

Map 7: Locations Showing Areas Susceptible to Groundwater Flooding in Hertfordshire

Map 7 Areas Susceptible to Groundwater Flooding

Legend

 Mineral Allocation Sites

 Plan Area Boundary

Susceptibility to Groundwater Flooding

 High

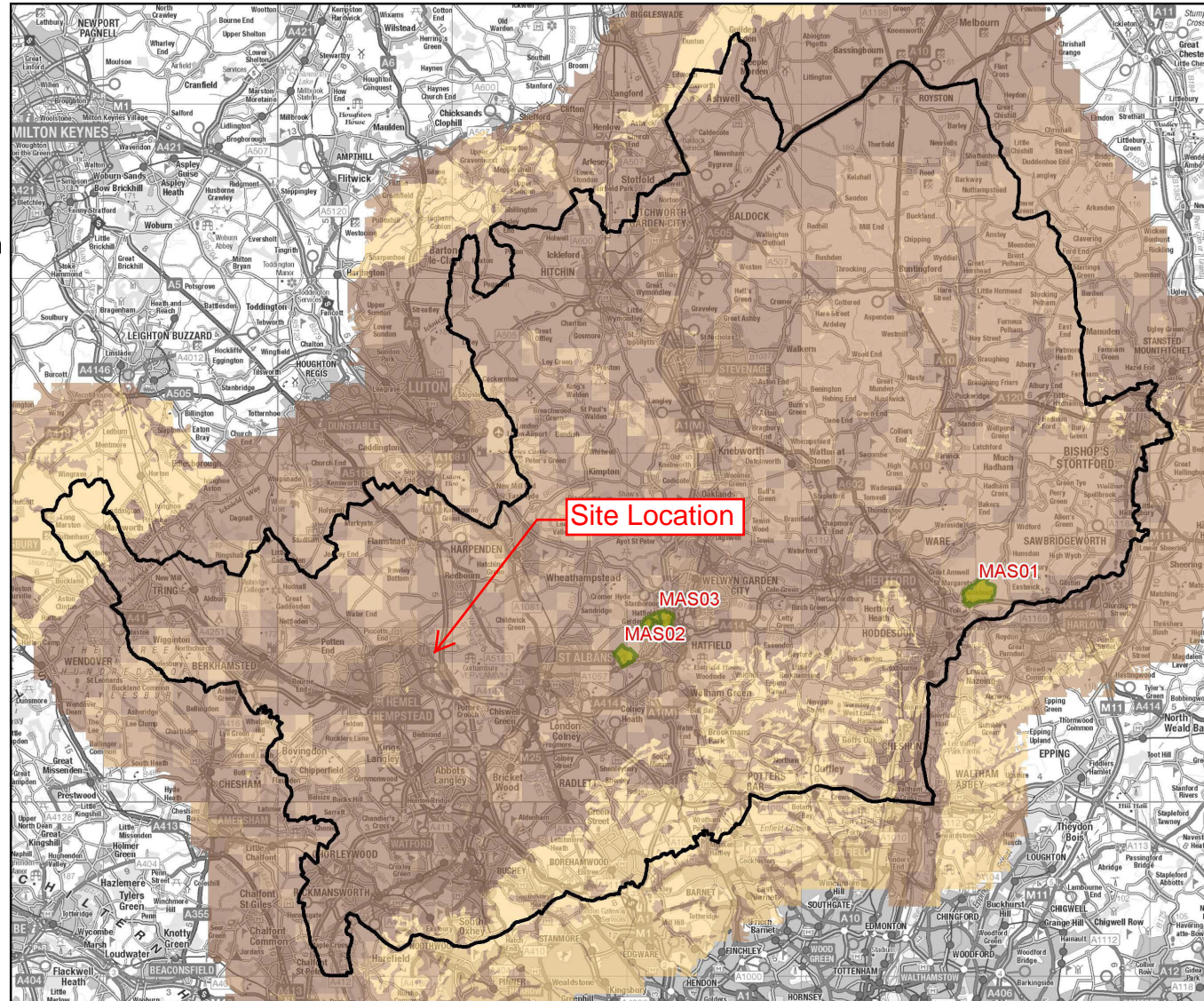
 Medium

 Low

 Unproductive



Scale: 1:300,000






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Map 8: Location of Areas at Risk from Surface Water Flooding in Hertfordshire

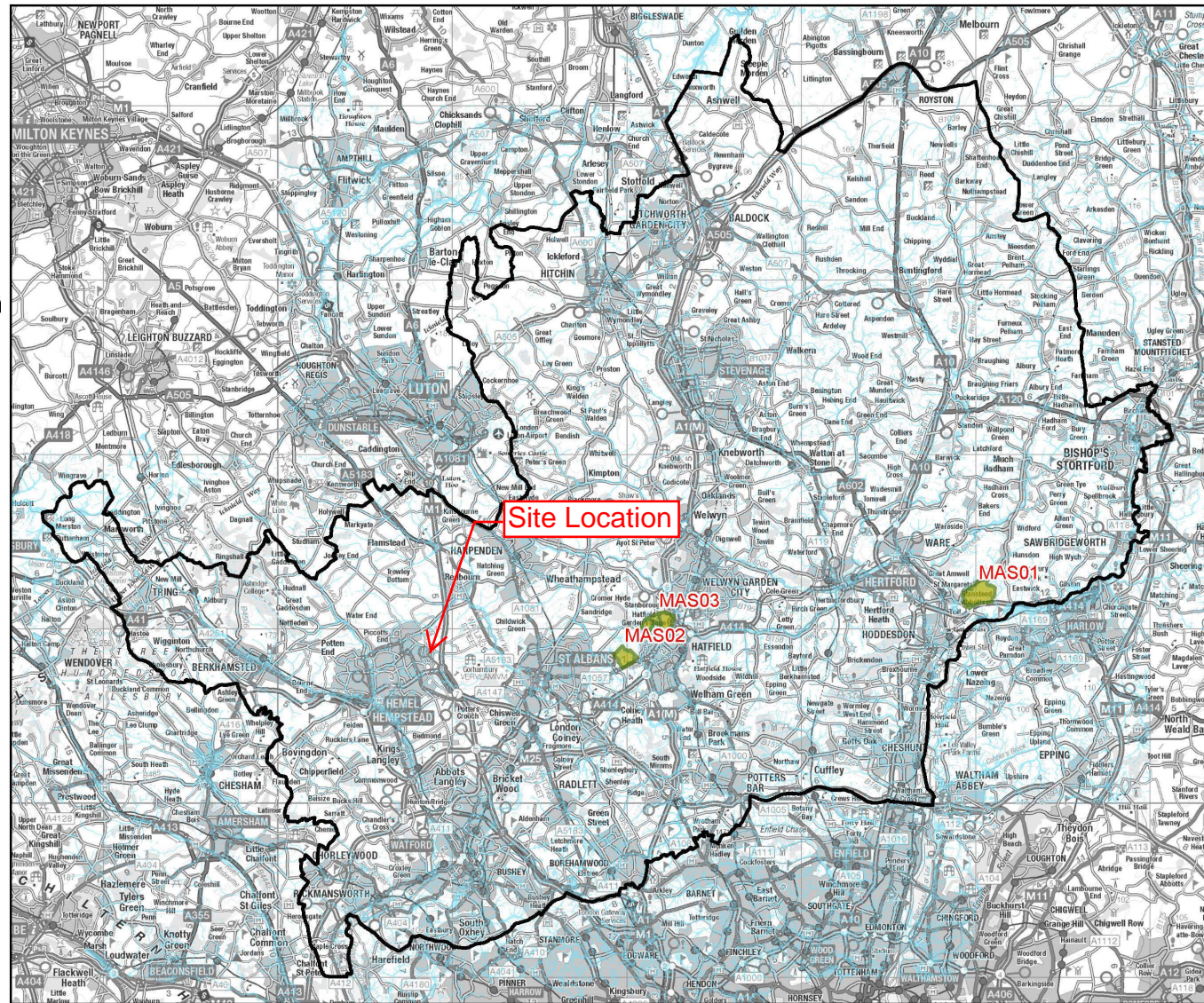
Map 8 Areas at Risk of Surface Water Flooding

Legend

-  Mineral Allocation Sites
-  Plan Area Boundary
-  Surface Water Flooding - Extent (1 in 100 year event)



Scale: 1:300,000






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Map 9: Areas Benefiting from Flood Management Features in Hertfordshire

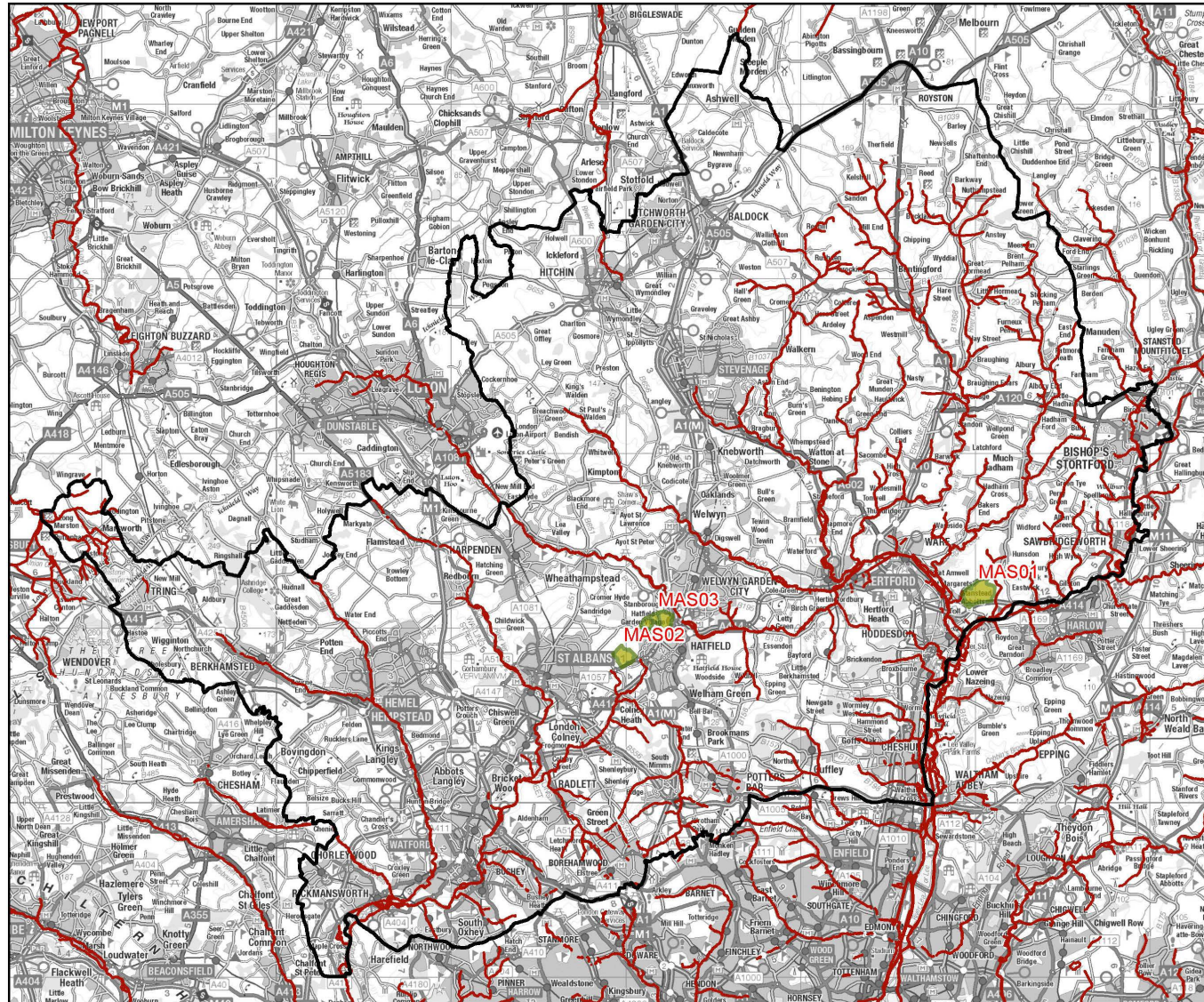
Map 9 Flood Management Features

Legend

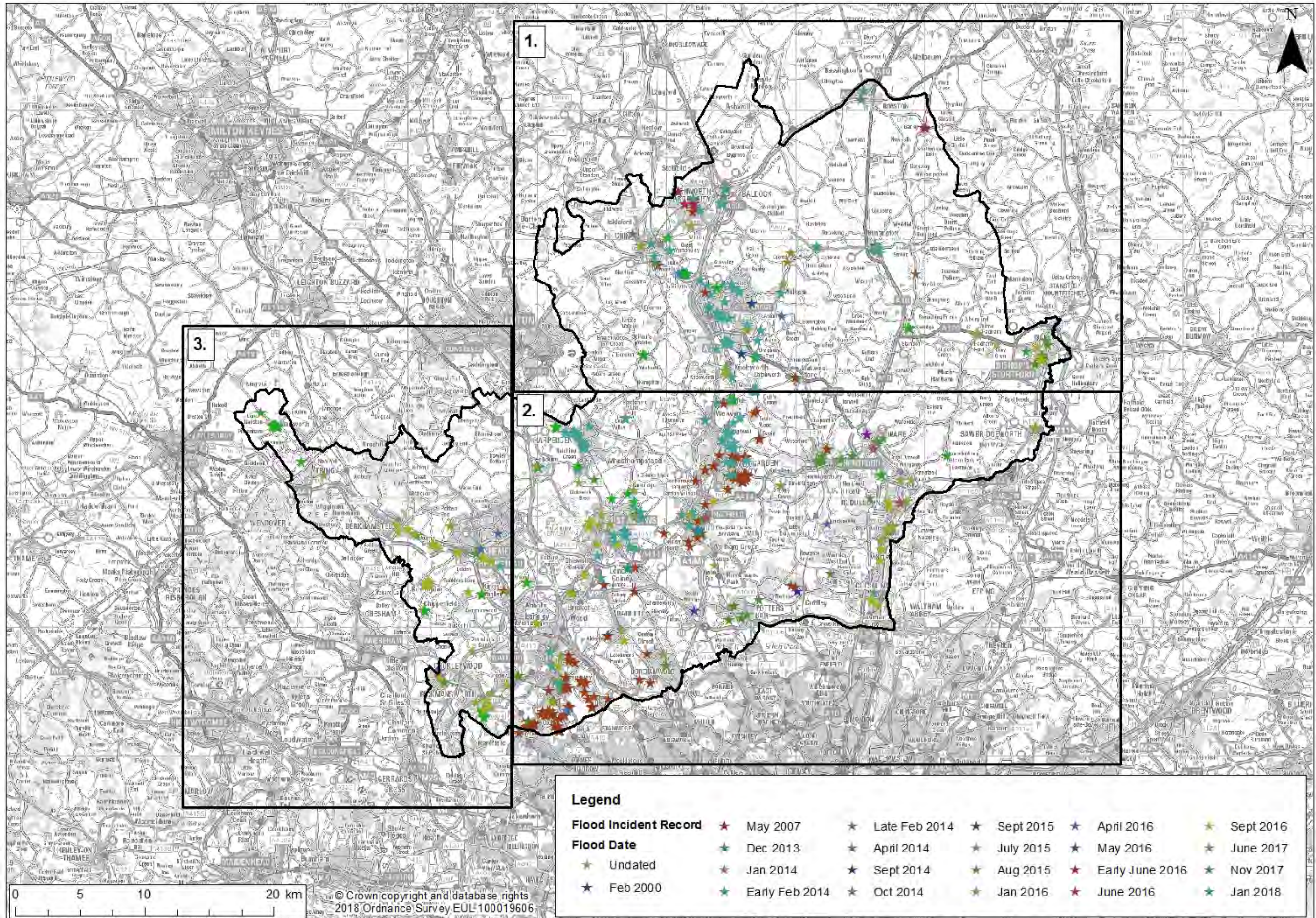
-  Mineral Allocation Sites
-  Plan Area Boundary
-  Flood Management Features



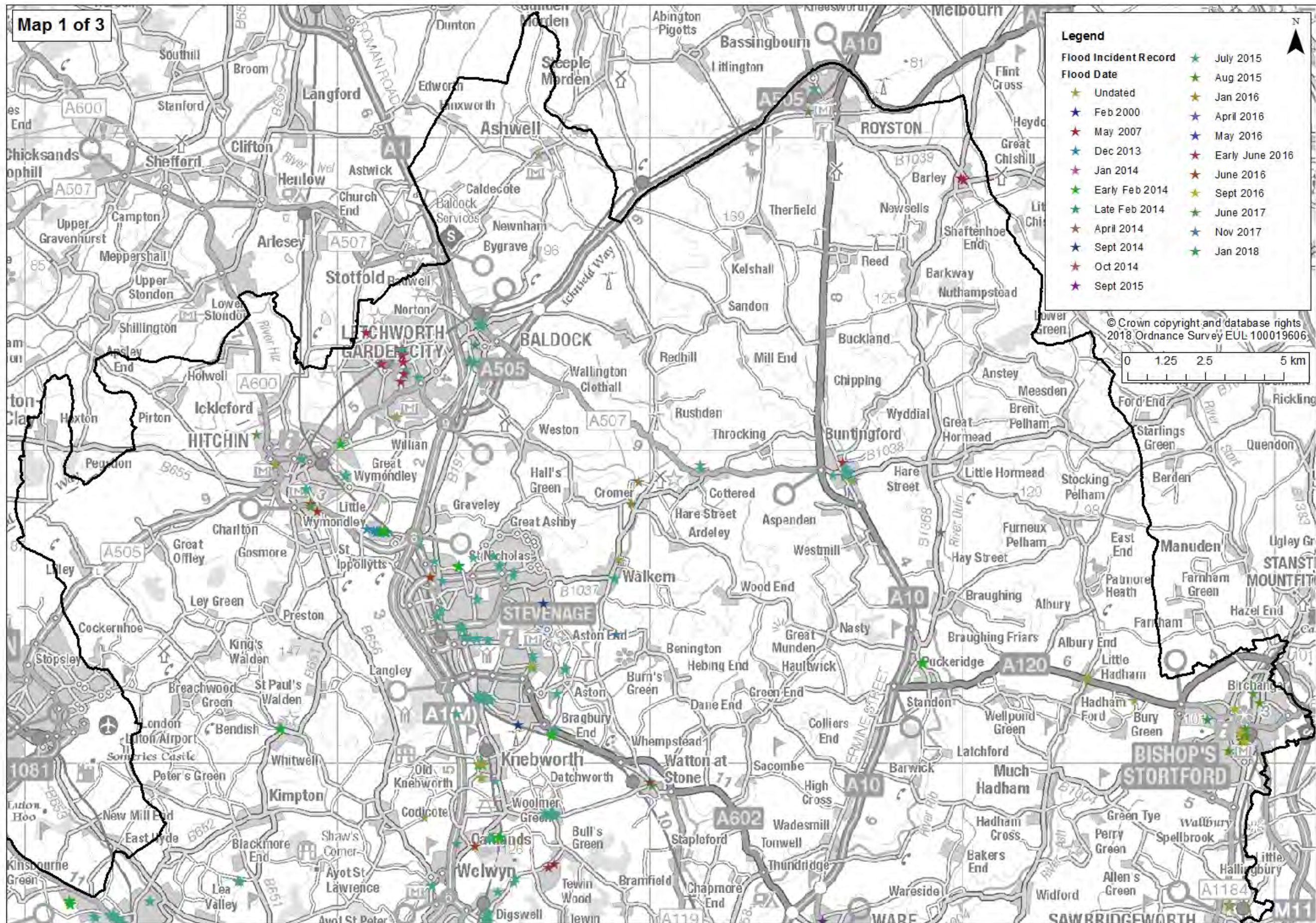
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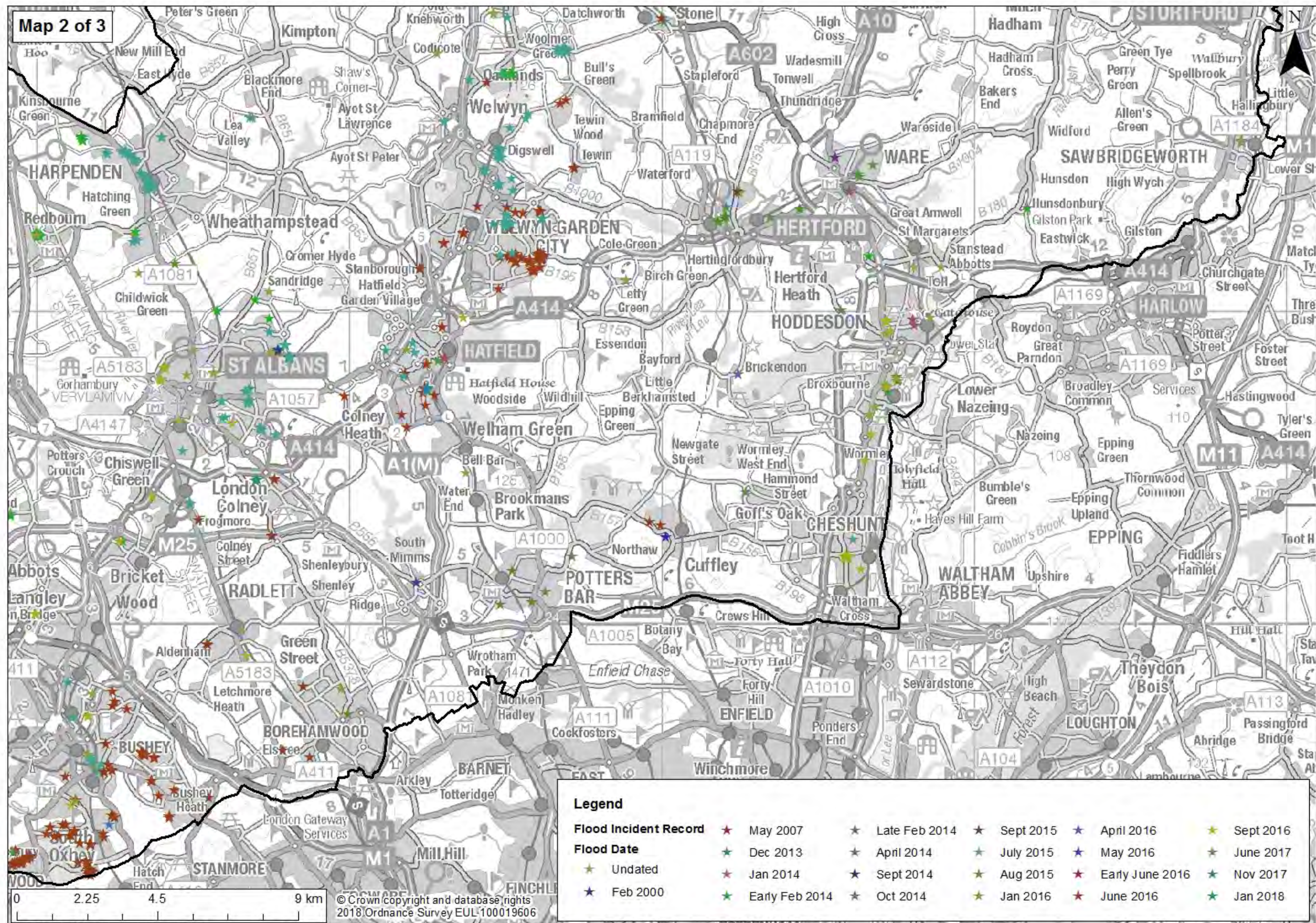
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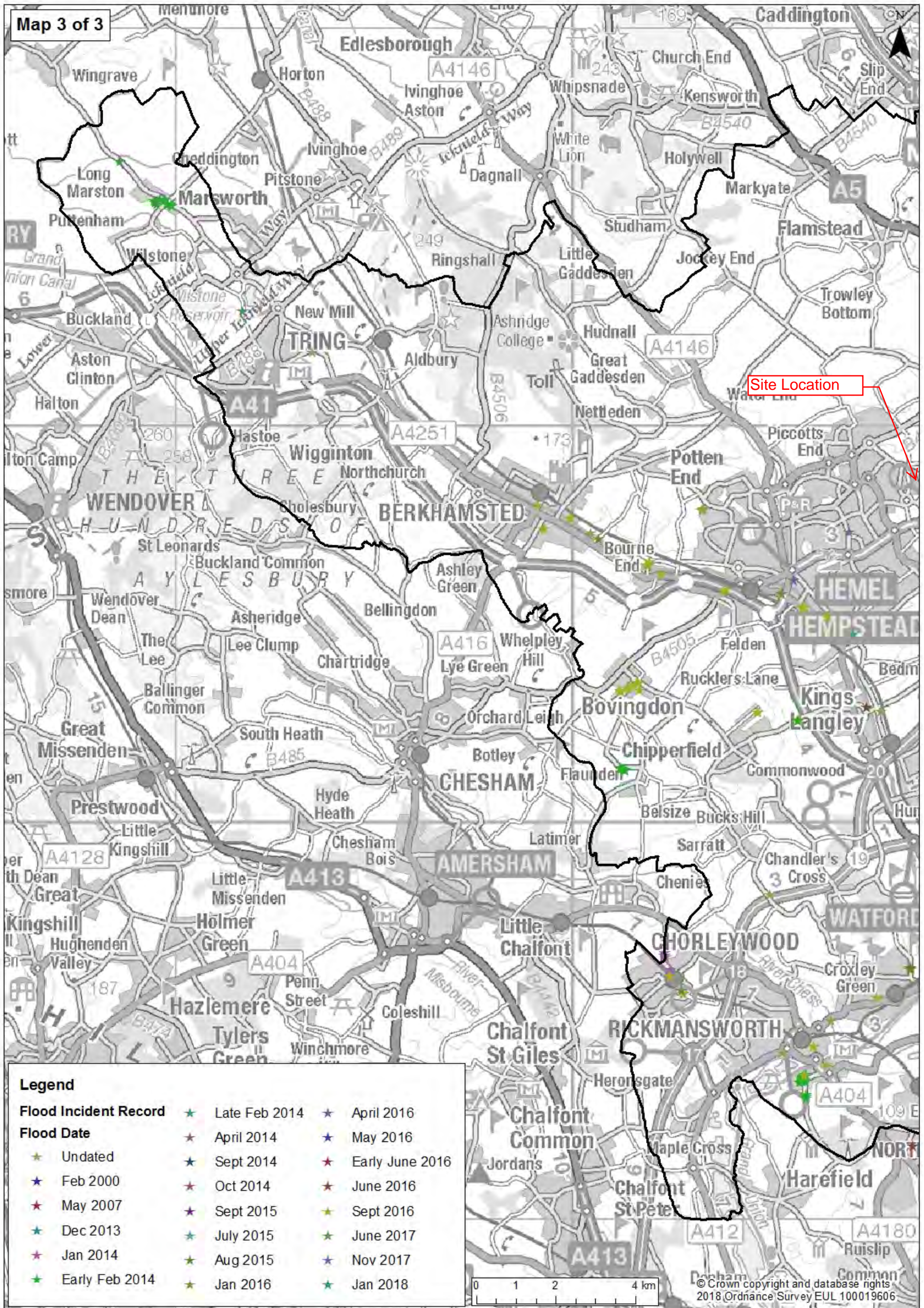
Map 1: Overview Map – Flood Incident Record for Hertfordshire



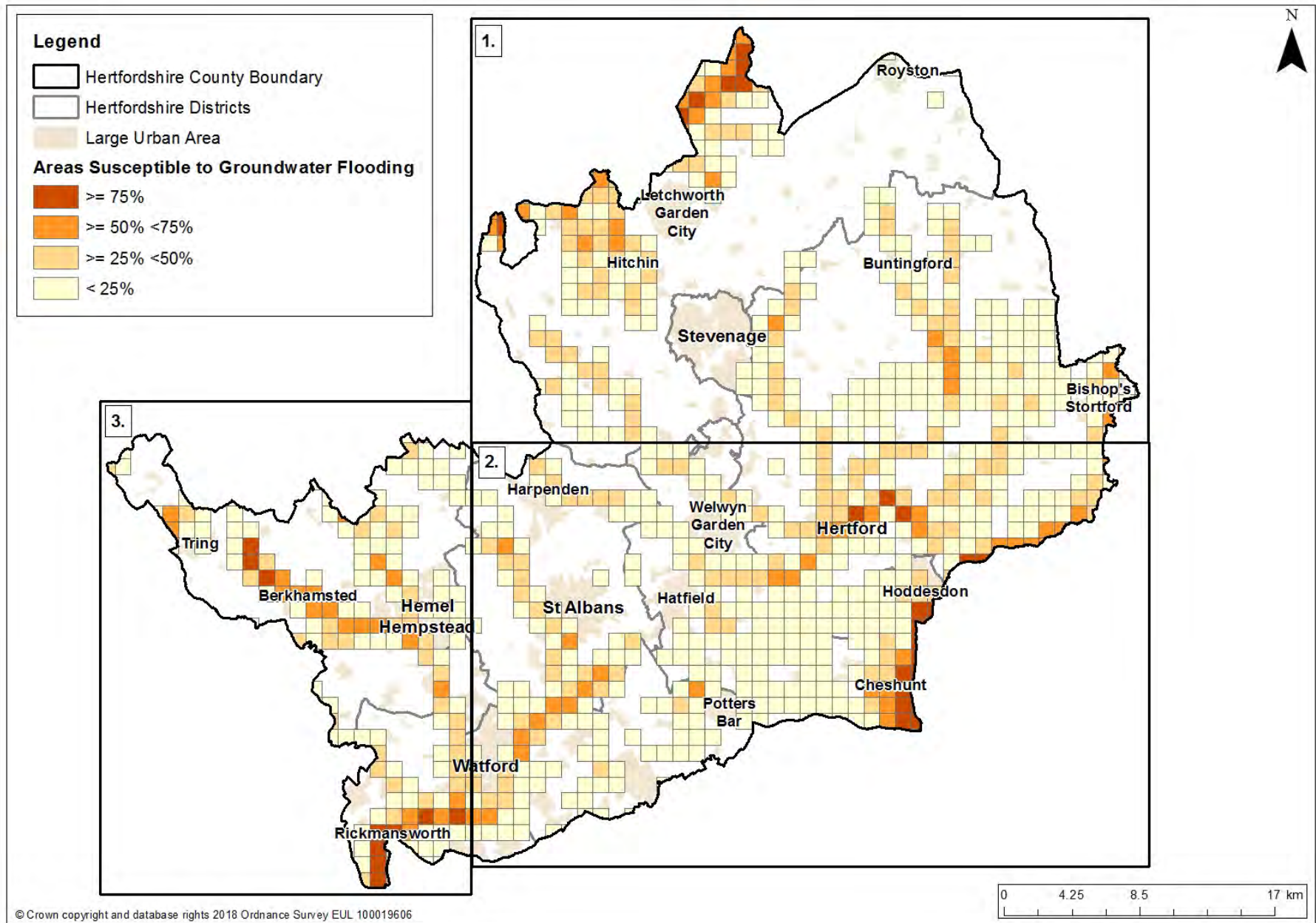
Map 1a: Map 1 of 3 – Flood Incident Record for Hertfordshire (North)



Map 1b: Map 2 of 3 – Flood Incident Record for Hertfordshire (South)

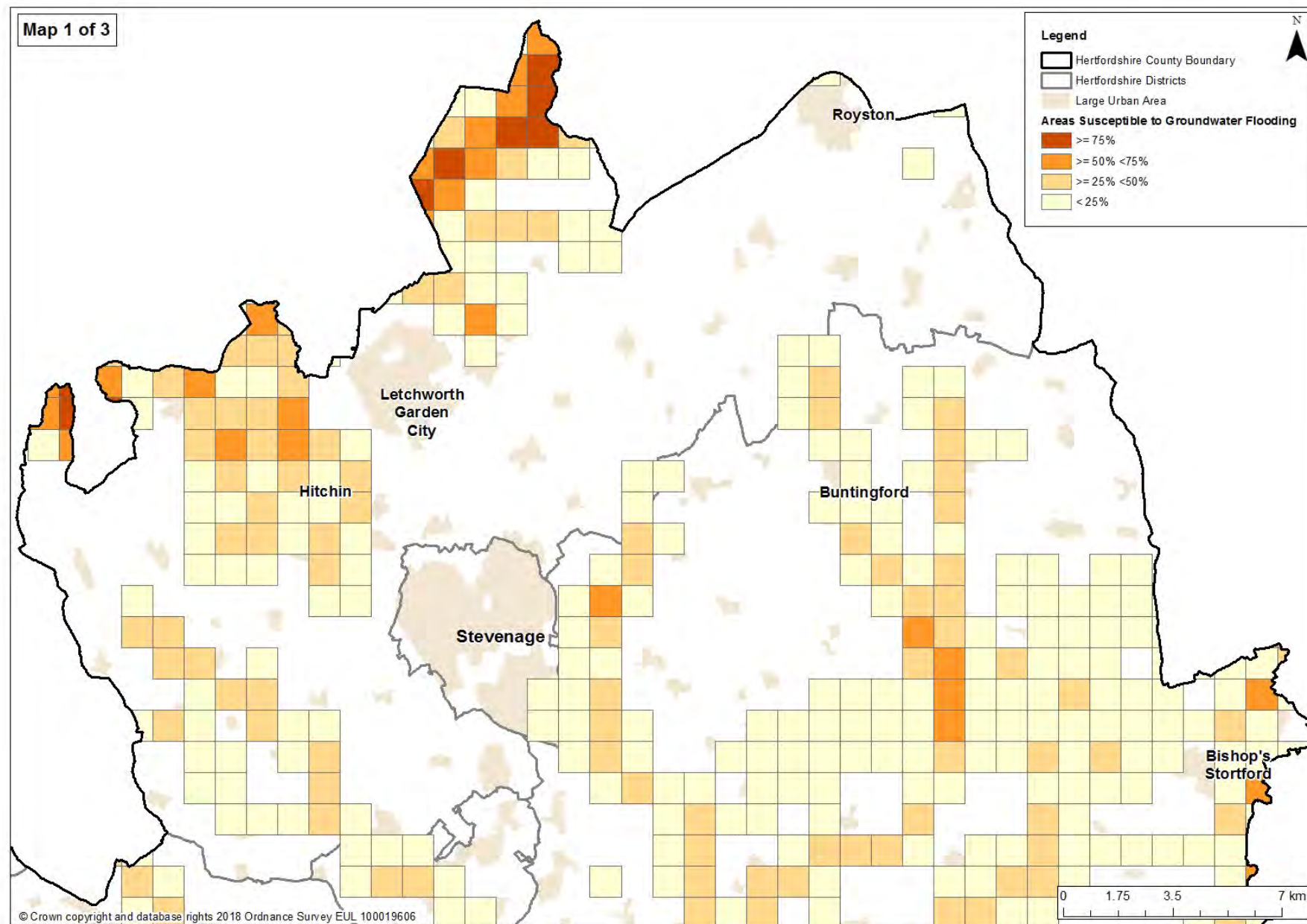


Map 1c: Map 3 of 3 – Flood Incident Record for Hertfordshire (West)

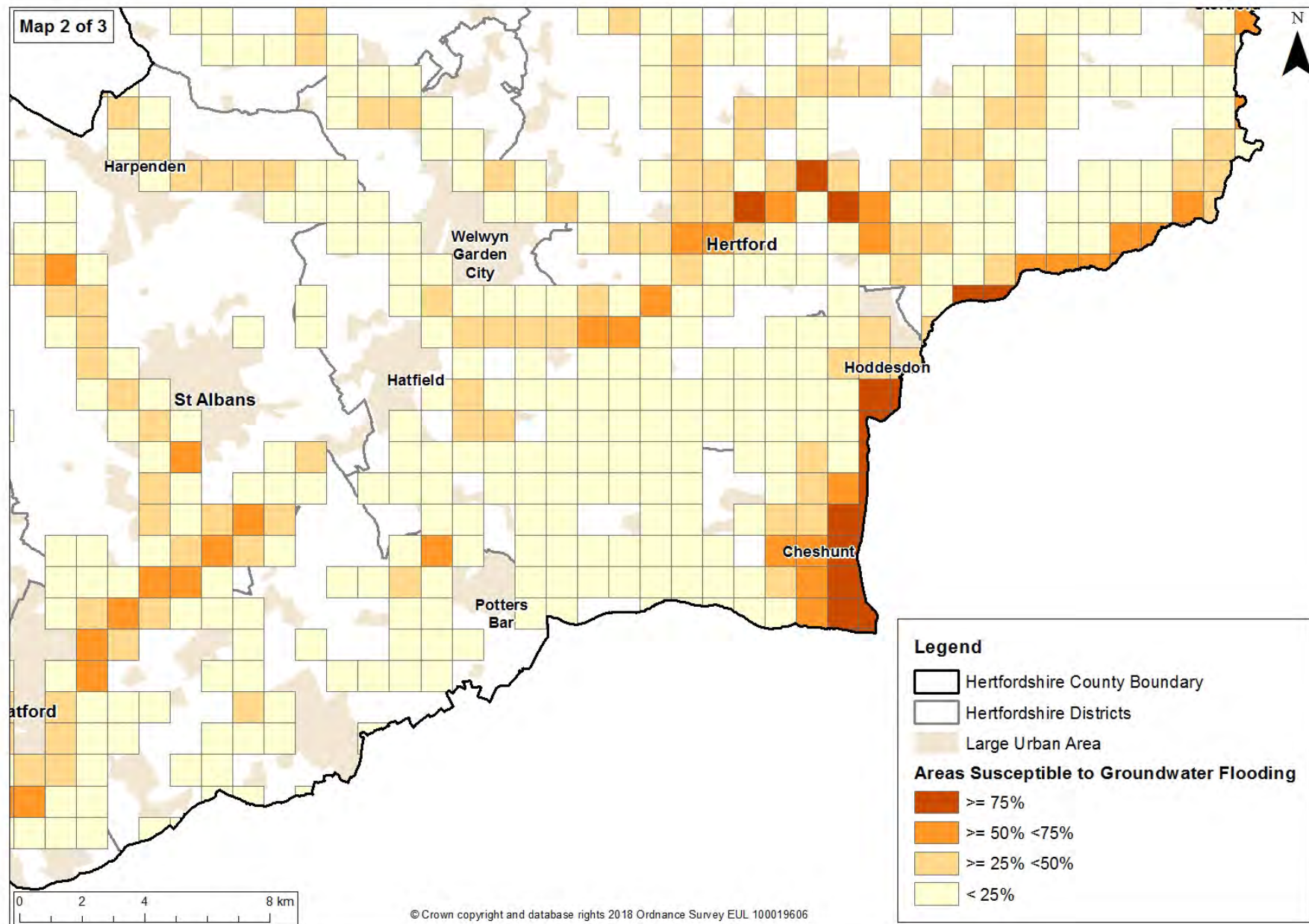


Map 6: Overview Map – Areas Susceptible to Groundwater Flooding in Hertfordshire

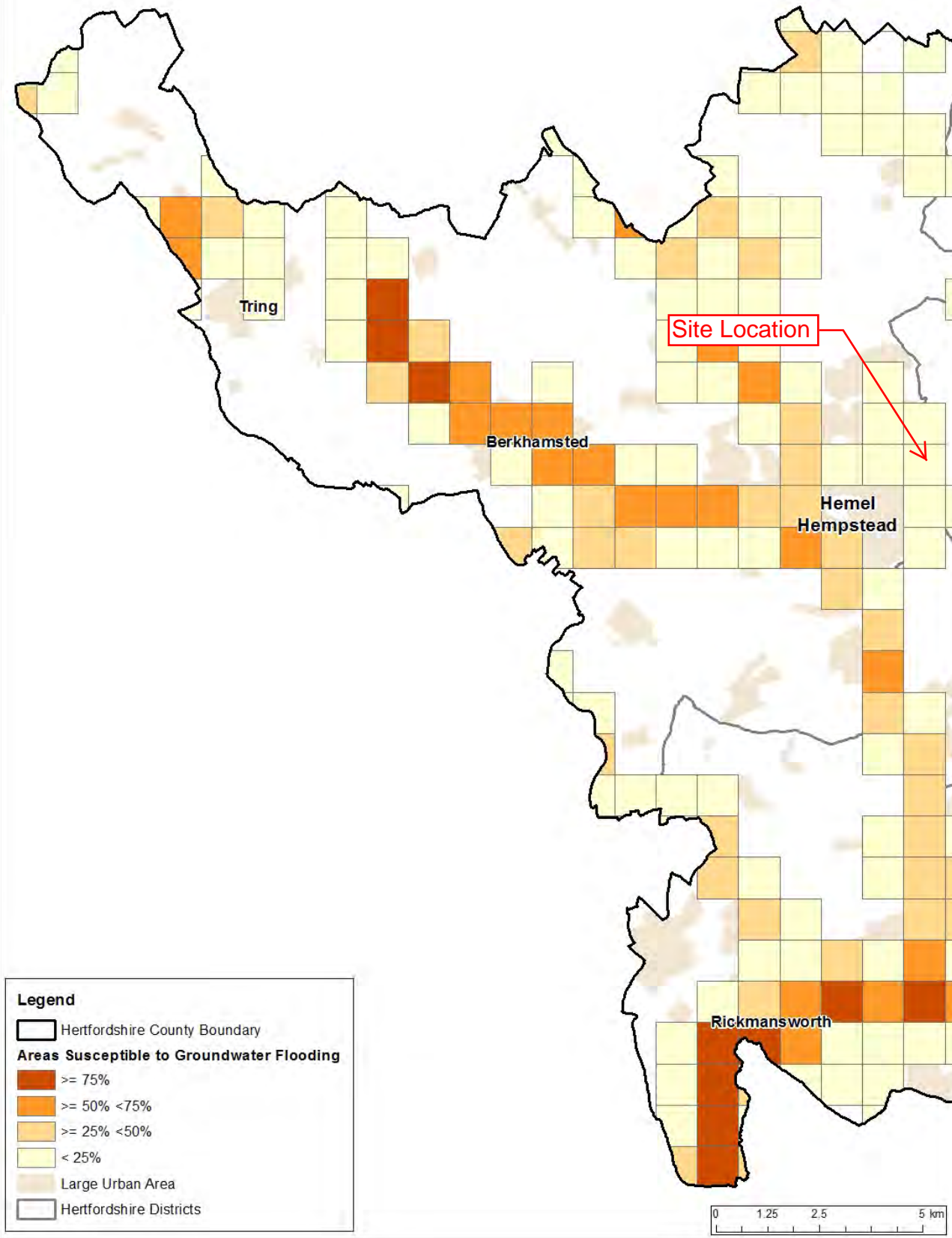
Adopted 18 February 2019



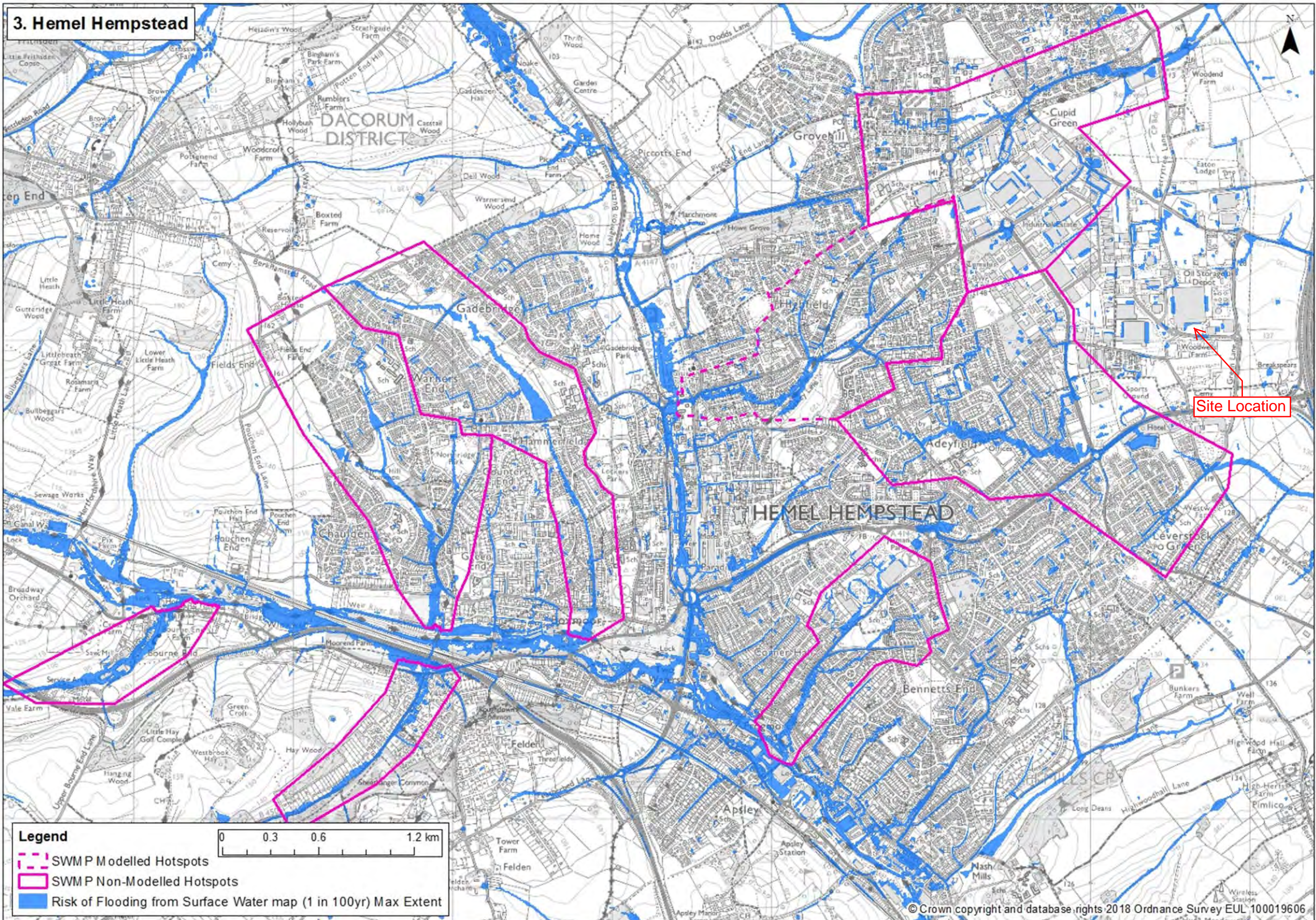
Map 6a: Map 1 of 3 – Areas Susceptible to Groundwater Flooding in Hertfordshire (North)



Map 6b: Map 2 of 3 – Areas Susceptible to Groundwater Flooding in Hertfordshire (South)

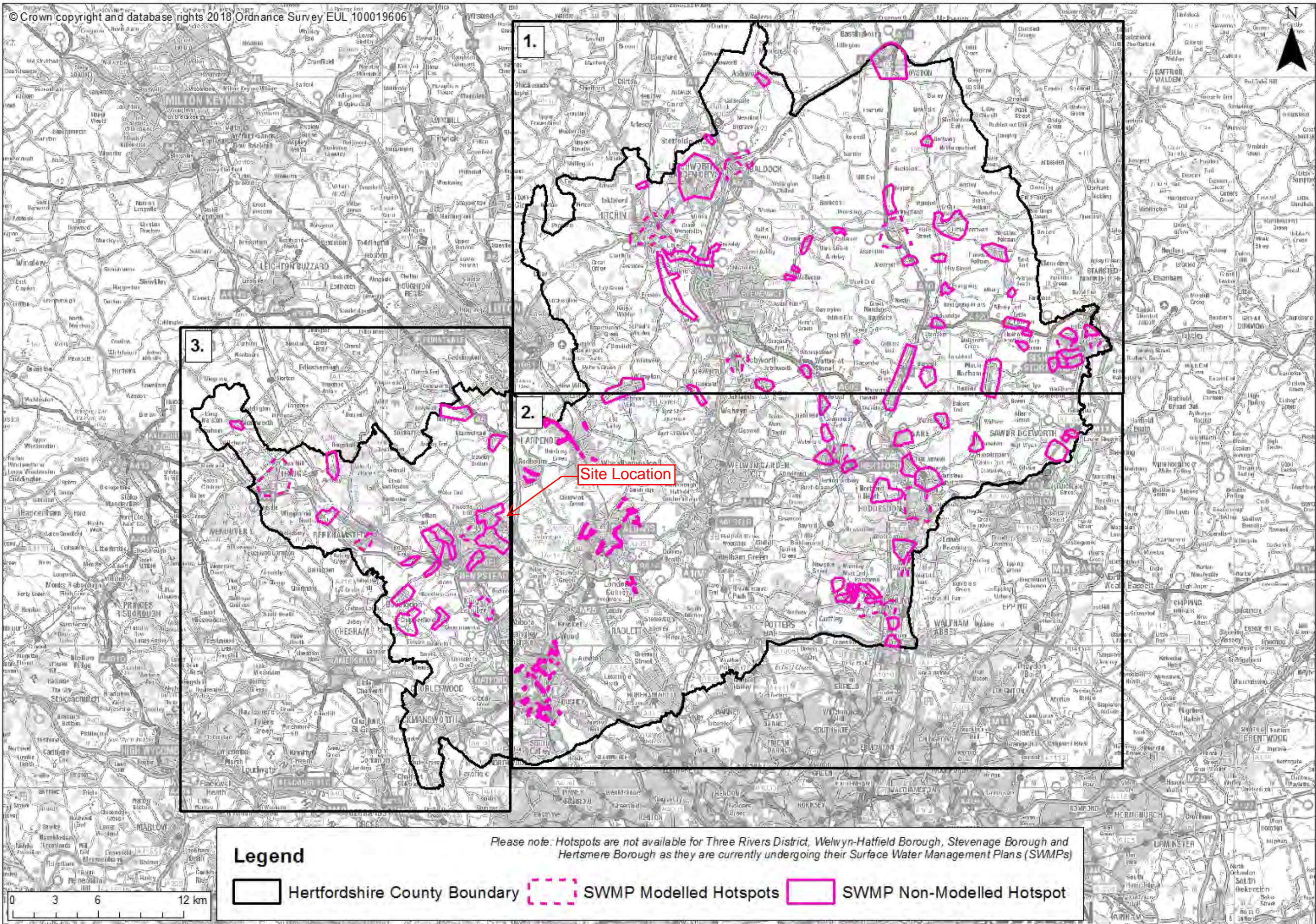


Map 6c: Map 3 of 3 – Areas Susceptible to Groundwater Flooding in Hertfordshire (West)



Map 10c: Map 3 of 4 – SWMP Hotspots and the Risk of Flooding from Surface Water map (1% AEP event) for Hemel Hempstead

Adopted 18 February 2019



Map 11: Overview Map – Surface Water Management Plan (SWMP) Hotspots for Hertfordshire

Appendix 5 – Drainage Strategy

Calculated by:	Iris Kalaci
Site name:	Hemel 465
Site location:	Hemel Hempstead

Site Details

Latitude:	51.76077° N
Longitude:	0.42701° W
Reference:	1578234113
Date:	Mar 22 2024 10:27

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Runoff estimation approach IH124

Site characteristics

Total site area (ha): 0.308

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Notes

(1) Is $Q_{BAR} < 2.0$ l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

Soil characteristics

	Default	Edited
SOIL type:	1	1
HOST class:	N/A	N/A
SPR/SPRHOST:	0.1	0.1

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

Hydrological characteristics

	Default	Edited
SAAR (mm):	700	700
Hydrological region:	6	6
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

(3) Is $SPR/SPRHOST \leq 0.3$?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	0.05	0.05
1 in 1 year (l/s):	0.04	0.04
1 in 30 years (l/s):	0.12	0.12
1 in 100 year (l/s):	0.17	0.17
1 in 200 years (l/s):	0.19	0.19

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

Quick Storage Estimate

Micro Drainage

Variables

FEH Rainfall

Return Period (years) 100

Version 2013 Catchment ...

Site GB 509050 208600 TL 09050 08600

Cv (Summer)	0.750
Cv (Winter)	0.840
Impermeable Area (ha)	0.308
Maximum Allowable Discharge (l/s)	2.0
Infiltration Coefficient (m/hr)	0.00000
Safety Factor	2.0
Climate Change (%)	40

Analyse OK Cancel Help

Enter Area between 0.000 and 999.999

Quick Storage Estimate

Micro Drainage

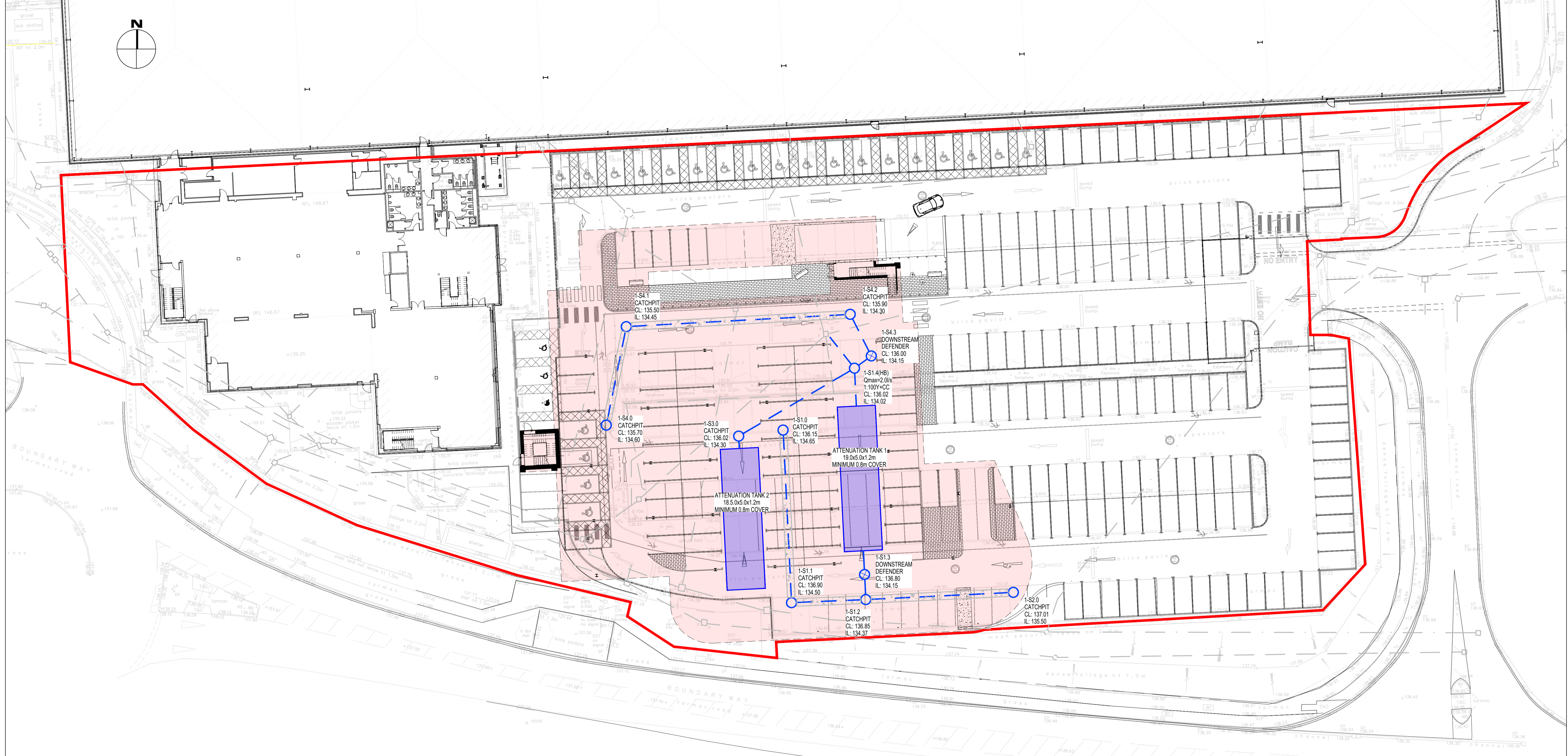
Results

Global Variables require approximate storage of between 202 m³ and 249 m³.

These values are estimates only and should not be used for design purposes.

Analyse OK Cancel Help

Enter Area between 0.000 and 999.999

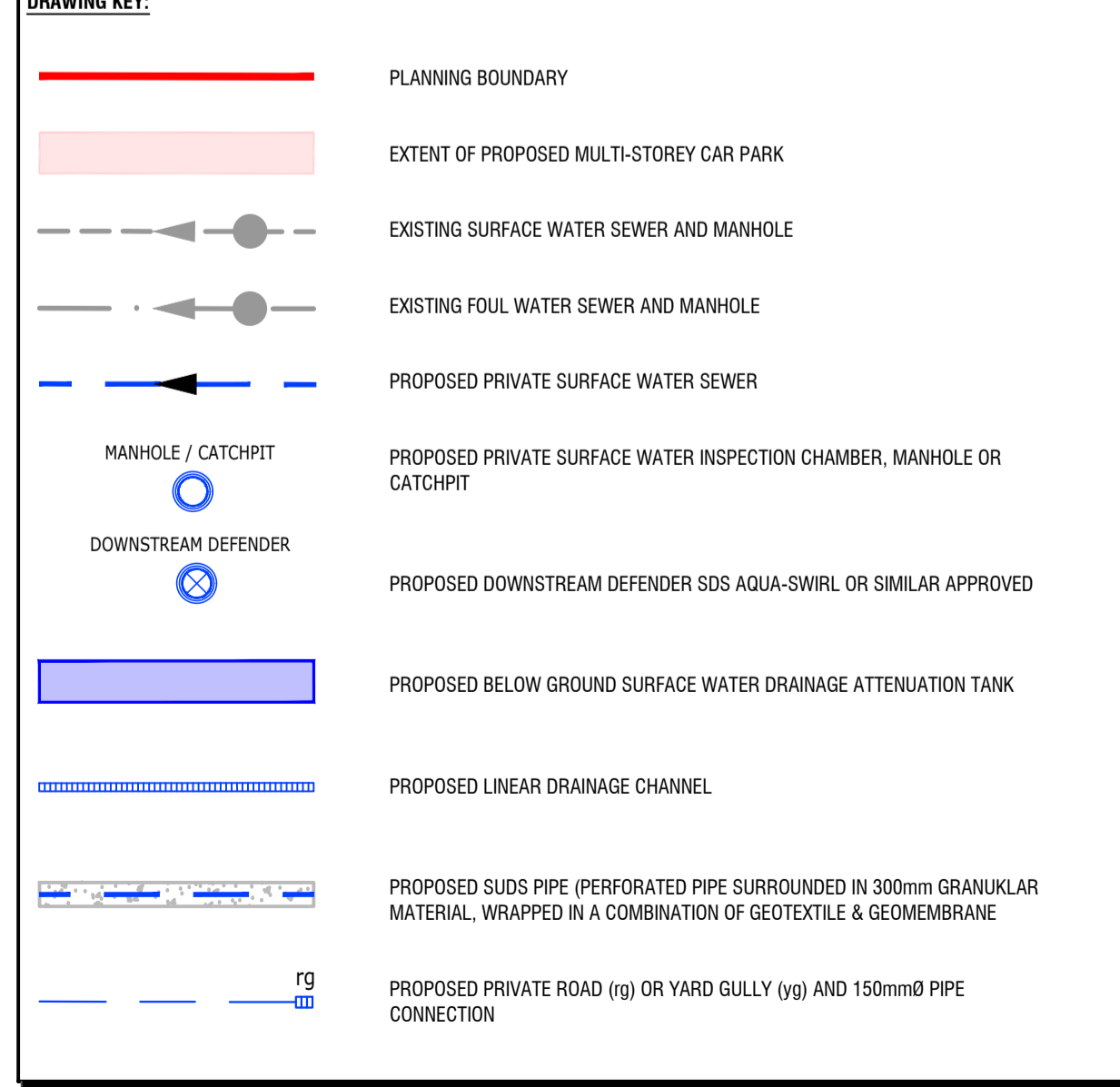


GENERAL NOTES

- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL ENGINEERS AND ARCHITECTS DRAWINGS, SPECIFICATIONS AND RISK REGISTERS.
- DO NOT SCALE FROM THIS DRAWING. USE ONLY DIMENSIONS AS INDICATED. CHECK ALL SITE DIMENSIONS PRIOR TO PLACING ANY ORDER OR FABRICATION. WHERE A CONFLICT OF INFORMATION EXISTS SEEK CONFIRMATION FROM CONSULTANTS PRIOR TO PROCEEDING FURTHER WITH THE WORKS.
- THIS DRAWING IS TO BE PRINTED IN COLOUR.
- TEMPORARY STABILITY OF THE EXISTING STRUCTURE AND ANY NEWLY CONSTRUCTED ELEMENTS OF PERMANENT WORKS DURING CONSTRUCTION IS SOLELY CONTRACTOR'S RESPONSIBILITY.
- ONLY DRAWINGS AND SPECIFICATIONS ISSUED FOR CONSTRUCTION CAN BE USED FOR THE WORKS. IT IS CONTRACTOR'S RESPONSIBILITY TO SEEK THE INFORMATION FROM CONSULTANTS.
- ALL PROPRIETARY ITEMS TO BE INSTALLED STRICTLY IN ACCORDANCE WITH MANUFACTURER'S REQUIREMENTS AND SPECIFICATIONS. ALL WATERPROOFING SUCH AS TANKING DETAILS, DAMP PROOF MEMBRANES, DAMP PROOF COURSES, CAVITY TRAYS ETC. ARE TO BE INSTALLED AS PER ARCHITECT'S DETAILS.
- THE ACTUAL FORM, EXTENT AND CONDITION OF ANY ELEMENTS MARKED AS 'TBC', IS TO BE CONFIRMED BY THE CONTRACTOR VIA LOCAL OPENING/TRIAL PIT PRIOR TO COMMENCEMENT OF ANY WORKS. EXACT DETAILS OF FINDINGS ARE TO BE IMMEDIATELY REPORTED TO ENGINEER.

DRAINAGE NOTES

- THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ENGINEERS AND ARCHITECTS DETAILS.
- ALL PRIVATE ON-LOT DRAINAGE WORK IS TO BE CARRIED OUT IN ACCORDANCE WITH BUILDING REGULATIONS PART H AND SEWERAGE SECTOR GUIDANCE, APPENDIX C - DESIGN AND CONSTRUCTION GUIDANCE (DCG).
- THE CONTRACTOR IS RESPONSIBLE FOR VALIDATING ALL ASSUMPTIONS PRIOR TO THE COMMENCEMENT OF WORKS, INCLUDING THE POSITION, DEPTH AND SIZE OF ANY EXISTING DRAINAGE INFRASTRUCTURE. ANY DISCREPANCIES MUST BE REPORTED TO THE ENGINEER BEFORE WORKS ARE ADVANCED.
- ALL WORKS ARE DESIGNED FOR THE FINAL CONSTRUCTED USE. TEMPORARY WORKS ARE THE RESPONSIBILITY OF THE PRINCIPAL CONTRACTOR.
- THE CONTRACTOR SHALL ADJUST THE EXACT POSITION OF GULLIES AND DRAINS TO SUIT THE AS-BUILT SURFACE LEVELS. GULLIES SHALL BE PLACED AT LOW SPOTS.
- ALL PIPES TO CONNECT SOFFIT TO SOFFIT UNLESS OTHERWISE STATED.
- THE CONTRACTOR SHALL CLEAN OUT AND REPAIR ALL RETAINED EXISTING DRAINAGE ON-SITE



BOX NOTE 1

ALL DRAINAGE CONNECTIONS TO GO THROUGH THE PROPOSED SUDS MEASURES (SUDDS PIPE AND DOWNSTREAM DEFENDER) IN ADVANCE OF DRAINING INTO THE ATTENUATION BASINS AND THEN OUTFALLING INTO THE EXISTING SURFACE WATER SEWERS

PROJECT TITLE:
HEMEL 465
MULTI STOREY CAR PARK
CLIENT:
J. MURPHY & SONS

DRAWING TITLE:
CAR PARK GROUND LEVEL
INDICATIVE DRAINAGE STRATEGY
DRAWING No:
E0837-EEE-07-00-DR-C-0500
SUITABILITY STATUS:
SUITABLE FOR INFORMATION



PROJECT No: E0837
DRAWN: IK
CHECKED: KG

REV: P01
SCALE @ A1:
1:250

a: 7 Ridgmount Street, WC1E 7AE,
London, United Kingdom
e: contact@engineeria.com
t: (+44)207 580 4588
w: www.engineeria.com

REV. description by chid



The pollution mitigation indices are as follows:

Device	Total suspended solids mitigation index	Total metals mitigation index	Soluble metals mitigation index ¹	Hydrocarbons ³
Aqua-swirl™ vortex grit separator	0.8 (0.5 on trunk roads and motorways where the suspended solids level is very high)	0.5 ⁴	The Aquaswirl™ is not designed to remove soluble pollutants	0.7 ³
Aqua-filter™ stormwater filtration unit	0.8	0.8	0.6	0.7 ³
Aqua-swirl™ and Aqua-filter™ in sequence	1.2 ²	0.9	0.6	1.0 ^{2,3}
Aqua-Xchange™	0.8 when installed as a layer in a filter drain	0.9	1.0	0.6 when installed as a layer in a filter drain

These indices can only be assumed when the treatment device is properly sized for the anticipated rate of runoff and the level of pollution in the runoff is not unusually high.

¹ When drainage schemes are designed for road developments in accordance with the Design Manual for Roads and Bridges, the mitigation index for soluble metals is required because particulate metals are considered separately in the total suspended solids assessment

² When designing in accordance with the SuDS Manual (Ciria C753), when two devices are used in sequence to target the same pollutant, half of the mitigation index of the second component should be allowed in the calculation.

³ The test procedures applied to manufactured treatment devices do not include measurement of hydrocarbon removal. Therefore, we have estimated that the Aqua-swirl™ removes free-phase hydrocarbons by flotation, and also removes hydrocarbons that are adhered to suspended solids. However, hydrocarbons are known to preferentially adhere to the smaller particles so the Aqua-filter™ will also remove a high proportion of those hydrocarbons as it is more effective at removing smaller suspended particles.

⁴ Where metals are present in the runoff in particulate form, particularly from vehicle emissions, the Aqua-swirl™ will effectively remove those particles in admixture with other suspended solids.

SDS Aqua-Swirl®

Hydrodynamic Vortex Separator

SDS Aqua-Swirl® is a custom engineered, flow-through water quality device that utilises hydrodynamic separation technology to maximise the removal of coarse sediment, debris and free-floating oil from surface water runoff.

SYMBiotic™

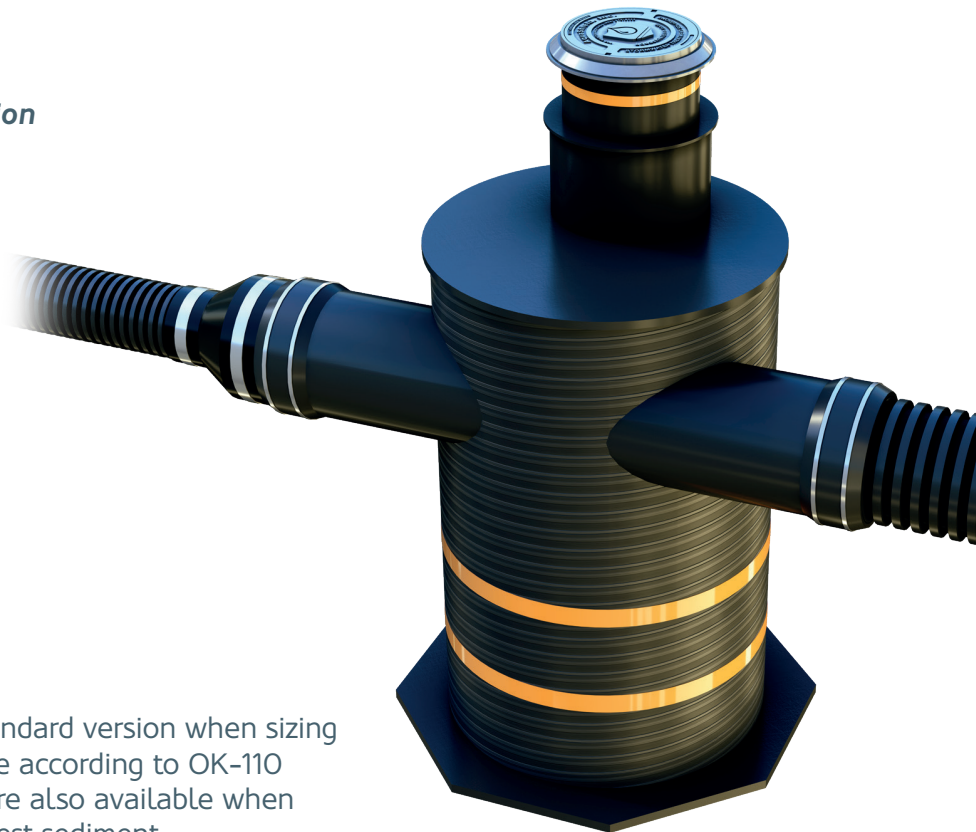
When connected to a SDS SYMBiotIC™ system, SDS Aqua-Swirl® provides real time data on a broad range of key operating factors such as pollutant loads and silt capture level.

- *BBA HAPAS approved*
- *HDPE plastic modular construction*
- *No moving parts*
- *Sealed baffle*
- *Large debris storage chamber*
- *Lifting supports*
- *Compact dimensions*
- *Available in 9 different sizes*
- *Bespoke sizing available*

SDS Aqua-Swirl® is supplied in the standard version when sizing to its water quality treatment flow rate according to OK-110 (coarse) test sediment. 'XC' versions are also available when sizing according to the NJDEP (finer) test sediment.

SDS Aqua-Swirl® is sized according to water quality treatment flow rates which are based on the initial movement of pollutants into the storm drainage system. This flow rate typically represents approximately 90% to 95% of the total pollutants in the runoff volume.

The treatment flow rate of the SDS Aqua-Swirl® system is engineered to meet or exceed the local water quality treatment criteria and form an intrinsic part of the SuDS solution.



Features	Benefits
Performance monitoring available via SDS SYMBiotIC™.	Provides bespoke suite of operating data, such as silt levels and pollutants, viewable via a secure web portal dashboard with live notifications via email and text.
BBA HAPAS certified.	Approved for installation under roads and pavements; adoptable by National Highways.
NJCAT/NJDEP-verified performance for sediment removal and retention.	Verification accepted by the Environment Agency (as cited in the CIRIA C753 SuDS Manual).
'XC' models meet NJDEP testing protocol.	Ensures that particulates and adhered pollutants are not mobilised during major storm events, maximising the capture of floating debris, oil and hydrocarbons.
Manufactured from HDPE high strength plastic Weholite.	Offers a durable, light weight and low-cost alternative to concrete. Easy and quick to install resulting in substantial cost savings.
Bespoke construction.	No on-site assembly required.
Specialised sealed baffle.	Prevents captured floatables from escaping.
Internal bypass with pollution retention.	Able to treat localised rain and larger storm events while retaining captured pollutants.
Single easy-access chamber for pollutant removal and storage.	Simplifies inspection and maintenance facilities with no special equipment required.
Compact dimensions.	Reduces ground excavation and product installation costs.
Small footprint design.	Can be retro-fitted with minimal disruption to existing infrastructure utilities or surface features, extending the ability to meet new regulations.
Certified installation lifting supports.	Easy installation without the need for large, expensive cranes.
Suitable for use during site construction programme.	Can be put into operation prior to completion of the site build, with the inclusion of a planned maintenance schedule.
Available in 9 different standard sizes and also bespoke.	Provides greater design flexibility and assists the removal of sediments at a greater rate than comparable systems.

SPECIFICATIONS

Aqua-Swirl® Model No.	Maximum ID Pipe Connection (mm) BYP ¹	Chamber Internal Diameter (mm)	Water Quality Treatment Flow Rate OK-110 Coarse (l/s) Model AS- ²	Water Quality Treatment Flow Rate NJDEP Fine (l/s) Model XC-	Oil/ Debris Storage Capacity (litres)	Sediment Storage Capacity (m ³)	Aqua-Swirl® Weight (kg)
AS-2/XC-2	375	750	30	16	136	0.3	300
AS-3/XC-3	500	1050	53	31	416	0.6	700
AS-4/XC-4	600	1200	77	40	644	0.8	1000
AS-5/XC-5	750	1500	120	63	1382	1.3	1100
AS-6/XC-6	900	1800	173	91	1439	1.8	1400
AS-7/XC-7	1050	2100	235	123	1987	2.5	1700
AS-8/XC-8	1200	2400	307	161	2612	3.3	2200
AS-9/XC-9	1350	2800	418	220	3596	4.4	2600
AS-10/XC-10	1500	3000	480	252	4164	5.1	3100

¹ BYP (Internal Bypass) provides full treatment of the first flush of water while the peak design storm is diverted and channelled through the main conveyance pipe.
² Based on the Tennessee Tech University 'Laboratory Evaluation of TSS Removal Efficiency for the Aqua-Swirl® Concentrator Stormwater Treatment System'.

Notes:

Details of pollution mitigation indices, head loss and CAD details, standard drawings and Installation Guides available upon request.

The sediment storage capacity has been calculated in accordance with the relevant test protocol and is not a physical maximum; any additional sediment capacity required is achieved with bespoke deeper units.

For assistance in design and specific sizing using historical rainfall data, please contact SDS.

A-S DS/0822