

New lane, Stanbridge Road

Havant

Flood Risk Assessment & Drainage Strategy Report

Project Ref: **13383**

Report Ref: **R100**

Draft

August 2022

Client

Hellier Langston

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REPORT STATUS

Client	Hellier Langston
Report Title	New Lane, Stanbridge Road, Havant
Report Type	Flood Risk Assessment & Outline Drainage Strategy
Report Number	R100
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Revision	Revised by	Approved by	Revised Date
-Draft-	AB	NSB	August 2022

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1 Introduction

- 1.01 Baynham Meikle Partnership Limited has been commissioned by XXXXX to prepare a Flood Risk Assessment and Drainage Strategy to support the full planning application for a new development on the site off of New Lane, Havant.
- 1.02 The Flood Risk Assessment will be part of a Full planning application to be made to Havant Council.
- 1.03 The proposed development is for a planning application comprising the construction of commercial units with associated yards, car parking and landscaping.
- 1.04 The development lies entirely within Flood Zone 1 where there is a low probability of fluvial flooding occurring. New Lane Road, running parallel to the sites north west boundary is identified within Flood Zone 2.
A product 4 information pack has been requested from the EA, once received this report will be updated to suit.
- 1.05 This Flood Risk Assessment follows government and local guidance on development and flood risk (National Planning Policy Framework NPPF¹) and is undertaken in consultation with the relevant bodies.
- 1.06 It is a requirement for development applications to consider the potential risk of flooding to the proposed development over its expected lifetime and any possible impacts on flood risk elsewhere in terms of its effects on flood flows and run off.
- 1.07 The following aspects of flood risk should be addressed in all planning applications in flood risk areas:
 - The area liable to flooding.
 - The probability of flooding occurring now and over time.
 - The extent and standard of existing flood defences and their effectiveness over time.
 - The rates of flow likely to be involved.
 - The likelihood of impacts to other areas, properties and habitats.
 - The effects of climate change which currently requires designs to include 1 in 100 - year rainfall events + 40% climate change allowance.
 - The nature and current expected lifetime of the development proposed and the extent to which it is designed to deal with flood risk.

¹ Communities and Local Government, July 2021, National Planning Policy Framework (NPPF)
Project: New lane, Stanbridge Road

2 Site Location and Description

- 2.01 The development site is located off Stanbridge Road, circa 200m west of the railways lines. The Ordnance Survey National Grid reference to the centre of the site is E472576, N107427.
- 2.02 A site location Plan and aerial view can be found in Appendix A.
- 2.03 The site comprises of commercial unit, service yard, carparking and landscaping.
- 2.04 The neighbouring land use is as follows:
- **North** New Lane, beyond which there are residential properties, and Stanbridge Road, with industrial units beyond.
 - **East** New Lane, with residential properties beyond.
 - **South** Commercial Units
 - **West** Commercial unit, with railway line beyond.
- 2.05 The site slopes gradually from the east towards the west from approximately 16.65 mAOD to 15.75 mAOD.
- 2.06 The site is regular in shape and occupies a total area of 0.987Ha.
- 2.07 Access to the site will be via Stanbridge Road.
- 2.08 A Topographical Survey can be found in Appendix B.

3 Development Proposals

3.01 At the time of writing the report the proposals are as follow:

- The construction of a commercial units with associated car parking and landscaping.

3.02 A site plan (HGP Architects – 22.015_HGP_XX_DR_A_02 Rev P2, May 2022) can be found in Appendix C.

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4 Existing Ground Conditions

4.01 Site Geology and Hydrology

- 4.01.1 At the time of writing the report there was no site investigation report available. To understand the sites ground condition, BGS geological online mapping service was used as well as DEFRA's MAGIC Map. A copy of the nearest borehole data and DEFRA's maps is can be found in Appendix D.

4.02 Ground Conditions

4.02.1 Ground Geology

BGS maps have indicated that the sites bedrock geology is London Clay Formation – Clay, silt and sand. The Superficial Deposits have been identified Head – poorly sorted and stratified, angular rock debris - clay and gravel. The MAGIC map has identified the Superficial deposits as Secondary A aquifer. The sites soilscape is identified as freely draining slightly acid loamy soils.

4.02.2 Hydrogeology

Groundwater Vulnerability Map produced by the MAGIC Map indicates that the site is in a Low Aquifer Zone.

The site is also indicated to be located in a Source Protection Zone, Zone I – Subsurface activity.

4.02.3 Soakaway Design

Soakaway tests have not been carried out at the time of writing this report. It is anticipated that the ground conditions are favourable for soakaway drainage. An assumed infiltration rate of 1.35×10^{-5} will be used on the proposed drainage strategy, however, Soakaway tests will need to be carried out at the proposed development to verify infiltration rates on site.

4.02.4 Hydrology (surface water features)

The nearest watercourse is an unnamed watercourse located to the northwest, west and south west of the site, running to the west of New Lane. The unnamed watercourse is an EA Statutory Main River.

The unnamed watercourse is approximately 18m northwest and west of the site.

Bridge Lake is located approximately 2.11km south of the site.

There are no surface water abstractions listed within 250m of the site.

5 Consultation and Policy

5.01 Drainage Authority

5.01.1 The sewerage service for the area is provided by Southern Water. There are existing public storm and foul water sewers within Stanbridge Road and New Lane.

5.01.2 Additional note:

Since 1st October 2011 many private sewers have been transferred into the ownership of the water authority as public sewers, where two or more properties in separate ownership are served by those sewers. Most of these former private sewers will not be shown on the public sewer records, therefore a full site survey should be carried out prior to any layout design or construction works to identify where these sewers may be and to avoid later delays and possible added costs.

5.02 Lead Local Flood Authority

5.02.1 The Lead Local Flood Authority (LLFA) is Hampshire County Council.

5.02.2 East Hampshire District have published a Level 1 Strategic Flood Risk Assessment² which define flooding and drainage requirements.

5.02.3 The purpose of the Level 1 SFRA is to collate and analyse the most up to date flood risk information for use by EHDC to inform the development of the Local Plan, and to inform site-specific flood risk assessments. The SFRA will assess the risks now and in the future from all types of flooding in accordance with the NPPF1 and PPG2. The SFRA will build on existing hydraulic modelling and available information.

5.03 Environment Agency

5.03.1 The Environment Agency (EA) flood mapping data for the site, shows the developable area to be within Flood Risk Zone 1 – with less than 1 in 1000 (0.1%) chance of flooding from rivers in any one year.

EA Flood mapping can be found in Appendix D.

5.04 Applicable Policy

5.04.1 Applicable Planning Policy

Planning Practice Guidance to the National Planning Policy Framework (NPPF) was introduced in March 2014 and was most recently updated in July 2021; it deals specifically with development planning zones. All plans should apply a sequential,

² East Hampshire District Council, Level 1 Strategic Flood Risk Assessment, May 2022.
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risk-based approach to the location of the development – taking into account all sources of flood risk and the current and future impacts of climate change – so as to avoid, where possible, flood risk to people and property.

The aim of the sequential test is to steer new developments to areas with the lowest risk of flooding from any source. Development should not be allocated or permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower risk of flooding.

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6 Flood Risk

6.01 In line with the latest NPPF guidance an appraisal was made of the site and surrounding areas to assess the potential risk of flooding at the site from the various sources:

6.01.1 Sea (Tidal) and River (Fluvial) – The site is not located in the vicinity of the coast, and is therefore not at risk of flooding due to Tidal Flows. There's an EA main river to the north west of the site that is indicated to be a source of flooding. A product 4 data has been requested from the EA and this report will be updated to suit the findings.

6.01.2 Surface (Pluvial) – Flood Map Data indicate that the site is in Flood Zone 1 – Low probability of flooding. The buildings ground floor levels will be set 150mm above surrounding ground levels.

6.01.3 Sewers –there has not been any historical risk of flooding from sewers located in the vicinity of the site. The proposed drainage will be designed in accordance with best practice and industry guidance; there will be negligible risk of flooding from sewers.

6.01.4 Groundwater – the BGS data indicates the site does lie within a ground water Source Protection Zone, Zone I – Subsurface activity.

6.01.5 Artificial Sources – There are no major artificial water sources such as canals, reservoirs or water tanks within the vicinity of the site, and therefore there is no flood risk due to artificial sources.

Table 4 – Flood Risk Assessment Summary

Aspects of Flood Risk	Assessment/Comment
Area liable to flooding	The development site lies almost entirely within Flood Zone 1 of the Environment Agency Flood Zone Map.
Probability of flooding occurring	Flooding from surface water at the site will be considered during the level and drainage design.
Standard of existing flood defences and their effectiveness	N/A
Likely depth of flooding	N/A
Rates of flow likely to be involved	N/A
Likelihood of impacts to other areas, properties and habitats	Any increase in the surface area, SUDS will be used for surface water management.
Effects of climate	The effects of climate change on flooding at the site are likely to be limited, due to the use of SuDS techniques and the system will be designed for 1 in 100 year storm event plus 40% climate change.

6.02 Sequential Test

6.02.1 The Sequential Test is intended to take into account all sources of flood risk and the current and future impacts of climate change, to avoid flood risk to people and property.

6.02.2 As the development extents of the site are within Flood Zone 1 and is in the Less Vulnerable category, the development can be considered appropriate for the proposed use, and therefore passes the Sequential Test.

6.03 Exception Test

6.03.1 The Exception Test is not required as the site is located within Flood Zone 1 and passes the Sequential Test.

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7 Sustainable Drainage Proposals

7.01 Storm Water Management and SuDS

7.01.1 Sustainable Drainage Systems (SuDS) involve the management of storm water from developments effectively in order to reduce the impact of run-off both to the site in question and properties downstream, and not to exacerbate existing problems. This is achieved by not increasing peak flows that will otherwise result from the development. The philosophy of SuDS is to mimic as closely as possible, the natural drainage from a site before development, and to ensure that storm water runoff is treated so there is no detriment to water quality of the receiving watercourse.

Using SuDS may provide water quantity and quality control, as well as increased amenity value. Appropriately designed and maintained schemes may improve the sustainable water management at the site by:

- Reducing peak flows to watercourses or sewers and potentially reducing the risk of flooding downstream.
- Reducing the volume, rate of discharge, and the frequency of water flowing directly to watercourses or sewers from the developed sites.
- Improving water quality compared with conventional surface water sewers by removing pollutants.

7.01.2 The following section represents the considered views on suitable SuDS options appropriate to this site both as part of the detailed infrastructure scheme and outline illustrative masterplan. CIRIA C753³ The SuDS Manual was consulted to examine the use of SuDS on this site. Conclusions are based on the assessment of the site and the evaluation of the relevant design requirements and regulatory consultation.

7.02 Potential SuDS Techniques Considered for this Site

7.02.1 Green Roofs

Green roofs comprise a multi-layered system that covers the roof of a building or podium structure with vegetation cover, over a drainage layer. They are designed to intercept and retain precipitation, reducing the volume of run-off and attenuating peak flows.

Cost to the structure can be considerable and poor maintenance will leave it looking unsightly.

Not recommended

³ CIRIA, 2016. The SuDS Manual C753
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7.02.2 Soakaways

Soakaways are square or circular excavations either filled with rubble or lined with brickwork, precast concrete or polyethylene rings/perforated storage structures surrounded by granular backfill. They can be grouped and linked together to drain large areas including highways. The supporting structure and backfill can be substituted by modular geocellular units. Soakaways provide storm water attenuation, storm water treatment and groundwater recharge.

Soakaway tests have not been carried out at the time of writing this report. Due to the anticipated ground conditions, it is likely soakaways will be implemented on site. We have therefore assumed infiltration rates of 1.35×10^{-5} for design purposes at this stage. Upon receipt of the ground investigation report and soakaway testing results, the drainage strategy will be reviewed and amended accordingly.

Recommended pending Soakaway testing and Ground Investigation.

7.02.3 Swales

Swales are linear vegetated drainage features in which surface water can be stored or conveyed. They can be designed to allow infiltration, where appropriate. They should promote low flow velocities to allow much of the suspended particulate load in the storm water runoff to settle out, thus providing effective pollutant removal. Roadside swales can replace conventional gullies and drainage pipes.

Due to insufficient space on site, swales have not been incorporated into the landscape design.

Not Recommended.

7.02.4 Pervious Pavements

Pervious pavements provide a pavement suitable for pedestrian and/or vehicular traffic, while allowing rainwater to infiltrate through the surface and into the underlying layers. The water is temporarily stored between infiltration to the ground, reuse or discharge to a watercourse or other drainage system. Pavements with aggregate sub-bases can provide good water quality treatment.

Recommended and proposed for the site.

7.02.5 Geo-cellular/Modular Systems

Modular plastic geo-cellular systems with a high void ratio that can be used to create a below ground storage structure.

Modular tanks can be used for runoff attenuation but requires silt trap protection and a suitable means of access for cleaning and inspection.

Recommended and proposed for the site.

7.02.6 Ponds/Infiltration Basin

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Ponds can provide both storm water attenuation and treatment. They are designed to support emergent and submerged aquatic vegetation along their shoreline. Run off from each rain event is detained and treated in the pool. The retention time promotes removal through sedimentation and the opportunity for biological uptake mechanisms to reduce nutrient concentrations.

Due to insufficient space on site, Ponds/Infiltration basins have not been incorporated into the landscaping design.

Not Recommended.

7.03 Sustainable Drainage Maintenance

7.03.1 The various SuDS features will remain privately owned and be maintained by the Development's Maintenance team. The exact details of this arrangement will be defined with the future development.

7.03.2 The SuDS operation and maintenance strategy will be in accordance with CIRIA C753 best practice, as tabled below:

Table 5 – SuDS Operation and Maintenance Requirements

Routine maintenance	Inspect flow control chamber for evidence of poor operation.	Monthly for 3 months then annually.
	Remove debris from catchment surface.	Monthly
	Remove sediment from catch-pits, flow control sumps, swales and ponds. Remove oil and silt from interceptors.	Annually, or as required by inspection
Remedial actions	Replace malfunctioning flow control parts.	As required
Monitoring	Inspect all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed.	Annually
	Survey and clear main attenuation pond.	Annually
	Survey inside of attenuation tanks for sediment build up and remove if necessary.	Every 5 years or as required by inspection.

8 Drainage Strategy – Surface Water

8.01 Drainage Strategy

8.01.1 In accordance with LLFA guidance, surface water discharge should be via natural means before consideration of discharge to a sewer network. The adjacent stream that runs west from the western site boundary, therefore serves as the ideal source of discharge.

8.02 Proposed Surface Water Runoff Rate

8.02.1 The site consists of a total area of 0.987 Ha of which approximately 88% is to be developed as impermeable at 0.872 Ha.

8.02.2 The existing greenfield contribution for the proposed sites impermeable area:

Discharge area: 0.872 Ha

1 year (l/s): 5.69

30 year (l/s): 15.40

100 year (l/s): 21.35

QBar (l/s): 6.69

8.02.3 The allowable surface water discharge will be based on greenfield run off rates of 6.69 l/s (QBar) for the design event of 100 - year return period + 40% climate change.

8.03 Attenuation Volume

8.03.1 Using hydraulic modelling software, the estimated total required attenuation for the total development in the 100 year + 40% storm event is 590.5m³ based on 6.69l/s discharge rate.

8.03.2 This attenuation is provided via underground cellular storage and permeable paving.

8.03.3 Storage of water on the surface in contained and safe locations is permitted in localised areas for events in excess of the 30 year storm scenario. These exceedance flows are directed towards landscaped areas in extreme events.

8.03.4 A SuDS treatment train has been included in the proposed drainage strategy. Yards and parking areas will be drained via full retention interceptors prior to final discharge and where this is not practical due to the layout of the site, permeable paving will be utilised.

8.04 Hydraulic Calculations

8.04.1 BMP have prepared a surface water strategy drawing see Appendix E.

8.04.2 Using Causeway Flow for Hydraulic modelling, BMP have produced surface water calculations which can be found in Appendix F.

8.04.3 The hydraulic modelling of the proposed network has indicated no flooding for the proposed developments drainage system.

A summary of the modelling results is as follows:

1 in 1-year return period: no surcharging, no flooding

1 in 30-year return period: no surcharging, no flooding

1 in 100-year + 40% climate change: surcharging and potential flood risk for the 480-minute critical storm duration.

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9 Drainage Strategy – Foul Water

- 9.01 The proposed foul drainage strategy is to discharge into Southern Waters public sewer located on Stanbridge Road.
- 9.02 BMP have prepared a foul water strategy drawing which can be found in Appendix E.

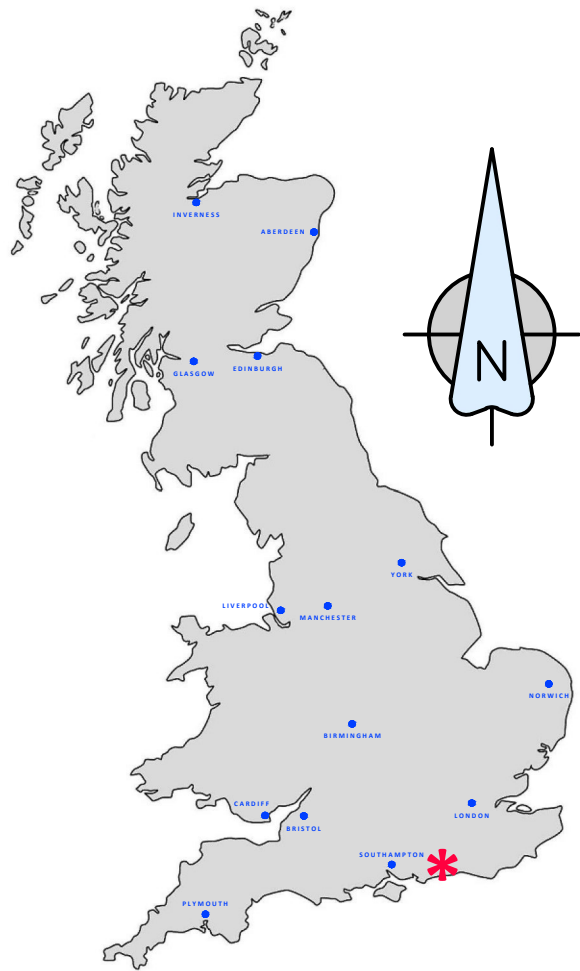
DRAFT

10 Conclusion

- 10.01 BMP was commissioned by Hellier Langston to prepare a Flood Risk Assessment for the Full planning application for the new development site off of New Lane, Havant.
- 10.02 The new development will be submitted for a full planning application comprising the construction of commercial units with associated yards, car parking and landscaping.
- 10.03 Foul water will discharge into Southern Waters existing Foul sewer in Stanbridge Road.
- 10.04 Surface water will be designed to cater for storm events up to 1 in 100 plus 40% climate change. The site is proposed to soakaway at an assumed infiltration rate of 1.35×10^{-5} . Some storage of exceedance flows at the surface in events in excess of the 30 - year event is considered providing they are safely contained within the site.
- 10.05 The use of sustainable drainage systems (SuDS) has been considered and can be incorporated within the design. Surface water discharge will be attenuated on site via underground cellular tanks and permeable paving.
- 10.06 The development is classified as Less Vulnerable usage; the area of the site to be developed is in Flood Zone 1 and meets the Sequential Test. The Exception Test is not therefore required.
- 10.07 The site does not pose any increased flood risk to the site itself or adjacent developments and is not susceptible to flooding by other techniques.
- 10.08 This report has been prepared to meet the requirements of National Planning Policy Framework (NPPF) for a site not at risk from flooding.
- 10.09 The hydraulic modelling indicates no flooding in the 1 in 1-year storm event, no flooding in the 1 in 30-year storm event and potential flood risk in the 1 in 100-year, 480-minute winter storm events.

Appendix A – Site Location Plan

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SITE DETAILS		
Address:	New Lane, Stanbridge Road	
Nearest Postcode:	PO9 2JL	
Grid Co-Ordinates:	E: 472561	N: 107451

FOR INFORMATION

—	20/07/2022	FIRST ISSUE.	AB	AB
Rev	Date	Description	By	Chkd

Revision Schedule				
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Project Title	NEW LANE, STANBRIDGE ROAD HAVANT
Drawing Title	SITE LOCATION PLAN

Drawn by AB	Checked by AB	Project Engineer NSB
Date JULY 2022		Scale @ A3 NTS
Project No. 13383	Drawing No. 100	Rev —

Appendix B – Topographical Survey

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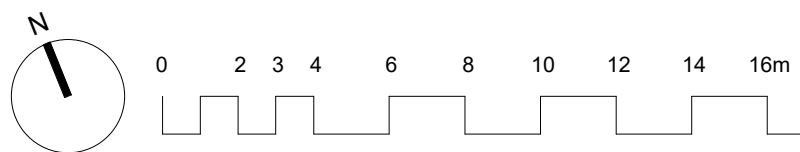
Appendix C – Development Proposals

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PARKING STANDARDS

Total - 100

Parking based on Havant Borough Council standards - 1 space per 45m²



P2	Layout amended to increase loading areas. Units 2 & 3 increased in size	01.06.22	UM	CJC
P1	First Issue, for Review	27.05.22	SL	LM
Rev.	Description	DATE	DB	CB

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Appendix D – EA Flood Maps/ BGS Maps/ Existing Borehole Logs

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Flood map for planning

Your reference
New Lane

Location (easting/northing)
472567/107443

Created
21 Jul 2022 9:47

Your selected location is in flood zone 1, an area with a low probability of flooding.

You will need to do a flood risk assessment if your site is **any of the following:**

- bigger than 1 hectare (ha)
- In an area with critical drainage problems as notified by the Environment Agency
- identified as being at increased flood risk in future by the local authority's strategic flood risk assessment
- at risk from other sources of flooding (such as surface water or reservoirs) and its development would increase the vulnerability of its use (such as constructing an office on an undeveloped site or converting a shop to a dwelling)

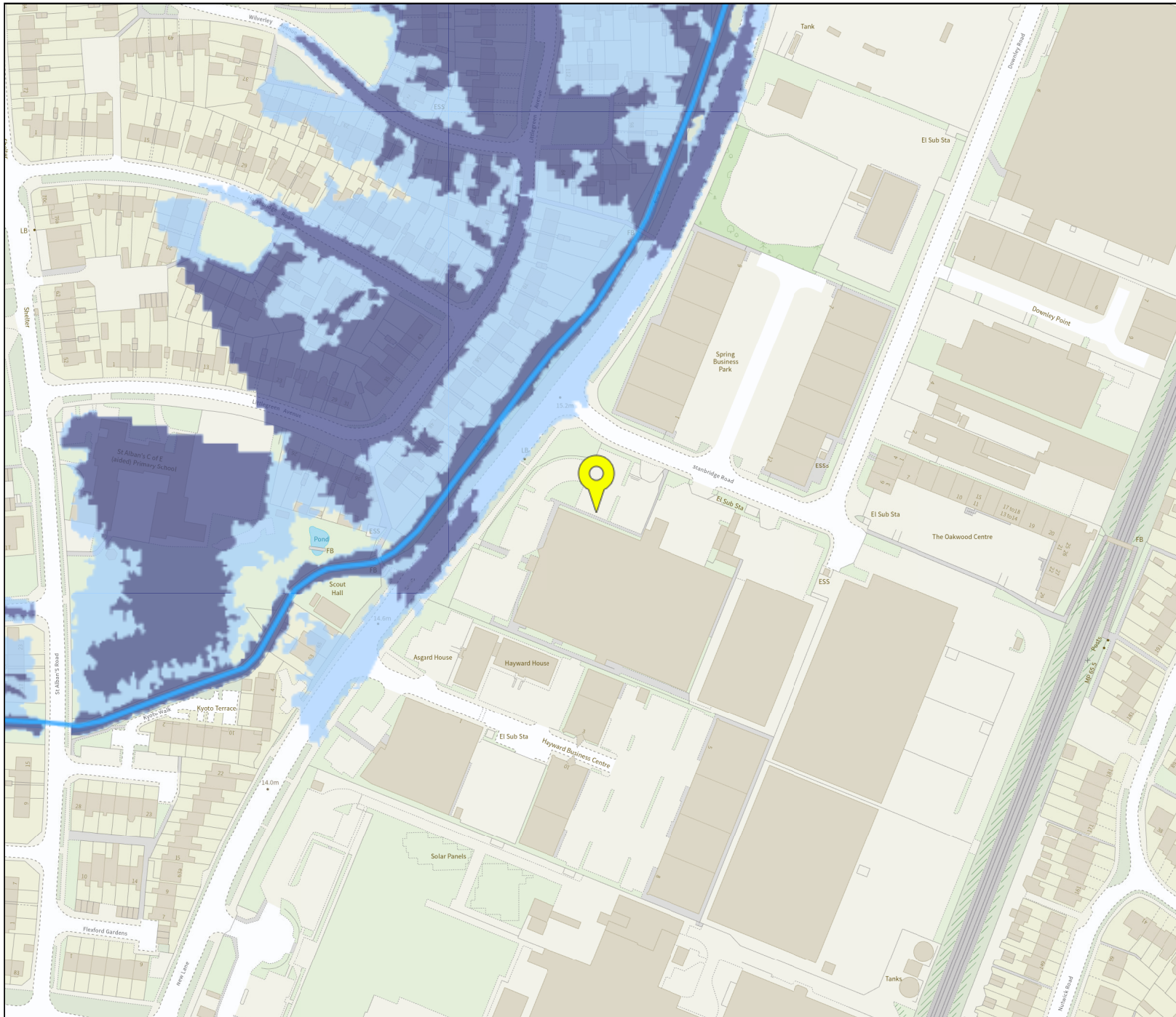
Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

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

Use of the address and mapping data is subject to Ordnance Survey public viewing terms under Crown copyright and database rights 2021 OS 100024198. <https://flood-map-for-planning.service.gov.uk/os-terms>



Flood map for planning

Your reference

New Lane

Location (easting/northing)

472567/107443

Scale

1:2500

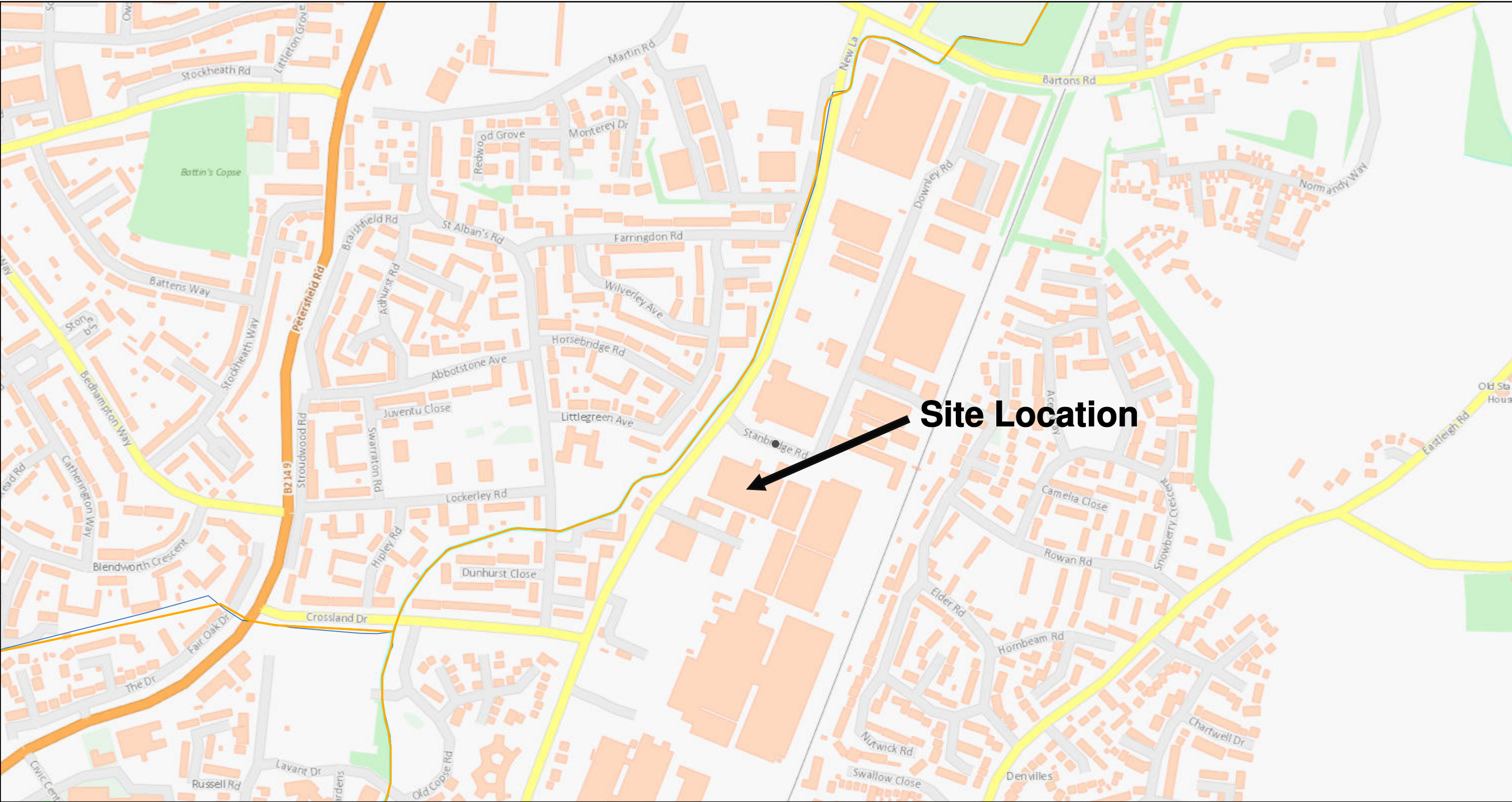
Created

21 Jul 2022 9:47

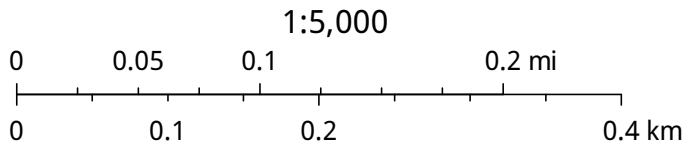
-  Selected point
-  Flood zone 3
-  Flood zone 3: areas benefiting from flood defences
-  Flood zone 2
-  Flood zone 1
-  Flood defence
-  Main river
-  Water storage area


0 20 40 60m

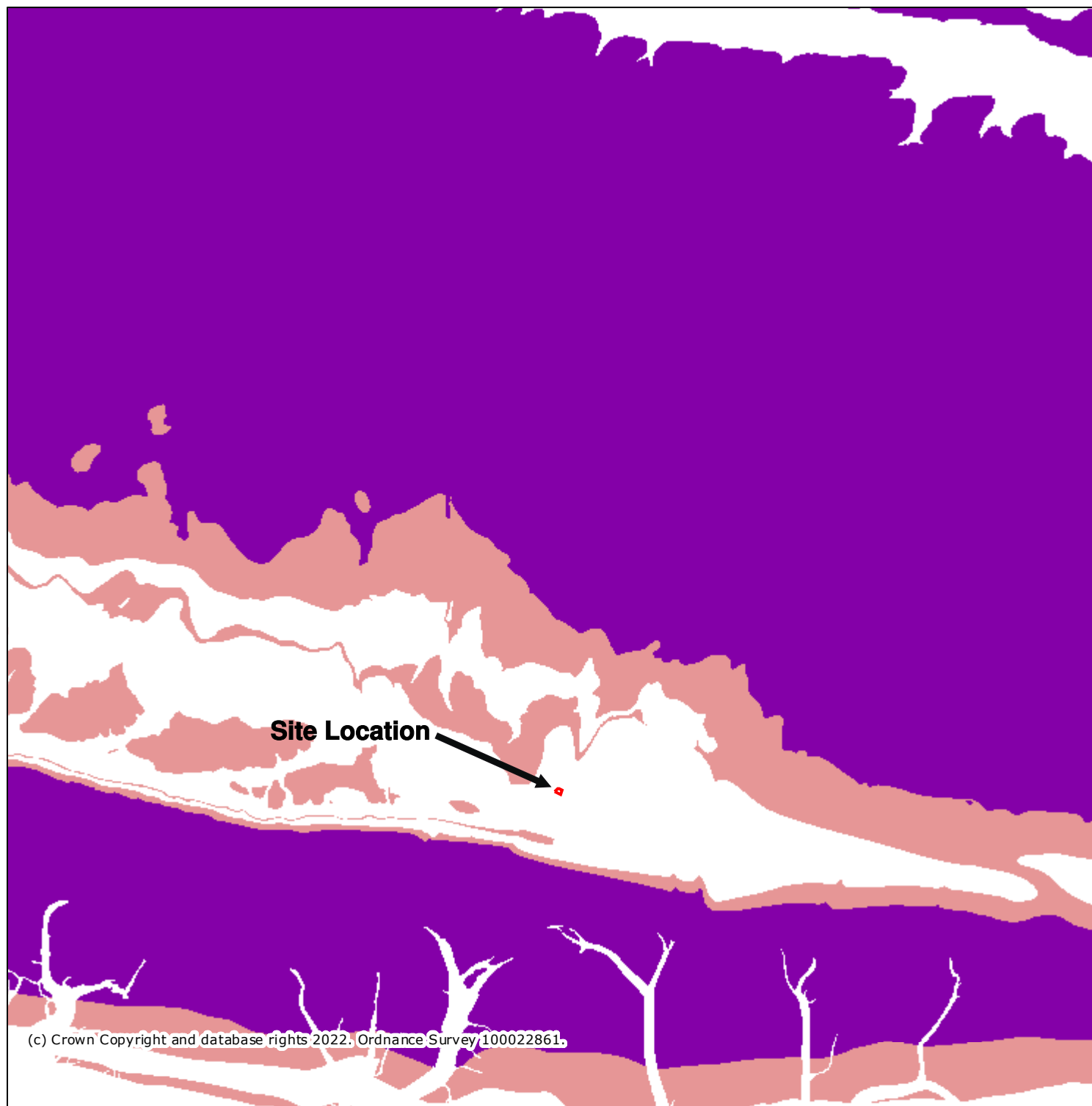
Main River Map: Rationalising Main River Network



7/21/2022, 9:56:45 AM
Statutory_Main_River_Map_Variations_2022
— Appeals
— Statutory Main River Map



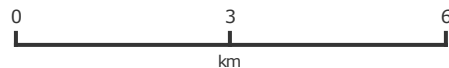
Contains OS data ° Crown Copyright and database right 2020



Legend

Aquifer Designation Map (Bedrock) (England)

- Principal
- Secondary A
- Secondary B
- Secondary (undifferentiated)
- Unproductive



Projection = OSGB36

xmin = 445800

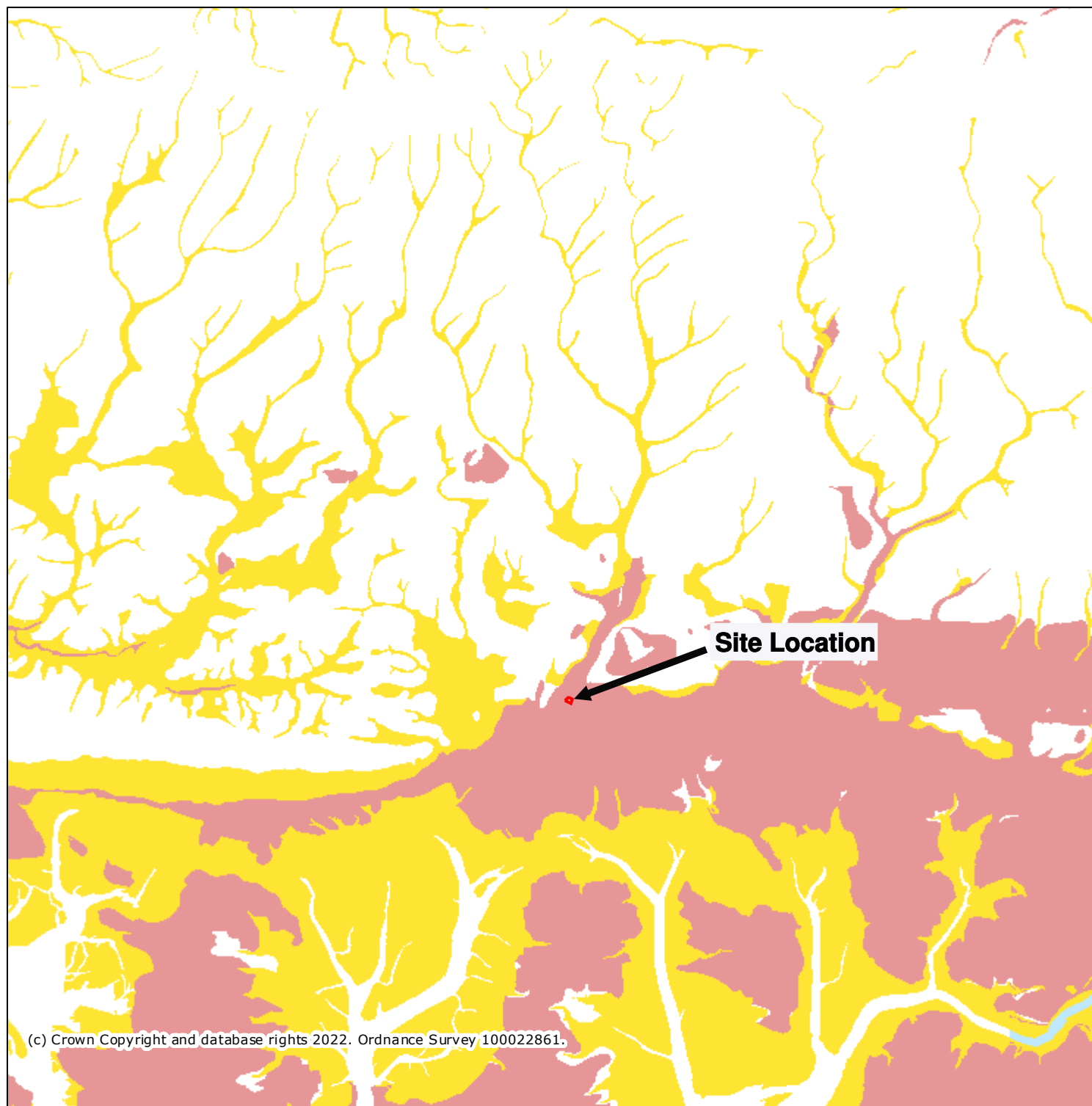
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xmax = 499100

ymax = 126600

Map produced by MAGiC on 21 July, 2022.

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Legend

Aquifer Designation Map (Superficial Drift) (England)

- Principal
- Secondary A
- Secondary B
- Secondary (undifferentiated)
- Unknown (lakes+landslip)
- Unproductive



Projection = OSGB36

xmin = 445600

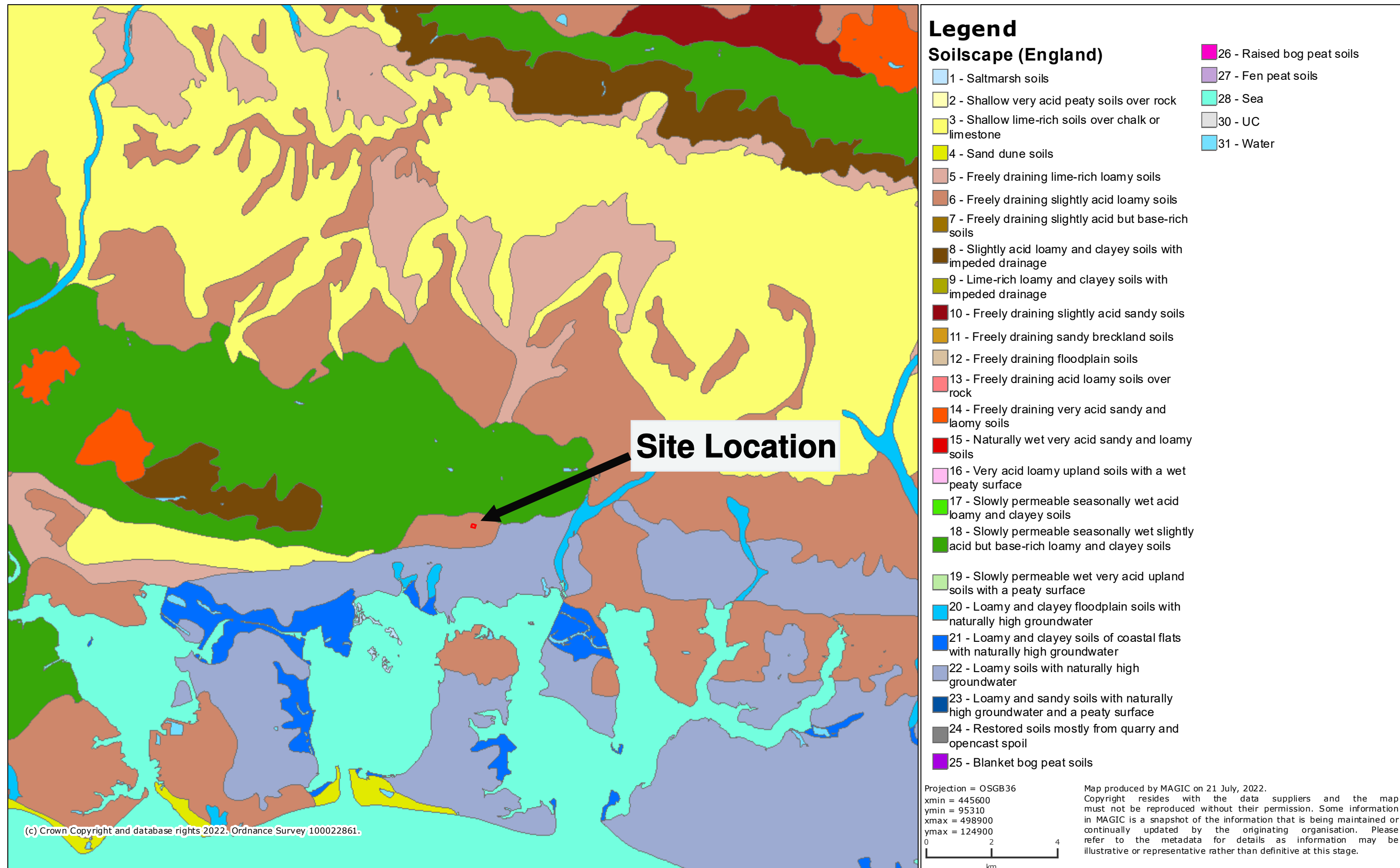
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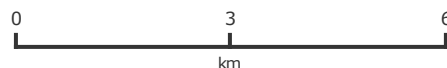
MAGiC groundwater Vulnerability Map



Legend

Groundwater Vulnerability Map (England)

-  Local Information
-  Soluble Rock Risk
-  High
-  Medium - High
-  Medium
-  Medium - Low
-  Low
-  Unproductive



Projection = OSGB36

xmin = 445600

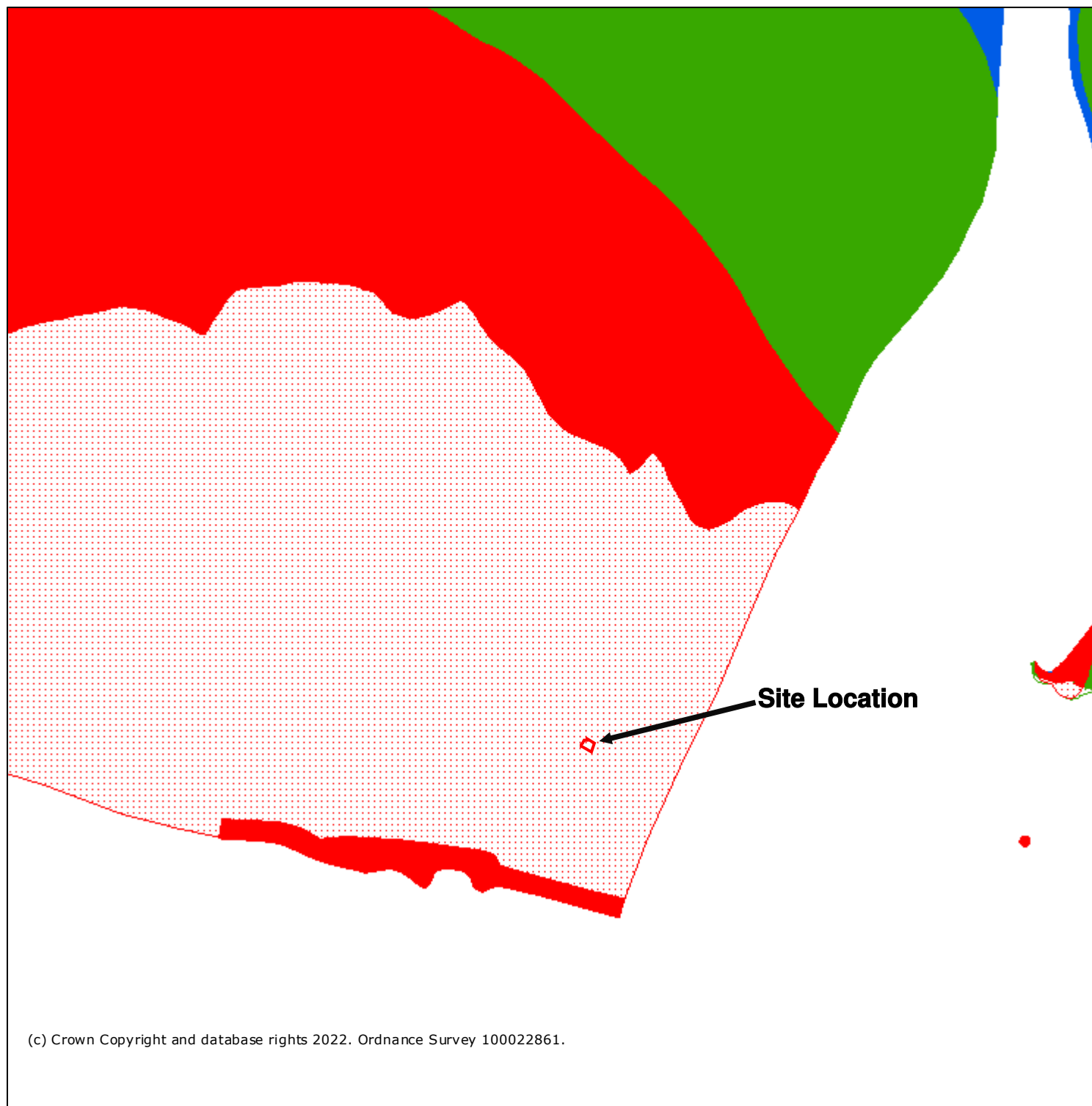
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ymax = 124900

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Legend

Source Protection Zones merged (England)

- Zone I - Inner Protection Zone
- Zone I - Subsurface Activity
- Zone II - Outer Protection Zone
- Zone II - Subsurface Activity
- Zone III - Total Catchment
- Zone III - Subsurface Activity
- Zone of Special Interest



Projection = OSGB36

xmin = 458900

ymin = 101800

xmax = 485600

ymax = 116600

Map produced by MAGiC on 21 July, 2022.

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S070NW/130

FIG. 1.

7239 '0687

BOREHOLE LOG

LOCATION S. 1. 4. 1. HAVANT, HANTS.

CARRIED OUT FOR Messrs. Malcolm Peck, Roberts & Associates.

BOREHOLE No. 1.

DIAMETER: 6in.

GROUND LEVEL: ca +12m

DATE: 27th-29th Nov. 1981.

DESCRIPTION OF STRATA	Sample	LEGEND	DEPTH	THICK- NESS	STANDARD PENETRATION T.S.G. NO. OF BLO S.
GRAY TOPSOIL.			G.L.	300m	
			1'0"	1'0"	
Earthy SILT with angular GRAVEL.	1		9'50	2'5"	250 BE
			3'6"		
MODERATELY COMPACT mixed GRAVEL in creamy sandy SILTY CHALK matrix.	2		1-9'50	3'0"	400
			6'6"		
	3				
	5			3-000M	
COMPACT medium to coarse GRAVEL and yellow brown sand, clayey at the top and base.	4			10'0"	50
	6				400 100 I (3 1/2" penetration)
	7		4'50		35
Yellow fine SAND.	8		15'6"	10'5"	150
	9		17'0"		12
			51-00		25(LC)
MODERATELY COMPACT grey SILT with SOFT CLAY pockets.	10			4'5"	450
			21'5"	penetrated.	
			6-450M		
			END OF BOREHOLE.		R.T.W. 20.10.82

Note:

GROUND WATER encountered at 7ft. 6in. below G.L.

Final WATER level 10ft. 6in. below G.L. on completion of borehole.

SU 70 NW/7A

C. 721.068

Boring method		Shell and Auger		Location		SU 721 068		Record of		BOREHOLE 1	
Boring diameter (mm)		150 to 10.20m						(sheet 1 of 2)			
Casing diameter (mm)		150 to 10.20m		Orientation				Ground level (m.O.D.)		10.75	
Boring equipment		Pileon Wayfarer 20						Date commenced		16.8.74	

Samples and in situ tests		Casing Depth (m)	Water Depth (m)			Date and Depth (m)	DESCRIPTION OF STRATA	O.D. Level (m.O.D.)	Legend
Depth (m)	Type								
0.10	D	NIL				0.10	TARMACADAM	10.65	
0.40	D					0.40	Brown fine to coarse GRAVEL with clay binder	10.35	
0.50	U								
0.95	D								
1.50	C19	1.50					Firm brown sandy silty CLAY with large FLINTS		
1.50	BD								
2.80	D	3.00				2.80	Soft to firm grey-brown sandy CLAY	7.95	
3.05	U								
3.50	SL1								
3.50	D								
3.50	D	3.60*				3.30	Medium dense grey silty fine to medium SAND	7.45	
3.70	D								
4.10	U	4.10							
4.30	W								
4.55	D								
5.60	U	5.50					Stiff to very stiff fissured dark brown silty CLAY		
6.05	D								
7.20	U	7.20							
7.65	D								
8.70	U	8.50							
9.15	D								
9.20	C67								
9.20	BD								
		5.60	4.30			9.20	Very dense grey fine to coarse SAND and GRAVEL	1.55	

REMARKS									
For explanation of symbols and abbreviations see Notes, pages (i) and (ii)									

LAB Ref. No.	HAVANT - ATE EXTENSION		Fig. 1
S/ 10783			

Appendix E – Drainage Plan

DRAFT

Appendix F – Hydraulic Calculations

DRAFT

Drainage Design Report

Flow

v10.1

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Network	Storm Network
Filename	13383 - Storm Drainage.pfd
Username	Alla Bolton (alla.bolton@bm-p.co.uk)
Last analysed	24/08/2022 08:27:52
Report produced on	24/08/2022 08:30:37

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Rainfall Methodology	FSR
Return Period (years)	2
Additional Flow (%)	0
FSR Region	England and Wales
M5-60 (mm)	20.000
Ratio-R	0.400
CV	0.750
Time of Entry (mins)	5.00
Maximum Time of Concentration (mins)	30.00
Maximum Rainfall (mm/hr)	50.0
Minimum Velocity (m/s)	1.00
Connection Type	Level Soffits
Minimum Backdrop Height (m)	0.200
Preferred Cover Depth (m)	1.200
Include Intermediate Ground	Yes
Enforce best practice design rules	Yes

	Name	Area (ha)	T of E (mins)	Add Inflow (l/s)	Cover Level (m)	Node Type	Manhole Type	Diameter (mm)	Width (mm)	Sump (m)	Easting (m)	Northing (m)	Depth (m)	Notes
	S1	0.032	5.00		16.310	Manhole	Adoptable	1050			472607.415	107358.921	1.010	
	S2	0.032	5.00		16.400	Manhole	Adoptable	1050			472631.034	107418.359	1.329	
	S3	0.032	5.00		16.370	Manhole	Adoptable	1050			472619.951	107422.950	1.342	
	S4	0.032	5.00		16.350	Manhole	Adoptable	1050			472628.595	107445.076	1.407	
	S5	0.032	5.00		16.460	Manhole	Adoptable	1050			472608.339	107453.363	1.595	
	S6	0.032	5.00		16.470	Manhole	Adoptable	1200			472604.746	107444.583	2.020	
	S7	0.073	5.00		16.020	Manhole	Adoptable	1200			472554.755	107388.375	1.310	
	S8	0.073	5.00		16.020	Manhole	Adoptable	1200			472563.511	107409.828	1.393	
	S9	0.073	5.00		16.020	Manhole	Adoptable	1200			472566.412	107416.937	1.366	
	S10	0.073	5.00		16.040	Manhole	Adoptable	1200			472569.522	107424.643	1.456	
	S11	0.073	5.00		16.040	Manhole	Adoptable	1200			472573.501	107434.741	1.636	
	S12	0.073	5.00		16.040	Manhole	Adoptable	1200			472582.112	107456.669	1.243	
	S13	0.021	5.00		16.340	Manhole	Adoptable	1050			472530.750	107388.918	1.040	
	S14	0.019	5.00		16.480	Manhole	Adoptable	1050			472538.340	107407.397	1.252	
	S15	0.011	5.00		16.480	Manhole	Adoptable	1050			472547.258	107429.921	1.338	
	S16	0.011	5.00		16.490	Manhole	Adoptable	1050			472553.163	107445.449	1.408	
	S17	0.021	5.00		16.210	Manhole	Adoptable	1050			472502.607	107400.905	0.910	
	S18	0.021	5.00		16.230	Manhole	Adoptable	1050			472510.787	107421.013	1.008	
	S19	0.020	5.00		16.260	Manhole	Adoptable	1050			472514.761	107419.504	1.053	
	S20	0.020	5.00		16.070	Manhole	Adoptable	1050			472523.680	107441.398	1.465	
	S21	0.011	5.00		16.330	Manhole	Adoptable	1050			472534.335	107453.013	1.830	
	S22	0.011	5.00		16.320	Manhole	Adoptable	1050			472537.732	107461.313	1.880	
	S23				16.100	Manhole	Adoptable	1200			472550.912	107464.780	1.750	
	S24	0.032	5.00		16.230	Manhole	Adoptable	1200			472575.339	107370.896	1.497	
	S25	0.032	5.00		16.480	Manhole	Adoptable	1200			472592.465	107413.174	1.910	
	S26				16.130	Manhole	Adoptable	1200			472565.975	107437.825	1.780	
	SA1				16.240	Junction		1200			472598.591	107446.984	3.110	
	SA2				16.160	Junction		1200			472564.859	107438.268	3.000	
	SA3				16.010	Junction		1200			472566.101	107408.800	3.000	
	SA4				16.160	Manhole	Adoptable	1200			472552.796	107464.002	3.000	

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)	US Node	Dia (mm)	Width (mm)	Sump (m)	Node Type	MH Type	DS Node	Dia (mm)	Width (mm)	Sump (m)	Node Type	MH Type
1.000	63.959	279.3	375	Circular	16.310	15.300	0.635	16.400	15.071	0.954	S1	1050			Manhole	Adoptable	S2	1050			Manhole	Adoptable
1.001	11.996	279.0	375	Circular	16.400	15.071	0.954	16.370	15.028	0.967	S2	1050			Manhole	Adoptable	S3	1050			Manhole	Adoptable
1.002	23.755	279.5	375	Circular	16.370	15.028	0.967	16.350	14.943	1.032	S3	1050			Manhole	Adoptable	S4	1050			Manhole	Adoptable
1.003	21.886	280.6	375	Circular	16.350	14.943	1.032	16.460	14.865	1.220	S4	1050			Manhole	Adoptable	S5	1050			Manhole	Adoptable
1.004	9.487	22.9	375	Circular	16.460	14.865	1.220	16.470	14.450	1.645	S5	1050			Manhole	Adoptable	S6	1200			Manhole	Adoptable
1.005	6.607	5.0	450	Circular	16.470	14.450	1.570	16.240	13.130	2.660	S6	1200			Manhole	Adoptable	SA1	1200			Junction	
2.000	45.615	279.8	375	Circular	16.230	14.733	1.122	16.480	14.570	1.535	S24	1200			Manhole	Adoptable	S25	1200			Manhole	Adoptable
2.001	33.725	281.0	450	Circular	16.480	14.570	1.460	16.470	14.450	1.570	S25	1200			Manhole	Adoptable	S6	1200			Manhole	Adoptable
3.000	21.708	278.3	375	Circular	16.210	15.300	0.535	16.230	15.222	0.633	S17	1050			Manhole	Adoptable	S18	1050			Manhole	Adoptable
3.001	4.251	283.4	375	Circular	16.230	15.222	0.633	16.260	15.207	0.678	S18	1050			Manhole	Adoptable	S19	1050			Manhole	Adoptable
3.002	23.641	39.3	375	Circular	16.260	15.207	0.678	16.070	14.605	1.090	S19	1050			Manhole	Adoptable	S20	1050			Manhole	Adoptable
3.003	15.762	150.1	375	Circular	16.070	14.605	1.090	16.330	14.500	1.455	S20	1050			Manhole	Adoptable	S21	1050			Manhole	Adoptable
3.004	8.968	149.5	375	Circular	16.330	14.500	1.455	16.320	14.440	1.505	S21	1050			Manhole	Adoptable	S22	1050			Manhole	Adoptable
3.005	13.628	151.4	450	Circular	16.320	14.440	1.430	16.100	14.350	1.300	S22	1050			Manhole	Adoptable	S23	1200			Manhole	Adoptable
3.006	2.038	1.7	450	Circular	16.100	14.350	1.300	16.160	13.160	2.550	S23	1200			Manhole	Adoptable	SA4	1200			Manhole	Adoptable
4.000	19.977	277.5	225	Circular	16.340	15.300	0.815	16.480	15.228	1.027	S13	1050			Manhole	Adoptable	S14	1050			Manhole	Adoptable
4.001	24.225	281.7	225	Circular	16.480	15.228	1.027	16.480	15.142	1.113	S14	1050			Manhole	Adoptable	S15	1050			Manhole	Adoptable
4.002	16.613	276.9	225	Circular	16.480	15.142	1.113	16.490	15.082	1.183	S15	1050			Manhole	Adoptable	S16	1050			Manhole	Adoptable
4.003	14.909	20.4	375	Circular	16.490	15.082	1.033	16.130	14.350	1.405	S16	1050			Manhole	Adoptable	S26	1200			Manhole	Adoptable
5.000	23.171	279.2	375	Circular	16.020	14.710	0.935	16.020	14.627	1.018	S7	1200			Manhole	Adoptable	S8	1200			Manhole	Adoptable
5.001	2.787	1.7	375	Circular	16.020	14.627	1.018	16.010	13.010	2.625	S8	1200			Manhole	Adoptable	SA3	1200			Junction	
6.000	7.678	284.4	450	Circular	16.020	14.654	0.916	16.020	14.627	0.943	S9	1200			Manhole	Adoptable	S8	1200			Manhole	Adoptable
7.000	23.558	59.9	375	Circular	16.040	14.797	0.868	16.040	14.404	1.261	S12	1200			Manhole	Adoptable	S11	1200			Manhole	Adoptable
7.001	8.133	150.6	450	Circular	16.040	14.404	1.186	16.130	14.350	1.330	S11	1200			Manhole	Adoptable	S26	1200			Manhole	Adoptable
7.002	10.000	8.4	450	Circular	16.130	14.350	1.330	16.160	13.160	2.550	S26	1200			Manhole	Adoptable	SA2	1200			Junction	
8.000	10.854	60.3	375	Circular	16.040	14.584	1.081	16.040	14.404	1.261	S10	1200			Manhole	Adoptable	S11	1200			Manhole	Adoptable

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Width (mm)	Sump (m)	Node Type	MH Type		Link	IL (m)	Dia (mm)	Link Type
S1	472607.415	107358.921	16.310	1.010	1050			Manhole	Adoptable					
										0	1.000	15.300	375	Circular
S2	472631.034	107418.359	16.400	1.329	1050			Manhole	Adoptable	1	1.000	15.071	375	Circular
										0	1.001	15.071	375	Circular
S3	472619.951	107422.950	16.370	1.342	1050			Manhole	Adoptable	1	1.001	15.028	375	Circular
										0	1.002	15.028	375	Circular
S4	472628.595	107445.076	16.350	1.407	1050			Manhole	Adoptable	1	1.002	14.943	375	Circular
										0	1.003	14.943	375	Circular
S5	472608.339	107453.363	16.460	1.595	1050			Manhole	Adoptable	1	1.003	14.865	375	Circular
										0	1.004	14.865	375	Circular
S6	472604.746	107444.583	16.470	2.020	1200			Manhole	Adoptable	1	2.001	14.450	450	Circular
										2	1.004	14.450	375	Circular
										0	1.005	14.450	450	Circular
S7	472554.755	107388.375	16.020	1.310	1200			Manhole	Adoptable					
										0	5.000	14.710	375	Circular
S8	472563.511	107409.828	16.020	1.393	1200			Manhole	Adoptable	1	6.000	14.627	450	Circular
										2	5.000	14.627	375	Circular
										0	5.001	14.627	375	Circular

S9	472566.412	107416.937	16.020	1.366	1200		Manhole	Adoptable						
										0	6.000	14.654	450	Circular
S10	472569.522	107424.643	16.040	1.456	1200		Manhole	Adoptable						
										0	8.000	14.584	375	Circular
S11	472573.501	107434.741	16.040	1.636	1200		Manhole	Adoptable	1	8.000	14.404	375	Circular	
									2	7.000	14.404	375	Circular	
									0	7.001	14.404	450	Circular	
S12	472582.112	107456.669	16.040	1.243	1200		Manhole	Adoptable						
										0	7.000	14.797	375	Circular
S13	472530.750	107388.918	16.340	1.040	1050		Manhole	Adoptable						
										0	4.000	15.300	225	Circular
S14	472538.340	107407.397	16.480	1.252	1050		Manhole	Adoptable	1	4.000	15.228	225	Circular	
										0	4.001	15.228	225	Circular
S15	472547.258	107429.921	16.480	1.338	1050		Manhole	Adoptable	1	4.001	15.142	225	Circular	
										0	4.002	15.142	225	Circular
S16	472553.163	107445.449	16.490	1.408	1050		Manhole	Adoptable	1	4.002	15.082	225	Circular	
										0	4.003	15.082	375	Circular
S17	472502.607	107400.905	16.210	0.910	1050		Manhole	Adoptable						

										0	3.000	15.300	375	Circular
S18	472510.787	107421.013	16.230	1.008	1050			Manhole	Adoptable	1	3.000	15.222	375	Circular
										0	3.001	15.222	375	Circular
S19	472514.761	107419.504	16.260	1.053	1050			Manhole	Adoptable	1	3.001	15.207	375	Circular
										0	3.002	15.207	375	Circular
S20	472523.680	107441.398	16.070	1.465	1050			Manhole	Adoptable	1	3.002	14.605	375	Circular
										0	3.003	14.605	375	Circular
S21	472534.335	107453.013	16.330	1.830	1050			Manhole	Adoptable	1	3.003	14.500	375	Circular
										0	3.004	14.500	375	Circular
S22	472537.732	107461.313	16.320	1.880	1050			Manhole	Adoptable	1	3.004	14.440	375	Circular
										0	3.005	14.440	450	Circular
S23	472550.912	107464.780	16.100	1.750	1200			Manhole	Adoptable	1	3.005	14.350	450	Circular
										0	3.006	14.350	450	Circular
S24	472575.339	107370.896	16.230	1.497	1200			Manhole	Adoptable					
										0	2.000	14.733	375	Circular
S25	472592.465	107413.174	16.480	1.910	1200			Manhole	Adoptable	1	2.000	14.570	375	Circular
										0	2.001	14.570	450	Circular
S26	472565.975	107437.825	16.130	1.780	1200			Manhole	Adoptable	1	7.001	14.350	450	Circular
										2	4.003	14.350	375	Circular

									0	7.002	14.350	450	Circular
SA1	472598.591	107446.984	16.240	3.110	1200		Junction		1	1.005	13.130	450	Circular
SA2	472564.859	107438.268	16.160	3.000	1200		Junction		1	7.002	13.160	450	Circular
SA3	472566.101	107408.800	16.010	3.000	1200		Junction		1	5.001	13.010	375	Circular
SA4	472552.796	107464.002	16.160	3.000	1200		Manhole	Adoptable	1	3.006	13.160	450	Circular

Rainfall Methodology	FSR		Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
FSR Region	England and Wales		1	0	0	0
M5-60 (mm)	20.000		30	0	0	0
Ratio-R	0.400		100	40	0	0
Summer CV	0.750					
Winter CV	0.840					
Analysis Speed	Detailed					
Skip Steady State	No					
Drain Down Time (mins)	1440					
Additional Storage (m³/ha)	0.0					
Storm Durations (mins)	15					
	30					
	60					
	120					
	180					
	240					
	360					
	480					
	600					
	720					
	960					
	1440					
Check Discharge Rate(s)	No					
Check Discharge Volume	No					
100 year 360 minute (m³)						

Depth/Area/Inf Area									
Node	Base Inf Coefficient (m/hr)	Side Inf Coefficient (m/hr)	Safety Factor	Porosity	Invert Level (m)	Time to half empty (mins)	Depth (m)	Area (m²)	Inf. Area (m²)
SA1	0.04860	0.04860	2.0	0.30	13.130	961	0.000	207.0	207.0
							2.000	207.0	207.0
							2.001	0.0	207.0
SA2	0.04860	0.04860	2.0	0.30	13.160	982	0.000	252.0	252.0
							2.000	252.0	252.0
							2.001	0.0	252.0
SA3	0.04860	0.04860	2.0	0.30	13.010	982	0.000	207.4	207.4
							2.000	207.4	207.4
							2.001	0.0	207.4
SA4	0.04860	0.04860	2.0	0.30	13.160	982	0.000	147.0	147.0
							2.000	147.0	147.0
							2.001	0.0	147.0

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.98%																
Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status	Link Event (Upstream Depth)	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S1	11	15.348	0.048	4.5	0.0415	0.0000	OK	15 minute winter	1.000	S2	4.3	0.393	0.036	0.7102	
15 minute winter	S2	11	15.141	0.070	8.6	0.0602	0.0000	OK	15 minute winter	1.001	S3	8.2	0.523	0.069	0.1908	
15 minute winter	S3	11	15.110	0.082	12.4	0.0710	0.0000	OK	15 minute winter	1.002	S4	12.3	0.620	0.104	0.4736	
15 minute winter	S4	11	15.039	0.096	16.5	0.0828	0.0000	OK	15 minute winter	1.003	S5	16.4	0.983	0.138	0.3713	
15 minute winter	S5	11	14.927	0.062	20.6	0.0535	0.0000	OK	15 minute winter	1.004	S6	20.5	2.105	0.049	0.0931	
15 minute winter	S6	11	14.496	0.046	33.2	0.0525	0.0000	OK	15 minute winter	1.005	SA1	33.2	3.518	0.023	0.2815	
15 minute winter	S7	10	14.787	0.077	10.3	0.0875	0.0000	OK	15 minute winter	5.000	S8	10.1	0.986	0.085	0.2487	
15 minute winter	S8	10	14.662	0.035	30.7	0.0394	0.0000	OK	15 minute winter	5.001	SA3	30.6	4.788	0.020	0.0886	
15 minute winter	S9	10	14.724	0.070	10.3	0.0790	0.0000	OK	15 minute winter	6.000	S8	10.2	0.999	0.054	0.0814	
15 minute winter	S10	10	14.635	0.051	10.3	0.0572	0.0000	OK	15 minute winter	8.000	S11	10.2	0.596	0.040	0.1933	
15 minute winter	S11	10	14.514	0.110	30.7	0.1241	0.0000	OK	15 minute winter	7.001	S26	30.3	1.514	0.115	0.1675	
15 minute winter	S12	10	14.847	0.050	10.3	0.0570	0.0000	OK	15 minute winter	7.000	S11	10.2	0.594	0.039	0.4191	
15 minute winter	S13	10	15.346	0.046	3.0	0.0400	0.0000	OK	15 minute winter	4.000	S14	2.9	0.393	0.094	0.1496	
15 minute winter	S14	11	15.292	0.064	5.6	0.0551	0.0000	OK	15 minute winter	4.001	S15	5.5	0.531	0.178	0.2500	
15 minute winter	S15	11	15.216	0.074	7.0	0.0644	0.0000	OK	15 minute winter	4.002	S16	7.0	0.932	0.226	0.1286	
15 minute winter	S16	11	15.118	0.036	8.5	0.0310	0.0000	OK	15 minute winter	4.003	S26	8.5	1.103	0.019	0.1166	
15 minute winter	S17	10	15.340	0.040	3.0	0.0347	0.0000	OK	15 minute winter	3.000	S18	2.9	0.358	0.024	0.1780	
15 minute winter	S18	10	15.278	0.056	5.9	0.0481	0.0000	OK	15 minute winter	3.001	S19	5.8	0.691	0.049	0.0357	
15 minute winter	S19	11	15.249	0.042	8.5	0.0363	0.0000	OK	15 minute winter	3.002	S20	8.5	0.847	0.027	0.2428	
15 minute winter	S20	11	14.674	0.069	11.2	0.0597	0.0000	OK	15 minute winter	3.003	S21	11.3	0.755	0.069	0.2365	
15 minute winter	S21	11	14.577	0.077	12.8	0.0664	0.0000	OK	15 minute winter	3.004	S22	12.8	0.765	0.079	0.1506	
15 minute winter	S22	11	14.521	0.081	14.3	0.0701	0.0000	OK	15 minute winter	3.005	S23	14.3	1.408	0.055	0.1527	
15 minute winter	S23	11	14.373	0.023	14.3	0.0264	0.0000	OK	15 minute winter	3.006	SA4	14.3	3.852	0.006	0.0387	
15 minute winter	S24	11	14.781	0.048	4.5	0.0545	0.0000	OK	15 minute winter	2.000	S25	4.3	0.413	0.036	0.4859	
15 minute winter	S25	11	14.636	0.066	8.7	0.0749	0.0000	OK	15 minute winter	2.001	S6	8.5	0.745	0.044	0.3884	
15 minute winter	S26	11	14.406	0.056	38.2	0.0637	0.0000	OK	15 minute winter	7.002	SA2	38.3	3.313	0.034	0.3841	
240 minute winter	SA1	228	13.545	0.415	7.2	25.7835	0.0000	OK	240 minute winter	Infiltration		1.4				
120 minute winter	SA2	118	13.518	0.358	13.1	27.0625	0.0000	OK	120 minute winter	Infiltration		1.7				
120 minute winter	SA3	118	13.348	0.338	10.2	21.0046	0.0000	OK	120 minute winter	Infiltration		1.4				
120 minute winter	SA4	114	13.354	0.194	4.8	8.7866	0.0000	OK	120 minute winter	Infiltration		1.0				

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.98%																
Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status	Link Event (Upstream Depth)	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S1	11	15.375	0.075	11.1	0.0646	0.0000	OK	15 minute winter	1.000	S2	10.6	0.479	0.089	1.4701	
15 minute winter	S2	11	15.191	0.120	21.6	0.1042	0.0000	OK	15 minute winter	1.001	S3	20.9	0.627	0.175	0.4040	
15 minute winter	S3	11	15.166	0.138	31.3	0.1198	0.0000	OK	15 minute winter	1.002	S4	31.3	0.792	0.263	0.9396	
15 minute winter	S4	11	15.096	0.153	41.7	0.1325	0.0000	OK	15 minute winter	1.003	S5	41.7	1.263	0.351	0.7274	
15 minute winter	S5	11	14.967	0.102	52.1	0.0885	0.0000	OK	15 minute winter	1.004	S6	52.1	2.685	0.124	0.1854	
15 minute winter	S6	11	14.522	0.072	83.9	0.0817	0.0000	OK	15 minute winter	1.005	SA1	84.0	3.858	0.058	0.5655	
15 minute winter	S7	10	14.830	0.120	25.3	0.1354	0.0000	OK	15 minute winter	5.000	S8	25.0	1.303	0.210	0.4614	
15 minute winter	S8	10	14.680	0.053	75.5	0.0604	0.0000	OK	15 minute winter	5.001	SA3	75.3	5.616	0.049	0.1652	
15 minute winter	S9	10	14.762	0.108	25.3	0.1225	0.0000	OK	15 minute winter	6.000	S8	25.2	1.305	0.132	0.1530	
15 minute winter	S10	10	14.662	0.078	25.3	0.0885	0.0000	OK	15 minute winter	8.000	S11	25.2	0.773	0.098	0.3626	
15 minute winter	S11	10	14.578	0.174	75.6	0.1973	0.0000	OK	15 minute winter	7.001	S26	74.8	1.956	0.284	0.3182	
15 minute winter	S12	10	14.875	0.078	25.3	0.0882	0.0000	OK	15 minute winter	7.000	S11	25.1	0.771	0.097	0.7863	
15 minute winter	S13	10	15.373	0.073	7.3	0.0631	0.0000	OK	15 minute winter	4.000	S14	7.2	0.485	0.231	0.2961	
15 minute winter	S14	11	15.335	0.107	13.8	0.0925	0.0000	OK	15 minute winter	4.001	S15	13.5	0.680	0.438	0.4797	
15 minute winter	S15	11	15.260	0.118	17.1	0.1021	0.0000	OK	15 minute winter	4.002	S16	17.2	1.229	0.555	0.2367	
15 minute winter	S16	11	15.137	0.055	20.8	0.0474	0.0000	OK	15 minute winter	4.003	S26	20.8	1.450	0.047	0.2174	
15 minute winter	S17	10	15.361	0.061	7.3	0.0532	0.0000	OK	15 minute winter	3.000	S18	7.2	0.468	0.060	0.3340	
15 minute winter	S18	10	15.308	0.086	14.4	0.0745	0.0000	OK	15 minute winter	3.001	S19	14.2	0.904	0.120	0.0671	
15 minute winter	S19	10	15.271	0.064	21.1	0.0557	0.0000	OK	15 minute winter	3.002	S20	20.9	1.060	0.065	0.4749	
15 minute winter	S20	10	14.717	0.112	27.8	0.0971	0.0000	OK	15 minute winter	3.003	S21	27.6	0.920	0.169	0.4727	
15 minute winter	S21	11	14.626	0.126	31.2	0.1088	0.0000	OK	15 minute winter	3.004	S22	31.4	0.965	0.192	0.2919	
15 minute winter	S22	11	14.567	0.127	35.0	0.1098	0.0000	OK	15 minute winter	3.005	S23	35.2	1.815	0.134	0.2885	
15 minute winter	S23	11	14.385	0.035	35.2	0.0401	0.0000	OK	15 minute winter	3.006	SA4	35.2	4.184	0.014	0.1320	
15 minute winter	S24	10	14.808	0.075	11.1	0.0847	0.0000	OK	15 minute winter	2.000	S25	10.7	0.539	0.090	0.9178	
15 minute winter	S25	11	14.673	0.103	21.8	0.1170	0.0000	OK	15 minute winter	2.001	S6	21.5	0.987	0.112	0.7397	
15 minute winter	S26	10	14.437	0.087	94.8	0.0985	0.0000	OK	15 minute winter	7.002	SA2	94.5	3.693	0.084	0.8643	
360 minute winter	SA1	352	14.363	1.233	12.0	76.5385	0.0000	OK	360 minute winter	Infiltration		1.4				
360 minute winter	SA2	352	14.221	1.061	13.4	80.1938	0.0000	OK	360 minute winter	Infiltration		1.7				
240 minute winter	SA3	236	14.009	0.999	14.1	62.1314	0.0000	OK	240 minute winter	Infiltration		1.4				
180 minute winter	SA4	180	13.752	0.592	8.4	26.7662	0.0000	OK	180 minute winter	Infiltration		1.0				

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.98%																
Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status	Link Event (Upstream Depth)	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
480 minute winter	S1	472	16.175	0.875	2.2	0.7576	0.0000	FLOOD RISK	480 minute winter	1.000	S2	2.2	0.325	0.018	7.0545	
480 minute winter	S2	472	16.175	1.104	4.4	0.9562	0.0000	FLOOD RISK	480 minute winter	1.001	S3	4.4	0.449	0.037	1.3231	
480 minute winter	S3	472	16.175	1.147	6.6	0.9935	0.0000	FLOOD RISK	480 minute winter	1.002	S4	6.6	0.520	0.055	2.6201	
480 minute winter	S4	472	16.175	1.232	8.8	1.0671	0.0000	FLOOD RISK	480 minute winter	1.003	S5	8.8	0.843	0.074	2.4140	
480 minute winter	S5	472	16.175	1.310	11.0	1.1345	0.0000	FLOOD RISK	480 minute winter	1.004	S6	11.0	1.777	0.026	1.0464	
480 minute winter	S6	472	16.175	1.725	28.0	1.9508	0.0000	FLOOD RISK	480 minute winter	1.005	SA1	41.9	2.067	0.029	1.0468	
480 minute winter	S7	472	15.780	1.070	5.0	1.2099	0.0000	FLOOD RISK	480 minute winter	5.000	S8	5.0	0.793	0.042	2.5557	
480 minute winter	S8	472	15.780	1.153	26.5	1.3036	0.0000	FLOOD RISK	480 minute winter	5.001	SA3	15.0	2.779	0.010	0.3074	
480 minute winter	S9	472	15.780	1.126	5.0	1.2730	0.0000	FLOOD RISK	480 minute winter	6.000	S8	9.6	0.795	0.050	1.2165	
480 minute winter	S10	472	15.798	1.214	5.0	1.3733	0.0000	FLOOD RISK	480 minute winter	8.000	S11	5.0	0.480	0.019	1.1972	
480 minute winter	S11	472	15.798	1.394	15.0	1.5770	0.0000	FLOOD RISK	480 minute winter	7.001	S26	15.7	1.232	0.060	1.2886	
480 minute winter	S12	472	15.798	1.001	5.0	1.1325	0.0000	FLOOD RISK	480 minute winter	7.000	S11	5.0	0.480	0.019	2.5984	
480 minute winter	S13	472	15.798	0.498	1.4	0.4309	0.0000	SURCHARGED	480 minute winter	4.000	S14	1.4	0.311	0.045	0.7945	
480 minute winter	S14	472	15.798	0.570	2.7	0.4933	0.0000	SURCHARGED	480 minute winter	4.001	S15	2.7	0.430	0.088	0.9635	
480 minute winter	S15	472	15.798	0.656	3.4	0.5678	0.0000	SURCHARGED	480 minute winter	4.002	S16	3.4	0.743	0.110	0.6607	
480 minute winter	S16	472	15.798	0.716	4.1	0.6203	0.0000	SURCHARGED	480 minute winter	4.003	S26	4.1	0.878	0.009	1.6444	
15 minute winter	S17	10	15.382	0.082	13.2	0.0713	0.0000	OK	15 minute winter	3.000	S18	13.0	0.558	0.109	0.5090	
15 minute winter	S18	10	15.338	0.116	26.2	0.1006	0.0000	OK	15 minute winter	3.001	S19	25.9	1.079	0.219	0.1024	
15 minute winter	S19	10	15.294	0.087	38.5	0.0749	0.0000	OK	15 minute winter	3.002	S20	38.2	1.213	0.119	0.7567	
15 minute winter	S20	10	14.765	0.160	50.8	0.1386	0.0000	OK	15 minute winter	3.003	S21	49.9	1.043	0.306	0.7570	
15 minute winter	S21	11	14.678	0.178	56.8	0.1540	0.0000	OK	15 minute winter	3.004	S22	56.9	1.126	0.348	0.4533	
15 minute winter	S22	11	14.613	0.173	63.4	0.1499	0.0000	OK	15 minute winter	3.005	S23	63.7	2.129	0.243	0.4418	
360 minute winter	S23	352	14.412	0.062	8.8	0.0698	0.0000	OK	360 minute winter	3.006	SA4	8.8	2.527	0.004	0.1747	
480 minute winter	S24	472	16.172	1.439	2.2	1.6280	0.0000	FLOOD RISK	480 minute winter	2.000	S25	2.2	0.337	0.018	5.0312	
480 minute winter	S25	472	16.174	1.604	5.5	1.8140	0.0000	SURCHARGED	480 minute winter	2.001	S6	4.4	0.606	0.023	5.3435	
480 minute winter	S26	472	15.798	1.448	19.4	1.6381	0.0000	SURCHARGED	480 minute winter	7.002	SA2	19.1	1.957	0.017	1.5844	
480 minute winter	SA1	472	16.175	3.045	41.9	124.2310	0.0000	OK	480 minute winter	Infiltration		1.4				
480 minute winter	SA2	472	15.798	2.638	19.1	151.2378	0.0000	OK	480 minute winter	Infiltration		1.7				
480 minute winter	SA3	472	15.780	2.770	15.0	124.4711	0.0000	OK	480 minute winter	Infiltration		1.4				
360 minute winter	SA4	352	14.412	1.252	8.8	56.6161	0.0000	OK	360 minute winter	Infiltration		1.0				