority (LLFA);
- Give HCC a better understanding of how the Environment Agency's Risk of Flooding from Surface Water map corresponds to the flooding mechanisms that occur in this borough;
- To identify hotspot sites which have the potential to benefit from scheme investment from funding such as Flood Defence Grant in Aid (FDGiA);
- To identify hotspots which do not need hydraulic modelling (e.g. due to flood mechanisms being well represented in the Risk of Flooding from Surface Water map), but are identified with suggested actions as part of the SWMP;
- Identify potential actions and recommendations to be undertaken by HCC and/or other Risk Management Authorities (RMAs);
- Identify mitigation measures where necessary; and
- Provide the general public with a tool which better represents the surface water flood risk in their area.

2 HOTSPOT DEFINITION

2.1.1 For the purpose of this Surface Water Management Plan (SWMP), a hotspot is defined as a spatially limited area in which there are a number of residential or commercial properties at risk from flooding resulting from surface water; other sources of flooding and their interaction with surface water flooding are also recognised. An example of such a hotspot is shown in Figure 1.

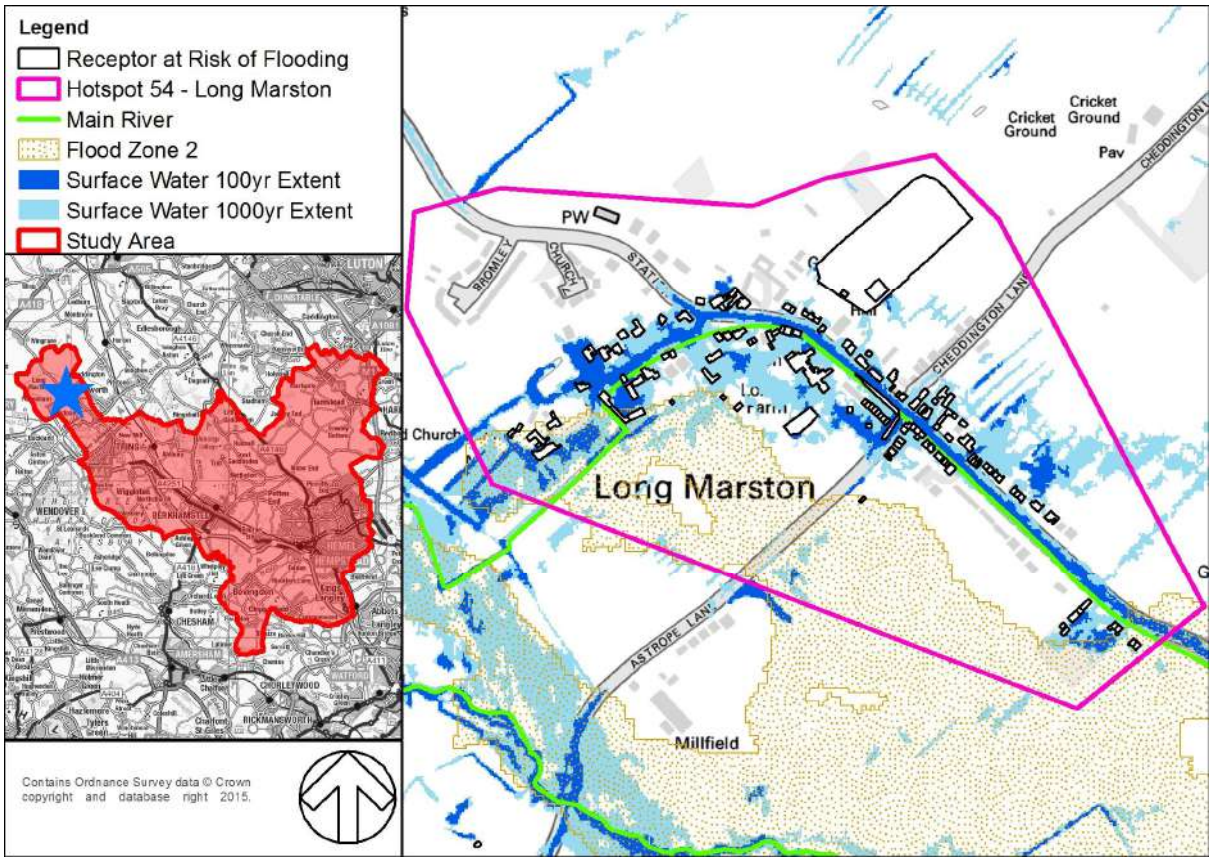

Figure 1: Example Hotspot

2.1.2 A number of different terms are used to describe how the hotspots are identified and how they are selected to be taken forward for detailed hydraulic modelling. The flow chart in Figure 2 illustrates the process for selecting hotspots and the terms used to describe each type of hotspot during the hotspot selection process. The Glossary (Section 10) also provides definitions of all terms used.

2.1.3 The methodology and analysis conducted as part of the early SWMP process is documented in Section 3 and 4. These sections explain the “Initial Hotspot identification and Multi-Criteria Analysis (MCA)” process and how this produced a list of Desk-Based Identified Hotspots which were discussed at the stakeholder meeting. At the meeting, stakeholders brought forward information on other areas within the Borough of Dacorum and this updated information was included in the SWMP hotspot assessment.

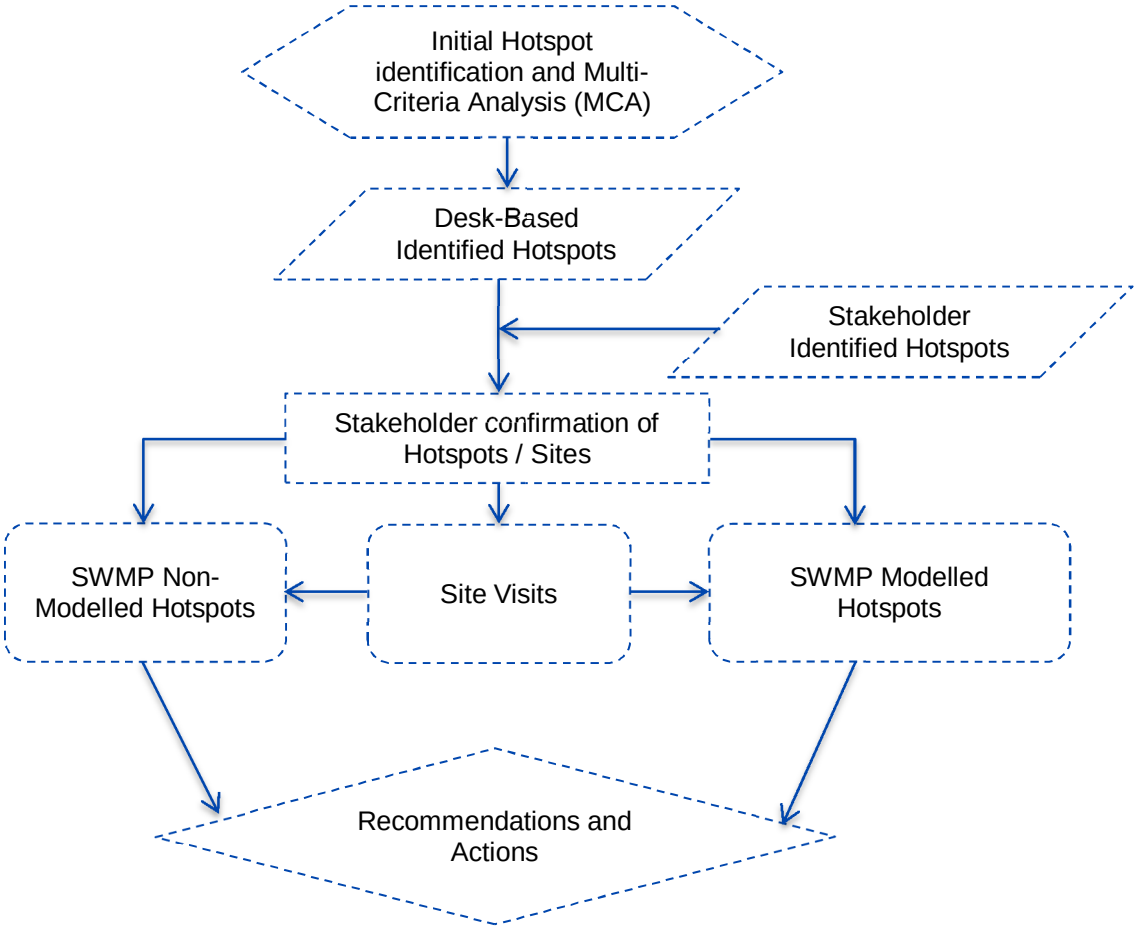

Figure 2: Hotspot Selection Process

2.1.4 Following stakeholder input, the Desk-Based Identified Hotspots and Stakeholder Identified Hotspots were assessed in combination, and the need for on-site assessments was identified; subsequently site visits were undertaken. Following the site visits, hotspots were assessed again and divided into SWMP Modelled and SWMP Non-Modelled Hotspots. SWMP Modelled Hotspots are those to be taken forward for detailed hydraulic modelling. Recommendations and Actions will be identified for all SWMP Modelled Hotspots, it is therefore anticipated that the majority of the Recommendations and Actions will be identified as a result of the detailed hydraulic modelling. However, Recommendations and Actions may also be identified for a number of SWMP Non-Modelled Hotspots.

2.1.5 Reasons for not modelling a hotspot include:

- The hotspot has already been extensively investigated, or is due to be investigated as part of current or planned works (by one or more of the stakeholders);
- The benefits from any further work would not be proportionate to the scale of the issue;
- The site visit confirmed that the surface water flow paths within the hotspot are well represented by current models and/or the Risk of Flooding from Surface Water map;
- Likely recommendations and actions would not have the potential to secure sufficient capital funding (Flood Defence Grant in Aid (FDGiA), Local Levy or third party contributions) to reduce flood risk;
- During the Initial Hotspot identification and MCA, the Desk-Based Identified Hotspots were ranked. If a hotspot ranked too low, it was not included in this round of assessment;
- The hotspot has already secured capital funding.

2.1.6 It should be noted that **all** hotspots identified through this process will be mapped within the SWMP, with the GIS layer information provided to HCC. This will allow periodic re-assessment and review (e.g. when making decisions regarding funding or post flooding). This re-assessment and review would likely involve looking again at the hotspots to see if there is any potential to reduce flood risk.

2.2 SWMP MODELLED HOTSPOTS

2.2.1 SWMP Modelled Hotspots will require some degree of hydraulic modelling to provide a greater understanding of the current flood mechanisms, pathways and receptors within the hotspot. The aim of this is to develop, where possible, a potential mitigation solution which is community focused and feasible in terms of funding and sustainability.

2.2.2 As part of this SWMP, Hertfordshire County Council (HCC) have requested ten hotspots are investigated in detail (detailed hydraulic modelling is undertaken) across the Borough of Dacorum and the District of North Hertfordshire as these were assessed concurrently.

2.2.3 The SWMP Modelled Hotspots will be selected from the hotspots listed within this Hotspot Selection Technical Note. As part of the hotspot selection process a number of factors influence the decision to progress a hotspot to the detailed modelling stage, these factors can include one or more of the following:

- The accuracy to which the current modelled flood extents (e.g. from the Risk of Flooding from Surface Water map) are represented;
- Site specific risks (e.g. details including surface water infrastructure, threshold levels, on site flow paths) that cannot be assessed as part of a desk based study;
- Potential for economically, sustainable and environmentally beneficial mitigation options to be derived and promoted;
- Potential sites where options identified could meet the criteria for funding from the Flood Defence Grant in Aid1 (FDGiA) programme; and those sites which could be potentially brought forward in the short to medium term by other stakeholders through local funding;
- The level of additional ancillary works needed to facilitate any future hydraulic modelling/assessment;
- Progressing will provide an evidence base for HCC as Lead Local Flood Authority (LLFA) and the Local Planning Authority (LPA) to help inform future development decisions.

2.2.4 This Technical Note is the hotspot selection stage of the SWMP, not all sites explained in this note will be taken forward for further modelling. In addition, this Technical Note does not quantify the hydraulic modelling required, as this is still dependent on the receipt of available data from stakeholders and the extent of topographical surveys required for each location.

2.3 SWMP NON-MODELLED HOTSPOTS

2.3.1 If a Desk-Based Identified Hotspot or a Stakeholder Identified Hotspot does not meet the requirements of a SWMP Modelled Hotspot; it is not suitable to be taken forward for further assessment or it is not possible to undertake detailed hydraulic modelling, then it will be classified as a SWMP Non-Modelled Hotspot. For a SWMP Non-Modelled Hotspot a potential sustainable mitigation solution or further study recommendation, if applicable, will be promoted through the SWMP (and included as part of the Recommendations and Actions). This will ensure that any recommendations and actions are recorded for future reference and future funding can be focussed accordingly if appropriate.

[1] Flood Defence Grant in Aid (FDGiA) funding is the mechanism through which the Environment Agency funds flood defence measures in England and Wales. Funding is based on the how much public benefit a project will have, e.g. economic value, how many households are better protected from flooding and the amount of environmental/habitat improvements are gained. As such, areas of land which do not meet the above criteria and are unable to demonstrate they meet the FDGiA criteria would be unable to secure funding, without substantial third party contributions. These include both undeveloped areas such as farmland and developed areas such as car parks.

2.3.2 A SWMP Non-Modelled Hotspot will also include hotspots where there is potential for works to be undertaken by HCC and/or other Risk Management Authorities (RMAs) to alleviate flooding without the need for detailed hydraulic modelling. This includes using Property Level Protection (PLP) measures, changes to current practices and readily implementable mitigation solutions, such as a change in maintenance regime, new manholes or gully installations, or for example highway flow control and restrictions such as raised kerbs or speed humps. These kinds of recommendations and actions will be things that can be implemented without further study or need to go through large financing or funding arrangements.

2.3.3 SWMP Non-Modelled Hotspots will not be economically assessed as part of the SWMP but will be included in the final SWMP report with associated recommendations and actions.

3 HOTSPOT SELECTION METHODOLOGY

3.1.1 The potential hotspots were selected as part of a phased approach, as follows:

- Phase 1 – Dataset and location review (by an experienced hydrologist)
- Phase 2 – (a) Initial Assessment and (b) Multi-Criteria Analysis (GIS and Excel based)
- Phase 3 – Stakeholder discussions and site visits
- Phase 4 – Hotspot selection process (by an experienced hydrologist).

3.1.2 The first phase involved reviewing a range of technical datasets (GIS based information) available from Hertfordshire County Council (HCC), the Environment Agency (EA) and the Water and Sewerage Company (WaSC) servicing the borough, which for the Borough of Dacorum is Thames Water Utilities Ltd (TWUL).

Phase 1 – Dataset and location review

3.1.3 The data was reviewed by an experienced hydrologist familiar with the relevant flooding mechanisms and SWMP assessments and mitigation designs. The datasets used from the aforementioned stakeholders were:

- Borough of Dacorum boundary
- OS MasterMap data and background mapping
- Environment Agency's National Receptor Database (NRD)
- Environment Agency's Main River network
- Environment Agency's Risk of Flooding from Surface Water map (High (3.33 % AEP, 1 in 30 year), Medium (1% AEP, 1 in 100 year) and Low (0.1% AEP, 1 in 1,000 year) extents)
- Environment Agency's Flood Map for Planning (Flood Zone 2 & 3)
- Environment Agency's Historic Flood Map
- Index of Multiple Deprivation (IMD) (2010)
- Lower Super Output Area (LSOA) boundaries

Phase 2 – (a) Initial Assessment

3.1.4 The Environment Agency's National Receptor Database (NRD) was combined with the underlying OS MasterMap layer. This created a spatial receptor layer with information on each "Receptor Type" such as "DWELLING" or "POST OFFICE" etc.

3.1.5 Each receptor was also combined with deprivation data using the Indices of Multiple Deprivation (IMD) (2010) dataset and the associated Lower Super Output Areas (LSOAs). The LSOAs are areas with a population of 1,000 – 3,000, the boundaries are available online. In the IMD, higher deprivation scores indicate more deprived areas and from this deprivation score the national deprivation rank is determined. Within this initial assessment

process, the deprivation score is applied to each receptor within the score's administrative area, hence all receptor types have deprivation scores associated with them. The deprivation scores were only taken into account when assessing the residential receptors.

3.1.6 Each receptor was updated with its maximum probability flood extent for fluvial, surface water and historic flooding sources. An example slice of data is shown in Table 1.

Table 1: Example Receptor Data

RECEPTOR TYPE	FLOOD ZONE	RISK OF FLOODING FROM SURFACE WATER	HISTORIC FLOOD MAP	LOWER SUPER OUTPUT AREA (LSOA) DESCRIPTION	INDEX OF MULTIPLE DEPRIVATION (IMD) SCORE	RANK
GENERAL COMMERCIAL	2	100		Dacorum 022A	8.35	26,154
SURGERY	3	100	YES	Dacorum 001C	6.42	28,498
OFFICE	1	1,000		Dacorum 022A	8.35	26,154
ROAD HAULIER	3	1,000		Dacorum 022A	8.35	26,154

3.1.7 19 Hotspots were developed within the borough of Dacorum and analysed in Excel using the below multi-criteria Analysis.

4 HOTSPOT ANALYSIS – MULTI-CRITERIA ANALYSIS (MCA)

Phase 2 – (b) Multi-Criteria Analysis

4.1.1 The Multi-Criteria Analysis (MCA) conducted and described below was developed during the Watford and St Albans SWMP updates and refined during the development of this Surface Water Management Plan. This MCA was undertaken on all Desk-Based Identified Hotspots (where Stakeholder Identified and Desk-Based Identified Hotspots coincided, MCA was also undertaken).

4.1.2 The MCA has been developed based on the principles from the Flood and Coastal Erosion Risk Management: A Manual for Economic Appraisal (Multi-Coloured Manual, 2013).

4.1.3 The MCA was used to assess the impacts of flooding on each hotspot and provide measurements to the prioritisation of hotspots.

4.1.4 Using the Receptor Type information from the National Receptor Database (NRD) dataset, buildings were assessed based on Residential or Non-Residential classes. This was further supplemented by Listed Buildings, Roads and Rail networks within each hotspot.

4.1.5 As there were some receptors within the NRD dataset which had no assigned receptor type (these were blank in the original dataset), an assumption was made as to their designation using the logic flow chart shown in Figure 3.

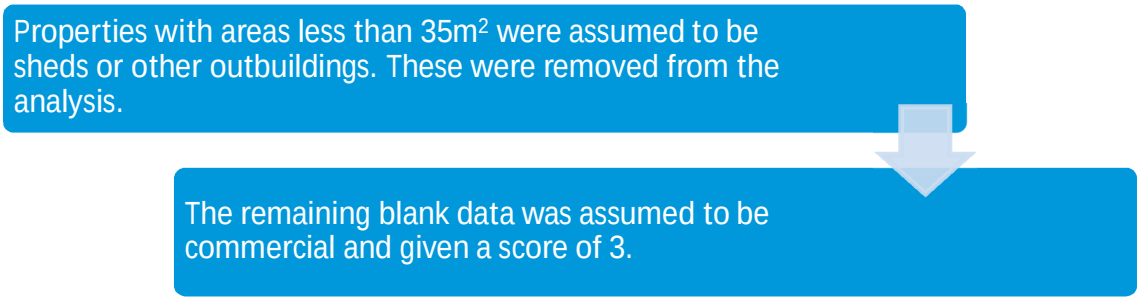

Figure 3: Logic Flow Chart – Assessing Missing Receptor Type

4.1.6 Residential and Non-Residential receptors were separated out and scored based on the criteria outlined in Table 2. The score was assigned to each individual receptor and summed for Residential and Non-Residential receptors for each hotspot.

Table 2: Receptor Type and Scoring Values

RECEPTOR TYPE		SCORING VALUE		
		1	3	9
Residential		60% Least Deprived	20-40% Most Deprived	20% Most Deprived
Non-Residential	Commercial	Retail Buildings	Warehouses & Offices	Industrial Buildings
	Critical Infrastructure	Hospitals, Hotels, Prisons, Residential homes etc.	Fire/Ambulance/Police Station	Electrical/sewage infrastructure etc.
	Educational, Cultural or Civic Buildings	Schools / Colleges Universities / Nurseries / Museums and Libraries	Churches	Community Centres / Village Halls / Law Courts etc.
Listed Buildings		n/a	n/a	n/a
Road		All Other	B Roads	Motorways / A Road
Rail		All rail tracks	n/a	n/a

4.1.7 The six flood extents used in the analysis are shown in Table 3. Each of the six flood extent types carries an associated weighting value, this was used to ensure priority was given to the highest probability flooding mechanism, these being the Risk of Flooding from Surface Water map 3.33% AEP (1 in 30 year) extent or in Flood Zone 3 (greater than 1% AEP, 1 in 100 year) extent. These extents are associated with the highest probability / highest frequency flooding and therefore relate to the most damage and greatest impact on people's lives. Therefore, they were considered the most important surface water and fluvial flood mechanisms.

4.1.8 Within each hotspot, a total count of the number of receptors affected by each flood extent was made. The total count was multiplied by the flood extent weighting (see Table 3). Flooding Index was calculated by summing the number of properties within each extent and multiplying by that extent's weighting.

$$\text{Flood Impact Score} = \frac{\text{Flooding Index} \times \text{Priority Scoring}}{\text{Hotspot Area}}$$

4.1.9 The Flood Impact Score was calculated using the above formula. The Flooding Index × Priority Scoring was divided by the Hotspot Area to ensure that larger urban areas did not dominate the analysis. Dividing by hotspot area ensured that the Flood Impact Score for each hotspot (no matter the hotspot's size) was comparable.

4.1.10 Data from Hotspot 53 – Kings Langley has been included in Table 3 to provide an illustrative example.

Table 3: Flood Extents and Weightings (including example data from Hotspot 53 – Kings Langley)

FLOOD EXTENT	FLOOD EXTENT WEIGHTING APPLIED	EXAMPLE RESIDENTIAL COUNT DATA FROM HOTSPOT 53 – KINGS LANGLEY	FLOODING INDEX (FLOOD EXTENT WEIGHTING × RESIDENTIAL COUNT)
No. of receptors in Flood Zone 2	0.1	12	1.2
No. of receptors in Flood Zone 3	0.25	77	19.25
No. of receptors in Risk of Flooding from Surface Water (3.33% AEP, 1 in 30 year)	0.25	47	11.75
No. of receptors in Risk of Flooding from Surface Water (1% AEP, 1 in 100 year)	0.15	96	14.4
No. of receptors in Risk of Flooding from Surface Water (0.1% AEP, 1 in 1000 year)	0.05	309	15.45
No. of receptors in Historic Flood Map	0.2	0	0
		Sum of Flooding Index:	62.05
		Sum of Residential Scoring (Priority Scoring):	477
		Hotspot Area (ha):	181.3
		Flood Impact Score:	163.3

4.1.11 The Road and Rail receptors were analysed on the area of road or length of rail track within the flood extent.

4.1.12 For the Road receptors, the Flooding Index was obtained in a similar way to that of the Residential and Non-Residential receptors. For each hotspot, the total area of road within each flood extent was multiplied by the same weightings (for the flood extents) shown in Table 3.

4.1.13 To calculate the Priority Scoring for each hotspot, priority score of each road type flooded within each hotspot was summed. Example Road data is shown in Table 4.

4.1.14 The same methodology was used for the Rail receptors, calculating the length of rail (as opposed to area of road) within each flood extent within each hotspot (and weighted for each flood extent accordingly, as it was for buildings and roads). The Scoring Value used for Rail receptors was 1 (see Table 2).

4.1.15 As can be seen in Table 4, there was typically less than 1ha of road area within each road class and flood extent. Therefore, flooding was assessed on an m2 basis and this was used to calculate the Flooding Index. The hotspot area in hectare was used to calculate the Flood Impact Score. As discussed below, the analysis between hotspots is based on its ranking therefore as long as units are consistent within each receptor type, the ranking will not be affected.

Table 4: Hotspot 53 – Kings Langley Example Roads Data

ROAD CLASS	ROAD AREA FLOODED (m^2)						SCORING VALUE (FROM TABLE 2)
	FLOOD ZONE 2	FLOOD ZONE 3	RISK OF FLOODING FROM SURFACE WATER (3.33% AEP, 1 IN 30 YEAR)	RISK OF FLOODING FROM SURFACE WATER (1% AEP, 1 IN 100 YEAR)	RISK OF FLOODING FROM SURFACE WATER (0.1% AEP, 1 IN 1,000 YEAR)	HISTORICAL	
A Road	0.0	0.0	2,239.8	3,029.0	4,117.3	0.0	9
Local Street	0.0	1,259.2	2,613.8	4,458.4	9,099.3	0.0	1
Minor Road	24.0	925.9	3,343.0	7,730.3	8,465.5	0.0	1
Private Road – Publicly Accessible	0.0	150.4	0.0	205.6	145.6	0.0	1
Private Road – Restricted Access	0.0	0.0	135.3	197.4	1,162.7	0.0	1
Total Area of road in each flood extent (m^2):	24.0	2,335.5	8,331.9	15,620.8	22,990.4	0.0	
Flood Zone Weighting:	0.1	0.25	0.25	0.15	0.05	0.2	
Flooding Index (Weighting × Total Area)	2.40	583.87	2,082.98	2,343.12	1,149.52	0.00	
						Sum of Flooding Index:	**6161.9**
						Sum of Scoring Values (Priority Scoring):	**13**
						Hotspot Area (Ha):	**181.3**
						Flood Impact Score:	**441.8**

4.1.16 When all Flood Impact Scores had been calculated, the Flood Impact Score for each receptor type was ranked from low to high with high ranking hotspots having the greatest scores. The ranks were then multiplied by an Importance Factor to gain a weighted rank. The weighted ranks were summed together across Receptor Types for each hotspot to obtain the "Total Risk Ranking." Hotspot 53 is provided as an example below in Table 5.

Table 5: Receptor Type and associated Importance Factor (Example data provided for Hotspot 53 – Kings Langley)

RECEPTOR TYPE	FLOOD IMPACT SCORE	RANK	IMPORTANCE FACTOR	WEIGHTED RANK
Residential	163.3	13	10	130
Non-Residential	9.96	12	7	84
Listed Buildings	0.028	16	1	16
Roads	441.9	12	3	36
Rail	0	1	2	2
	Un-weighted Hotspot score:	54	**Total Risk Ranking Weighted Hotspot score:**	268

5 MULTI-CRITERIA ANALYSIS (MCA) RESULTS

5.1.1 The top five hotspots from the Multi-Criteria Analysis (MCA) are shown in Table 6

Table 6: Total Risk Ranking – Top Ranked Hotspots

HOTSPOT NUMBER*	HOTSPOT NAME	UN-WEIGHTED HOTSPOT SCORE**	TOTAL RISK RANKING WEIGHTED HOTSPOT SCORE
0	Tring	113	640
24	Highfield – Hemel Hempstead	87	512
3	Adeyfield – Hemel Hempstead	78	497
28	Cupids Green – Hemel Hempstead	74	473
53	Kings Langley	54	268

* Note: Each hotspot was assigned a number across the Borough of Dacorum (and North Hertfordshire District as these were assessed concurrently). The Hotspot Number just corresponds to the assigned hotspot, GIS polygon number/ID, and does not have any reference to the hotspot ranking.

6 STAKEHOLDER MEETING AND SITE VISITS

Phase 3 – Stakeholder discussions and site visits

6.1.1 In addition to the GIS and Excel review detailed in the previous sections, parish councils and Dacorum Borough Council were contacted to put forward their knowledge of surface water historical flooding, in order to inform the process of selecting SWMP Modelled Hotspots. Any hotspots stakeholders put forward were termed "Stakeholder Identified Hotspots." The information provided by stakeholders was cross referenced with the emerging hotspots selected as part of the Phase 1 and Phase 2 works and discussed further at the stakeholder meeting.

6.1.2 A stakeholder meeting was undertaken on 3rd February to discuss the outcome of the Desk-Based hotspot analysis (GIS and MCA), with the additional aims to share information and flooding knowledge on issues within the Borough of Dacorum. This included reviewing the hotspots analysed by the MCA within the Borough of Dacorum, discussing where they ranked and their potential as SWMP Modelled Hotspots, in addition to identifying any high level recommendations and actions at this initial stage.

6.1.3 The suggested approach determined by WSP | Parsons Brinckerhoff was also discussed along with any existing and previous studies conducted by stakeholders.

6.1.4 Following a review of the Stakeholder Identified Hotspot sites raised during the meeting, site visits were subsequently conducted at a number of locations in February 2015. The primary aims of the site visits were to:

- Assess on site the land elevation and topographical changes.
- Understand if the site met the criteria detailed in Section 2 for a SWMP Modelled or SWMP Non-Modelled Hotspot.
- If the hotspot visited was considered to meet the criteria for a SWMP Modelled Hotspot, then to gain an understanding of the most appropriate modelling approach.
- Understand if there were any immediate recommendations and actions identified for the site.

6.1.5 This all led onto Phase 4 – Hotspot selection process, which is detailed in Section 7 and 8.

7 SWMP MODELLED HOTSPOTS

7.1 INTRODUCTION

7.1.1 This section (Section 7) identifies the proposed SWMP Modelled Hotspots for the Borough of Dacorum. These have been put forward for modelling as they meet the criteria for a SWMP Modelled Hotspot as detailed in Section 2.

7.2 HOTSPOT 0 – TRING

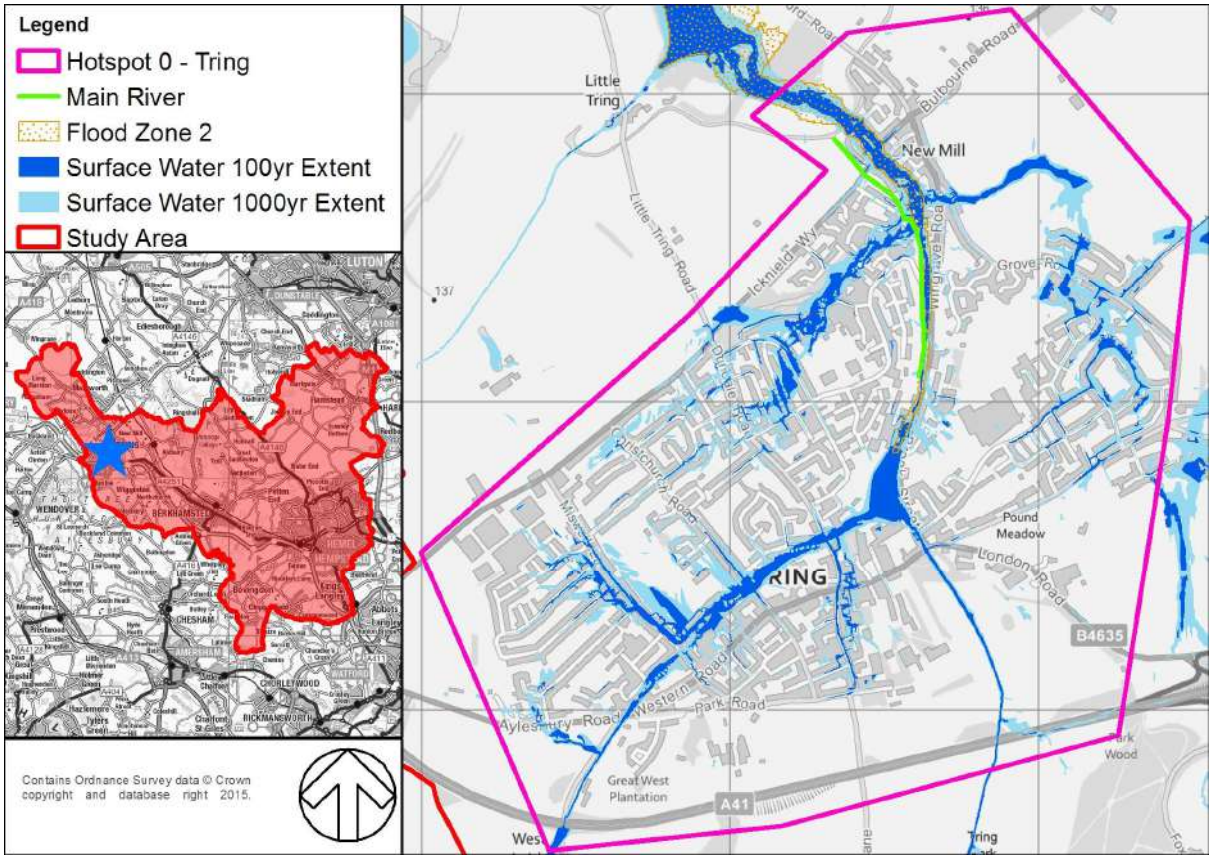

Figure 4: Hotspot 0 – Tring

KEY ISSUES

- Surface Water Flooding
- Non-inclusion of water features
- Open Channel Extents

SUGGESTED APPROACH

- Direct rainfall construction with downstream boundary and existing flood map extents

LOCAL KNOWLEDGE/SITE VISIT OBSERVATIONS

- It is unclear how the A41 drains and little available on highway records
- Consultation with Dacorum Borough Council on flooding history.

AGREED APPROACH

- Hydraulic Modelling of the upstream section of the tributary to the EA Flood Zones.

7.3 HOTSPOT 20 – BERKHAMSTED

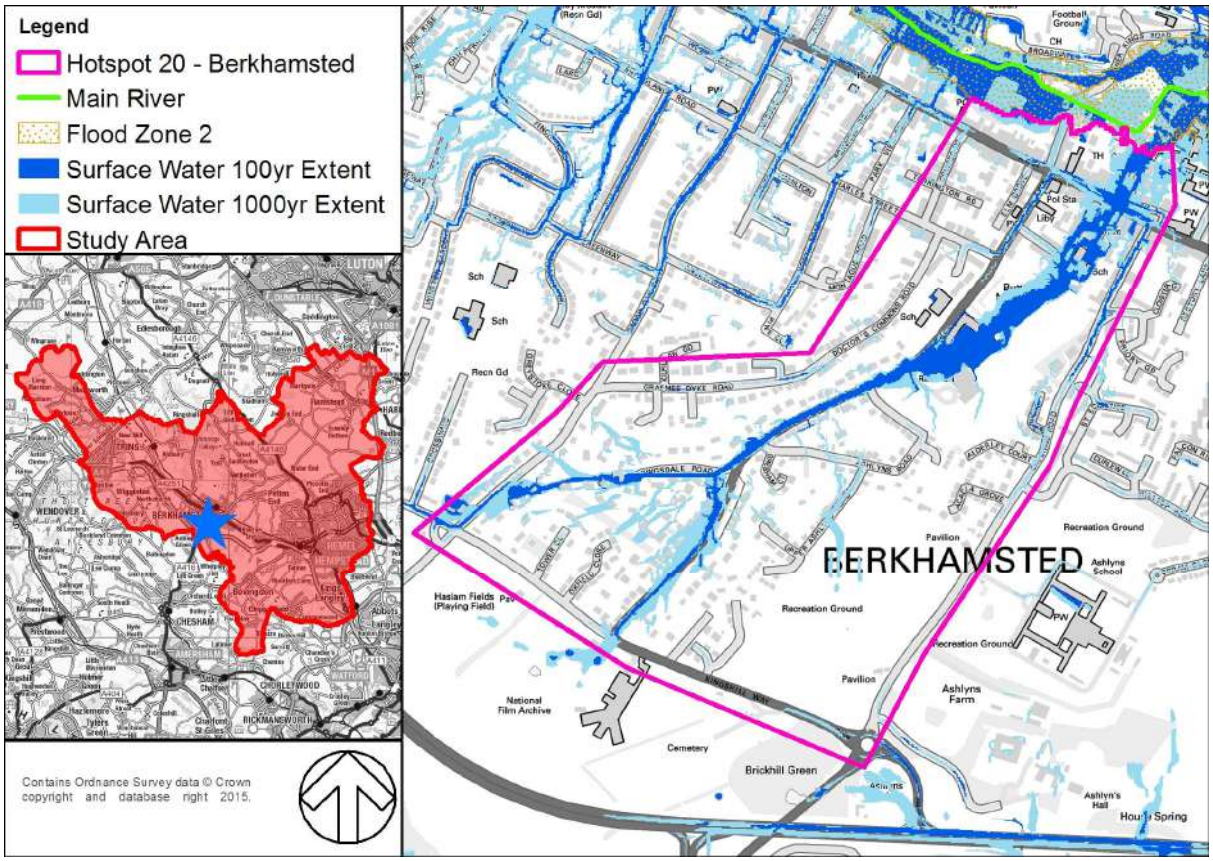

Figure 5: Hotspot 20 – Berkhamsted

KEY ISSUES

- Surface Water Flooding;
- Natural open flood storage area

SUGGESTED APPROACH

- Direct Rainfall Model with input of surface waters sewers
- Downstream boundary Flood Zone 2 and 3 Extents

LOCAL KNOWLEDGE / SITE VISIT OBSERVATIONS

- Chalk Catchment and very steep hotspot
- Potential site for refinement of model i.e. to take into account kerb heights etc.

AGREED APPROACH

- Hydraulic Modelling – to demonstrate actual risk to properties shown to be in flow path and those which may be should the road act as a preferential flow path

7.4 HOTSPOT 24 – HIGHFIELD

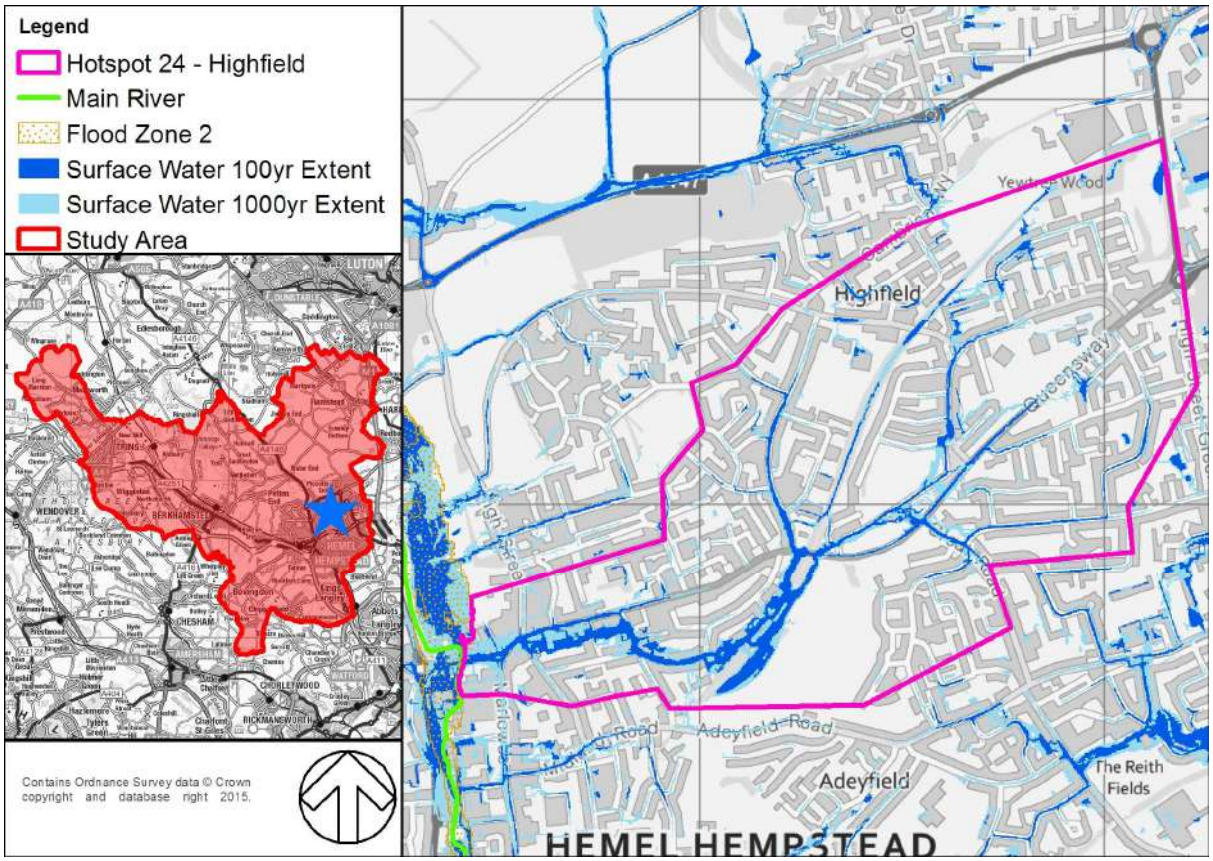

Figure 6: Hotspot 24 – Highfield

KEY ISSUES

- Overland flows

SUGGESTED APPROACH

- Storage Areas
- Utilising Roads as preferential flow paths
- Need to consider any low lying properties

LOCAL KNOWLEDGE

- A disused rail track runs through this part of Hemel.
- Area of the railway in cutting which spills and potentially contributes to flooding at this hotspot
- To be discussed with Dacorum Borough Council on any background history of known flooding.

AGREED APPROACH

Hotspot to be taken forward for modelling due to its high vulnerability.

7.5 HOTSPOT 53 – KINGS LANGLEY

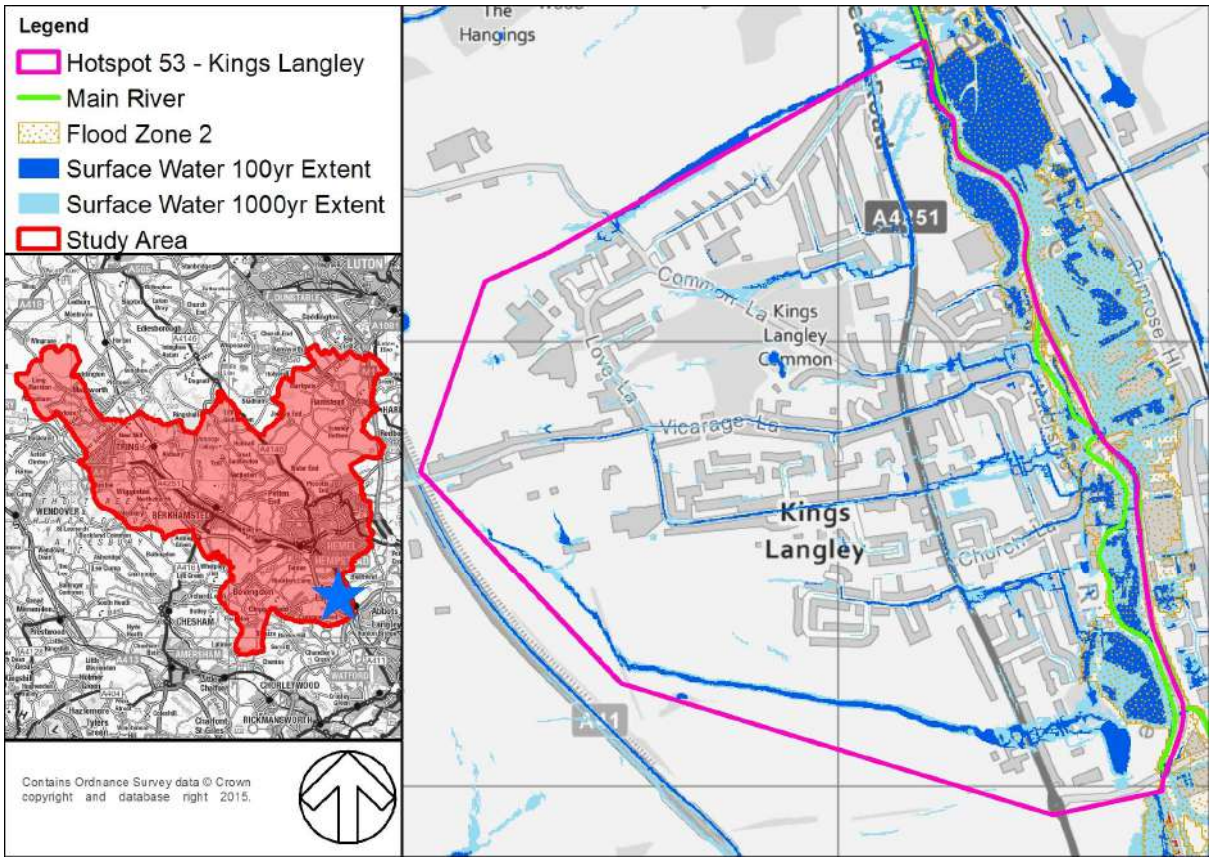

Figure 7: Hotspot 53 – Kings Langley

KEY ISSUES:

- Number of surface water flow routes fall in easterly direction to the River Gade
- Surface water flooding areas are within Flood Zone extent.
- Borough boundary runs on top of the River Gade, significant flooding is to the east of the hotspot and outside of the Borough.

SUGGESTED APPROACH

- Direct rainfall model construction

LOCAL KNOWLEDGE

- Stakeholder identified site which is subject to frequent flooding.

AGREED APPROACH

- Take forward for hydraulic modelling and detailed assessment.

8 SWMP NON-MODELLED HOTSPOTS

8.1 HOTSPOT 1 – ALDBURY

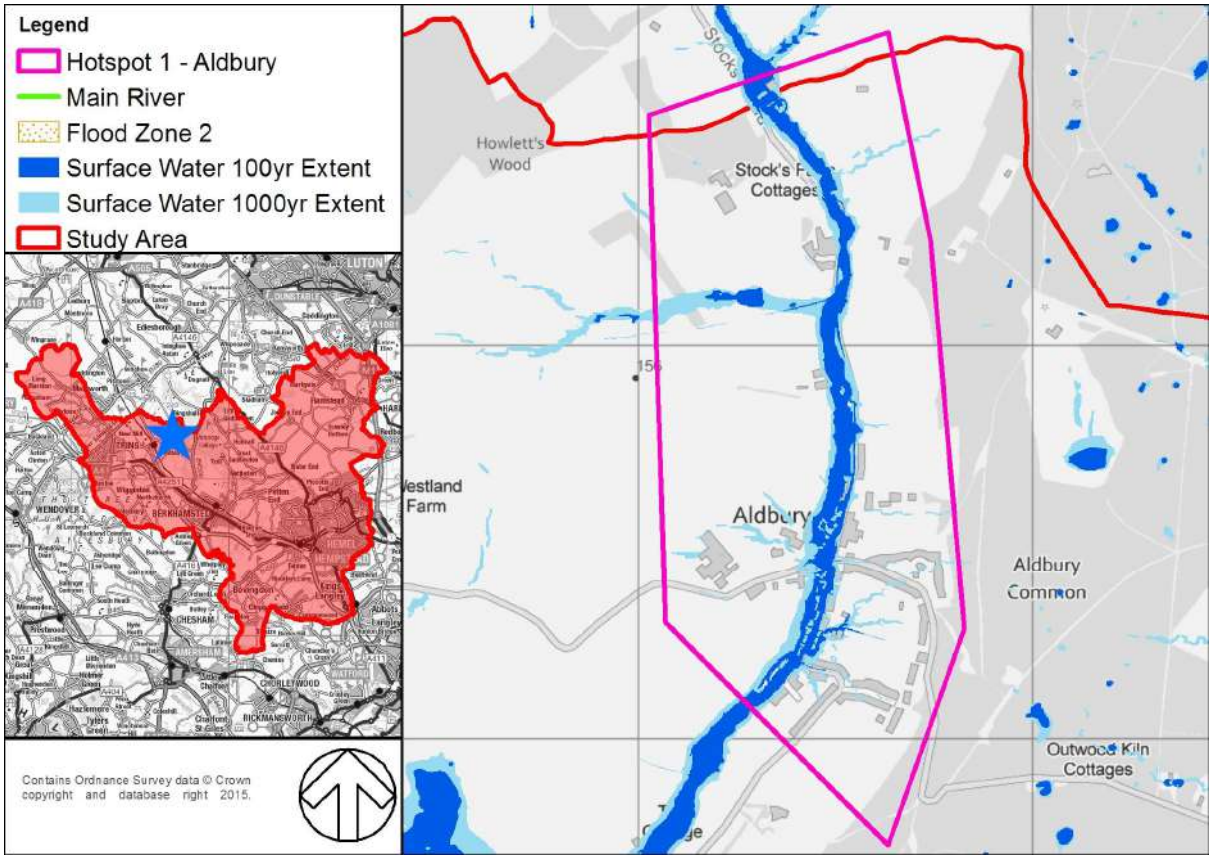

Figure 8: Hotspot 1 – Aldbury

KEY ISSUES

- High chalk and thin soils
- Road at property level through the centre of the village

SUGGESTED APPROACH

- Direct rainfall model to assess runoff and impacts through the centre of the village

LOCAL KNOWLEDGE

- Taken forward on the recommendation of stakeholders at the stakeholder meeting.

AGREED APPROACH

- Taken forward to consider the impacts of the chalk, consider short sharp summer events or prolonged winter ones as there is no watercourse and no significant sewers.

8.2 HOTSPOT 2 – BOVINGDON

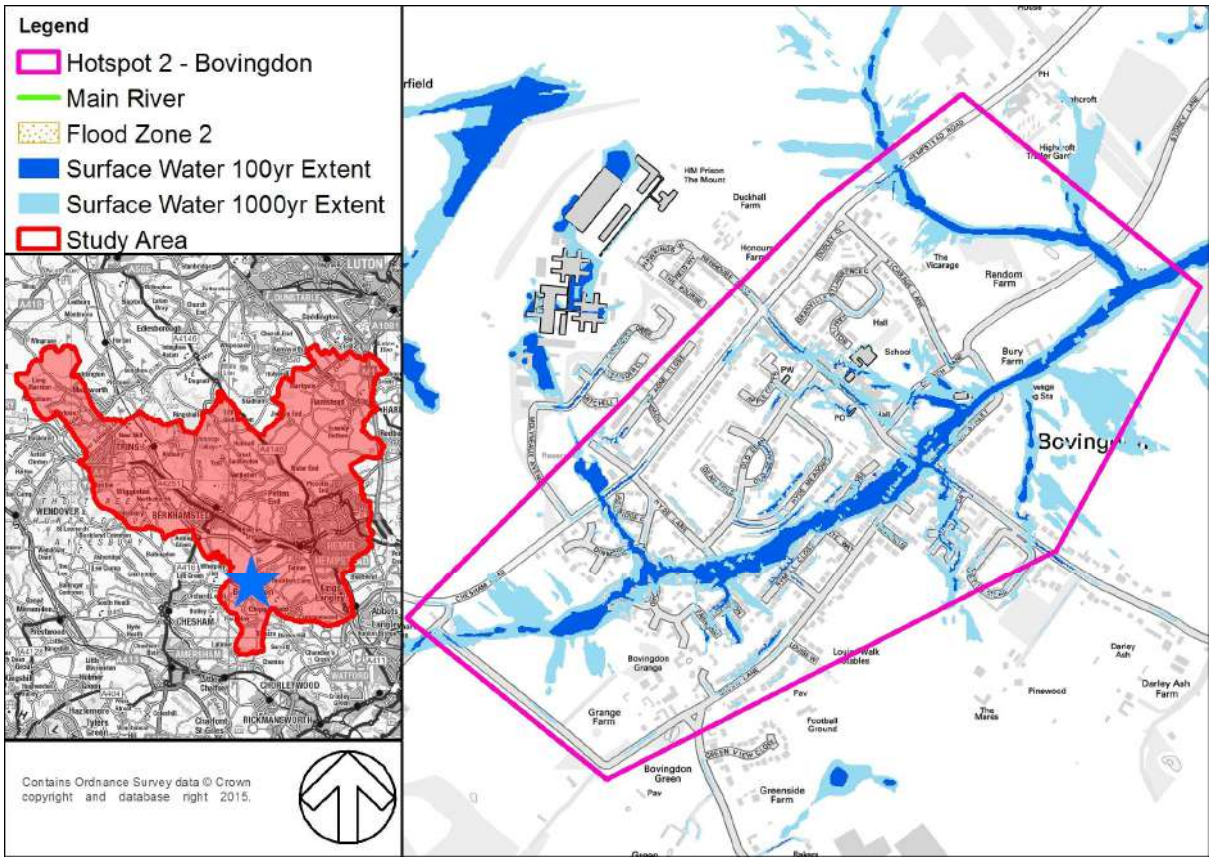

Figure 9: Hotspot 2 – Bovingdon

KEY ISSUES

- Surface water Flooding
- Preferential flow path through the centre of the urban area unlikely to remain functioning and surface water sewers are unlikely to have sufficient capacity as the catchment is relatively flat
- There could be areas of extensive ponding.

SUGGESTED APPROACH

- Direct rainfall model to assess runoff and impacts through the centre of Bovingdon

LOCAL KNOWLEDGE/SITE VISIT OBSERVATIONS

- Estate drains to a number of boreholes
- Tanks were installed by Thames Water.

AGREED APPROACH

- Further consideration for hydraulic modelling as the catchment is relatively flat.

8.3 HOTSPOT 3 – ADEYFIELD – HEMEL HEMPSTEAD

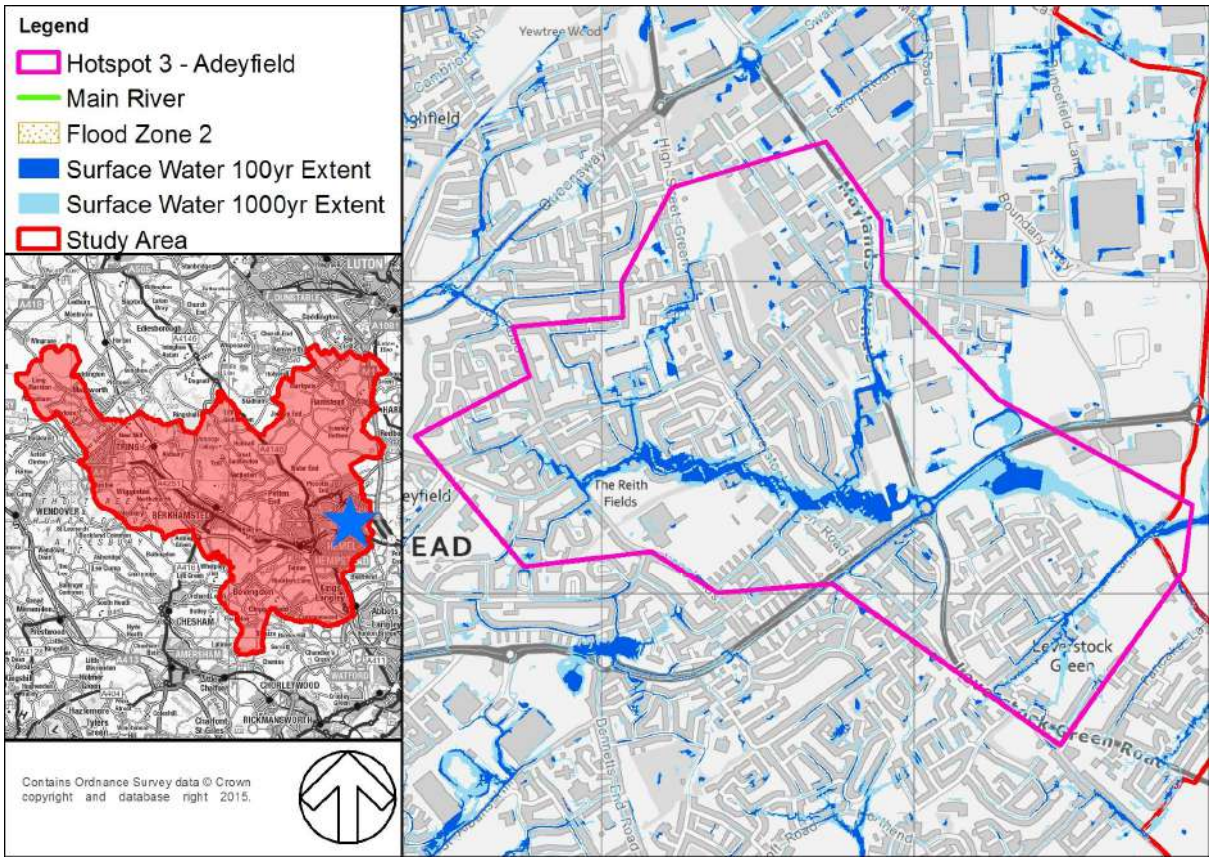

Figure 10: Hotspot 3 – Adeyfield

KEY ISSUES

- Surface Water / Fluvial Flooding.
- EA Flood Map.
- Open Channel Extents.

SUGGESTED APPROACH

- Possible three hotspots within the area
- Adopt EA model and convert to direct Rainfall.

LOCAL KNOWLEDGE

- Thames Water has undertaken a significant scheme on the western tributary which incorporates underground tanks. It is unlikely that costs could be secured to do further work.
- The EA mapping for the area is J-Flow hydraulic model.

AGREED APPROACH

- No further modelling to be undertaken.

8.4 HOTSPOT 22 – CHAULDEN

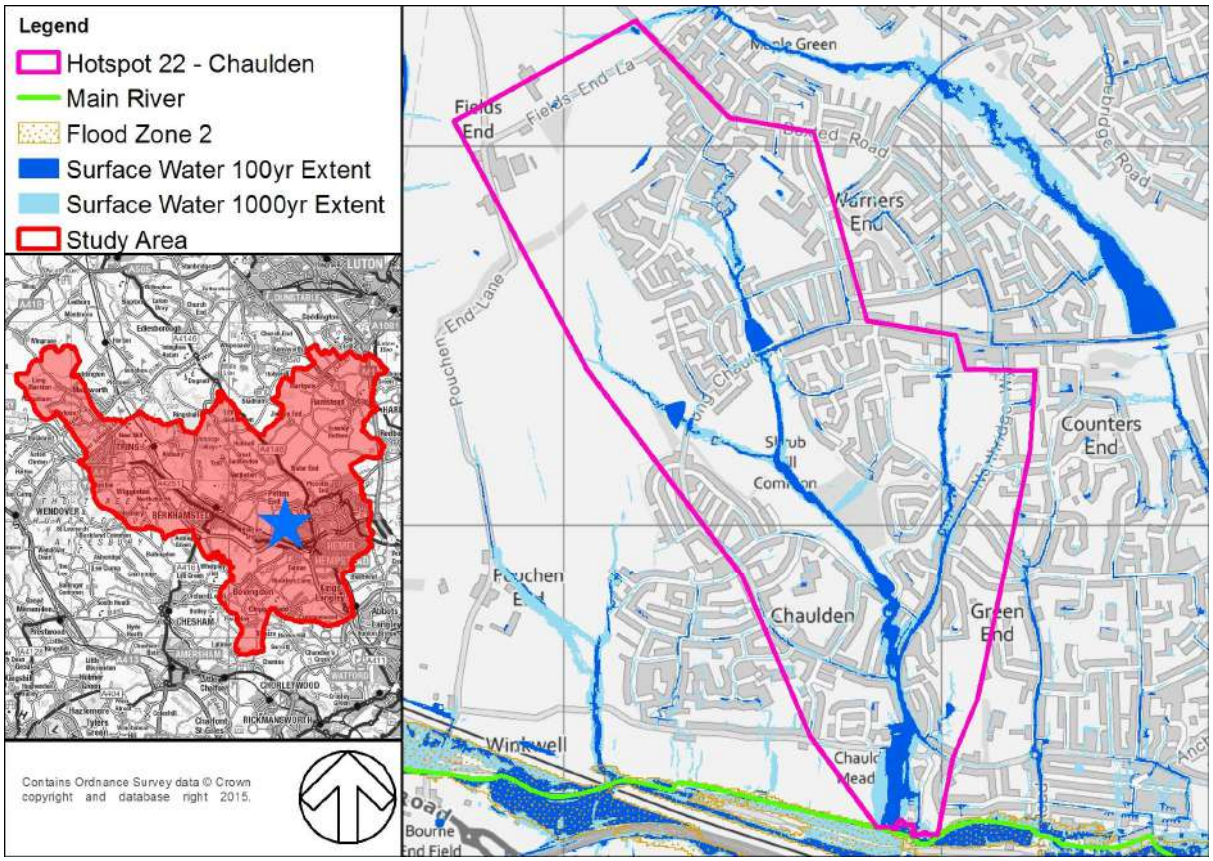

Figure 11: Hotspot 22 – Chaulden

KEY ISSUES

- Overland flow routes

SUGGESTED APPROACH

- Storage areas with possibility of locating this within Shrub Hill Common

LOCAL KNOWLEDGE

- Properties have been known to flood, located within the north-western extent of the hotspot boundary, Larkspur Close.
- A field drain and bund has already been installed locally to help mitigate existing flooding.

AGREED APPROACH

- Hold any further investigations pending the outcome of the mitigation features already in place at the site.

8.5 HOTSPOT 23 – WARNERS END

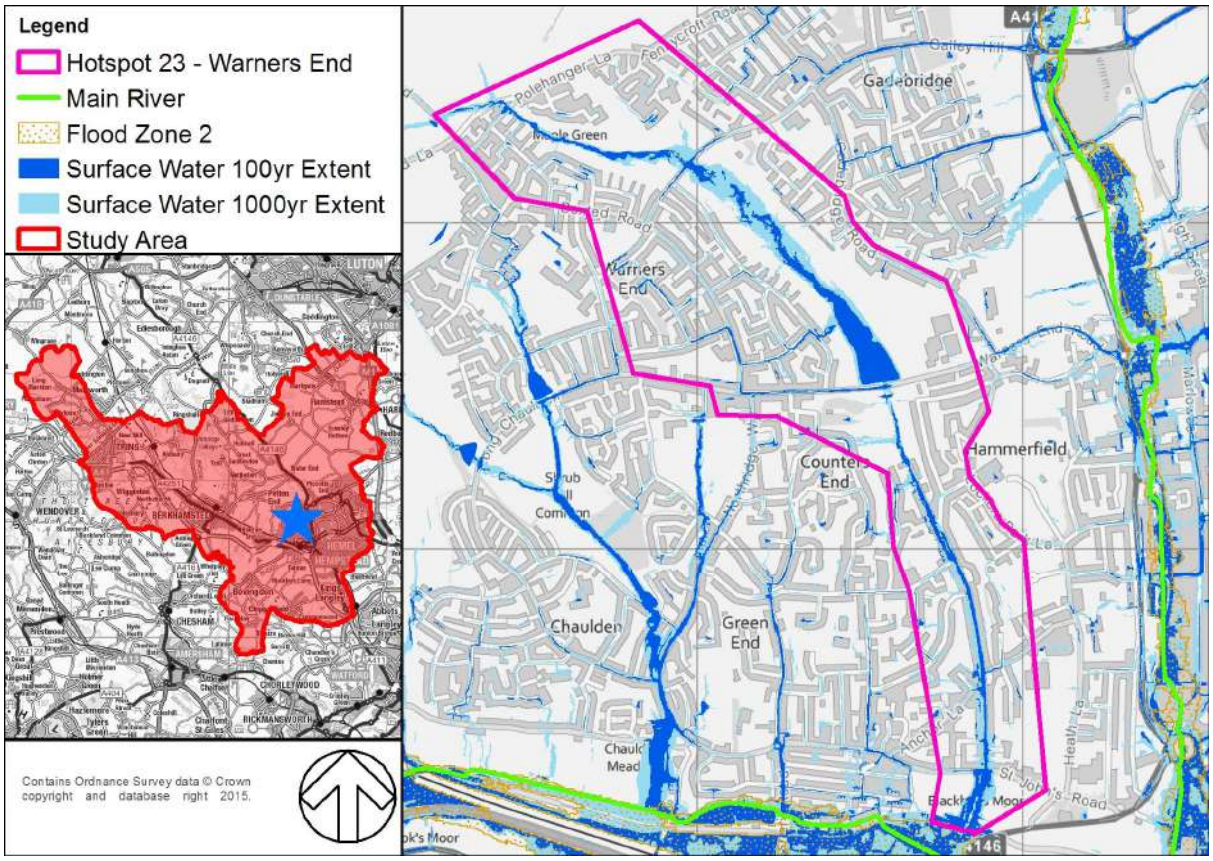

Figure 12: Hotspot 23 – Warners End

KEY ISSUES

- Overland flow routes

SUGGESTED APPROACH

- Storage Areas
- Utilising roads as preferential flow paths
- Need to consider any low points / low lying properties

AGREED APPROACH

- To be discussed with Dacorum Borough Council on any background history of known flooding.

8.6 HOTSPOT 26 – ST ALBAN'S HILL

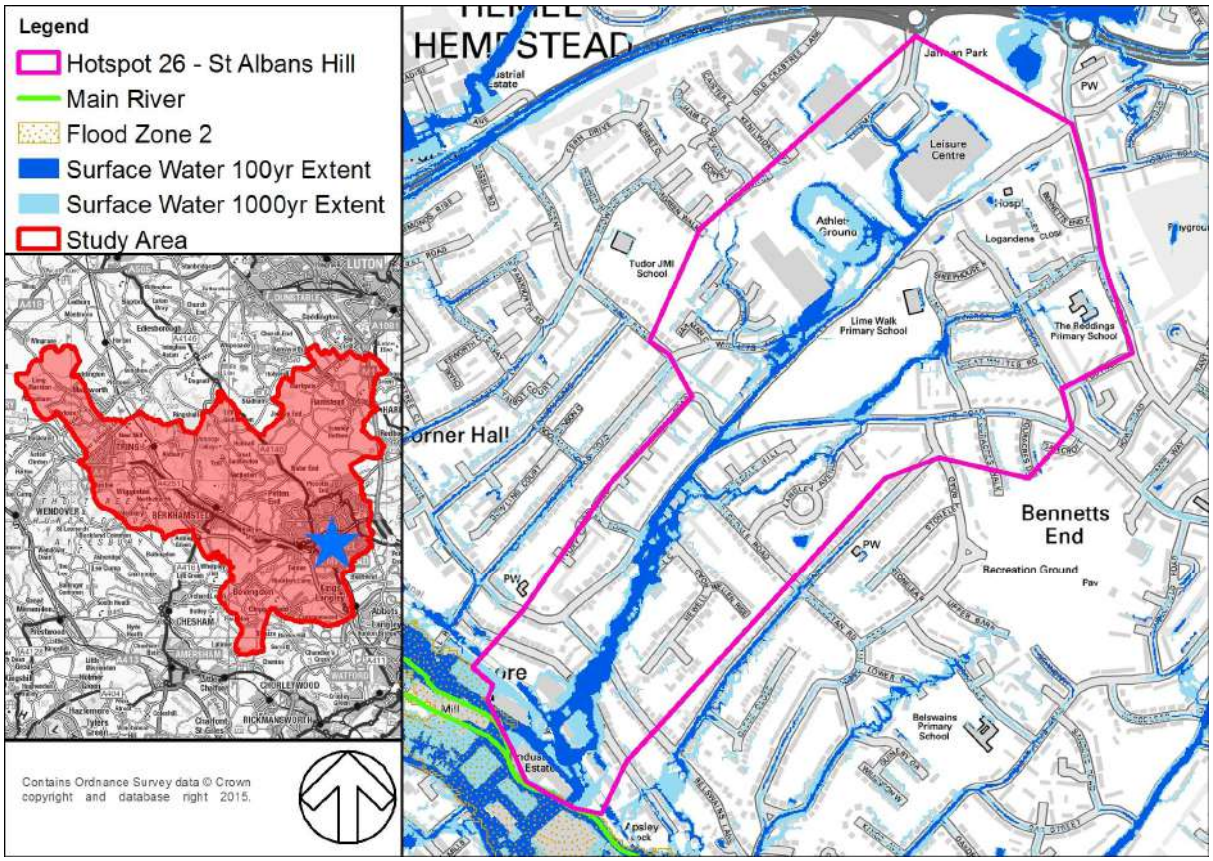

Figure 13: Hotspot 26 – St Albans Hill

KEY ISSUES

- Overland flow routes

SUGGESTED APPROACH

- Storage Areas
- Utilising roads as preferential flow paths
- Need to consider any low points / low lying properties

LOCAL KNOWLEDGE

- Controls in place to merge existing fluvial flood risk
- Control device (valve) at outfall
- EA to confirm current flood management in the hot spot location
- To be discussed with Dacorum Borough Council on any background history of known flooding.
- A4251 flooding occurs
- EA to confirm addressed previous flooding mechanisms – via Penny Carver at the EA

AGREED APPROACH

- On hold pending on-going discussions

8.7 HOTSPOT 27 – HOGPIT'S BOTTOM

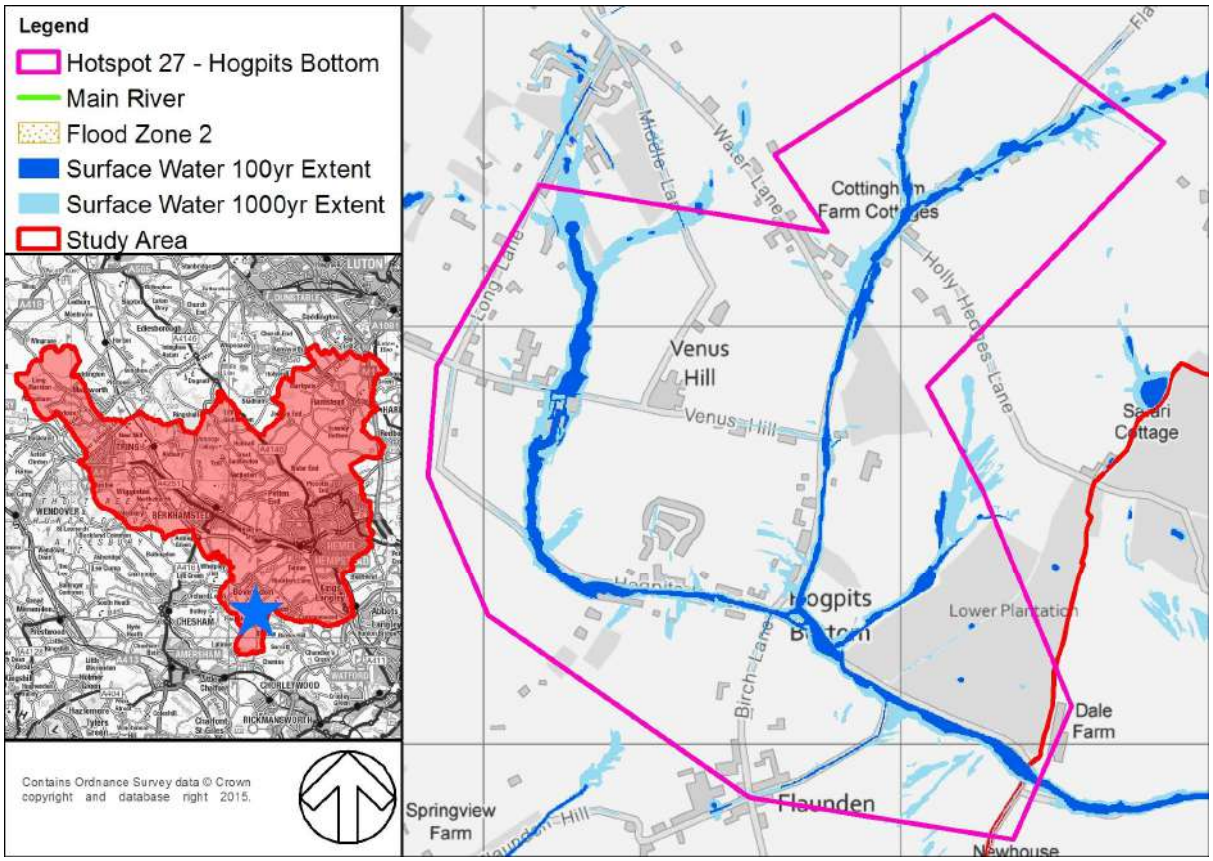

Figure 14: Hotspot 27 - Hogpit's Bottom

KEY ISSUES

- 4 properties have flooded within this area
- Options are limited due to constraints of the surface water sewers in this area
- Flooding is not associated with a watercourse but applicable to overland flow routes.

SUGGESTED APPROACH

- Address as an Identified Approach Hotspot and suggest solution to direct flows away from flooded properties.

AGREED APPROACH

- Hertfordshire County Council to confirm on the locality of the flooded properties to inform the proposed solution.

8.8 HOTSPOT 28 – CUPIDS GREEN

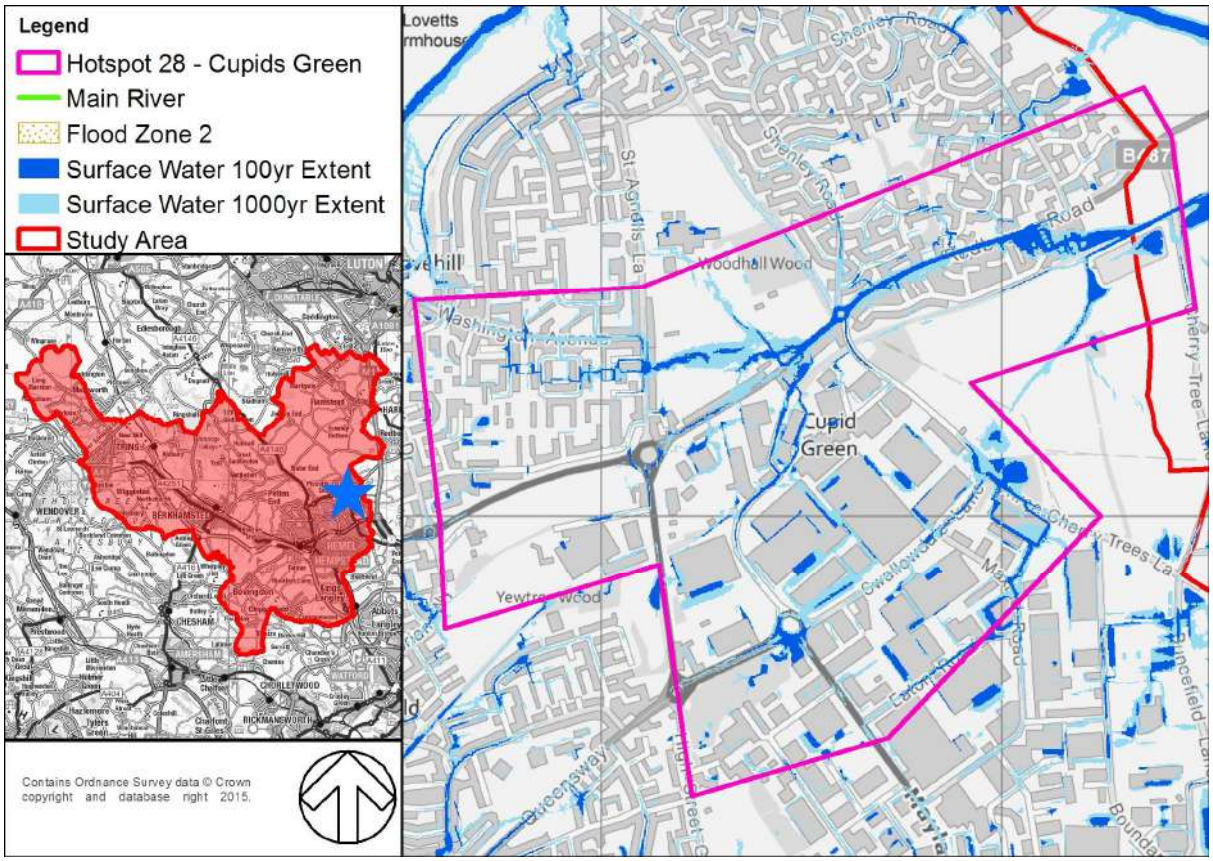

Figure 15: Hotspot 28 – Cupid's Green

KEY ISSUES

→ DTM shows isolated low points around buildings which by the nature of the modelling (i.e. no surface water drainage) these areas a shown to flood as the buildings are large commercial properties.

LOCAL KNOWLEDGE

→ Attenuation pond thought to be part of the highway drainage.

AGREED APPROACH

→ Do not take forward for further assessment.

9 SUMMARY

9.1.1 A Desk-Based analysis was conducted to assess the flood risk to receptors within the Borough of Dacorum. From this, 19 hotspots were analysed using a GIS Multi-Criteria Analysis (MCA) to prioritise the hotspots most at risk of flooding within the Borough of Dacorum.

9.1.2 A stakeholder meeting was held on 3rd February 2015 to discuss the results of the analysis with relevant stakeholders and allow stakeholders to share information and recommend further sites that should be analysed.

9.1.3 Site visits were conducted with Hertfordshire County Council in attendance in February 2015. The aim of the site visits was to assess hotspots on the ground and determine if the proposed solutions would be appropriate and cost-beneficial.

9.1.4 The initial top five Desk-Based Identified Hotspots, produced as a result of the Multi-Criteria Analysis (MCA) were:

1. Hotspot 0 Tring
2. Hotspot 24 Highfield, Hemel Hempstead
3. Hotspot 3 Adeyfield, Hemel Hempstead
4. Hotspot 28 Cupids Green, Hemel Hempstead
5. Hotspot 53 Kings Langley

9.1.5 Following stakeholder engagement and site visits, four of the Desk-Based Identified Hotspots and two Stakeholder Identified Hotspots have been chosen to be considered for hydraulic modelling, and be analysed further in the Modelling Methodology Technical Note. The six hotspots being taken forward for further assessment are:

1. Hotspot 0 Tring
2. Hotspot 1 Aldbury
3. Hotspot 2 Bovingdon
4. Hotspot 20 Berkhamsted
5. Hotspot 24 Highfield, Hemel Hempstead
6. Hotspot 53 Kings Langley

9.1.6 These six hotspots will be assessed as to the suitability of modelling and those to be taken forward as SWMP Modelled Hotspots will be determined from the list of hotspots analysed for both the Borough of Dacorum and North Hertfordshire District (as these were assessed in tandem). SWMP Modelled Hotspots will then be modelled and then mitigation and economic assessment will be undertaken. Further information on the hotspots taken forward as SWMP Modelled Hotspots can be found in the Modelling Methodology Technical Note.

9.1.7 The hotspots detailed in Table 1 are not being progressed further as SWMP Modelled Hotspots; however, they will be included in the SWMP as SWMP Non-Modelled Hotspots. Possible actions and mitigations are provided where appropriate.

Table 7: Initial Recommendations and Actions for the Borough of Dacorum – SWMP Non-Modelled Hotspots

HOTSPOT NUMBER	LOCATION	RECOMMENDATIONS AND ACTIONS
→ Hotspot 3	Adeyfield, Hemel Hempstead	Ensure Thames Water tanks and highway gullies are suitably maintained and cleaned after larger storm events.
→ Hotspot 22	Chaulden, Hemel Hempstead	Hold any further investigations pending the outcome of the mitigation features already in place at the site.
→ Hotspot 23	Warners End, Hemel Hempstead	To be discussed with Dacorum Borough Council on any background history of known flooding.
→ Hotspot 26	St Alban's Hill, Hemel Hempstead	On hold pending on-going discussions
→ Hotspot 27	Hogpit's Bottom, Flaunden	HCC to confirm on the locality of the flooded properties to inform the proposed solution.
→ Hotspot 28	Cupid's Green, Hemel Hempstead	Work with tenant/property owners to ensure awareness and suitable drainage maintenance regimes are in place across the industrial estate

10 GLOSSARY

Hotspot – a spatially limited area in which there are a number of residential or commercial properties at risk from flooding resulting from one or more sources/mechanisms.

Desk-Based Identified hotspots – ranked hotspots identified by GIS/mapping analysis of density of receptors at risk from flooding.

Flood Defence Grant in Aid (FDGiA) – Flood Defence Grant in Aid funding is the mechanism through which the Environment Agency funds flood defence measures in England and Wales. Funding is based on the how much public benefit a project will have, e.g. economic value, how many households are better protected from flooding and the amount of environmental/habitat improvements are gained. As such, areas of land which do not meet the above criteria and are unable to demonstrate they meet the FDGiA criteria would be unable to secure funding, without substantial third party contributions. These include both undeveloped areas such as farmland and developed areas such as car parks.

Stakeholder Identified hotspots – hotspots identified by key stakeholders (districts, boroughs, parishes, Environment Agency, relevant water company/ies) based upon local knowledge and evidence.

SWMP Modelled Hotspots – five hotpots within the administrative boundary to have detailed assessment and hydraulic modelling undertaken to better understand the risks from surface water flooding as part of this iteration of the SWMP. These were identified from a review of both Desk-Based and Stakeholder Identified Hotspots.

SWMP Non-Modelled Hotspots – hotspots within the administrative boundary not put forward for detailed hydraulic modelling; these hotspots may not be modelled for a number of reasons including:

- The hotspot has already been extensively investigated, or is due to be investigated as part of current planned works (by one or more of the stakeholders);
- The benefits from any further work would not be proportionate to the scale of the issue;
- The site visit confirmed that the surface water flow paths within the hotspot are well represented by current models and the Risk of Flooding from Surface Water Map;
- The hotspot is deemed not to have the potential to secure sufficient capital funding (Flood Defence Grant in Aid (FDGiA), Local Levy or third party contributions) to reduce flood risk;
- During the Desk-Based analysis, the hotspot ranked too low, and it was therefore not one of the higher priority sites in this round of assessment;
- The hotspot has already secured capital funding.

It should be noted that all hotspots identified are recorded within the SWMP and will go forward to be periodically assessed for the potential to reduce flood risk. Recommendations and actions (see definition) could be identified for these hotspots.

Recommendations and actions – actions which could be undertaken to reduce the risk of surface water flooding. These actions could range from enhanced maintenance regimes through to capital funded flood alleviation schemes. They could be identified for both SWMP Modelled Hotspots and SWMP Non-Modelled Hotspots.