BETTS HYDRO
CONSULTING ENGINEERS

OXFORD ROAD
BODICOTE

FLOOD RISK ASSESSMENT AND DRAINAGE MANAGEMENT STRATEGY

For

Hollins Strategic Land,
Suite 4,
1 King Street,
Manchester,
M2 6AW

HSL | HOLLINS STRATEGIC LAND

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BODICOTE

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DRAINAGE MANAGEMENT STRATEGY

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Prepared by:

Megan Berry BSc (Hons)
Graduate Flood Risk Analyst

Checked by:

Dominic Kearney BEng (Hons) MSc PhD
Principal Hydraulic Analyst

Authorised by:

Richard Nicholas BEng (Hons) MBA
Director

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Old Marsh Farm Barns
Welsh Road, Sealand
Flintshire CH5 2LY
Telephone: 01244 289 041
www.betts-associates.co.uk

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EXECUTIVE SUMMARY

This Flood Risk Assessment and Drainage Management Strategy was commissioned by Hollins Strategic Land referred to hereafter as 'the client'. This report has been prepared to support an outline planning application for the construction of a residential development on land adjacent to Oxford Road in Bodicote.

Flood Risk

The site lies solely within Flood Zone 1 based on the Environment Agency Flood Map for Planning and is 2.197ha in size. Residential development is classified as 'more vulnerable' within the Planning Practice Guidance which supports the National Planning Policy Framework. The Planning Practice Guidance confirms that 'more vulnerable' development is appropriate to be located within Flood Zone 1, providing there is no increase in flood risk elsewhere due to the proposals.

This report has reviewed all sources of flood risk both to and resulting from the proposed development site. Consultations with the Environment Agency, Oxfordshire County Council, Cherwell District Council and Thames Water have been undertaken and did not identified any historical incidents of flooding to the site.

The proposals are considered to be at 'very low' flood risk from the majority of flood sources. The nearest watercourse to site is Sor Brook located approximately 1km south of site, the Oxford Canal is also located approximately 1.5km north with the River Cherwell located beyond. The primary flood risk however, is considered to be from 'very low' surface water run-off, which is closely associated with the existing topography on site. The risk associated with surface water flooding will be reduced and sustainably managed post-development, following the implementation of mitigation measures proposed within this assessment.

Drainage Strategy

Due to the relatively low flood risks identified, the principle focus of this assessment is on sustainable management of surface water run-off in accordance with national and local policy. Surface water discharge options have been assessed in accordance with the sustainable drainage hierarchy. Infiltration testing was unable to be carried out onsite due to the current tenant business however, it is understood infiltration is unlikely to provide a viable means of discharging surface water run-off as infiltration within the wider area has not been proven feasible.

Infiltration rates however due vary on a site by site basis, it would therefore be recommended that further investigation (onsite testing) takes place upon planning approval to identify if infiltration would be feasible onsite. It would also be recommended that the specific infiltration methods to be used are discussed with the key stakeholders, including the Local Planning Authority and Thames Water at an early stage. Infiltration method(s) and any adoption design standards used will need to be to BRE365 standard and designed in accordance with the CIRIA Sustainable Drainage System Manual.

In terms of discharge rates, in accordance with the SuDS Manual (CIRIA 753) and the Non-Statutory Technical Standards for Sustainable Drainage Systems (March 2015) all sites should endeavour to achieve as close to pre-development greenfield rates as is viable. The proposals are therefore discharge at greenfield rates, the discharge rate will not exceed that of the existing

onsite percolation rate(s) based on testing at the proposed depths of drainage infrastructure proposed.

The proposed onsite surface water drainage system will need to be sized to contain the 1 in 30yr return period event below ground with overland run-off from storm events up to and including the 1 in 100yr return period event with a 40% allowance for climate change being contained onsite. It would be beneficial to implement SuDS features including permeable surfaces, bio-filtration and infiltration basin (or similar), to assist with this requirement.

Should infiltration be proven not be a feasible surface water drainage method for the site following onsite testing, then the next outfall in the hierarchical approach is to discharge to the watercourse however, there are no watercourses suitable for outfall within close proximity of the site. The alternative would therefore be to discharge to the public sewer network; further discussion with Thames Water has been undertaken and an agreement in principle has been provided to allow the development to discharge into the nearest public surface water sewer network at a restricted rate of 5l/s.

The Flood Risk Assessment and Drainage Management Strategy has been prepared in consultation with the relevant interested parties and incorporates their comments where possible. The report is considered to be commensurate with the scale and nature of the development proposals and in summary, the development can be considered appropriate in accordance with the Planning Practice Guidance.

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Specialist Software

- MicroDrainage WinDES (v.14.1) – Calculation of Greenfield run-off rates IH124/ICP-SUDS, Greenfield run-off volumes, rates of rainfall and stormwater storage estimates.
- Flood Estimation Handbook FEH CD-ROM (v.3.0) – Determination of Catchment Descriptors and depths of rainfall.

Abbreviations & Acronyms

AEP	Annual Exceedance Probability
BGL	Below Ground Level
BGS	British Geological Survey
CDC	Cherwell District Council
CC	Climate Change
CSAI	Cranfield Soil and Agrifood Institute
EA	Environment Agency
FEH	Flood Estimation Handbook
FRA	Flood Risk Assessment
FZ	Flood Zone
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
mAOD	Metres Above Ordnance Datum
NGR	National Grid Reference
NPPF	National Planning Policy Framework
NSRI	National Soil Resources Institute
OS	Ordnance Survey
OCC	Oxfordshire County Council
PFRA	Preliminary Flood Risk Assessment
PPG	Planning Practice Guidance
QSE	Quick Storage Estimate
QBAR	Mean Annual Flood
SfA	Sewers For Adoption
SFRA	Strategic Flood Risk Assessment
SuDS	Sustainable Drainage Systems
TW	Thames Water
TWL	Top Water Level

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1.0 INTRODUCTION

1.1 Planning Policy Context

1.1.1 All forms of flooding and their impact on the natural and built environment are material planning considerations. The revised National Planning Policy Framework (NPPF) sets out the Government's objectives for the planning system, and how planning should facilitate and promote sustainable patterns of development, avoiding flood risk and accommodating the impacts of climate change. Government policy with respect to development in flood risk areas is contained within the NPPF (2018) and the supporting Planning Practice Guidance (PPG) (refer to extracts in **Appendix A**).

1.1.2 A Flood Risk Assessment and Drainage Management Strategy (FRA&DMS) has been completed in accordance with the revised NPPF (2018) and the PPG, to review all sources of flood risk both to and from the proposed development. The report also considers the most appropriate drainage options including the implementation of Sustainable Drainage Systems (SuDS) in line with the recent changes to national policy.

1.1.3 The proposals are considered to be solely 'residential' in nature and as such is classified as 'more vulnerable' in Table 2: Flood Risk Vulnerability Classification, within the Planning Practice Guidance. The PPG confirms that this type of land use is appropriate for Flood Zone 1, providing there is no increase in flood risk elsewhere due to the proposals.

1.2 Site Context

1.2.1 This FRA&DMS has been prepared to support an outline planning application for a residential development on land off Oxford Road in Bodicote. The proposals will be complete with access, car parking, external works and lighting, landscaping, boundary walls and fencing, external services and drainage.

1.3 Consultation

1.3.1 The preparation of this report has been undertaken in consultations with the Environment Agency (EA), Oxfordshire County Council (OCC), Cherwell District Council (CDC) and Thames Water (TW). Consultation responses can be seen in **Appendix B, C** and **D** respectively. The NPPF advises that CDC as the Local Planning Authority (LPA) should consult with the EA who will provide advice and guidance on flood issues at a strategic level and in relation to planning applications.

2.0 EXISTING SITE LOCATION

2.1 Location

2.1.1 The proposed development site is located adjacent to Oxford Road in Bodicote. The Ordnance Survey National Grid Reference (OS NGR) for the site is E: 446170, N: 238398 and the nearest postcode is OX15 4QL. The total site covers 2.197ha and is edged in red in **Figure 1** (see location plan in **Appendix E**).

2.1.2 Adjacent to the north-eastern boundary of site is Oxford Road with existing residential dwellings with further residential development being undertaken. To the south-east of site is Park End Close residential estate and Cherwell District Council Offices. Further west of the council offices is Bishop Loveday C of E Primary School with White Post Road to the north-west of site. White Post Road is bounded by recreational land, residential dwellings, and Saltway Day Nursey (as illustrated in **Figure 1**).

Figure 1: Aerial Photograph of site (Bing Maps, 2018)

2.2 Existing and Historical Land Use

2.2.1 This assessment has identified that the site was historically used as the former Bodicote Flyover Farm Shop. There are numerous buildings onsite located within the south-west corner adjacent to the Bishop Loveday C of E Primary School. The undeveloped land located north of the Farm Shop compromises of low density vegetation, several trees, and taller shrubs along the site boundaries. No other historical uses of the site has been identified as part of this assessment.

2.3 Topography

2.3.1 The site is reasonably flat however, there is a gentle fall from 123.04mAOD in the north-eastern corner that slopes towards the south-western boundary of site, to a level of 120.51mAOD. A full topographical survey has been carried out and is included in **Appendix B**.

3.0 DEVELOPMENT PROPOSALS

3.1 Nature of the development

3.1.1 This assessment is to support an outline planning application for a residential development on land off Oxford Road. The application also includes demolition of the former Bodicote Flyover Farm Shop buildings. The proposals will be complete with access, car parking, external works and lighting, landscaping, ponds, boundary walls and fencing, external services and drainage as show on the proposed planning layout in **Figure 2** (**Appendix G**).

Figure 2: Proposed Planning Layout (HSL, 2018)

3.1.2 The total site covers 2.197ha and the proposed development area however excludes those areas that will remain undeveloped and equates to 1.415ha. The site is partly developed and the pre-development area is 20% impermeable at present. Due to the nature of the proposals the impermeable area post-development is assumed to increase to approximately 45% of the development site (0.637ha).

3.1.3 National and local policy identifies that Sustainable Drainage Systems (SuDS) should be incorporated into new development where at all feasible. There is likely to be scope to incorporate some SuDS features within the proposed open space/amenity areas on the site. Although detailed design will be required to confirm the specific types, subject to ground investigations and detailed levels review (refer to Section 5.0 for the proposed outline drainage strategy).

4.0 SOURCES OF FLOOD RISK

4.1 Fluvial Flood Risk

4.1.1 Information relating to flood risk at the site has been obtained from the Environment Agency and from the Gov.uk website. An extract of the EA's Flood Zone Map for Planning is shown in **Figure 3**, which illustrates that the proposed development site is located solely within Flood Zone 1. Flood Zone 1 is an area considered to be at little or no flood risk from rivers and/or the sea (as defined by the EA).

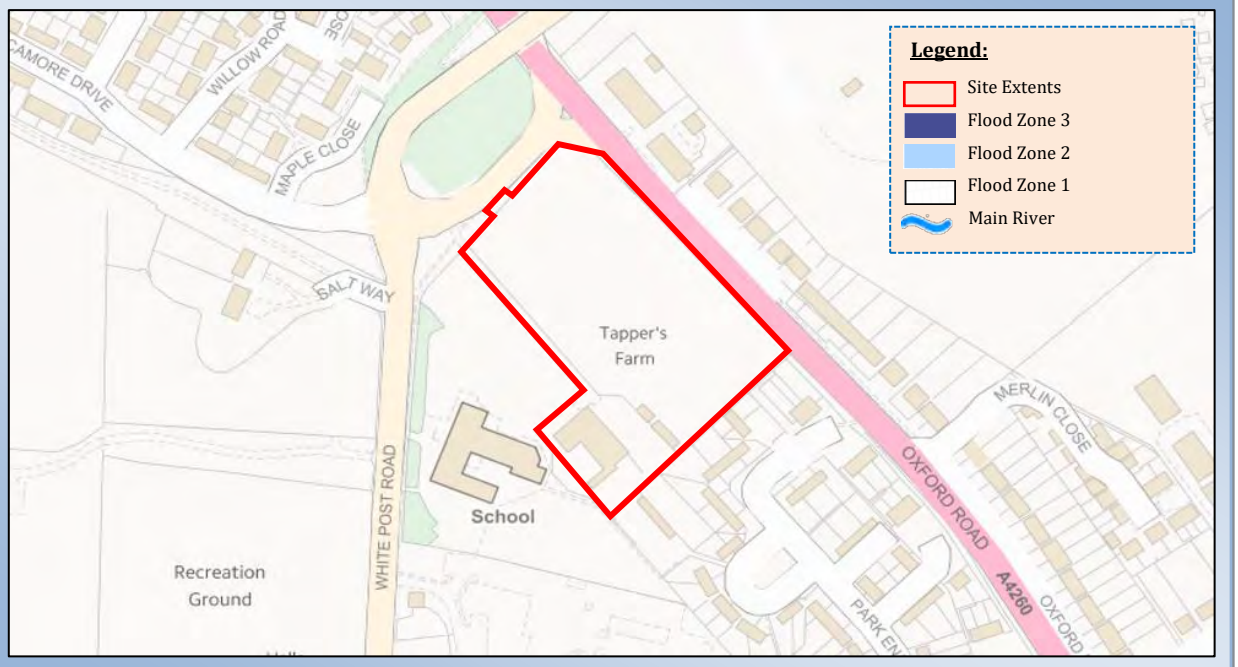

Figure 3: Fluvial/Tidal Flood Zone Map for Planning Extract (GOV.UK 2018)

4.1.2 The nearest Main River to the site is Sor Brook located approximately 1km south of site, the River Cherwell and the Oxford Canal are also located approximately 1.5km to the north-east. The risk to the site from these potential flood sources is considered to be 'very low' due to their proximity from the site and the existing surrounding topography.

4.1.3 There are also Ordinary Watercourses (land drainage) located approximately 1km to the west of site. The flood risk from these features is also considered to be 'very low' due to the proximity and the surrounding topography, this can be seen in the Governments Long-Term Flood Risk Mapping, see **Appendix B**.

Safe Access and Egress

4.1.4 The proposed access road for the site will be via White Post Road adjacent to the north-eastern site boundary. This is shown on the EA's Flood Zone Map for Planning, to also be located within Flood Zone 1 and is therefore at very low risk from fluvial/tidal flooding. Safe access and egress will therefore be maintained via the new proposed access road onto Oxford Road.

4.2 Tidal Flood Risk

4.2.1 The Bristol Channel is located approximately 100km of the development site and the Severn Estuary is also located approximately 90km south-west of site. Due to the distance from the coast, the associated flood risk from these sources is considered to be very low. This is supported by the EA's Fluvial/Tidal Flood Zone Map for Planning as the site is located within Flood Zone 1 (**Figure 3**).

4.3 Flood Risk Vulnerability Classification and Flood Zone Compatibility

4.3.1 The proposals are solely 'residential' in nature and as such is classified as 'more vulnerable' in Table 2: Flood Risk Vulnerability Classification within the PPG. Table 3: Flood Risk Vulnerability and Flood Zone 'Compatibility' within the PPG confirms that this type of land use is appropriate for Flood Zone 1, providing there is no increase in flood risk elsewhere due to the proposals.

4.4 Surface Water Flood Risk

4.4.1 Surface water flooding occurs when rainwater is unable to drain away through the normal drainage systems or soak into the ground, but lies on or flows over the ground instead. The risk associated with surface water run-off is indicated by the long term flood mapping (extract shown in **Figure 4**).

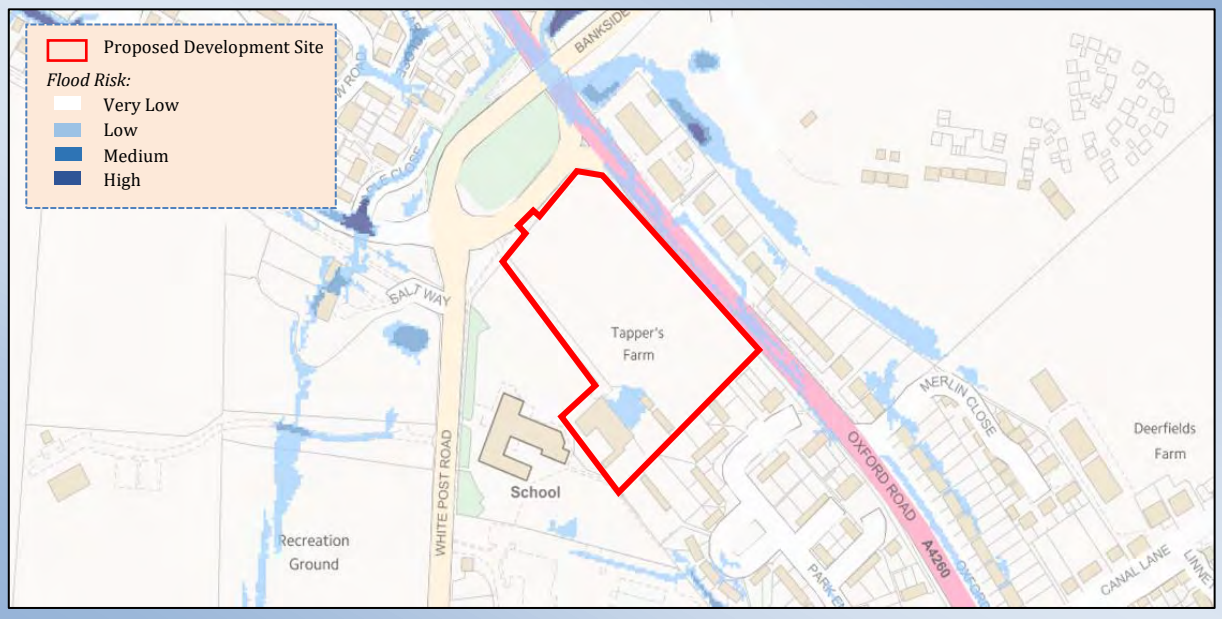

Figure 4: Surface Water Flood Map Extract (GOV.UK, 2018)

4.4.2 As indicated in **Figure 4**, the site is considered to predominantly be at 'very low' risk from surface water flooding. There is an area onsite shown to be at 'low' risk from surface water, located on existing hardstanding areas associated with the former Bodicote Flyover Farm Shop. The ground has been identified as low-lying gravel (120.86mAOD) in comparison to the surrounding ground levels (121.15mAOD). Run-off naturally falling onsite would direct to the low-lying areas and is unable to direct elsewhere due to the surrounding higher land and therefore may be susceptible to ponding in the extreme storm events.

4.4.3 There could be potential for surface water exceedance from the adjacent highway to flow towards the site along the Oxford Road boundary, an interception method could be implemented if deemed necessary along this boundary to mitigate for any associated residual risks.

4.4.4 The risk to the proposals from surface water flooding will be inherently reduced, post-development through appropriate levels design and implementation of a sustainable surface water drainage regime. In order to further mitigate for any residual risks it is advised that (following any re-grade of the site) finished floor levels are elevated above the external levels to provide safe overland flood routes for excess surface water run-off.

Pluvial (Overland run-off) Flood Risk

4.4.5 Intense rainfall that is unable to soak into the ground or enter drainage systems can run-off land and result in flooding. Local topography and the land use can have a strong influence on the direction and depth of flow. The topography of the development and surrounding area means there is little likelihood of significant flows impacting on the proposed development or on land/ property adjacent to the development. The only flows that are likely to be present on site are from direct rainfall on areas of hard-standing.

4.4.6 The volume and rate of overland flow from land can be exacerbated if development increases the percentage of impermeable area. Any overland flows generated by the development must be carefully controlled, safe avenues directing overland flow away from adjacent proposed development being advised.

Sewer Flood Risk

4.4.7 In urban areas, rainwater is frequently drained into surface water sewers or sewers containing both surface and waste water known as 'combined sewers'. Foul water flooding often occurs in areas prone to overland flow and can result when the sewer is overwhelmed by heavy rainfall and will continue until the water drains away.

4.4.8 Thames Water sewer records identify there to be limited public surface water sewer infrastructure within the vicinity of the site however, the nearest public surface water sewer is located within Sycamore Drive approximately 118m north-west of site. We have contacted TW regarding the possibility of sewer flooding in the vicinity of the site, they have confirmed there has been no recorded of historical sewer flooding issues, refer to **Appendix C**.

4.5 Groundwater Flood Risk

4.5.1 High groundwater levels are usually the key source of groundwater flooding, which occurs when excess water emerges at the grounds surface (or within manmade underground structures such as basements). Groundwater flooding is often more insistent than surface water flooding and would typically last for weeks/months rather than days meaning the result to property is often more severe.

4.5.2 In general terms groundwater flooding can occur from three main sources:

- If groundwater levels are naturally close to the surface then this can present a flood risk during times of intense rainfall. No groundwater flood risk has been identified

during review of the Oxfordshire County Council Strategic Flood Risk Assessment (SFRA).

- Seepage and percolation occur where embankments above ground level hold water. In these cases water travels through the embankment material and emerges on the opposite side of the embankment. At present there are no reported problems with groundwater flooding.
- Groundwater recovery/rebound occurs where the water table has been artificially depressed by abstraction. When the abstraction stops the water table makes a recovery to its original level. There is the potential for groundwater flooding in low lying areas where groundwater levels have been depressed below their pre-pumping conditions, where these were at or close to ground level. As with the seepage scenario the likelihood of flooding from this source is low.

4.5.3 The EA mapping data for groundwater shows that the site is underlain by a Secondary A Bedrock Aquifer with no superficial deposits (**Appendix B**). The site is located within a High Groundwater Vulnerability Zone to a Minor Aquifer. No historical groundwater flooding of the site has been identified during consultation with interested parties. Irrespective, it is advised that external levels fall away from the property (where feasible) to minimise the flood risk from a variety of sources. By keeping the finished floor levels elevated relative to the externals, this should help create an overland flow route.

4.6 Artificial Sources of Flood Risk

4.6.1 National policy states that a FRA should consider the potential risks from a variety of other flood sources including artificial sources (such as risks from reservoirs and canals).

Reservoirs

4.6.2 The EA recognises reservoirs as bodies of water over 25,000cu.m and the long term flood mapping is included in **Appendix B** which shows the extents of flooding associated with reservoirs does not impact upon or near to the proposed development site.

4.6.3 There is a small body of water (less than 25,000cu.m) 1km south-west of the proposed development site which has been identified as an existing reservoir. This feature is understood to aid in supplying water to the neighbouring areas, due to the distance and the surrounding natural topography the risk it poses to site is minimal.

Canals

4.6.3 The nearest canal to site is the Oxford Canal located approximately 1.5km north-east of the proposed development site. Consultation with the Canal & Rivers Trust did not identify any historical flooding to site during the preparation of this assessment as a result of canal flood sources. Due to the distance from site the risk of flooding associated with canals is considered to be 'very low'.

4.6.4 Irrespective, it is advised that external levels fall away from the property (where feasible) to minimise the flood risk from a variety of sources. By keeping the finished floor levels elevated relative to the externals, this should help create an overland flood flow route in the event of a breach or any other source of flooding that could lead to overland flows including reservoir or canal flooding.

4.7 Historical and Anecdotal Flooding Information

4.7.1 An internet based search for flooding events did not recall any historical flooding to the immediate development site area. There has been instances of flooding recorded to the wider Oxford area associated with the River Cherwell and surface water run-off. However, due to the distance from the River Cherwell to site and the surrounding natural topography the risk to the proposals from the future events would be minimal.

4.7.2 Review of the Oxfordshire County Council Preliminary Flood Risk Assessment (PFRA) and the Cherwell District Council's Strategic Flood Risk Assessment (SFRA) did not highlight any historic flooding pertinent to this FRA (general mapping data is included in **Appendix H**). Consultation with EA, OCC, CDC and TW failed to highlight any historical flooding directly to the site (see correspondence in **Appendix B, C and D** respectively).

4.8 Flood Risk Mitigation Measures & Residual Risks

4.8.1 The site is located within Flood Zone 1 and considered to be at little risk of fluvial/tidal flooding. To observe a conservative approach, mitigation measures have been proposed below to safeguard the development with regards to other potentials residual sources of flood risk and to consider the uncertainties of climate change in accordance with the revised NPPF (2018) and the PPG.

Mitigation Measures

4.8.2 For 'more vulnerable' development located within Flood Zone 1, it is typical to set the Finished Floor Levels (FFL) of residential dwellings to a minimum of 150mm above the existing ground levels. By ensuring the FFLs are raised sufficiently above the external levels (following any re-grade) should mitigate any risk of flooding from a variety of sources, including groundwater and surface water run-off risks at the proposed development.

4.8.3 Any overland flows generated by the development must be carefully controlled. Safe avenues directing overland flow way from any existing and proposed buildings are advised.

4.8.4 To minimise the flood risk to the neighbouring properties it is recommended that the surface water run-off generated by the proposals be managed effectively with the peak rates of run-off being restricted to the equivalent of the pre-development situation (with betterment where required).

4.8.5 The proposed onsite surface water drainage system will need to be sized to contain the 1 in 30yr return period event below ground with exceedance from storm events up to and including the 1 in 100yr return period storm event with a 40% allowance for climate change being contained onsite.

4.8.6 As with any drainage system blockages within either the foul or surface water system have the potential to cause flooding or disruption. It is important that should any drainage systems not be offered for adoption to either the Water Company or the Local Authority then an appropriate maintenance regime should be scheduled with a suitably qualified management company for these private drainage systems.

Residual Risks

4.8.7 If an extreme rainfall event exceeds the design criteria for the drainage system it is likely that there will be some overland flows that are unable to enter the system, it is important that these potential overland flows are catered for within the development site in the event that the capacity of the drainage system is exceeded.

5.0 SURFACE WATER MANAGEMENT

5.1 Pre-Development Surface Water Run-off

5.1.1 The total site covers 2.197ha, however the proposed development area excludes areas which will remain undeveloped and covers a smaller portion at approximately 1.415ha. At present the development area is approximately 20% impermeable and it is assumed to have existing positive surface water drainage infrastructure to cater for the existing run-off generated; further investigation would be required to confirm the presence of these existing assets. Furthermore, the undeveloped areas located onsite are considered to discharge naturally to ground over an extended time.

5.1.2 As the existing method of surface water management is unconfirmed and national planning policy states new development should endeavour to achieve greenfield equivalent rates. The peak rates and volumes of run-off for the development area have therefore been calculated based on a greenfield scenario. The FEH Statistical Method has been utilised to calculate the figures noted in **Table 1** (full details **Appendix I**).

Site Area	Run-Off Rates				Run-Off Volumes	
	1 In 1 Year	1 In 30 Year	1 In 100 Year	QBar	1 In 1 Year	1 In 100 Year
1.415ha	6.6l/s	17.8l/s	24.6l/s	7.7l/s	15.1cu.m	76.5cu.m

Table 1: Pre-Development Surface Water Run-Off Rates (Betts Hydro, 2018)

5.2 Post Development Surface Water Run-Off

5.2.1 At present the indicative proposals show the development area to cover 1.415ha of the wider site. Based on the planning layout we have estimated that the post-development impermeable areas will increase to approximately 45% of the development area. The unrestricted post-development run-off rates have been detailed in **Table 2**.

Site Area	Run-Off Rates		
	1 In 1 Yr	1 In 30 Yr	1 In 100 Yr +CC
0.637ha	24.6l/s	54.5l/s	92.1l/s

Table 2: Post-Development Un-Restricted Run-Off Rates (Betts Hydro, 2018)

5.2.2 The proposals however will be to restrict the rate of discharge from the development to mimic a pre-development greenfield situation (**Table 1**), betterment in the form of permeable surfaces will also be considered as part of detailed design where feasible to reduce surface water run-off rates. Permeable surfaces will also be considered as part of detailed design where feasible to reduce surface water run-off rates.

5.3 Sustainable Drainage Systems (SuDS)

5.3.1 Sustainable Drainage Systems (SuDS) have the ability to address four key objectives; water quantity, water quality, amenity and biodiversity. In accordance with the revised NPPF (2018), SuDS should be specified wherever possible to manage surface water run-off generated onsite. With the appropriate system specified, all core objectives can be

satisfied, this in turn reduces the burden downstream on both watercourses and sewerage systems.

5.3.2 Where possible, peak surface water discharge rates to watercourses and sewers should be appropriately managed and where possible reduced. Preference should always be given to SuDS over the traditional methods within green spaces (POS) areas, where SuDS features can be implemented. Given the indicative layout there may be the opportunity to incorporate methods such as swales and basins to provide a degree of treatment before flows are carried offsite. The photographs in **Figure 5** illustrate similar residential schemes which have utilised SuDS as part of the surface water management strategy.

Figure 5: SuDS Photographs (SusDrain, 2012)

5.3.3 Should the ground conditions onsite prove favourable, it would also be recommended that permeable paving, swales or tree pits be utilised in non-adopted areas where at all feasible; if infiltration is proven not feasible then the permeable paving should be lined with a positive connection into the proposed main drainage for the site. Detailed design should confirm which SuDS method would be suitable for incorporation into the development proposals following more detailed analysis of levels, ground conditions, and attenuation requirements.

5.4 Methods of Surface Water Management

5.4.1 At present the proposed development site is 2.197ha and the proposed impermeable area is understood to increase to 45% of the development area. There are three methods that have been reviewed for the management and discharge of surface water. These may be applied individually or collectively to form a complete strategy and should be applied in the order of priority listed below:

- Discharge via infiltration
- Discharge to watercourse
- Discharge to public sewerage system

5.5 Discharge via Infiltration

5.5.1 Any impermeable areas that can drain to soakaway or an alternative method of infiltration would significantly improve the sustainability of any surface water systems.

5.5.2 The Cranfield Soil and AgriFood Institute (CSAI), Soilscapes viewer identifies the soils to be freely draining, slightly acid, but base-rich. The British Geology Survey (BGS) mapping data indicates that ground conditions are as follows:-

- *Bedrock Geology: Marlstone Rock Formation - Ferruginous Limestone and Ironstone.*
- *Superficial Deposits: None Recorded.*

5.5.3 Based on the ground conditions identified by the online datasets it can be considered that infiltration may offer a viable drainage solution for the development site due to the permeable strata however, onsite Soakaway Testing has been unable to be undertaken due to the current tenants business and infiltration within the wider Bodicote area has been identified as unviable, therefore alternative methods of discharging surface water run-off from site have been investigated.

5.5.4 It should be noted infiltration rates do however vary on a site by site basis and therefore further investigation is recommended in the form of Soakaway Testing to BRE365 standards is proposed to be undertaken upon planning approval, as infiltration is the primary proposed means of discharging surface water run-off. Discussion with the LLFA and the LPA will also be required as part of detailed design to ensure the infiltration methods conform to their standards of design.

5.6 Discharge to Watercourse

5.6.1 Should infiltration not be feasible then the next outfall in the hierarchical approach should be discharge to the watercourse. There are however no watercourses suitable for outfall within close proximity of the site therefore, discharge to the sewer network would be the alternative approach; subject to the relevant consents and agreements.

5.7 Discharge to Public Sewer Network

5.7.1 Should infiltration not offer a feasible solution for surface water management, then given the limited watercourses in proximity of site, the proposals are to discharge surface water to the neighbouring public sewer network. Thames Water have identified limited public surface water sewers in proximity to site, there is however a 225mm public surface water sewer located approximately 118m north-west of site within Sycamore Drive and a 375mm public surface water sewer located 400m south of site within Broad Gap (see sewer records in **Appendix B**).

5.7.2 As illustrated in **Figure 6** there are three options for discharging surface water run-off from site into the public surface water sewer network. Option 1A is to connect into the public surface water sewer (375mm dia) located approximately 400m to the south of site at manhole no.2051. It should be noted this option would require significant offsite routing down Oxford Road and Broad Gap and discussion with the relevant parties (including Highways Authority) will be required during the detailed design process. Detailed design will also be required to confirm the feasibility of this option and other technical details such as whether a full gravity solution is achievable.

5.7.3 Option 1B is to discharge into the same public surface water sewer network as Option 1A (manhole no.2051) but pipe through third party land (see **Figure 6**). This option is subject to discussion and agreements with the land owners, however due to the existing topographic levels identified an onsite gravity system is understood to be feasible; detailed design will confirm the feasibility of this option at a later stage.

5.7.4 Alternatively, Option 2 would be to discharge into the 225mm dia public surface water sewer located approximately 118m north-west of site within Sycamore Drive at manhole no.9455. Furthermore, detailed design is required to confirm feasibility of this option as it has been identified a pumped solution would be required.

Figure 6: Preliminary Drainage Plan Extract (Betts Hydro, 2018)

5.7.5 Early discussion with TW has been undertaken and an agreement in principle has been obtained (see correspondence in **Appendix B**). TW have agreed to allow a connection into the public surface water sewer within Broad Gap (375mm dia, manhole no. 2051) or to the public surface water sewer within Sycamore Drive (225mm dia, manhole no. 9455) at a restricted rate of 5l/s (**Appendix B**).

5.7.6 Once the preferred drainage strategy is chosen detailed design will be required to refine the drainage strategy, following a more in-depth review of levels and other engineering constraints. The proposed point of connection will also need to be investigated to ascertain whether a full gravity solution is achievable, this can be carried out at the next stage of the application.

5.6.7 Relevant consents and agreements will still be required to be confirmed from TW for works to the public sewer network (**Appendix B**). It should also be noted any offsite works will need to be discussed and agreed with the relevant parties (including Highways Authority) during detailed design process.

5.6.8 The proposed discharge rate will be managed via a flow control device, with a maximum flow restriction of 5l/s as agreed in principle with TW (**Appendix B**). The restricted discharge rate will generate a storage requirement during the extreme storm events (**Appendix I**). The proposed surface water system onsite will need to be designed to cater for the 1 in 30yr return period event below ground, with the difference between that and the 1 in 100yr (plus allowance for climate change) being contained onsite. The stormwater storage figures quoted in **Table 3** are estimates only for the site and detailed drainage design at a later stage will determine with accuracy the stormwater storage requirements.

Impermeable Area (0.637ha)	1 In 1 Year	1 In 30 Year	1 In 100 Year + 40% CC
Restricted Run-Off Rate	5l/s	5l/s	5l/s
Estimated Stormwater Storage Volume	50cu.m-83cu.m	163cu.m-229cu.m	352cu.m-476cu.m

Table 3: Estimated Stormwater Storage Requirements (Betts Hydro, 2018)

5.6.9 It would be beneficial to incorporate SuDS features to assist in this attenuation measures, given the proposed planning layout there is scope to include SuDS in the form of permeable paving, tree pits, swales or underground tanked storage subject to the requirements of TW. Detailed design will be required to confirm feasibility of these attenuation methods on site following more in-depth levels review.

5.8 Climate Change

5.8.1 There are indications that the climate in the UK is changing significantly and it is widely believed that the nature of climate change will vary greatly by region. Current expert opinion indicates the likelihood that future climate change would produce more frequent short duration and high intensity rainfall events with the addition of more frequent periods of long duration rainfall. It is believed that the impact of climate change means there is likely to be a long term increase in the average sea levels, with an expectation that sea levels will rise gradually. An increase in flood water levels means that future flooding events will occur more frequently and will have a greater impact.

5.8.2 In light of the future uncertainties Climate Change should be accounted for within the design of all new developments. The recently published Environment Agency document '*Adapting to Climate Change : Advice for Flood and Coastal Erosion Risk Management Authorities*' supersedes Defra's policy statement on Flood Risk and Coastal Erosion Risk Management (2009) and should be used for future proposals. Climate change factors have been considered and any increase in the level of flood risk (to the site) from climate change is likely to be related to the increase in rainfall intensity and duration and its impact upon the surface water drainage system.

5.8.3 In accordance with the updated Climate Change projections provides estimated changes to rainfall intensity (**Table 4**) and based on the design life of the development (100yrs) the "total potential change figures for the 2080's has been utilised.

PROJECTIONS	TOTAL POTENTIAL CHANGE ANTICIPATED FOR THE 2080'S
Upper End Estimate	40%
Central Change Factor	20%

Table 4: Change to Extreme Rainfall Intensity Compared to 1961-1990 Baseline (Environment Agency, 2016)

6.0 FOUL WATER MANAGEMENT

6.1 Review of the TW sewer records identify there to be limited public sewer infrastructure in proximity to the site however, the nearest foul water sewer (150mm dia.) is located adjacent to the north-eastern site boundary within Oxford Road (refer to sewer records within **Appendix C**). Due to the site being brownfield there is a possibility there is an existing connection, however further investigation is required to confirm the condition and capacity of the existing sewer network.

6.2 The proposals are to connect into the nearest fowl water sewer within Oxford Road adjacent to the north-eastern site boundary, the exact location of the proposed connection point is subject to early discussions with TW. Based on the proposals for the construction of 52no. residential units the approximate peak foul water flows generated by the development will be 2.4l/s. This figure is calculated based on 4000 litres per dwelling per 24 hours; the guidance contained within Sewers for Adoption (SfA).

6.3 Early discussions with TW have confirmed a connection into the public foul water sewer network will be likely after modelling and improvements have been undertaken to the sewer network upon planning approval. These necessary works are required to be able to provide a viable solution for handling foul water flows from site (see correspondence in **Appendix B**).

6.4 Detailed design will be required to confirm feasibility based on the topographic levels following further detailed investigation. It is not clear whether a full site gravity connection will be achievable onsite as further investigation as part of detailed design of the TW public sewer system is required to ascertain the existing invert levels.

6.5 Consents and relevant agreements will be required from TW prior to commencement of works. Early consultation with TW is recommended to identify any additional constraints and their preferred point(s) of connection. It is possible that offsite works would be required for a connection to the public sewer network. Any offsite asset routing works will also need to be considered in terms of consents with the relevant land owners (Highways Authority).

7.0 SUMMARY AND CONCLUSIONS

7.1 This Flood Risk Assessment and Drainage Management Strategy was commissioned by Hollins Strategic Land referred to hereafter as 'the client'. This report has been prepared to support an outline planning application for the construction of a residential development on land adjacent to Oxford Road in Bodicote.

Flood Risk

7.2 The site lies solely within Flood Zone 1 based on the Environment Agency Flood Map for Planning and is 2.197ha in size. Residential development is classified as 'more vulnerable' within the Planning Practice Guidance which supports the National Planning Policy Framework. The Planning Practice Guidance confirms that 'more vulnerable' development is appropriate to be located within Flood Zone 1, providing there is no increase in flood risk elsewhere due to the proposals.

7.3 This report has reviewed all sources of flood risk both to and resulting from the proposed development site. Consultations with the Environment Agency, Oxfordshire County Council, Cherwell District Council and Thames Water have been undertaken and did not identified any historical incidents of flooding to the site.

7.4 The proposals are considered to be at 'very low' flood risk from the majority of flood sources. The nearest watercourse to site is Sor Brook located approximately 1km south of site, the Oxford Canal is also located approximately 1.5km north with the River Cherwell located beyond. The primary flood risk however, is considered to be from 'very low' surface water run-off, which is closely associated with the existing topography on site. The risk associated with surface water flooding will be reduced and sustainably managed post-development, following the implementation of mitigation measures proposed within this assessment.

Drainage Strategy

7.5 Due to the relatively low flood risks identified, the principle focus of this assessment is on sustainable management of surface water run-off in accordance with national and local policy. Surface water discharge options have been assessed in accordance with the sustainable drainage hierarchy. Infiltration testing was unable to be carried out onsite due to the current tenant business however, it is understood infiltration is unlikely to provide a viable means of discharging surface water run-off as infiltration within the wider area has not been proven feasible.

7.6 Should infiltration not offer a feasible solution for surface water management, then given the limited watercourses in proximity of site, the proposals are to discharge surface water to the neighbouring public sewer network. Thames Water have identified limited public surface water sewers in proximity to site, there is however a 225mm public surface water sewer located approximately 118m north-west of site within Sycamore Drive and a 375mm public surface water sewer located 400m south of site within Broad Gap.

7.7 As previously discussed there are three options for discharging surface water run-off from site into the public surface water sewer network. Option 1A is to connect into the public surface water sewer (375mm dia) located approximately 400m to the south of site

at manhole no.2051. It should be noted this option would require significant offsite routing down Oxford Road and Broad Gap and discussion with the relevant parties (including Highways Authority) will be required during the detailed design process.

7.8 Option 1B is to discharge into the same public surface water sewer network as Option 1A (manhole no.2051) but pipe through third party land. This option is subject to discussion and agreements with the land owners, however due to the existing topographic levels identified an onsite gravity system is understood to be feasible; detailed design will confirm the feasibility of this option at a later stage.

7.9 Alternatively, Option 2 would be to discharge into the 225mm dia public surface water sewer located approximately 118m north-west of site within Sycamore Drive at manhole no.9455. Furthermore, detailed design is required to confirm feasibility of this option however, it has been identified a pumped solution would be required.

7.10 Early discussion with Thames Water has been undertaken and an agreement in principle has been obtained. Thames Water have agreed to allow a connection into the public surface water sewer within Broad Gap (375mm dia, manhole no. 2051) or to the public surface water sewer within Sycamore Drive (225mm dia, manhole no. 9455) at a restricted rate of 5l/s.

7.11 Detailed design will be required to refine the preferred drainage strategy, following a more in-depth review of levels and other engineering constraints. The proposed points of connection will also need to be investigated to ascertain whether a full gravity solution is achievable, this can be carried out at the next stage of the application. Relevant consents and approaches will still be required to be confirmed from Thames Water for works to the public sewer network. It should also be noted any offsite works will need to be discussed and agreed with the relevant parties (including Highways Authority) during detailed design process.

7.12 The proposed discharge rate will be managed via a flow control device, with a maximum flow restriction of 5l/s as agreed in principle with Thames Water. The restricted discharge rate will generate a storage requirement during the extreme storm events. Consideration is recommended into the stormwater attenuation requirements due to restricting the surface water discharge from the site. The proposed onsite surface water drainage system will need to be sized to contain the 30yr return period event wholly below ground with overland run-off from storm events up to and including the 1 in 100yr return period storm event with an allowance for climate change being contained onsite.

7.13 The Flood Risk Assessment and Drainage Management Strategy has been prepared in consultation with the relevant interested parties and incorporates their comments where possible. The report is considered to be commensurate with the scale and nature of the development proposals and in summary, the development can be considered appropriate in accordance with the Planning Practice Guidance.

8.0 RECOMMENDATIONS

8.1 For 'more vulnerable' development located within Flood Zone 1, it is typical to set the Finished Floor Levels (FFL) of residential dwellings to a minimum of 150mm above the existing ground levels. By ensuring the FFLs are raised sufficiently above the external levels (following any re-grade) should mitigate any risk of flooding from a variety of sources, including groundwater and surface water run-off risks at the proposed development.

8.2 To minimise the flood risk to the neighbouring property and proposed dwellings it is proposed that the surface water run-off generated by the proposals be managed effectively with the peak rates of run-off being restricted in accordance with the revised NPPF (2018) and Non-Technical Standards for SuDS.

8.3 In accordance with LPA's and TW requirements, Soakaway Testing to BRE365 may be required to be undertaken upon planning approval to evidence that discharge to ground will not be a viable solution, this can be via a standard condition (prior to commencement of work).

8.4 Should infiltration not offer a feasible solution for surface water management, then given the limited watercourses in proximity of site, the proposals are to discharge surface water to the neighbouring public sewer network. Detailed design will refine the drainage strategy once an outfall point is determined, along with confirming whether a full site gravity system can be achieved; it is likely that a pumped solution in part would be required for a surface water and foul water connection to the public sewer network.

8.5 Early discussion with TW has also been undertaken and an agreement in principle has been provided as previously discussed. Any further proposed works to the public sewer network will need to be discussed and agreed with TW. Furthermore, consents with other land owners including Highway Authority will be required for any offsite works.

8.6 Consideration is recommended into the stormwater attenuation requirements due to restricting the surface water discharge from the site. The proposed onsite surface water drainage system will need to be sized to contain the 30yr return period event wholly below ground with overland run-off from storm events up to and including the 1 in 100yr return period storm event with a 40% allowance for climate change being contained onsite.

8.7 It is important that should any drainage systems not be offered for adoption to either the Water Company or the Local Authority then an appropriate maintenance regime should be scheduled with a suitably qualified management company for these private drainage systems.

BIBLIOGRAPHY & REFERENCES

Adapting to Climate Change: Advice for Flood and Coastal Erosion Risk Management Authorities – Environment Agency/DEFRA 2016
CIRIA 522: Sustainable urban drainage systems – design manual for England and Wales (2000).
CIRIA 523: Sustainable urban drainage systems – best practice manual (2001).
CIRIA 609: Sustainable drainage systems. Hydraulic, structural and water quality advice (2004).
CIRIA 624: Development and flood risk – guidance for the construction industry (2004).
CIRIA 635: Designing for Exceedance in urban drainage: Good practice (2006).
CIRIA 644: Building Greener (2007).
CIRIA 753: The SUDS manual (2015).
Flood Risk to People – Phase 2 (FD2321/TR2), DEFRA and the Environment Agency (2006).
Flood estimation for small catchments: Institute of Hydrology Report No.124, NERC (1994).
Flood Estimation Handbook, Centre for Ecology and Hydrology (1999).
Planning Policy Statement 25: Development and Flood Risk (2006).
Sewers for Adoption 7th Edition, WRc (2012).
National Planning Policy Framework, Ministry of Housing, Communities and Local Government (2018).

Web-based References

Anglian Water - http://www.anglianwater.co.uk/
Bingmaps – http://www.bing.com/Maps/
British Geological Survey – http://www.bgs.ac.uk/opengeoscience/home.html
Chronology of British Hydrological Events – www.dundee.ac.uk/
CIRIA – http://www.ciria.org/
Cranfield University – http://www.landis.org.uk/soilscapes/
Environment Agency – www.environment-agency.gov.uk/
FloodProBE – http://www.floodprobe.eu/
Flood Forum – http://www.floodforum.org.uk/
Flood London – http://www.floodlondon.com/
Google Maps – http://maps.google.co.uk/
Streetmap – http://www.streetmap.co.uk/
Thames Water - https://www.thameswater.co.uk/

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APPENDIX A: NPPF & PPG EXTRACTS

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14. Meeting the challenge of climate change, flooding and coastal change

148. The planning system should support the transition to a low carbon future in a changing climate, taking full account of flood risk and coastal change. It should help to: shape places in ways that contribute to radical reductions in greenhouse gas emissions, minimise vulnerability and improve resilience; encourage the reuse of existing resources, including the conversion of existing buildings; and support renewable and low carbon energy and associated infrastructure.

Planning for climate change

149. Plans should take a proactive approach to mitigating and adapting to climate change, taking into account the long-term implications for flood risk, coastal change, water supply, biodiversity and landscapes, and the risk of overheating from rising temperatures[48]. Policies should support appropriate measures to ensure the future resilience of communities and infrastructure to climate change impacts, such as providing space for physical protection measures, or making provision for the possible future relocation of vulnerable development and infrastructure.

150. New development should be planned for in ways that:

a) avoid increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through the planning of green infrastructure; and

b) can help to reduce greenhouse gas emissions, such as through its location, orientation and design. Any local requirements for the sustainability of buildings should reflect the Government's policy for national technical standards.

151. To help increase the use and supply of renewable and low carbon energy and heat, plans should:

a) provide a positive strategy for energy from these sources, that maximises the potential for suitable development, while ensuring that adverse impacts are addressed satisfactorily (including cumulative landscape and visual impacts);

b) consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development; and

c) identify opportunities for development to draw its energy supply from decentralised, renewable or low carbon energy supply systems and for co-locating potential heat customers and suppliers.

[48] In line with the objectives and provisions of the Climate Change Act 2008.

152. Local planning authorities should support community-led initiatives for renewable and low carbon energy, including developments outside areas identified in local plans or other strategic policies that are being taken forward through neighbourhood planning.

153. In determining planning applications, local planning authorities should expect new development to:

a) comply with any development plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or viable; and

b) take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption.

154. When determining planning applications for renewable and low carbon development, local planning authorities should:

a) not require applicants to demonstrate the overall need for renewable or low carbon energy, and recognise that even small-scale projects provide a valuable contribution to cutting greenhouse gas emissions; and

b) approve the application if its impacts are (or can be made) acceptable[49]. Once suitable areas for renewable and low carbon energy have been identified in plans, local planning authorities should expect subsequent applications for commercial scale projects outside these areas to demonstrate that the proposed location meets the criteria used in identifying suitable areas.

Planning and flood risk

155. Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere.

156. Strategic policies should be informed by a strategic flood risk assessment, and should manage flood risk from all sources. They should consider cumulative impacts in, or affecting, local areas susceptible to flooding, and take account of advice from the Environment Agency and other relevant flood risk management authorities, such as lead local flood authorities and internal drainage boards.

157. All plans should apply a sequential, risk-based approach to the location of development – taking into account the current and future impacts of climate change

[49] Except for applications for the repowering of existing wind turbines, a proposed wind energy development involving one or more turbines should not be considered acceptable unless it is in an area identified as suitable for wind energy development in the development plan; and, following consultation, it can be demonstrated that the planning impacts identified by the affected local community have been fully addressed and the proposal has their backing.

– so as to avoid, where possible, flood risk to people and property. They should do this, and manage any residual risk, by:

a) applying the sequential test and then, if necessary, the exception test as set out below;

b) safeguarding land from development that is required, or likely to be required, for current or future flood management;

c) using opportunities provided by new development to reduce the causes and impacts of flooding (where appropriate through the use of natural flood management techniques); and

d) where climate change is expected to increase flood risk so that some existing development may not be sustainable in the long-term, seeking opportunities to relocate development, including housing, to more sustainable locations.

158. The aim of the sequential test is to steer new development to areas with the lowest risk of flooding. 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. The strategic flood risk assessment will provide the basis for applying this test. The sequential approach should be used in areas known to be at risk now or in the future from any form of flooding.

159. If it is not possible for development to be located in zones with a lower risk of flooding (taking into account wider sustainable development objectives), the exception test may have to be applied. The need for the exception test will depend on the potential vulnerability of the site and of the development proposed, in line with the Flood Risk Vulnerability Classification set out in national planning guidance.

160. The application of the exception test should be informed by a strategic or site-specific flood risk assessment, depending on whether it is being applied during plan production or at the application stage. For the exception test to be passed it should be demonstrated that:

a) the development would provide wider sustainability benefits to the community that outweigh the flood risk; and

b) the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

161. Both elements of the exception test should be satisfied for development to be allocated or permitted.

162. Where planning applications come forward on sites allocated in the development plan through the sequential test, applicants need not apply the sequential test again. However, the exception test may need to be reapplied if relevant aspects of the proposal had not been considered when the test was applied at the plan-making stage, or if more recent information about existing or potential flood risk should be taken into account.

163. When determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood-risk assessment[50]. Development should only be allowed in areas at risk of flooding where, in the light of this assessment (and the sequential and exception tests, as applicable) it can be demonstrated that:

a) within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location;

b) the development is appropriately flood resistant and resilient;

c) it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;

d) any residual risk can be safely managed; and

e) safe access and escape routes are included where appropriate, as part of an agreed emergency plan.

164. Applications for some minor development and changes of use[51] should not be subject to the sequential or exception tests but should still meet the requirements for site-specific flood risk assessments set out in footnote 50.

165. Major developments should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate. The systems used should:

a) take account of advice from the lead local flood authority;

b) have appropriate proposed minimum operational standards;

c) have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development; and

d) where possible, provide multifunctional benefits.

Coastal change

166. In coastal areas, planning policies and decisions should take account of the UK Marine Policy Statement and marine plans. Integrated Coastal Zone Management should be pursued across local authority and land/sea boundaries, to ensure effective alignment of the terrestrial and marine planning regimes.

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[50] A site-specific flood risk assessment should be provided for all development in Flood Zones 2 and 3. In Flood Zone 1, an assessment should accompany all proposals involving: sites of 1 hectare or more; land which has been identified by the Environment Agency as having critical drainage problems; land identified in a strategic flood risk assessment as being at increased flood risk in future; or land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use.

[51] This includes householder development, small non-residential extensions (with a footprint of less than 250m^2) and changes of use; except for changes of use to a caravan, camping or chalet site, or to a mobile home or park home site, where the sequential and exception tests should be applied as appropriate.

167. Plans should reduce risk from coastal change by avoiding inappropriate development in vulnerable areas and not exacerbating the impacts of physical changes to the coast. They should identify as a Coastal Change Management Area any area likely to be affected by physical changes to the coast, and:

a) be clear as to what development will be appropriate in such areas and in what circumstances; and

b) make provision for development and infrastructure that needs to be relocated away from Coastal Change Management Areas.

168. Development in a Coastal Change Management Area will be appropriate only where it is demonstrated that:

a) it will be safe over its planned lifetime and not have an unacceptable impact on coastal change;

b) the character of the coast including designations is not compromised;

c) the development provides wider sustainability benefits; and

d) the development does not hinder the creation and maintenance of a continuous signed and managed route around the coast[52].

169. Local planning authorities should limit the planned lifetime of development in a Coastal Change Management Area through temporary permission and restoration conditions, where this is necessary to reduce a potentially unacceptable level of future risk to people and the development.

[52] As required by the Marine and Coastal Access Act 2009.

Revision date: 06 03 2014

What should be considered if bringing forward a Neighbourhood Development Order/Community Right to Build Order in an area at risk of flooding?

The general approach and requirements for site-specific flood risk assessments should be applied to developments in areas at risk of flooding to be permitted by Neighbourhood Development/ Community Right to Build Orders. This means that for any development proposals:

- in Flood Zone 2 or 3;
- or of at least 1 hectare;
- or in an area that has critical drainage problems (as notified to the local planning authority by the Environment Agency);
- or that may be subject to other sources of flood risk;

a site-specific flood risk assessment should support the draft Order. The flood risk assessment checklist may be helpful in this respect.

Where the neighbourhood planning area is in Flood Zone 2 or 3, or is in an area with critical drainage problems, advice on the scope of the flood risk assessment required should be sought from the Environment Agency. Where the area may be subject to other sources of flooding, it may be helpful to consult other bodies involved in flood risk management, as appropriate.

Where a Neighbourhood Development/Community Right to Build Order is under consideration for a site/area in Flood Zone 2 or 3, which has not been allocated in the development plan through the Sequential Test, and if necessary the Exception Test, it will be necessary for those proposing the development, in having regard to the National Planning Policy Framework's policies on flood risk, to demonstrate why the development cannot reasonably be located in areas of lower flood risk.

In all cases where new development is proposed, the sequential approach to locating development in areas of lower flood risk should still be applied within a neighbourhood planning area.

Neighbourhood Development/Community Right to Build Orders that propose new development that would be;

- contrary to the flood risk vulnerability and flood zone compatibility table (Table 3), or;
- within areas at risk of flooding where sequential testing shows there to be places at lower flood risk which are suitable and reasonably available for the development proposed,

should not be considered appropriate, having regard to the national policies on development and flood risk.

Paragraph: 064 Reference ID: 7-064-20140306

Revision date: 06 03 2014

Flood Zone and flood risk tables

- Table 1: Flood Zones
- Table 2: Flood risk vulnerability classification
- Table 3: Flood risk vulnerability and flood zone 'compatibility'

Table 1: Flood Zones

These Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences. They are shown on the Environment Agency's Flood Map for Planning (Rivers and Sea (https://flood-map-for-planning.service.gov.uk/)), available on the Environment Agency's web site, as indicated in the table below.

Flood Zone	Definition
Zone 1 Low Probability	Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3)
Zone 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. (Land shown in light blue on the Flood Map)
Zone 3a High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding.(Land shown in dark blue on the Flood Map)
Zone 3b The Functional Floodplain	This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)

Note: The Flood Zones shown on the Environment Agency's Flood Map for Planning (Rivers and Sea) do not take account of the possible impacts of climate change and consequent changes in the future probability of flooding. Reference should therefore also be made to the Strategic Flood Risk Assessment when considering location and potential future flood risks to developments and land uses.

Paragraph: 065 Reference ID: 7-065-20140306

Revision date: 06 03 2014

Table 2: Flood risk vulnerability classification

Essential infrastructure

- Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk.
- Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood.
- Wind turbines.

Highly vulnerable

- Police and ambulance stations; fire stations and command centres; telecommunications installations required to be operational during flooding.
- Emergency dispersal points.
- Basement dwellings.
- Caravans, mobile homes and park homes intended for permanent residential use.
- Installations requiring hazardous substances consent. (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as 'Essential Infrastructure').

More vulnerable

- Hospitals
- Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels.
- Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels.
- Non–residential uses for health services, nurseries and educational establishments.
- Landfill* and sites used for waste management facilities for hazardous waste.
- Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.

Less vulnerable

- Police, ambulance and fire stations which are not required to be operational during flooding.
- Buildings used for shops; financial, professional and other services; restaurants, cafes and hot food takeaways; offices; general industry, storage and distribution; non-residential institutions not included in the 'more vulnerable' class; and assembly and leisure.
- Land and buildings used for agriculture and forestry.
- Waste treatment (except landfill* and hazardous waste facilities).
- Minerals working and processing (except for sand and gravel working).
- Water treatment works which do not need to remain operational during times of flood.
- Sewage treatment works, if adequate measures to control pollution and manage sewage during flooding events are in place.

Water-compatible development

- Flood control infrastructure.
- Water transmission infrastructure and pumping stations.
- Sewage transmission infrastructure and pumping stations.
- Sand and gravel working.
- Docks, marinas and wharves.
- Navigation facilities.
- Ministry of Defence defence installations.
- Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location.
- Water-based recreation (excluding sleeping accommodation).
- Lifeguard and coastguard stations.
- Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms.
- Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.

" * " Landfill is as defined in Schedule 10 of the Environmental Permitting (England and Wales) Regulations 2010 (http://www.legislation.gov.uk/uksi/2010/675/schedule/10/made).

Paragraph: 066 Reference ID: 7-066-20140306

Revision date: 06 03 2014

Table 3: Flood risk vulnerability and flood zone 'compatibility'

Table 3: flood risk vulnerability and flood zone ‘compatibility'
(https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/575184/Table_3_-_Flood_risk_vulnerability_and_flood_zone__compatibility_.pdf) (PDF, 58.1KB, 1 page)

Key:

✓ Development is appropriate

✗ Development should not be permitted.

Notes to table 3:

- This table does not show the application of the Sequential Test which should be applied first to guide development to Flood Zone 1, then Zone 2, and then Zone 3; nor does it reflect the need to avoid flood risk from sources other than rivers and the sea;
- The Sequential and Exception Tests do not need to be applied to minor developments and changes of use, except for a change of use to a caravan, camping or chalet site, or to a mobile home or park home site;
- Some developments may contain different elements of vulnerability and the highest vulnerability category should be used, unless the development is considered in its component parts.

† In Flood Zone 3a essential infrastructure should be designed and constructed to remain operational and safe in times of flood.

” * “ In Flood Zone 3b (functional floodplain) essential infrastructure that has to be there and has passed the Exception Test, and water-compatible uses, should be designed and constructed to:

- remain operational and safe for users in times of flood;
- result in no net loss of floodplain storage;
- not impede water flows and not increase flood risk elsewhere.

Paragraph: 067 Reference ID: 7-067-20140306

Revision date: 06 03 2014

Site-specific flood risk assessment: Checklist

1 - Development site and location

You can use this section to describe the site you are proposing to develop. It would be helpful to include, or make reference to, a location map which clearly indicates the development site.

a. Where is the development site located? (eg postal address or national grid reference)

b. What is the current use of the site? (eg undeveloped land, housing, shops, offices)

c. Which Flood Zone (for river or sea flooding) is the site within? (ie Flood Zone 1, Flood Zone 2, Flood Zone 3). As a first step, you should check the Flood Map for Planning (http://apps.environment-agency.gov.uk/wiyby/37837.aspx) (Rivers and Sea). It is also a good idea to check the Strategic Flood Risk Assessment for the area available from the local planning authority.

2 - Development proposals

APPENDIX B: EA INFORMATION & CORRESPONDENCE

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Megan Berry

From: Enquiries_THM <enquiries_THM@environment-agency.gov.uk>
Sent: 26 March 2018 12:30
To: Megan Berry
Subject: THM 79766 Flood Risk Advice
Attachments: flood map.pdf; surface water flood map.pdf

Dear Megan

Thank you for your email.

We are unable to supply any modelled flood levels as the site is located in Flood Zone 1. Please find attached an extract from our flood map and surface water flood map.

I hope that we have correctly interpreted your request. Please refer to our Open Government Licence for the permitted use of the supplied data: http://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/

Please be aware that many of our datasets are now available online. Simply visit environment.data.gov.uk

We respond to requests for recorded information that we hold under the Freedom of Information Act 2000 (FOIA) and the associated Environmental Information Regulations 2004 (EIR).

Please get in touch if you have any further queries or contact us within two months if you'd like us to review the information we have sent.

Yours sincerely

Dawn Cooper
Customers & Engagement Officer
Direct Dial: 020 302 59465

Environment Planning & Engagement Team
Environment Agency
Thames Area

Did you know that the Environment Agency publishes most of its data via www.data.gov.uk? Using this site you can search for our data alongside other environmental data providers from the Defra Network and local authorities.

Follow us on:-

From: Megan Berry [mailto:meganberry@betts-associates.co.uk]
Sent: 20 March 2018 09:30
To: Enquiries_THM <enquiries_THM@environment-agency.gov.uk>
Subject: Flood Risk Advice

F.A.O Flood Risk, Drainage and/or Planning department

Please forward to the correct department/ office

To whom it may concern,

Oxford Road, Bodicote.

Please could you confirm whether you have any information that you feel would be valuable to a Flood Risk Assessment and Drainage Management Strategy for the site above (see location plan attached), including details of historical flooding and any predicted flood water levels; this would be greatly appreciated. If there are any specific requirements that you require in a scope of works for this site please can you advise at this stage so that it can be fully incorporated into the proposals at an early stage.

Please do not hesitate to contact me on the details below to discuss further should you require additional information or clarification.

Kind Regards

Megan Berry BSc(Hons)
Graduate Flood Risk Analyst

BETTS HYDRO
Specialists in Drainage and Flood Risk
Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire, CH5 2LY

CHESTER OFFICE - 01244 289041

meganberry@betts-associates.co.uk
www.betts-associates.co.uk

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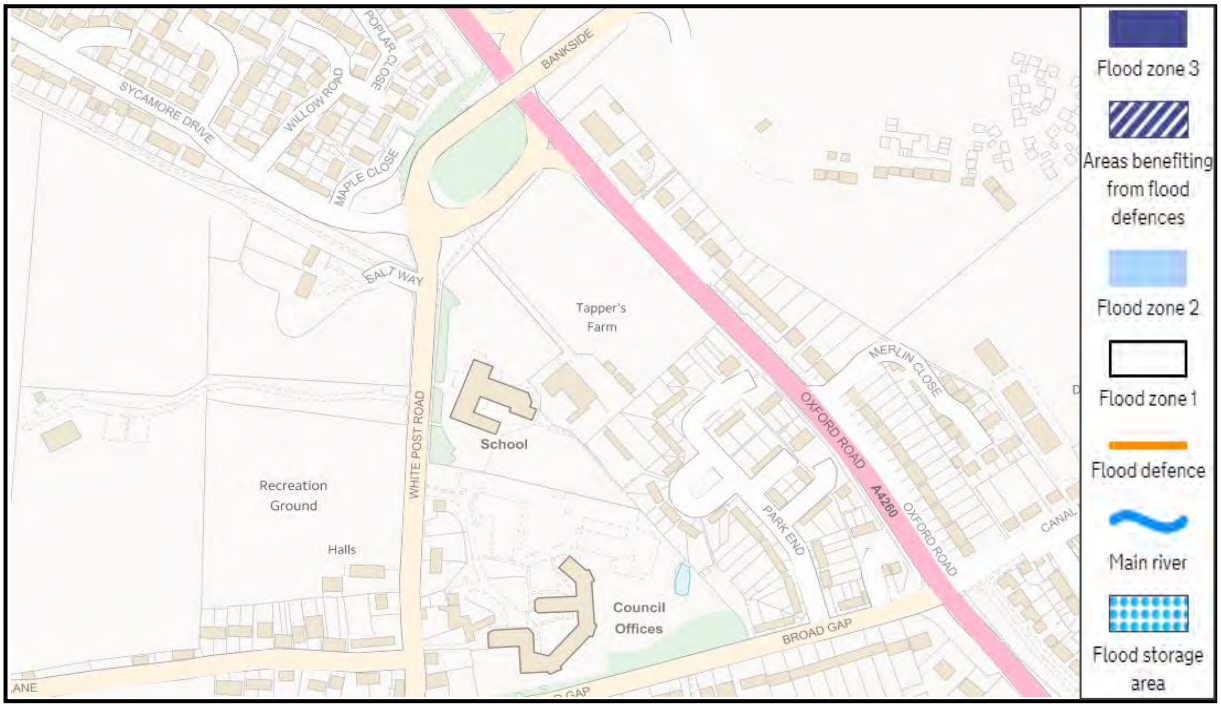
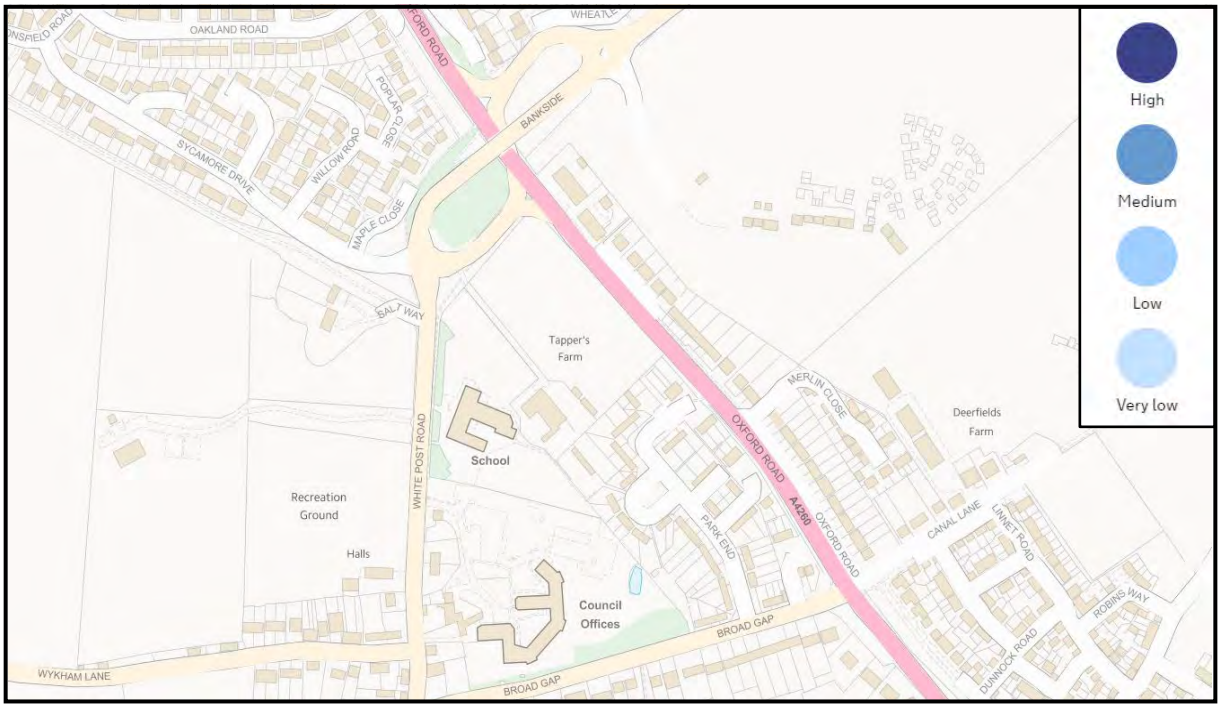
NATIONAL FLOOD MAPPING

BETTS HYDRO
CONSULTING ENGINEERS

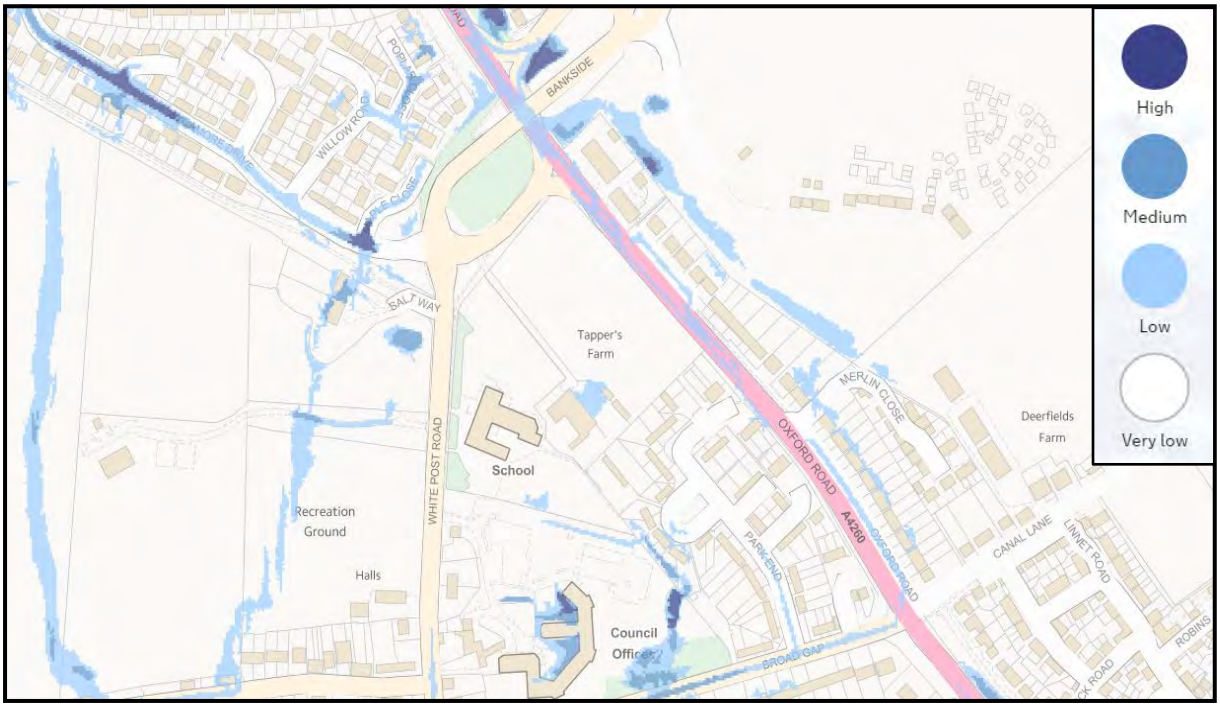
Flood Map for Planning



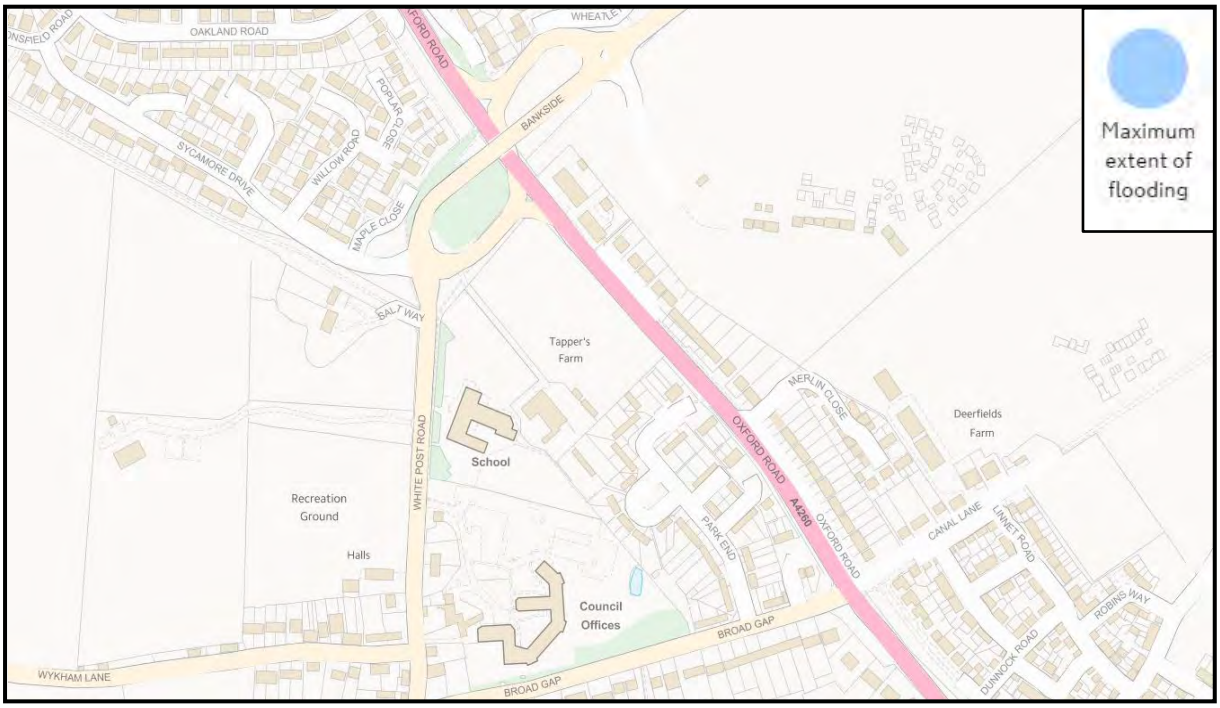
Long Term Flood Risk – Rivers or Sea



Long Term Flood Risk – Surface Water



Long Term Flood Risk - Reservoirs



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APPENDIX C: TW CORRESPONDENCE

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Megan Berry

From: Megan Berry
Sent: 20 March 2018 09:30
To: 'DEVELOPER.SERVICES@THAMESWATER.CO.UK'
Subject: Flood Risk Advice
Attachments: LOCATION PLAN.pdf

F.A.O Flood Risk, Drainage and/or Planning department

Please forward to the correct department/ office

To whom it may concern,

Oxford Road, Bodicote.

Please could you confirm whether you have any information that you feel would be valuable to a Flood Risk Assessment and Drainage Management Strategy for the site above (see location plan attached), including details of historical flooding and any predicted flood water levels; this would be greatly appreciated. If there are any specific requirements that you require in a scope of works for this site please can you advise at this stage so that it can be fully incorporated into the proposals at an early stage.

Please do not hesitate to contact me on the details below to discuss further should you require additional information or clarification.

Kind Regards

Megan Berry BSc(Hons)
Graduate Flood Risk Analyst

BETTS HYDRO
Specialists in Drainage and Flood Risk
Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire, CH5 2LY

CHESTER OFFICE - 01244 289041

meganberry@betts-associates.co.uk
www.betts-associates.co.uk

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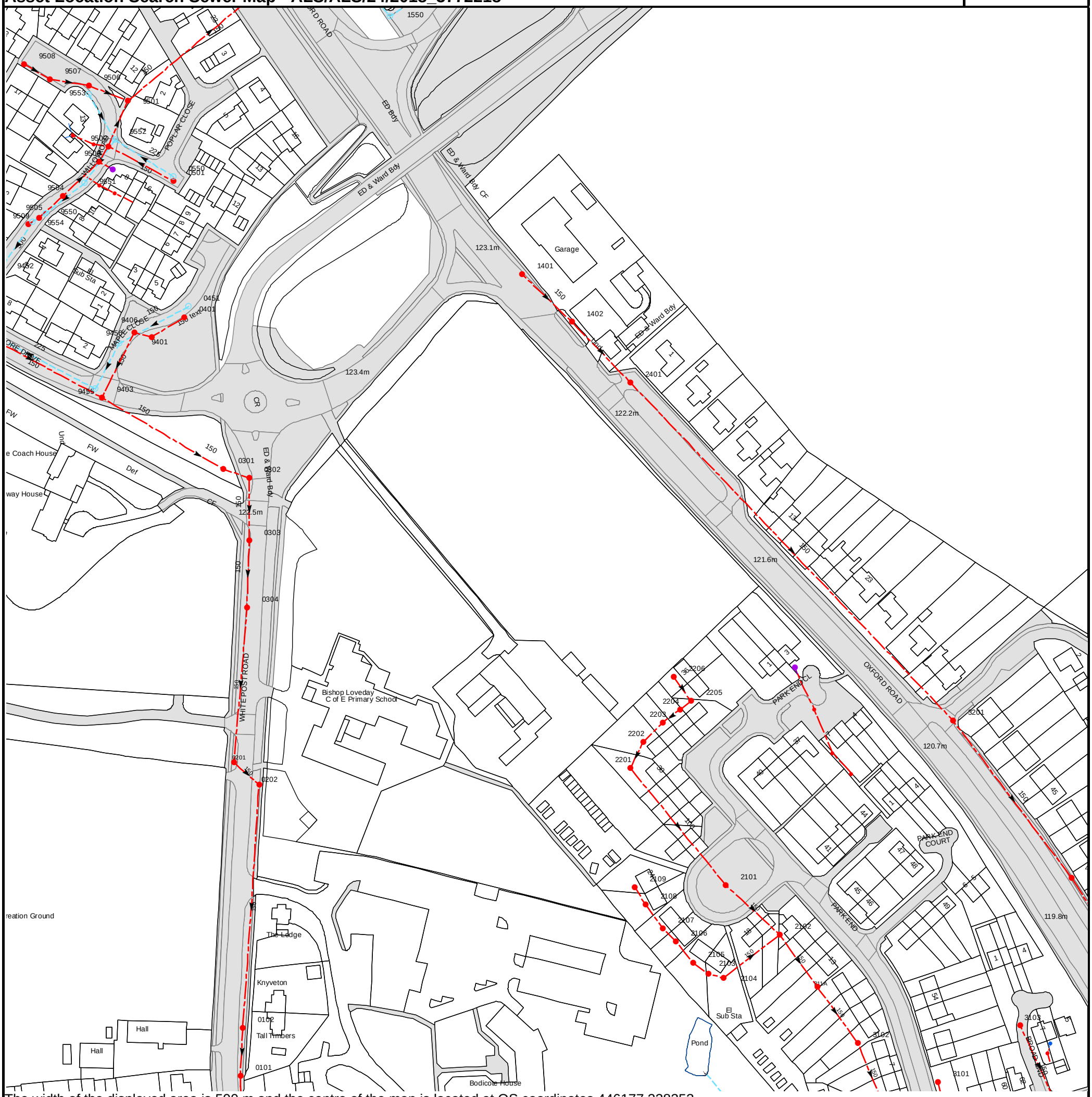
Asset Location Search Sewer Map - ALS/ALS/24/2018_3772218



The width of the displayed area is 500 m and the centre of the map is located at OS coordinates 446177,238353

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

Based on the Ordnance Survey Map with the Sanction of the controller of H.M. Stationery Office, License no. 100019345 Crown Copyright Reserved.

Megan Berry

From: Megan Berry
Sent: 13 July 2018 16:13
To: 'developer.services@thameswater.co.uk'
Cc: Kirsty Williams; Richard Nicholas
Subject: Pre-Planning Enquiry - Oxford Road Bodicote - Surface Water Connections
Attachments: LOCATION PLAN.pdf; TW.pdf; HYD317 Surface Water Run-off Calcs 13.07.18 Rev.1.0.pdf; 3772218-WW-20180612-141128-noconnor.pdf; Pre-Planning Enquiry Form - Surface Water.pdf

TW PREDEVELOPMENT ENQUIRY. Pro-forma attached.

To Whom It May Concern,

We are currently preparing a Flood Risk Management Assessment and Drainage Management Strategy to support a residential planning application on land off Oxford Road in Bodicote. As part of the preparation, a drainage management strategy has been devised and at this stage we are seeking to begin discussions with TW with regards to the proposed foul water: attached is the pre-application advice form, I have also summarised the proposed drainage strategy below;

Surface Water: Surface water discharge options have been assessed in accordance with the sustainable drainage hierarchy and based on the ground conditions identified by the online datasets, infiltration may offer a part or fully viable drainage solution for the development site due to the permeable strata, we have therefore recommended that further investigation (onsite testing) takes place as soon as possible as infiltration would be the primary means of discharging surface water run-off. Should infiltration be proven not be a feasible surface water drainage method for all the site following onsite testing, then the next outfall in the hierarchical approach is to discharge to the watercourse however, there are no watercourses suitable for outfall within close proximity of the site. The alternative would therefore be to discharge to the sewer network; subject to the relevant consents and agreements from Thames Water.

Should infiltration not offer feasible solution for surface water management at the site, then the alternative option would be to discharge to the nearest Thames Water public surface water sewer. The primary option would be to connect into the public surface water sewer (375mm Manhole no.2051) located approximately 400m to the south of site (this option may require a requisition depending upon routing). The secondary option would be to discharge into the 225mm surface water sewer (Manhole No.9455) located approximately 118m north-west of site within Sycamore Drive (may require a pumped solution, more detailed information to be provided to TW which is currently not available due to the nature of the planning application). The proposed rate of discharge in the surface water sewers is 9.9 l/s (QBar – FEH Method) base on an impermeable area of 0.878ha. Detailed design will be required and full consents to be obtained as the application progresses at a later stage, it is also noted significant offsite works would be required.

Foul Water: Previous foul water pre-planning enquiry has been undertaken.

We are ultimately seeking to identify TW's preferred points of connection(s) to the public surface water sewer network and to confirm any constraints and obtain agreement in principle to connect surface water flows to the public sewer system. Hopefully the summary above and the attached are of assistance and allow agreement in principle to be given, do not hesitate to contact me on the details below should you require any further assistance.

Kind Regards

Megan Berry BSc(Hons)
Graduate Flood Risk Analyst

BETTS HYDRO
Specialists in Drainage and Flood Risk

Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire, CH5 2LY

CHESTER OFFICE - 01244 289041

meganberry@betts-associates.co.uk
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Miss Megan Berry
Betts Hydro
Old Marsh Barns
Welsh Road, Sealand
CH5 2LY

Wastewater pre-planning
Our ref DS6049796

20 August 2018

Pre-planning enquiry: Capacity concerns

Dear Miss Berry

Thank you for providing information on your development at **Oxford Road, Bodicote, Banbury, OX15 4QL, OS grid ref. 446170, 238398.**

Proposed development: Residential development comprising 52 units. Foul Water discharging by gravity into MH ref SP46383201. Surface Water discharging by gravity into MH ref SP46382051 at max 5l/s for range of storms.

We've assessed your **foul water** proposals and concluded that our sewerage network will not have enough capacity to accommodate flows from proposed development

We're pleased to confirm that there will be sufficient **surface water** capacity in our sewerage network to serve your development, so long as your phasing follows the timescale you've suggested.

In order to ensure we make the appropriate upgrades – or 'off-site reinforcement' – to serve the remainder of your development, we'll need to carry out modelling work, design a solution and build the necessary improvements. This work is done at our cost.

Once we've begun modelling, we may need to contact you to discuss changing the connection point for capacity reasons. Please note that we'll pay the cost of covering any extra distance if the connection needs to be made at a point further away than the nearest practicable point of at least the same diameter.

How long could modelling and reinforcement take?

Typical timescales for a development of your size are:

Modelling: 8 months
Design: 6 months
Construction: 6 months
Total: 20 months

If the time you're likely to take from planning and construction through to first occupancy is longer than this, we'll be able to carry out the necessary upgrades in time for your development. If it's shorter, please contact me on the number below to discuss the timing of our activities.

What do you need to tell us before we start modelling?

We're responsible for funding any modelling and reinforcement work. We need, though, to spend our customers' money wisely, so we'll only carry out modelling once we're confident that your development will proceed.

In order to have this confidence, we'll need to know that you **own the land and have either outline or full planning permission**. Please email this information to us as soon as you have it.

If you'd like us to start modelling work ahead of this point, we can do this if you agree to underwrite the cost of modelling and design. That means we'll fund the work – but you agree to pay the cost if you don't achieve first occupancy within five years.

I've attached an example of our underwriting agreement. Please call me on the number below if you'd like to discuss this or want to request a copy of the agreement to complete.

If the modelling shows we need to carry out reinforcement work, then before we start construction we'll need you to supply us with notification that you've confirmed your 'nominated competent person' (NCP) submission to the Health and Safety Executive.

What do I need to do next?

If we haven't heard from you by 02/08/18 we'll contact you so you can confirm whether you can provide the confidence we need. If so, we'll be able to start modelling if you still need it – but we won't do so until you've confirmed that you need it.

Please note that you must keep us informed of any changes to your design – for example, an increase in the number or density of homes. Such changes could mean there is no longer sufficient supply capacity.

If you've any further questions, please contact me on 0203 577 8082.

Yours sincerely

Artur Jaroma

Thames Water

Megan Berry

From: Artur Jaroma <artur.jaroma@thameswater.co.uk>
Sent: 17 August 2018 09:04
To: Megan Berry
Cc: Richard Nicholas
Subject: RE: Pre-Planning Enquiry - Oxford Road Bodicote - Surface Water Connections DS6049796

Dear Megan

Thank you for submitting your revised strategy.

Just tried to call you to discuss below.

I would not have concerns for the proposed sw discharge into MH2051, however option 2 (MH9455) requires further restriction i.e. 5l/s.
May I ask whether the development has now achieved planning consent please?

Kind Regards

Artur Jaroma
Developer Services – Sewer Adoptions Engineer
Office: 0203 577 8082
artur.jaroma@thameswater.co.uk

Clearwater Court, Vastern Road, Reading, RG1 8DB
Find us online at developers.thameswater.co.uk

From: Megan Berry [mailto:meganberry@betts-associates.co.uk]
Sent: 16 August 2018 16:49
To: Artur Jaroma
Cc: Richard Nicholas
Subject: Pre-Planning Enquiry - Oxford Road Bodicote - Surface Water Connections

TW PREDEVELOPMENT ENQUIRY. Pro-forma attached.

Hi Artur,

We have just spoken on the phone regarding the site on land off Oxford Road in Bodicote, please find attached the pre-planning form which provides additional information regarding a connection into the public surface water sewer.

It is understood that there are capacity issues regarding surface water connections, however as infiltration is not feasible at this site and there is no watercourses in proximity, we have followed the drainage hierarchy and are suggesting a connection into the surface water sewer as the last drainage option. Please see below and attached for more information regarding our proposed connection;

Surface Water: Surface water discharge options have been assessed in accordance with the sustainable drainage hierarchy and based on further testing infiltration has been identified as non-viable drainage option. Our next approach was to outfall into a watercourse in accordance with the hierarchical approach however, there are no watercourses suitable for outfall within close proximity of the site. The alternative is to therefore discharge to the sewer network; subject to the relevant consents and agreements from Thames Water.

The primary option would be to connect into the public surface water sewer (375mm Manhole no.2051) located approximately 400m to the south of site (this option may require a requisition depending upon routing). The secondary option would be to discharge into the 225mm surface water sewer (Manhole No.9455) located approximately 118m north-west of site within Sycamore Drive (may require a pumped solution, more detailed information to be provided to TW which is currently not available due to the nature of the planning application). The proposed rate of discharge in the surface water sewers is 9.9 l/s (QBar – FEH Method) base on an impermeable area of 0.878ha. Detailed design will be required and full consents to be obtained as the application progresses at a later stage, it is also noted significant offsite works would be required.

We are therefore ultimately at this stage seeking to identify TW's preferred points of connection(s) to the public surface water sewer network and to confirm any constraints and obtain agreement in principle to connect surface water flows to the public sewer system. It is understood that there are capacity issues however it would be appreciated if TW could agree a way forward at this stage.

If you require clarification on our proposals please do not hesitate to contact me on the details below

Thank you.

Kind Regards

Megan Berry BSc(Hons)
Graduate Flood Risk Analyst

BETTS HYDRO
Specialists in Drainage and Flood Risk
Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire, CH5 2LY

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meganberry@betts-associates.co.uk
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Megan Berry

From: DEVELOPER.SERVICES@THAMESWATER.CO.U <DEVELOPER.SERVICES@THAMESWATER.CO.UK>
Sent: 02 July 2018 09:31
To: Megan Berry
Subject: RE: DS6049796 PPLA OX15 4QL Park End Close
Attachments: pastedImage1; pastedImage1; DS6049796 PPLA OX15 4QL Park End Close.pdf; Wastewater FAQs for pre-planning enquiries.pdf; LON_LIB1-#18279149-v2-Waste Cost Underwriting Agreement.pdf

Dear Sir/Madame

Following your Pre-Planning Enquiry for the above site, please find our formal response enclosed. Please note, we have identified an inability of the existing waste water infrastructure to accommodate foul water flows from proposed development, and request to provide a build programme and further information describing confidence of the delivery of this scheme.

Should you have any further queries, please do not hesitate to contact me again.

Kind Regards

Artur Jaroma
Developer Services – Sewer Adoptions Engineer
Office: 0203 577 8082
artur.jaroma@thameswater.co.uk

Clearwater Court, Vastern Road, Reading, RG1 8DB
Find us online at developers.thameswater.co.uk

Original Text

From: "DEVELOPER.SERVICES@THAMESWATER.CO.U" <DEVELOPER.SERVICES@THAMESWATER.CO.UK>
To: meganberry@betts-associates.co.uk
CC:
Sent: 22.06.18 15:21:06
Subject: DS6049796 PPLA OX15 4QL Park End Close

Dear Sir/Madame

Thank you for submitting additional information. I have now consulted our Planning Team to assess impact of your development on to waste water infrastructure downstream of the proposed site. Planning Team usually respond within 5-10 working days. I will issue a formal response shortly after receiving their comments.

Kind Regards

Kind Regards

Artur Jaroma

Megan Berry

From: Megan Berry
Sent: 12 June 2018 15:46
To: 'developer.services@thameswater.co.uk'
Subject: Pre-Planning Enquiry
Attachments: Preliminary Proposed Drainage Plan.pdf; LOCATION PLAN.pdf; TW.pdf; Pre-planning enquiry form.pdf

TW PREDEVELOPMENT ENQUIRY. Pro-forma attached.

To Whom It May Concern,

We are currently preparing a Flood Risk Management Assessment and Drainage Management Strategy to support a residential planning application on land off Oxford Road in Bodicote. As part of the preparation, a drainage management strategy has been devised and at this stage we are seeking to begin discussions with TW with regards to the proposed foul water: attached is the pre-application advice form, I have also summarised the proposed drainage strategy below;

Surface Water: Surface water discharge options have been assessed in accordance with the sustainable drainage hierarchy and based on the ground conditions identified by the online datasets, infiltration may offer a part or fully viable drainage solution for the development site due to the permeable strata, we have therefore recommended that further investigation (onsite testing) takes place as soon as possible as infiltration would be the primary means of discharging surface water run-off. Should infiltration be proven not be a feasible surface water drainage method for all the site following onsite testing, then the next outfall in the hierarchical approach is to discharge to the watercourse however, there are no watercourses suitable for outfall within close proximity of the site. The alternative would therefore be to discharge to the sewer network; subject to the relevant consents and agreements from Thames Water.

We have currently excluded a surface water connection enquiry from the attached form at this moment in time until Soakaway Testing has been completed and further investigation of levels and the nearest surface water sewer has been undertaken, as a pumped solution may be required which would require more detailed information to be provided to TW which is currently not available due to the nature of the planning application. If infiltration is proven not to be feasible the current proposals would be to discharge into a 225mm public surface water sewer located approximately 118m north-west of site within Sycamore Drive at a rate of 7.9 l/s (QBar) (see drainage plan attached). Detailed design will be required and full consents to be obtained as the application progresses at a later stage, it is also noted significant offsite works would be required.

Foul Water: Foul water flows generated by the development are proposed to connect to nearest the public foul water sewer. Review of the TW sewer records identify there to be a public foul water sewer (150mm) within Oxford Road located adjacent to site as shown in our Preliminary Drainage Plans (see attached) and connection into this system would be preferred. It is understood that offsite works will be required to achieve this point of connection into Manhole 3201 as described within the Pre-development enquiry form. Further discussion with the relevant land owners (Highways Authority) is understood to be required and it is also anticipated that a gravity system will be feasible. Based on the proposals for the construction of approximately no.52 residential units the approximate peak foul water flows generated by the development are 2.4l/s. This is based on 4000 litres per dwelling per 24 hours; the guidance contained within Sewers for Adoption (SfA).

We are ultimately seeking to identify TW's preferred points of connection(s) to the public foul sewer network and to confirm any constraints and obtain agreement in principle to connect foul water flows to the public sewer system. It would also be helpful if TW could also identify the nearest public surface water to site within Oxford Road which could provide an alternative surface water drainage option at this time.

Hopefully the summary above and the attached are of assistance and allow agreement in principle to be given, do not hesitate to contact me on the details below should you require any further assistance.

Kind Regards

Megan Berry BSc(Hons)
Graduate Flood Risk Analyst

BETTS HYDRO
Specialists in Drainage and Flood Risk
Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire, CH5 2LY

CHESTER OFFICE - 01244 289041

meganberry@betts-associates.co.uk
www.betts-associates.co.uk

CIVIL | STRUCTURAL | GEO-ENVIRONMENTAL | HYDROLOGY | FLOOD RISK MANAGEMENT
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Pre-planning enquiry

Application form

Please complete this form and return it to us at
developer.services@thameswater.co.uk or
Thames Water, Developer Services, Clearwater Court,
Vastern Road, Reading, RG1 8DB.

Thames Water

Application for a pre-planning enquiry

Please complete all sections of this form in BLOCK CAPITALS

If you're using this form to request a budget estimate, please note that you should be able to calculate the likely charges involved in your scheme by consulting our guide, 'Charging arrangements for new connection services', on our website.

Are you a: Developer Consultant Land promoter (Please tick one.)

Is your application for: Water Wastewater Both (Please tick one.)

Would you like a water budget estimate? Yes No

(We can only offer a wastewater budget estimate after modelling, if required).

A - About the person applying

Company name BETTS HYDRO

Title Mr Mrs Ms Miss Dr Other

First name(s) MEGAN

Last name BERRY

Preferred contact number 01244 289041

Alternative number

Email address MEGANBERRY@BETTS-ASSOCIATES.CO.UK

Full postal address

Address line 1 OLD MARSH BARNS

Address line 2 WELSH ROAD

Town SEALAND

County FLINTSHIRE Postcode CH5 2LY

B - Nominated contact

Who should we contact to process your application? Applicant Someone else

(Please tick one.)

If someone else:

Company name

Title Mr Mrs Ms Miss Dr Other

First name(s)

Last name

Preferred contact number

Alternative number

Email address

Full postal address

Address line 1

Address line 2

Town

County

Postcode

C - Where the work is taking place

What is the address of the property being connected?

Same as applicant ☐ Same as nominated contact ☐

Somewhere else ☐ (Please tick one.)

If somewhere else:

Site name OXFORD ROAD

Full postal address

Address line 1 PARK END CLOSE

Address line 2

Town BODICOTE

County BANBURY

Postcode OX15 4QL

D - About the site

What is the local authority? OXFORDSHIRE COUNTY COUCIL

Ordnance Survey grid ref 446170 238398

Type of site Greenfield ☐ Brownfield ☐ Mixed ☐

How big is the site? 2.204 hectares

When do you intend to have first occupancy? MM YYYY (Approximate date if necessary)

E - Planning status (if you've already started the planning process)

Is the development identified in the local plan? Yes ☐ No ☐ Don't know ☐ If Yes, reference number

Does it have outline planning permission? Yes ☐ No ☐ Don't know ☐ If Yes, reference number

Does it have full planning permission? Yes ☐ No ☐ Don't know ☐ If Yes, reference number

Does the development have building regulations permission? Yes ☐ No ☐ Don't know ☐

When do you intend to start on site? MM YYYY

F - About the water supply

If you're proposing a water storage tank, what is its capacity? ☐ m^3

When will you want your first domestic connection laid on? MM ☐ YYYY ☐

For water supplies, what is the estimated flow rate required for your site? ☐ litres/sec (Not required if applying only for wastewater.)

G - Existing sewerage connections (Not required if applying only for water.)

	Foul water	Surface water
Does the site have the following sewerage connections?	☐	☐
What is the type of discharge method?	☐ Gravity ☐ Pumped	☐ Gravity ☐ Pumped
If sewage is pumped, what is the pump rate?	☐ litres/sec	☐ litres/sec
Amount of existing impermeable area per connection	~~N/A~~	THERE IS AN EXSTING IMPERMABLE AREA OF 0.430HA. HOWEVER, AT THIS MOMENT IN TIME, EXISTING CONNECTIONS HAVE NOT BEEN ABLE TO BE CONFIRMED DUE TO EXISTING ONSITE RESTRICTIONS CAUSED BY THIRD PARTIES.
What are the existing connection points? (For example, 'X' number of domestic and commercial properties drain into manhole 'Y' / sewer with diameter of 'Z'.)	DUE TO THE NATURE OF THE ONSITE BUILDING EXISTING CONNECTION ARE ASSUMED TO EXIST HOWEVER, UNABLE TO BE CONFIRMED DUE TO THIRD PARTIES.	CURRENTLY UNKNOWN - SEE ABOVE

H - Proposed sewerage connections (Not required if applying only for water.)

	Foul water	Surface water
Does the site have the following sewerage connections?	☐	☐
What is the type of discharge method?	☐ Gravity ☐ Pumped	☐ Gravity ☐ Pumped
If sewage is pumped, what is the pump rate?	N/A litres/sec	N/A litres/sec
What is your proposed approach to surface water drainage?	N/A	☐ Traditional piped system ☐ Sustainable drainage system (SuDS)
Do you propose using separate highway and surface water drainage systems?	N/A	Yes No
If the surface water rate is attenuated, to what rate is it attenuated?	N/A	9.9 litres/sec
Amount of proposed impermeable area per connection	N/A	THE 9.9L/S (QBAR) HAS BEEN CALCULATED USING THE FEH STATISTICAL DATA. THE TOTAL SITE COVERS 2.204ha AND THE PROPOSED DEVELOPMENT AREA EQUATES TO 1.806HA. DUE TO THE NATURE OF THE PROPOSALS THE IMPERMEABLE AREA POST-DEVELOPMENT IS ASSUMED TO INCREASE TO APPROXIMATLY 49% OF THE DEVELOPMENT SITE (0.878HA).
What are the proposed connection points? (For example, 'X' number of domestic and commercial properties drain into manhole 'Y' / sewer with diameter of 'Z'.)	52 DWELLINGS MANHOLE - 3201 COVER LEVEL -120.81 IVERT LEVEL - 118.36	THE PRIMARY OPTION WOULD BE TO DISCHARGE INTO MANHOLE NO. 2050/2051 (375MM) VIA GRAVITY SOLUTION COVER LEVEL - 116.59 INVERT LEVEL - 114.42 THIS OPTION MAY REQUIRE A REQUISITION DEPENDING UPON ROUTING. THE SECONDARY OPTION WOULD BE TO DISCHARGE INTO MANHOLE NO.9455 (225MM) THIS OPTION MAY REQUIRE A PUMPED SOLUTION. COVER LEVEL -123.13 INVERT LEVEL -122.66

Please note: The developer is expected to follow the local authority's drainage strategy and be able to demonstrate how the proposed (attenuated) discharge rate of any surface water flows has been calculated. For developments in Greater London, please refer to the London Plan Drainage Hierarchy (Policy 5.13). We will challenge the rates provided if they are not in line with those based on the local drainage strategies.

I - Additional information (where available)

When we're assessing your development needs, it's important that we know what buildings (if any) currently exist on the site. It may be, for example, that the infrastructure serving those properties is already sufficient to cater for your proposed development.

We realise it may be too early in your process to complete this table, but any information you can provide at this stage will help improve the accuracy of our assessment and could prevent us from requesting data in the future.

Property type	Existing site	Proposed site
General housing (units 3 person+)		52 DWELLINGS
Flat (units up to 2 person)		
Primary school (max. pupil capacity)		
Senior school (max. pupil capacity)		
Boarding school (max. pupil capacity)		
Assembly hall (max. capacity)		
Cinema (max. capacity)		
Theatre (max. capacity)		
Sports hall (max. capacity)		
Hotel (total bedrooms)		
Guest house (total bedrooms)		
Motel (total bedrooms)		
Holiday apartment (capacity)		
Leisure park (capacity)		
Caravan park standard (per space)		
Caravan site standard (per space)		
Camping site standard (per space)		
Camping site serviced (per space)		
Public house (max. capacity)		
Restaurant / Day care centre (max. capacity)		
Drive in restaurant (max. capacity)		
Hospital (per bed)		
Nursing / Care home (per bed)		
Offices (gross internal area in m^2)		
Shopping centre (gross internal area in m^2)		
Warehouse (gross internal area in m^2)		
Commercial premises (gross internal area in m^2)		
Manufacturing unit (gross internal area in m^2)		
Other (please state units and description)		

J - Enclose your documents

Please make sure any attachments are in PDF format and don't exceed a total of 20MB in size per email.

All drawings must be of suitable detail and have a drawing reference number on them.

What we need from you to process your application:

Site location plan	This should show the site with nearby buildings, roads and any sewers.
Scaled site layout	This should show existing and proposed layouts.
Site drainage strategy plan (if available at this stage)	This should show all proposed sewers, pipe sizes and gradients. (Not required if applying only for water.)

Please also let us know if you have a **schedule of planned works** showing how you might phase your development.

Please note, without this information we may need to make assumptions about your requirements when calculating your budget estimate (if requested).

K - How we'll use this information

We'll use the information you give on this application form, and potentially share it with our delivery partners, to provide the service you've requested.

This could include contacting you to discuss your application and/or provide more details, visiting the site where work needs to be carried out, and invoicing you when appropriate. Your feedback is important to us, so we may also use the information to ask for your feedback on how we can improve our performance.

We won't use this information for marketing purposes without contacting you to seek your consent.

You can find Thames Water's privacy policy at **thameswater.co.uk/Legal/Privacy**.

L - Declaration

I confirm to the best of my knowledge that the information in this application is complete and correct.

Print name	MEGAN BERRY
Position within company	GRADUATE FLOOD RISK ANALYST
Company	BETTS HYDRO
Date	13/07/2018
Signature	

Submitting your application

Please email your completed form to **developer.services@thameswater.co.uk** or send it to Thames Water Developer Services, Clearwater Court, Vastern Road, Reading RG1 8DB.

Once we've assessed your application, we'll write to tell you the result within 21 calendar days.

Where we know there's sufficient capacity we'll tell you, but if we're concerned there may not be, we'll advise you of the next steps. We'll also let you know if we need further information from you.

Getting in touch

For enquiries regarding this application or any other questions relating to your building or development work please contact us on:

thameswater.co.uk/developerservices

developer.services@thameswater.co.uk

0800 009 3921
Monday – Friday, 8am – 5pm

**Thames Water, Developer Services, Clearwater Court,
Vastern Road, Reading, Berkshire RG1 8DB**

This leaflet can be supplied in braille or audio-tape upon request.

Thames Water

03/18

APPENDIX D: LPA/LLFA CORRESPONDENCE

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Megan Berry

From: John Kearsey <John.Kearsey@canalrivertrust.org.uk>
Sent: 28 March 2018 09:26
To: Megan Berry
Cc: enquiries southeast
Subject: RE: Flood Risk Advice

Dear Megan
The site in question is remote from the South Oxford Canal which will not present any flood risk.

Regards
John

John Kearsey
Principal Water Engineer - South
Canal & River Trust

M 07710 796354

Please visit our website to find out more about our 10 year strategy.

From: enquiries southeast
Sent: 22 March 2018 11:37
To: John Kearsey <John.Kearsey@canalrivertrust.org.uk>
Subject: FW: Flood Risk Advice

Hi John,

Please see below, can I leave this with you to respond to?

Many thanks

Lou

From: Megan Berry [mailto:meganberry@betts-associates.co.uk]
Sent: 20 March 2018 16:50
To: enquiries southeast <enquiries.southeast@canalrivertrust.org.uk>
Subject: Flood Risk Advice

F.A.O Flood Risk, Drainage and/or Planning department

Please forward to the correct department/ office

To whom it may concern,

Oxford Road, Bodicote.

Please could you confirm whether you have any information that you feel would be valuable to a Flood Risk Assessment and Drainage Management Strategy for the site above (see location plan attached), including details of historical flooding and any predicted flood water levels; this would be greatly appreciated. If there are any specific requirements that you require in a scope of works for this site please can you advise at this stage so that it can be fully incorporated into the proposals at an early stage.

Please do not hesitate to contact me on the details below to discuss further should you require additional information or clarification.

Kind Regards

Megan Berry BSc(Hons)
Graduate Flood Risk Analyst

BETTS HYDRO
Specialists in Drainage and Flood Risk
Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire, CH5 2LY

CHESTER OFFICE - 01244 289041

meganberry@betts-associates.co.uk
www.betts-associates.co.uk

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Cadw mewn cysylltiad
Cofrestrwch i dderbyn e-gylchlythyr Glandŵr Cymru https://canalrivertrust.org.uk/newsletter
Cefnogwch ni ar https://www.facebook.com/canalrivertrust
Dilynwch ni ar https://twitter.com/canalrivertrust ac https://www.instagram.com/canalrivertrust

Mae'r e-bost hwn a'i atodiadau ar gyfer defnydd y derbynnydd bwriedig yn unig. Os nad chi yw derbynnydd bwriedig yr e-bost hwn a'i atodiadau, ni ddylech gymryd unrhyw gamau ar sail y cynnwys, ond yn hytrach dylech eu dileu heb eu copïo na'u hanfon ymlaen a rhoi gwybod i'r anfonwr eich bod wedi eu derbyn ar ddamwain. Mae unrhyw farn neu safbwynt a fynegir yn eiddo i'r awdur yn unig ac nid ydynt o reidrwydd yn cynrychioli barn a safbwyntiau Glandŵr Cymru.

Megan Berry

From: Tony Brummell <Tony.Brummell@cherwellandsouthnorthants.gov.uk>
Sent: 03 April 2018 09:24
To: Megan Berry
Subject: Site off Oxford Road Bodicote - Flood Risk (nearest post code OX15 4QL)

Hello, I have received your emailed enquiry of 20th March.

You are probably aware that the site is shown to be in Flood Zone 1. Reference to the surface water flood risk maps show there may be a small risk of surface water flooding within the site.

We are not aware that the site has been affected by flooding. However, because of its current use and nature, we may not necessarily have been notified if it has.

Tony Brummell CEng FICE
Building Control Manager

Cherwell and South Northants Building Control Service
Place and Growth Directorate
Cherwell and South Northants Councils

Direct Tel: 01327 322273
tony.brummell@cherwellandsouthnorthants.gov.uk
www.cherwell.gov.uk | www.southnorthants.gov.uk

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Megan Berry

From: FOI - E&E <FOI-E&E@Oxfordshire.gov.uk>
Sent: 28 March 2018 15:53
To: Megan Berry
Cc: FOI - E&E
Subject: 13380 EIR Acknowledgement

Dear Ms Berry,

Thank you for your request of 20 March 2018 in which you asked for the flood risk assessment and drainage management strategy for Oxford Road, Bodicote.

Your request is being considered and Oxfordshire County Council will respond within 20 working days in compliance with the Freedom of Information Act 2000. This means that the council will send a response to you by 19 April 2018.

Please note that there will be a fee payable for this information and we would be grateful if you notify us if you wish to proceed with your request.

If appropriate, the information requested can be made available in alternative formats, including other languages, Braille, large print, and audiocassette. If you require any of these formats then please let us know.

Please contact us if you have any have further enquiries about your request. We would be grateful if you could quote the reference number given at the top of this email.

Kind regards
Renata Malinowski

E&E Freedom of Information and Complaints Support Officer
Joint Commissioning and E&E
Email: E&E-FOI@oxfordshire.gov.uk and JointCommissioningFOI@oxfordshire.gov.uk

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APPENDIX E: LOCATION PLAN

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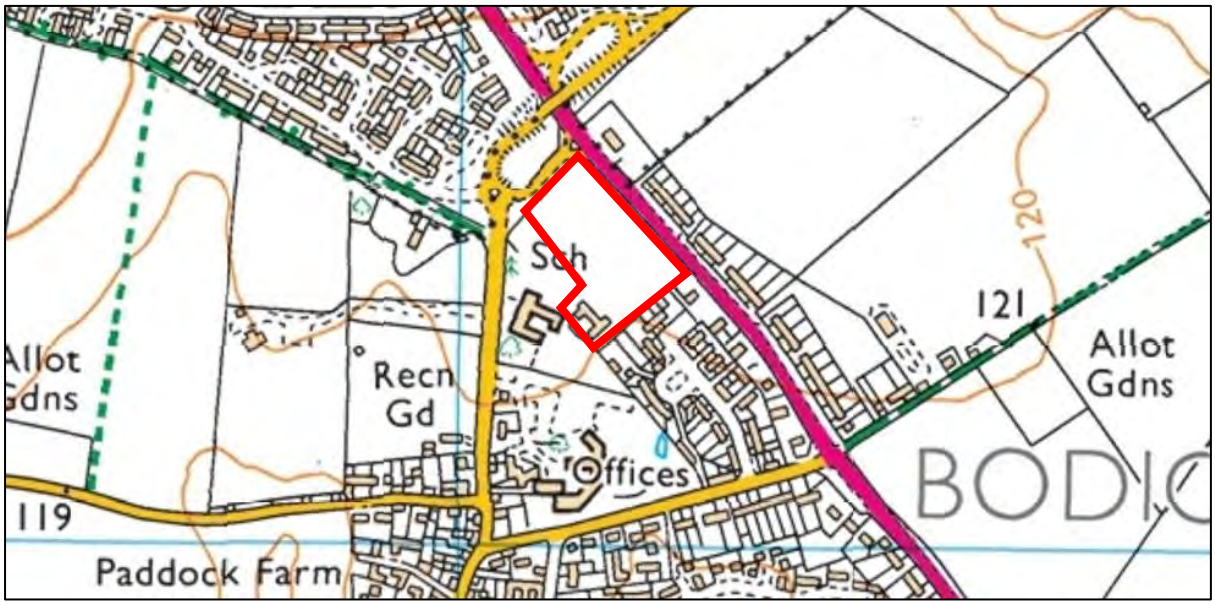
LOCATION PLAN

Oxford Road, Bodicote.



OS X (Eastings)	446170
OS Y (Northings)	238398
Nearest Post Code	OX15 4QL
Lat (WGS84)	N52:02:31 (52.042065)
Long (WGS84)	W1:19:42 (-1.328260)
Lat,Long	52.042065,-1.328260
Nat Grid	SP461383 / SP4617038398
mX	-147861
mY	6774022

APPENDIX F: TOPOGRAPHIC SURVEY

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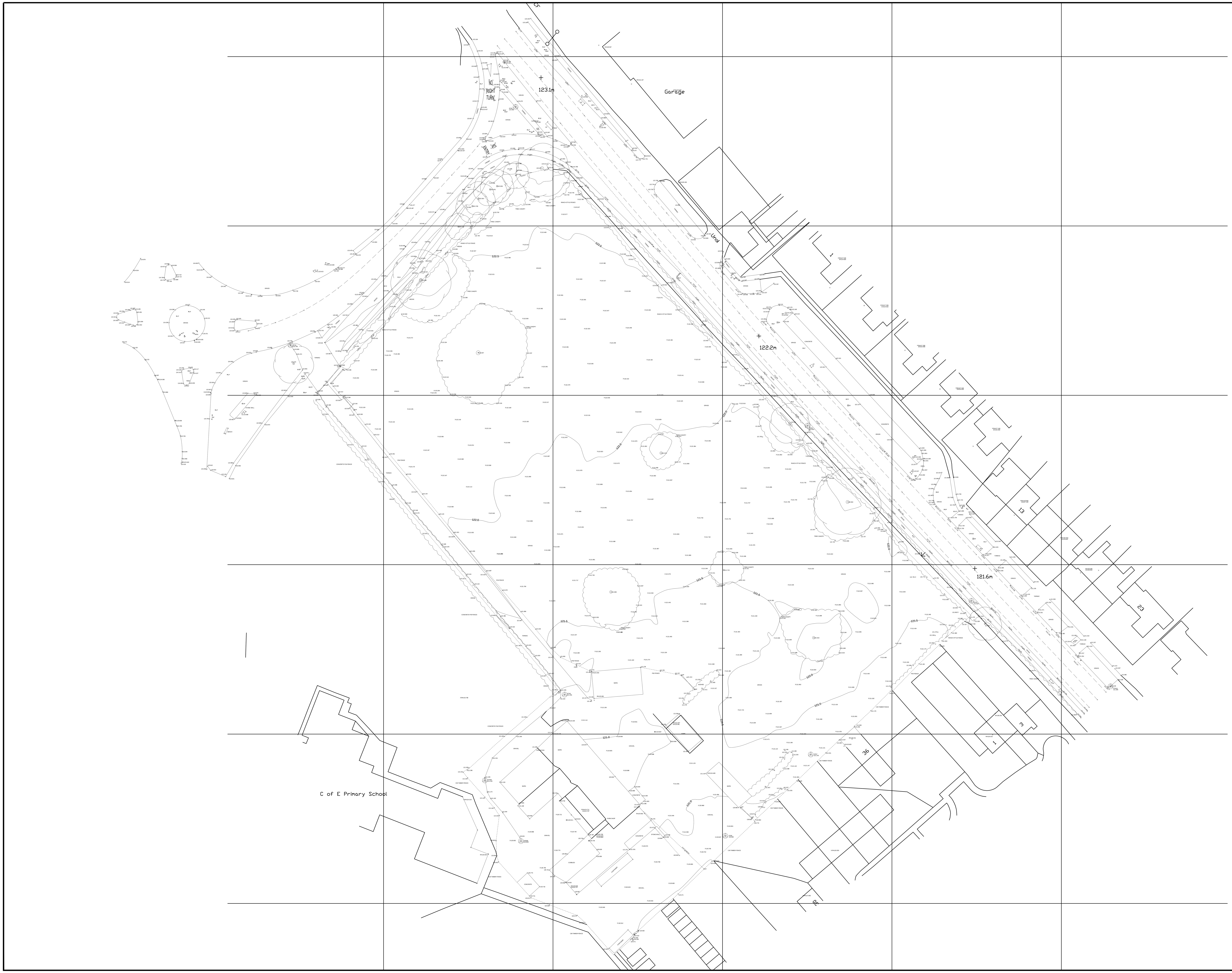

SURVEY ORIENTATED TO REAL TIME GPS

0m 10m 20m 30m 40m

SCALE BAR 1:500

NOTES AND AMENDMENTS

ONLY MANHOLES AND SERVICES VISIBLE AT TIME OF SURVEY SHOWN

DRAINAGE INFORMATION MUST BE CHECKED AND VERIFIED WITH LOCAL AUTHORITY RECORDS PRIOR TO WORK COMMENCING
Levels defining edge of carriageway are observed at channel (bottom of kerb). Unless otherwise stated.

TREE SPREADS ARE SYMBOLIC ONLY AND ARE REPRESENTATIVE OF THE THE AVERAGE SPREAD.
THE DRIP LINE LAYER DENOTES THE TREES EXTREMITY

REVISIONS

REV.	DESCRIPTION	DRAWN	CHKD.	DATE

Topographical Survey Legend

Bin	Litter bin	TL	Tie line
BH	Bore Hole	TP	Telegraph pole
Bol	Bollard	TPS	Tactile paving slabs
BS	Bus stop	TS	Traffic signal light
BT	British telecom ic	TV	Television cover
CPS	Concrete paving slabs	VP	Vent pipe
DR	Drain	WM	Water meter
Elec	Electrical ic	WO	Wash Out
EP	Elec. pole	UTL	Unable to lift
ER	Earth rod	Fence annotation	
FH	Fire Hydrant	B/W	Barbed wire
FP	Flagpole	C/B	Closed boarded
FT	Floodlight	C/I	Corrugated iron
G	Gully	C/L	Chain link
GP	Gate post	C/P	Concrete panel
GV	Gas valve	H/R	Hand rail
IC	Inspection cover	I/R	Iron railings
JB	Junction box	O/B	Open boarded
KO	Kerb outlet	P/C	Post & chain
LB	Letter box	P/R	Post & rail
LP	Lamp post	P/W	Post & wire
Mkr	Utility marker	W/M	Wire mesh
MP	Mile post	Level prefix descriptions	
MW	Monitoring Well	AL	Arch level
NP	Name plate	BL	Bed level
P	Post	CL	Cover level
PM	Parking meter	EH	Eaves level
RE	Rodding eye	FL	Floor level
RS	Road sign	IL	Invert level
rwp	Rain water pipe	PL	Parapet level
SP	Sign post	RH	Roof/ridge level
ST	Stop tap	SL	Soffit level
SB	Service Box	Spr	Arch springing level
SV	Stop valve	Top	Top of pipe/culvert
TCB	Telephone call box	WH	Wall height
TH	Trial Hole	WL	Water level

BENCH MARK INFORMATION

All levels relate to OSBM Newlyn

Datum Generated by VRS GPS

SURVEY STATIONS

STN1	446273.464	238339.336	121.522
STN1A	446314.538	238314.097	121.185
STN2	446225.133	238391.042	122.053
STN3	446138.958	238485.152	123.485
STN4	446072.531	238414.824	123.760
STN5	446153.437	238311.660	121.501
STN5A	446129.903	238286.325	121.244
STN5B	446140.552	238268.390	120.863
STN6	446200.834	238269.951	120.858
STN7	446226.057	238293.961	121.145

JLP Surveying

JLP Surveying Consultants Ltd,
Suite 25 Rodney House,
King Street,
Wigan
WN1 1BT
Tel - 01942 243313
Fax - 01942 492230
Mobile - 07710 428498
EMAIL:- peterhouston@jlpsurveys.com

PROJECT
OXFORD ROAD,
BODICOTE

DRAWING TITLE
Topographical Land Survey

SCALE	SHEET SIZE	No. of SHEETS	DATE	REVISION
1:500	A1	1	04.04.18	

DRAWING NUMBER
S18-225

APPENDIX G: PROPOSED PLANNING LAYOUT

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N

Drawing Title:	-	Illustrative Masterplan
Drawing Number:	-	1732-URB-UD-GA-90-001
Project:	-	Bodicote, Banbury
Revision:	-	F
Scale:	-	1:500 @ A2
Date:		170918

the urbanists
planning & design

APPENDIX H: PFRA/SFRA PLANNING EXTRACTS

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North

0 5 10 20 Kilometers

Legend

Surface water hotspots

Areas Susceptible to Groundwater Flooding

- >= 75%
- >= 50% <75%
- >= 25% <50%
- < 25%

Proportion of each 1km square that is susceptible to groundwater emergence

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JBA consulting

Crowmarsh Battle Barns
100 Preston Crowmarsh
Wallingford
OX10 6SL

www.jbaconsulting.co.uk

t +44 (0)1491 836688
f +44 (0)0870 0519307
e info@jbaconsulting.co.uk

OXFORDSHIRE COUNTY COUNCIL
www.oxfordshire.gov.uk

Other offices at Atherstone, Doncaster, Edinburgh, Haywards Heath, Limerick, Newcastle upon Tyne, Newport, Northallerton, Saltaire, Skipton & Tadcaster

for

OXFORDSHIRE COUNTY COUNCIL

PRELIMINARY FLOOD RISK ASSESSMENT

Map 7: Areas Susceptible to Groundwater Flooding

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Drawn by:	AB	Scale: Not to scale
Date:	09/06/2011	
Status:	FINAL	
File Name:	N/A	
Drawing Number:	Map 7	

Original @ A3

North

0 5 10 20 Kilometers

Explanatory note:
Maps 6a to 6c show the spatial distribution of three receptors (people, critical services and non-residential properties) that may be affected by future surface water flooding in an event with a 1 in 200 chance of occurring in any given year.
This map shows the number of non-residential properties affected, which can be considered an indicator of the consequences of flooding for economic activity. Non-residential properties are defined in the Environment Agency's PFRA and property count guidance, and include all industrial, commercial, retail, public buildings etc.
Calculations for each 1km square were carried out using the Flood Map for Surface Water (1 in 200 >0.3m), Environment Agency's detailed method of counting (based on property outlines) and the National Receptors Database v1.1.
The 1km squares are shaded from light to dark purple as the number of non-residential properties affected in each square increases.
Also overlaid on the map are surface water flooding 'hot spots', or areas where the consequences of a surface water event are likely to be more severe. These have been defined as 1km grid squares where at least one of the three indicators is above the threshold given below (thresholds defined by Defra guidance):
•More than 200 people affected
•One or more critical services affected
•More than 20 non-residential properties affected
The maps show that:
•The main hotpots are in more urban locations due to the concentration of population, industrial and commercial buildings, and critical services.
•Several more rural communities have less people affected but will still experience an adverse impact, particularly those where local critical services are affected.
More detail is given in the main report.

Legend

Hotspots

Non-residential properties

< 5	Number of non-residential properties affected per 1km grid square
5 - 10	
10 - 20	
> 20	

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JBA consulting
Crowmarsh Battle Barns
100 Preston Crowmarsh
Wallingford
OX10 6SL
www.jbaconsulting.co.uk
t +44 (0)1491 836688
f +44 (0)0870 0519307
e info@jbaconsulting.co.uk
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Other offices at Atherstone, Doncaster, Edinburgh, Haywards Heath, Limerick, Newcastle upon Tyne, Newport, Northallerton, Saltaire, Skipton & Tadcaster

for

OXFORDSHIRE COUNTY COUNCIL

PRELIMINARY FLOOD RISK ASSESSMENT
Map 6c: Non-residential properties affected by flooding in a rainfall event with a 1 in 200 chance of occurring in any given year

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Date:	09/06/2011	
Status:	FINAL	
File Name:	N/A	
Drawing Number:	Map 6c	

Original @ A3

North

0 5 10 20 Kilometers

Explanatory note:
Maps 6a to 6c show the spatial distribution of three receptors (people, critical services and non-residential properties) that may be affected by future surface water flooding in an event with a 1 in 200 chance of occurring in any given year.
This map shows the number of people affected, which can be considered an indicator of the consequences of flooding for human health. The number of people is defined by the Environment Agency guidance as the number of residential (housing) properties multiplied by 2.34.
Calculations for each 1km square were carried out using the Flood Map for Surface Water (1 in 200 >0.3m), Environment Agency's detailed method of counting (based on property outlines) and the National Receptors Database v1.1.
The 1km squares are shaded from light to dark purple as the number of people affected in each square increases.
Also overlaid on the map are surface water flooding 'hot spots', or areas where the consequences of a surface water event are likely to be more severe. These have been defined as 1km grid squares where at least one of the three indicators is above the threshold given below (thresholds defined by Defra guidance):
•More than 200 people affected
•One or more critical services affected
•More than 20 non-residential properties affected
The maps show that:
•The main hotpots are in more urban locations due to the concentration of population, industrial and commercial buildings, and critical services.
•Several more rural communities have less people affected but will still experience an adverse impact, particularly those where local critical services are affected. More detail is given in the main report.

Legend

Hotspots

Number of people

Number of people affected per 1km grid square

- < 20
- 20 - 50
- 50 - 100
- 100 - 200
- > 200

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PRELIMINARY FLOOD RISK ASSESSMENT

Map 6a: People affected by flooding in a rainfall event with a 1 in 200 chance of occurring in any given year

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Drawing Number: Map 6a	

Original @ A3

North

0 5 10 20 Kilometers

Legend

- Breach location
- Overtopping location
- Oxford Canal

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PRELIMINARY FLOOD RISK ASSESSMENT

Map 4: Past flooding - Canal flooding in July 2007

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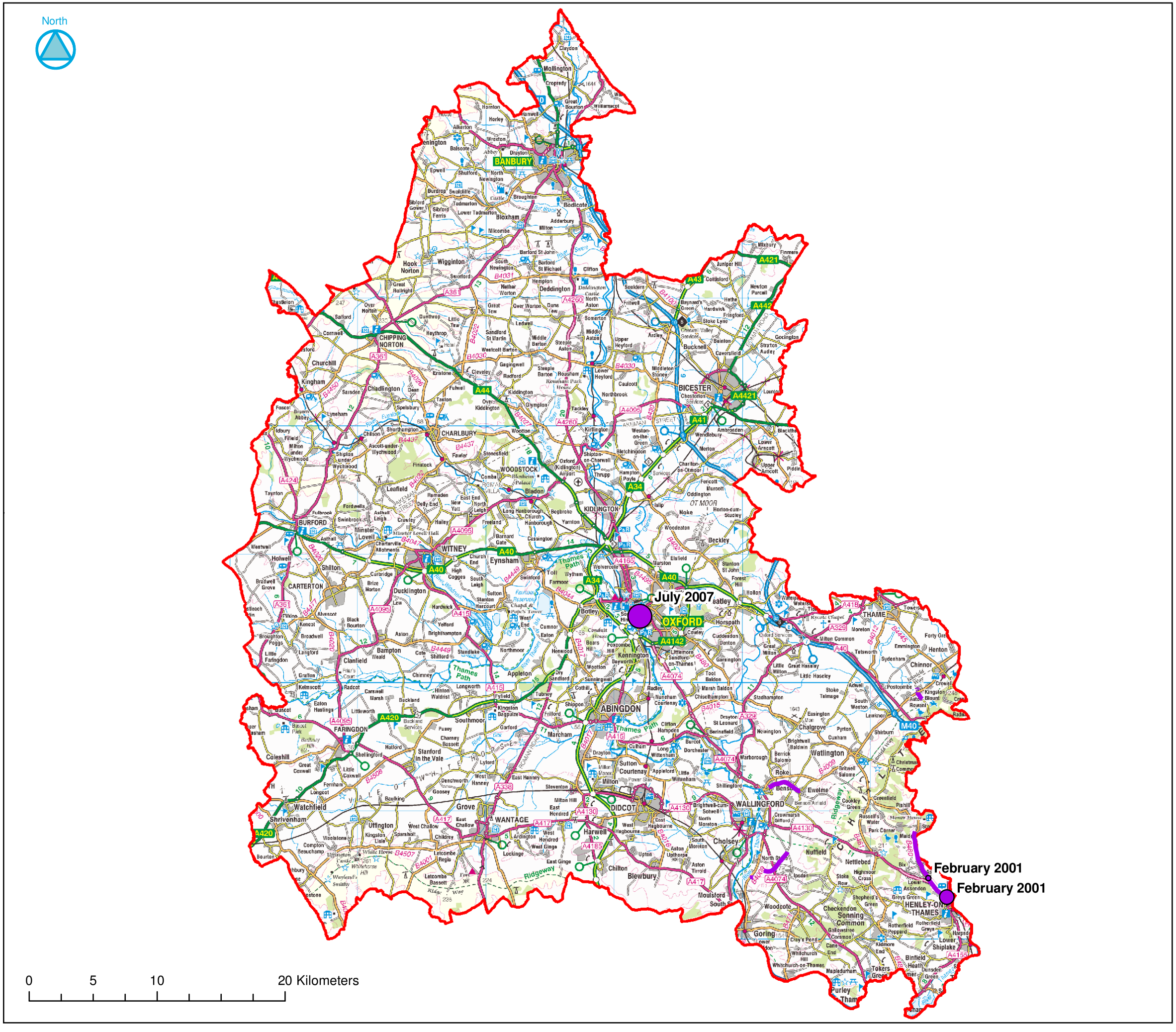
Drawing Number:	Map 4		

Original @ A3



Legend

Past flooding from groundwater

Number of properties

- 0 to 10
- 11 to 20
- 21 to 200

Groundwater flooding locations (2001)

Note: Points are an indication of the approximate location of the settlement affected, NOT the location of individual properties flooded.

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PRELIMINARY FLOOD RISK ASSESSMENT

Map 3: Past flooding - Ground water

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Status: FINAL	
File Name: N/A	
Drawing Number: Map 3	

Original @ A3

North

January 2007

October 2006

0 5 10 20 Kilometers

Legend

June 2008

Number of properties flooded by parish

- Less than 2
- 2 to 5
- 5 to 10
- 10 to 15
- 15 to 20

Number of properties flooded by other events

- 20
- 25

Note: Points are an indication of the approximate location of the settlement affected, NOT the location of individual properties flooded.

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PRELIMINARY FLOOD RISK ASSESSMENT

Map 2: Past flooding - Surface water in other events

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Status: FINAL	
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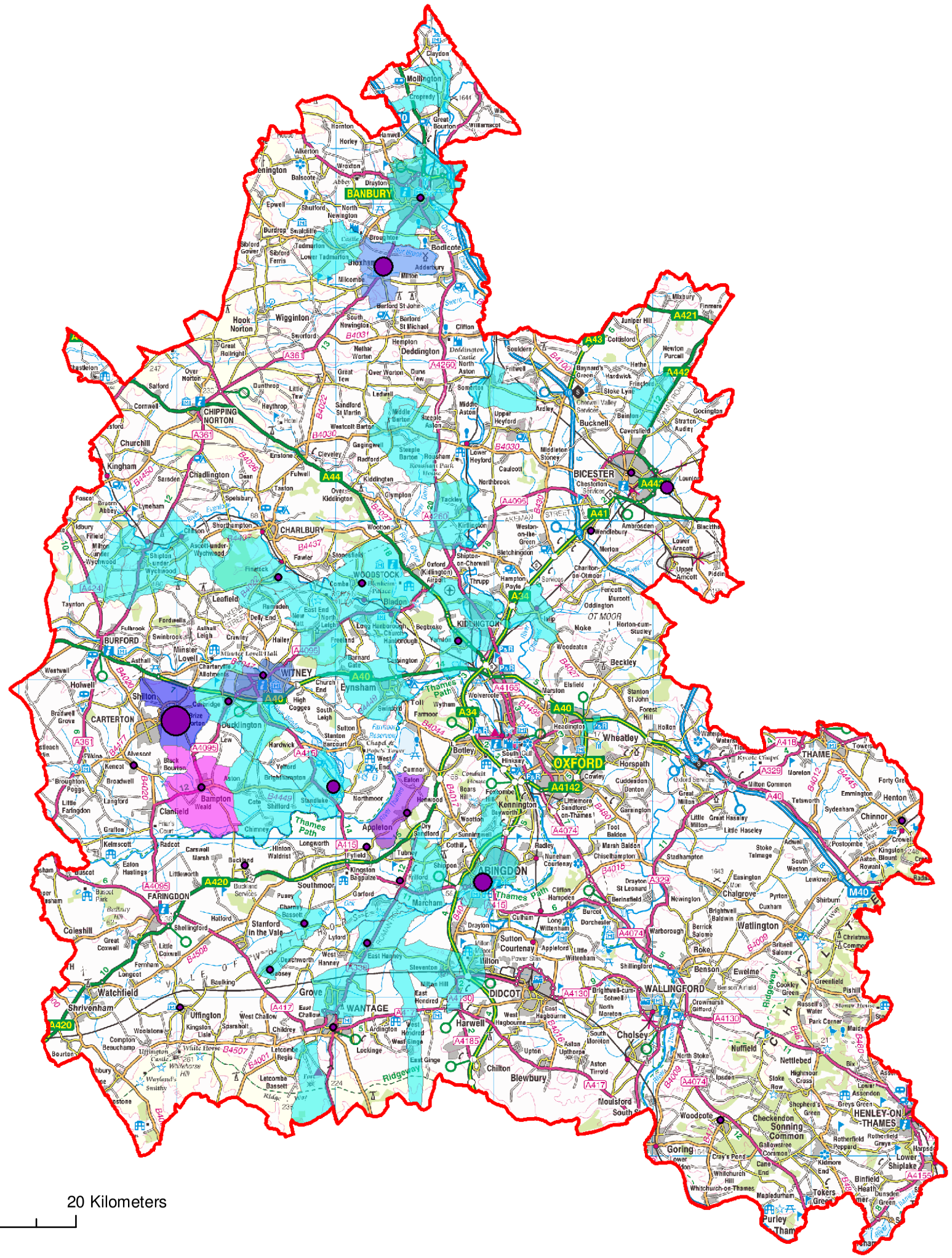
Drawing Number: Map 2	

Original @ A3

North



0 5 10 20 Kilometers

Legend

July 2007 (Environment Agency)

1 - 5 6 - 10 11 - 15 16 - 20 21 - 24	Number of properties flooded internally by 'surface water' (by settlement). Note: Points are an indication of the approximate location of the settlement affected, NOT the location of individual properties flooded.

July 2007 (Fire and Rescue Service)

1-5 6-10 11-20 21-50 51-125	Number of properties flooded internally by 'drainage' and 'ordinary watercourse' (by parish)

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PRELIMINARY FLOOD RISK ASSESSMENT

Map 1: Past flooding - Surface water in July 2007

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File Name:	N/A		
Drawing Number:	Map 1		

Original @ A3

North

0 5 10 20 Kilometers

Explanatory note:
Maps 6a to 6c show the spatial distribution of three receptors (people, critical services and non-residential properties) that may be affected by future surface water flooding in an event with a 1 in 200 chance of occurring in any given year.
This map shows the number of non-residential properties affected, which can be considered an indicator of the consequences of flooding for economic activity. Non-residential properties are defined in the Environment Agency's PFRA and property count guidance, and include all industrial, commercial, retail, public buildings etc.
Calculations for each 1km square were carried out using the Flood Map for Surface Water (1 in 200 >0.3m), Environment Agency's detailed method of counting (based on property outlines) and the National Receptors Database v1.1.
The 1km squares are shaded from light to dark purple as the number of non-residential properties affected in each square increases.
Also overlaid on the map are surface water flooding 'hot spots', or areas where the consequences of a surface water event are likely to be more severe. These have been defined as 1km grid squares where at least one of the three indicators is above the threshold given below (thresholds defined by Defra guidance):
•More than 200 people affected
•One or more critical services affected
•More than 20 non-residential properties affected
The maps show that:
•The main hotpots are in more urban locations due to the concentration of population, industrial and commercial buildings, and critical services.
•Several more rural communities have less people affected but will still experience an adverse impact, particularly those where local critical services are affected.
More detail is given in the main report.

Legend

Hotspots

Non-residential properties

< 5	Number of non-residential properties affected per 1km grid square
5 - 10	
10 - 20	
> 20	

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PRELIMINARY FLOOD RISK ASSESSMENT
Map 6c: Non-residential properties affected by flooding in a rainfall event with a 1 in 200 chance of occurring in any given year

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Original @ A3

North

0 5 10 20 Kilometers

Explanatory note:
Maps 6a to 6c show the spatial distribution of three receptors (people, critical services and non-residential properties) that may be affected by future surface water flooding in an event with a 1 in 200 chance of occurring in any given year.
This map shows the number of people affected, which can be considered an indicator of the consequences of flooding for human health. The number of people is defined by the Environment Agency guidance as the number of residential (housing) properties multiplied by 2.34.
Calculations for each 1km square were carried out using the Flood Map for Surface Water (1 in 200 >0.3m), Environment Agency's detailed method of counting (based on property outlines) and the National Receptors Database v1.1.
The 1km squares are shaded from light to dark purple as the number of people affected in each square increases.
Also overlaid on the map are surface water flooding 'hot spots', or areas where the consequences of a surface water event are likely to be more severe. These have been defined as 1km grid squares where at least one of the three indicators is above the threshold given below (thresholds defined by Defra guidance):
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Legend

Hotspots

Number of people

Number of people affected per 1km grid square

- < 20
- 20 - 50
- 50 - 100
- 100 - 200
- > 200

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PRELIMINARY FLOOD RISK ASSESSMENT

Map 6a: People affected by flooding in a rainfall event with a 1 in 200 chance of occurring in any given year

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North

0 5 10 20 Kilometers

Legend

- Breach location
- Overtopping location
- Oxford Canal

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PRELIMINARY FLOOD RISK ASSESSMENT

Map 4: Past flooding - Canal flooding in July 2007

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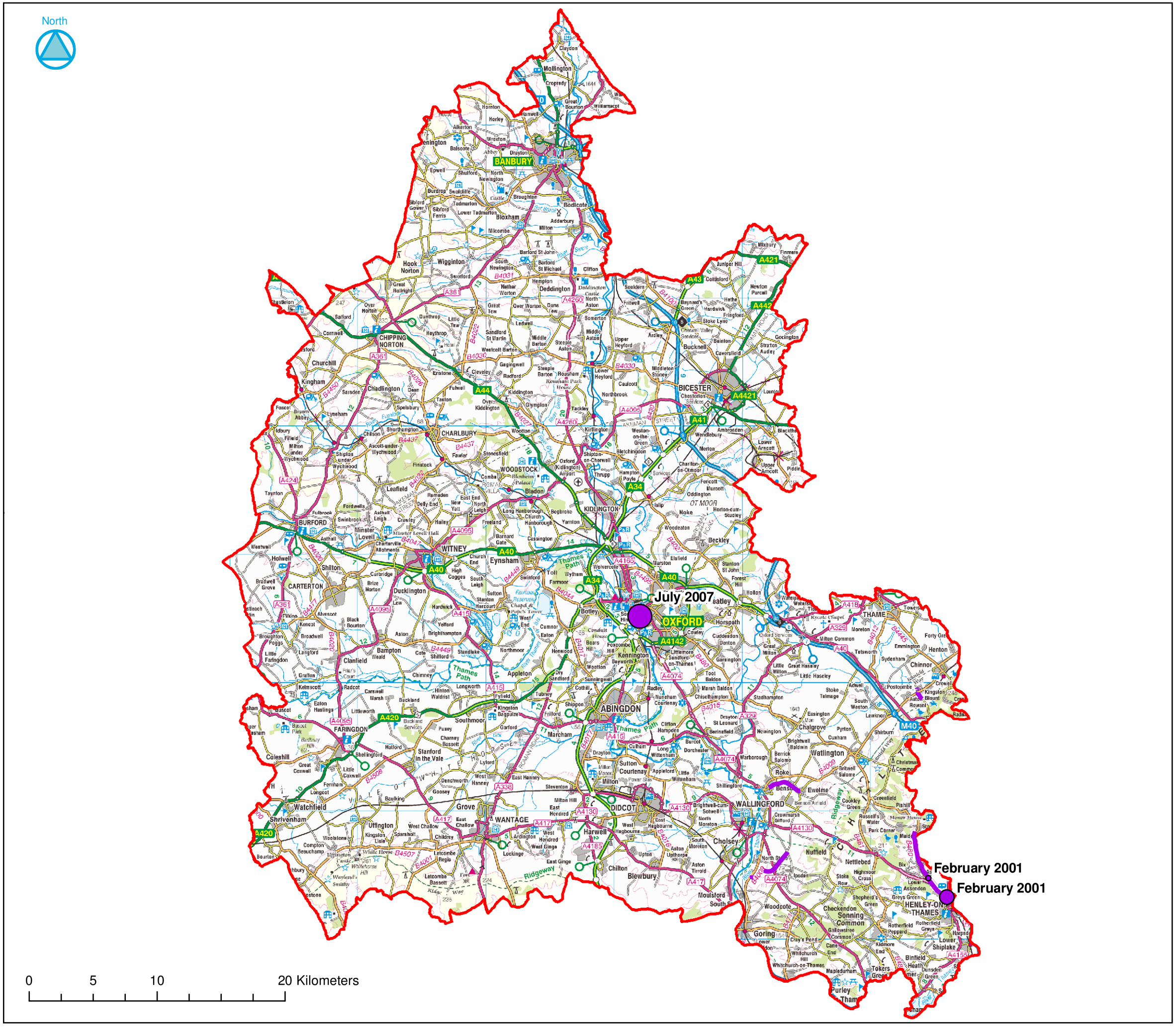
Drawing Number:	Map 4		

Original @ A3



Legend

Past flooding from groundwater

Number of properties

- 0 to 10
- 11 to 20
- 21 to 200

Groundwater flooding locations (2001)

Note: Points are an indication of the approximate location of the settlement affected, NOT the location of individual properties flooded.

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PRELIMINARY FLOOD RISK ASSESSMENT

Map 3: Past flooding - Ground water

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Status: FINAL	
File Name: N/A	
Drawing Number: Map 3	

Original @ A3

North

January 2007

October 2006

0 5 10 20 Kilometers

Legend

June 2008

Number of properties flooded by parish

- Less than 2
- 2 to 5
- 5 to 10
- 10 to 15
- 15 to 20

Number of properties flooded by other events

- 20
- 25

Note: Points are an indication of the approximate location of the settlement affected, NOT the location of individual properties flooded.

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PRELIMINARY FLOOD RISK ASSESSMENT

Map 2: Past flooding - Surface water in other events

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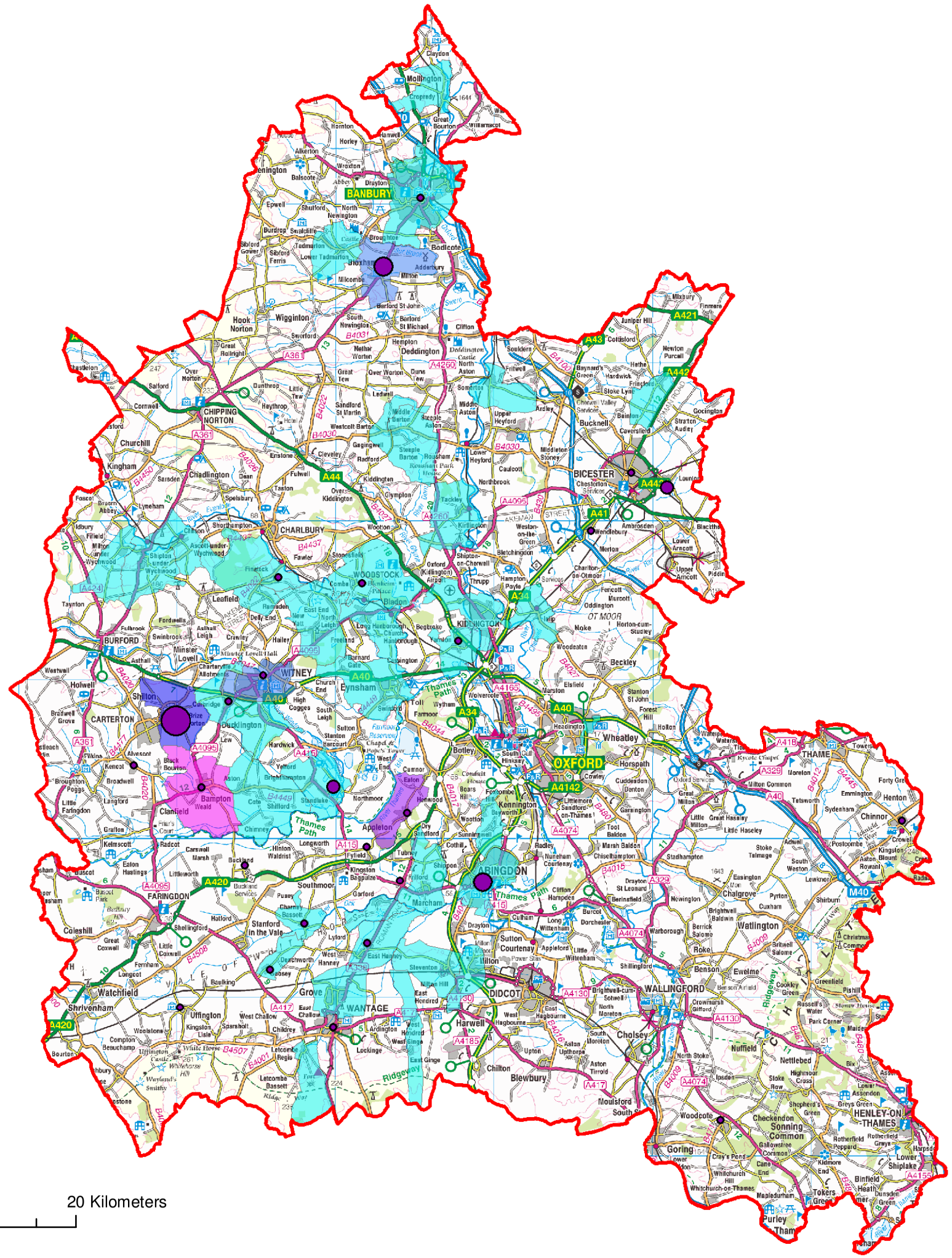
File Name: N/A	
Drawing Number: Map 2	

Original @ A3

North



0 5 10 20 Kilometers

Legend

July 2007 (Environment Agency)

1 - 5 6 - 10 11 - 15 16 - 20 21 - 24	Number of properties flooded internally by 'surface water' (by settlement). Note: Points are an indication of the approximate location of the settlement affected, NOT the location of individual properties flooded.

July 2007 (Fire and Rescue Service)

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PRELIMINARY FLOOD RISK ASSESSMENT

Map 1: Past flooding - Surface water in July 2007

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File Name:	N/A		
Drawing Number:	Map 1		

Original @ A3

APPENDIX I: SURFACE WATER RUN-OFF CALCULATIONS

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HR Wallingford
Working with water

Greenfield runoff estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Megan Berry
Site name:	OXFORD ROAD
Site location:	BODICOTE

This is an estimation of the greenfield runoff rate limits that are needed to meet normal best practice criteria in line with Environment Agency guidance "Preliminary rainfall runoff management for developments", W5-074/A/TR1/1 rev. E (2012) and the SuDS Manual, C753 (Ciria, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site coordinates

Latitude:	52.04181° N
Longitude:	1.32831° W

Reference:	6431603
Date:	2018-09-20T12:07:28

Methodology	FEH Statistical

Site characteristics

Total site area (ha)	1.415

Methodology

Qmed estimation method	Calculate from BFI and SAAR
BFI and SPR estimation method	Calculate from dominant HOST
HOST class	25
BFI / BFIHOST	0.17
Qmed (l/s)	6.8
Qbar / Qmed Conversion Factor	1.14

Hydrological characteristics

	Default	Edited
SAAR (mm)	654	654
Hydrological region	6	6
Growth curve factor: 1 year	0.85	0.85
Growth curve factor: 30 year	2.3	2.3
Growth curve factor: 100 year	3.19	3.19

Notes:

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

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

(3) Is SPR/SPRHOST ≤ 0.3?

Greenfield runoff rates

	Default	Edited
Qbar (l/s)	7.72	7.72
1 in 1 year (l/s)	6.56	6.56
1 in 30 years (l/s)	17.76	17.76
1 in 100 years (l/s)	24.63	24.63

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 http://uksuds.com/terms-and-conditions.htm. The outputs from this tool have been used to estimate storage volume requirements. 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 use of this data in the design or operational characteristics of any drainage scheme.

SURFACE WATER RUN-OFF CALCULATION SHEET

Development	OXFORD ROAD BODICOTE
Project No.	HYD317

Revision	2.0	**Completed by**	MB
Date	20/08/2018	**Checked by**	DK

BETTS HYDRO
CONSULTING ENGINEERS

Areas			**Catchment Charateristics**		
Total Site	2.204	ha	SAAR	654	mm
Development Area (for SW Strategy)	1.670	ha	SPR	0.17	%
Existing Impermeable	0.430	ha	i_1	13.9	mm/hr
Existing Impermeable (for SW Strategy)	0.430	ha	i_{30}	30.8	mm/hr
Existing Pervious	1.774	ha	i_{100}	40.0	mm/hr
Existing Pervious (for SW Strategy)	1.240	ha			
Proposed Impermeable (total)	0.878	ha			
Proposed Impermeable (domestic only)	0.878	ha			

Run-off Rates

Pre-development

Impermeable	1yr	16.6	l/s
	30yr	36.8	l/s
	100yr	47.8	l/s
	50mm/hr	59.7	l/s
Pervious	1yr	7.8	l/s
	30yr	21.0	l/s
	100yr	29.1	l/s
	QBar	9.1	l/s
Total	1yr	24.4	l/s
	30yr	57.8	l/s
	100yr	76.9	l/s

Post-development

Impermeable (total)	1yr	34.0	l/s
	30yr	75.2	l/s
	100yr+CC	126.9	l/s

Volumes

Pre-development

Impermeable	1yr	0.0	cu.m
	100yr	0.0	cu.m
Pervious	1yr	10.4	cu.m
	100yr	69.2	cu.m
Total	1yr	10.4	cu.m
	100yr	69.2	cu.m

Quick storage Estimates

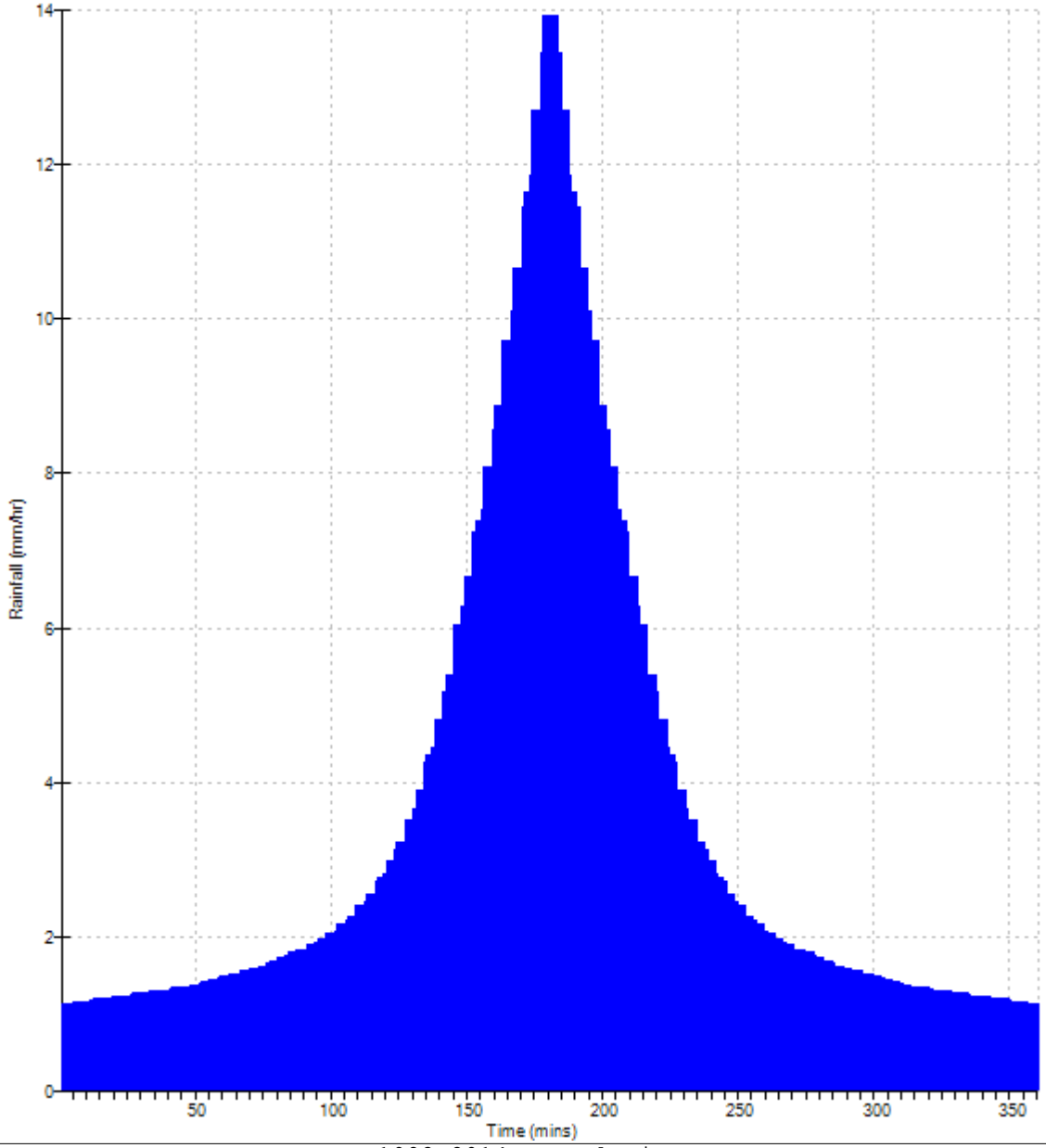
		low	high	mean	Imp. Area (ha)	Max. Discharge (l/s)		Rainfall	CC
Return Period	1yr	80	127	103.5	0.878	5.0	*	FEH	0
Return Period	30yr	247	344	295.5	0.878	5.0	*	FEH	0
Return Period	100yr+CC	435	585	510	0.878	5.0	*	FEH	20%
Return Period	100yr+CC	529	707	618	0.878	5.0	*	FEH	40%

*restricted to 5l/s as requested by Thames Water

Rainfall profile

Storm duration (mins) 360

FSR Data	
Region	England and Wales
M5-60 (mm)	19.800
Ratio R	0.412
Peak Intensity (mm/hr)	13.930
Ave. Intensity (mm/hr)	3.553
Return Period (years)	1



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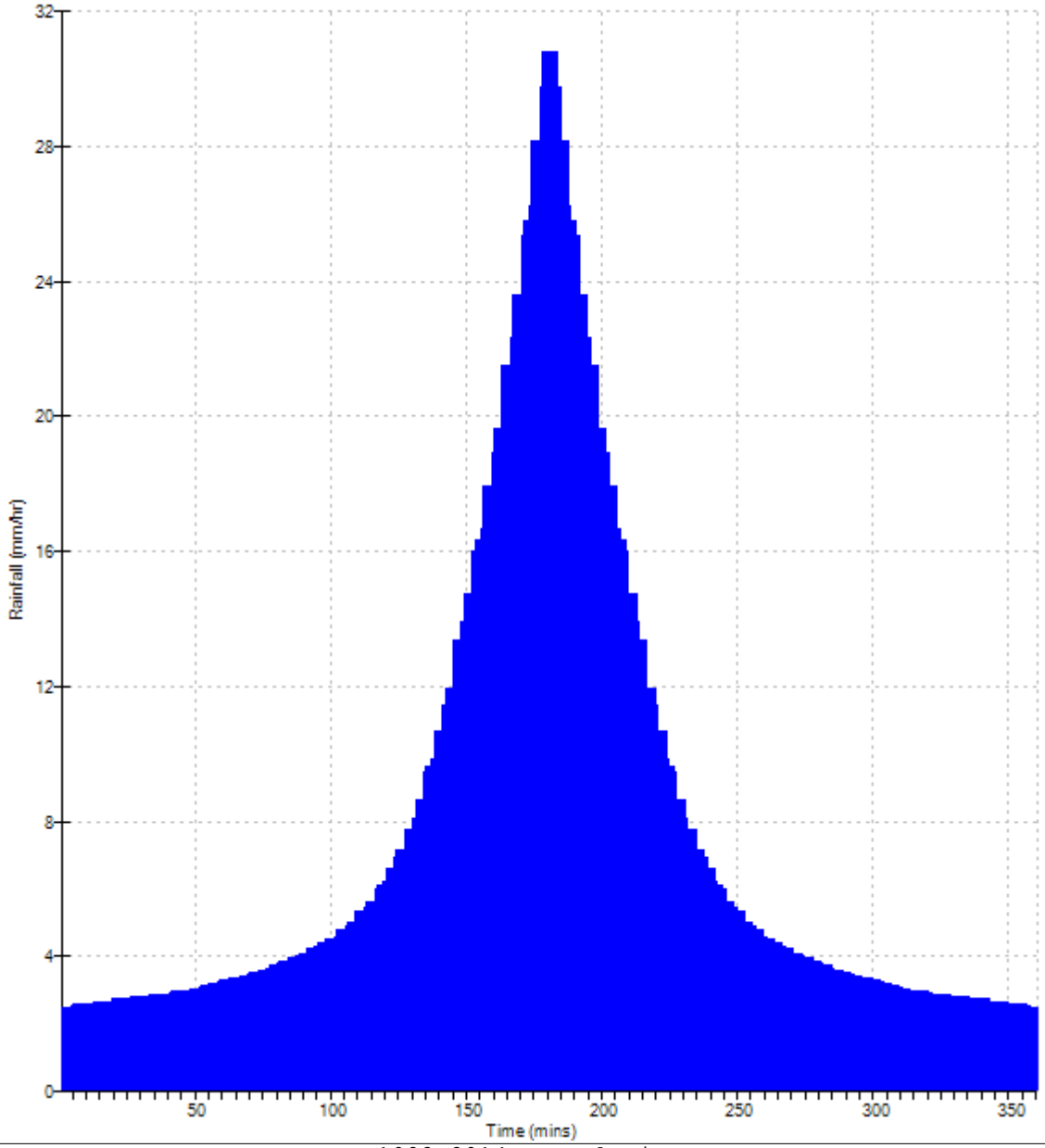
Rainfall profile

Storm duration (mins) 360

FSR Data	
Region	England and Wales
M5-60 (mm)	19.800
Ratio R	0.412
Peak Intensity (mm/hr)	30.824
Ave. Intensity (mm/hr)	7.863
Return Period (years)	30



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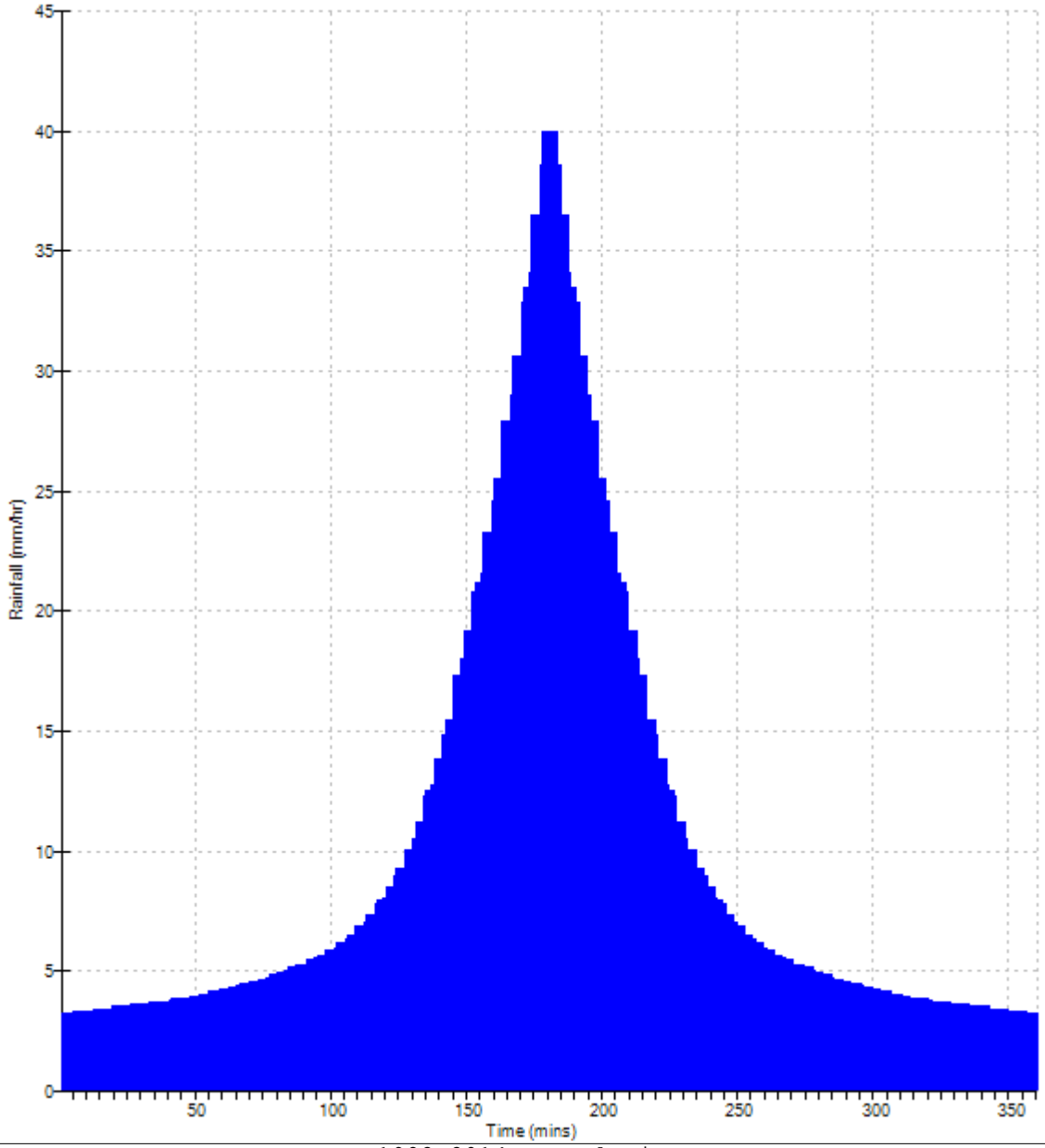
Rainfall profile

Storm duration (mins) 360

FSR Data	
Region	England and Wales
M5-60 (mm)	19.800
Ratio R	0.412
Peak Intensity (mm/hr)	40.019
Ave. Intensity (mm/hr)	10.209
Return Period (years)	100



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Greenfield Runoff Volume

FSR Data

Return Period (years)	100
Storm Duration (mins)	360
Region	England and Wales
M5-60 (mm)	19.800
Ratio R	0.412
Areal Reduction Factor	1.00
Area (ha)	1.415
SAAR (mm)	700
CWI	105.000
Urban	0.000
SPR	10.000

Results

Percentage Runoff (%)	8.82
Greenfield Runoff Volume (m^3)	76.472

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Greenfield Runoff Volume

FSR Data

Return Period (years)	1
Storm Duration (mins)	360
Region	England and Wales
M5-60 (mm)	19.800
Ratio R	0.412
Areal Reduction Factor	1.00
Area (ha)	1.415
SAAR (mm)	700
CWI	105.000
Urban	0.000
SPR	10.000

Results

Percentage Runoff (%)	5.00
Greenfield Runoff Volume (m^3)	15.085

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APPENDIX J: IMPERMEABLE AREAS PLANS

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DO NOT SCALE

LEGEND

TOTAL SITE AREA- 2.197ha
DEVELOPMENT AREA- 1.415ha

PRE-DEVELOPMENT IMPERMEABLE AREAS- 0.430ha

REV	DATE	BY	DESCRIPTION	CHK
B	20.09.18	MB	UPDATED PLANNING LAYOUT	KW
A	05.04.18	MB	PRELIMINARY FOR ISSUE	KW

DRAWING STATUS: PRELIMINARY

BETTS HYDRO CONSULTING ENGINEERS
Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire, CH5 2LY
Tel: 01244 288178 enquiries@betts-associates.co.uk

HSL | HOLLINS STRATEGIC LAND

PROJECT: OXFORD ROAD BODICOTE

TITLE: PRE-DEVELOPMENT IMPERMEABLE AREAS PLAN

DATE:	SCALE @ SIZE:	DRAWN:	CHECKED:
05.04.18	1:1@A1	MB	DK

PROJECT No:	DRAWING No:	REV:
HYD317	101	B

DO NOT SCALE

LEGEND

TOTAL SITE AREA- 2.197ha

DEVELOPMENT AREA- 1.415ha

ASSUMED IMPERMEABLE AREA
POST-DEVELOPMENT - 0.637ha (45%)

REV	DATE	BY	DESCRIPTION	CHK
B	20.09.18	MB	UPDATED PLANNING LAYOUT	KW
A	05.04.18	MB	PRELIMINARY FOR ISSUE	KW

DRAWING STATUS: PRELIMINARY

BETTS HYDRO CONSULTING ENGINEERS
Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire, CH5 2LY
Tel: 01244 288178 enquiries@betts-associates.co.uk

HSL | HOLLINS STRATEGIC LAND

PROJECT: OXFORD ROAD BODICOTE

TITLE: POST DEVELOPMENT ROUGH SIZE OF POND

DATE:	SCALE @ SIZE:	DRAWN:	CHECKED:
05.04.18	1:1@A1	MB	DK

PROJECT No:	DRAWING No:	REV:
HYD317	301	B

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APPENDIX K: PRELIMINARY PROPOSED DRAINAGE PLANS

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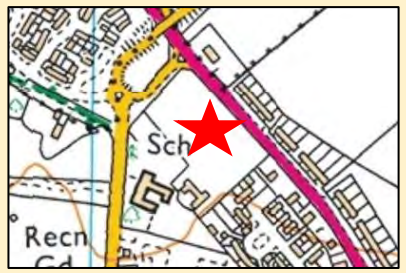
SITE: OXFORD ROAD, BODICOTE

REF: HYD317
REV: 0
DATE: 06.04.18

BETTS HYDRO
CONSULTING ENGINEERS

EXISTING DRAINAGE SITUATION PLAN



LEGEND

Site Extents

Existing Land Features

General Topographic Fall

Existing Drainage Features

TBC

Existing Sewer Infrastructure

Surface Water Sewer (public)

Foul Water Sewer (public)

FURTHER NOTES:

This drawing is not a drainage 'design' it is a preliminary drainage strategy showing existing sewer locations.

No hydraulic simulation or assessment of these proposals has been undertaken.

Proposed points of connection to the existing watercourse and sewer require invert levels to be accurately established. Refer to proposed drainage plan.

Surcharging of the proposed outfall will require modelling to satisfy the requirements of united utilities along with full hydraulic analysis.

Option 2 is to discharge into the 225mm public surface water sewer (Manhole no.9455) located approximately 118m north-west of site within Sycamore Drive. A pumped solution would be required, and discharge rates would need to be restricted to 5l/s as agreed in principle with TW.

TW have confirmed a connection into the public foul water sewer network will be likely after modelling and improvements have been undertaken to the sewer network upon planning approval to be able to provide a solution for handling foul water flows from site.

Option 1A is to connect into the public surface water sewer (375mm Manhole no.2051) located approximately 400m to the south of site this option would require significant offsite routing down Oxford Road and Broad Gap. An agreement in principle has been obtain from TW to connect into the public surface water sewer at a rate of 5l/s.

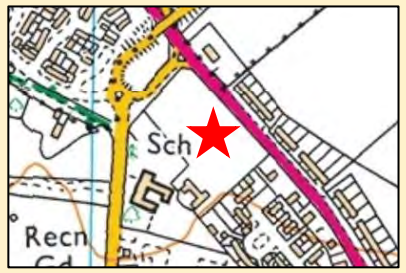
Option 1B is to pipe through third party land subject to discussion and agreements with the land owners to reach the public surface water sewer and discharge at 5l/s as agreed in principle with TW.

SYCAMORE DRIVE
WHITE POST ROAD
OXFORD ROAD
PARK END CLOSE
BROAD GAP
BISHOP LOVEDAY PRIMARY SCHOOL
CHERWELL DISTRICT COUNCIL OFFICES
2
1A
1B
(P)

SITE: OXFORD ROAD, BODICOTE
REF: HYD317
REV: 0
DATE: 20/09/18

BETTS HYDRO CONSULTING ENGINEERS

PRELIMINARY
PROPOSED DRAINAGE PLAN



LEGEND

Site Extents

Existing Drainage Features

(P) Ponds/Basins

Existing Sewer Infrastructure

Surface Water Sewer (Public)
Foul Water Sewer (Public)

Proposed Drainage Route/Connection(s)

Surface Water Connection – Option 1A
Surface Water Connection – Option 1B
Surface Water Connection – Option 2
Foul Water

FURTHER NOTES:

This drawing is not a drainage 'design' it is a preliminary drainage strategy showing existing sewer locations.

No hydraulic simulation or assessment of these proposals has been undertaken.

Proposed points of connection to the existing watercourse and sewer require invert levels to be accurately established. Refer to proposed drainage plan.

Surcharging of the proposed outfall will require modelling to satisfy the requirements of united utilities along with full hydraulic analysis.

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APPENDIX L: STORMWATER STORAGE ESTIMATES

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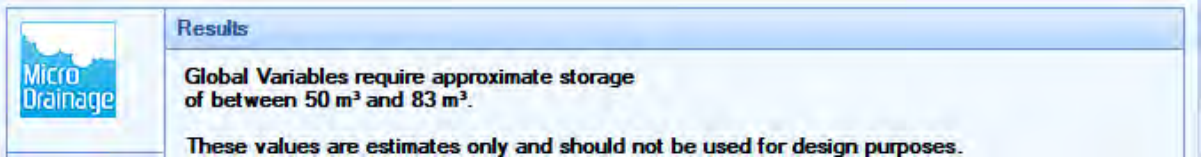
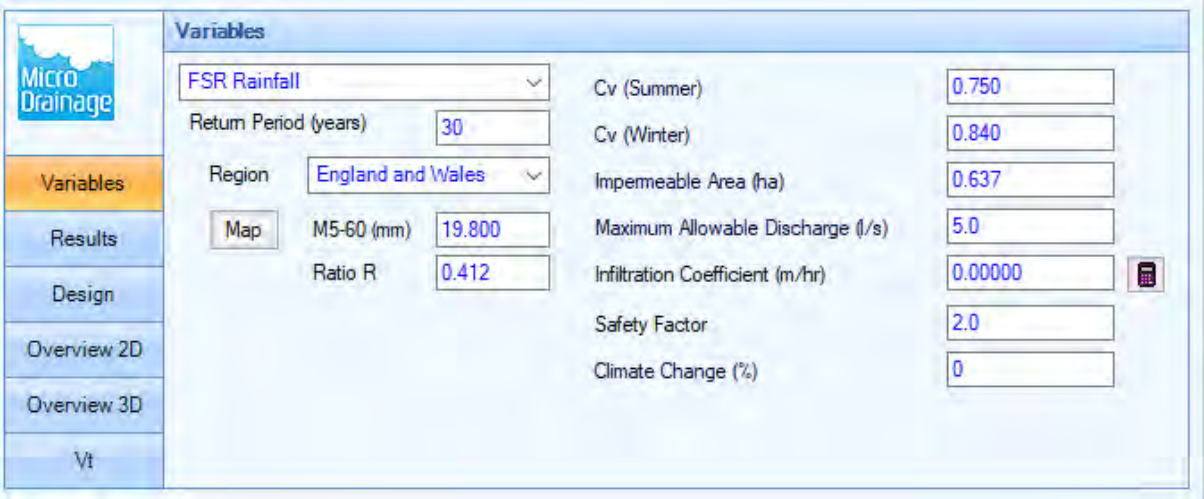
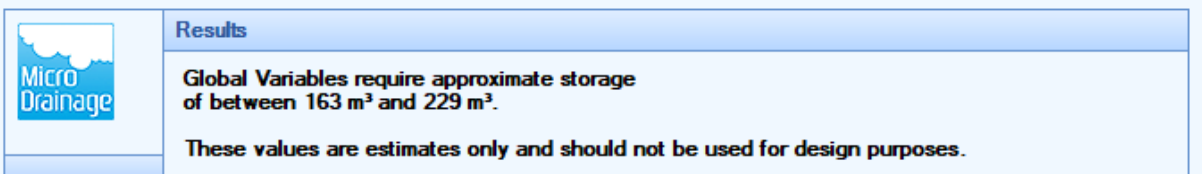
1 YEAR RETURN PERIOD STORM EVENT

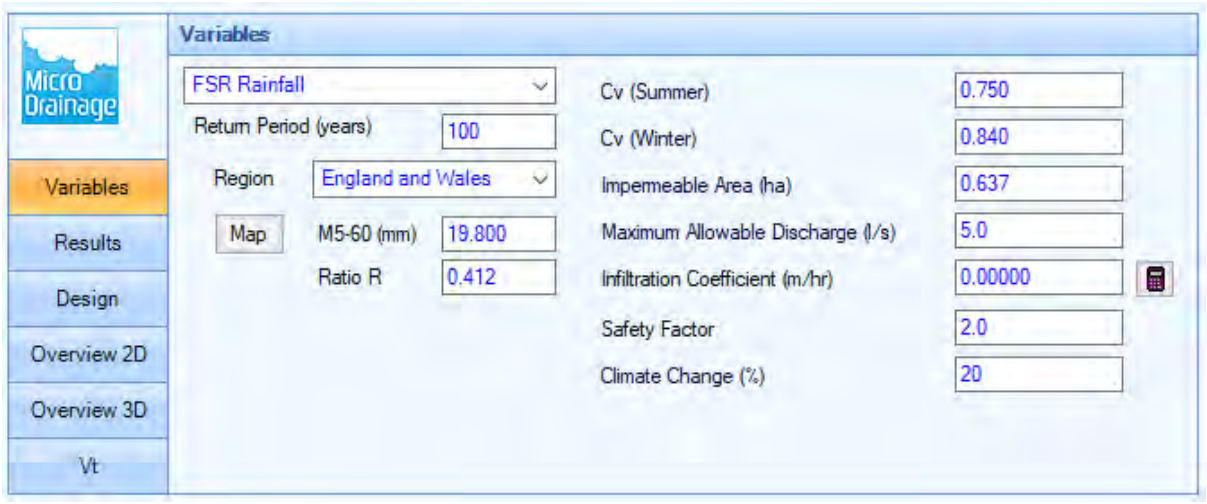


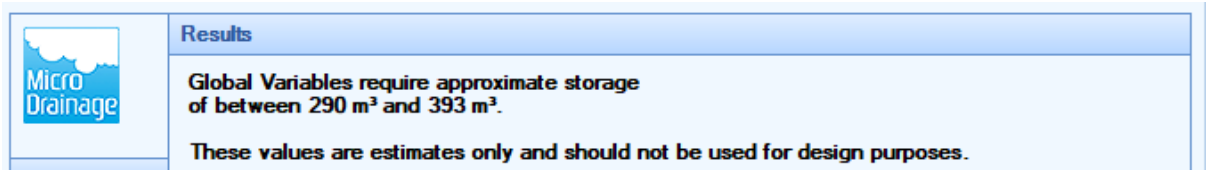
30 YEAR RETURN PERIOD STORM EVENT



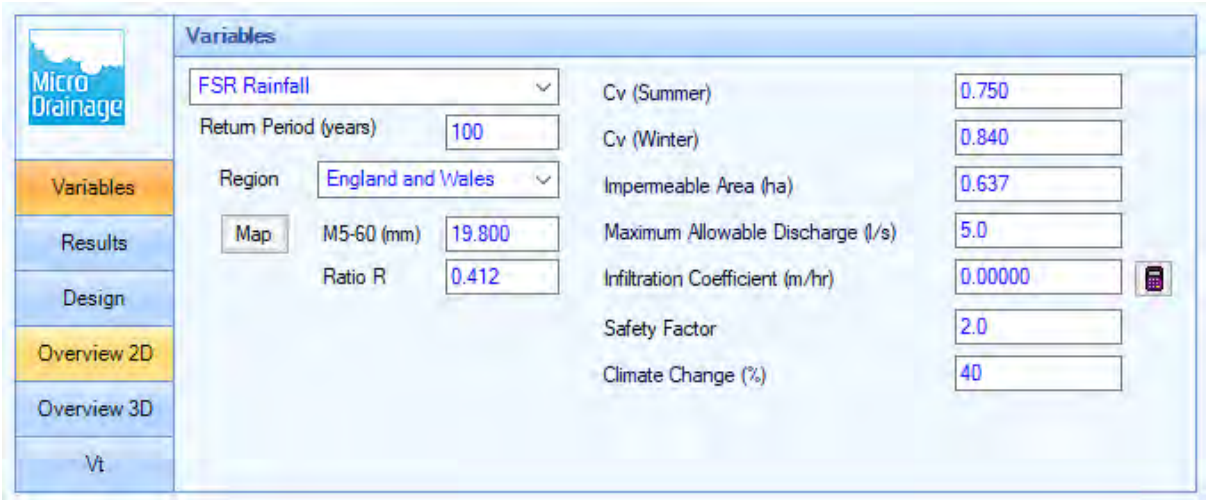


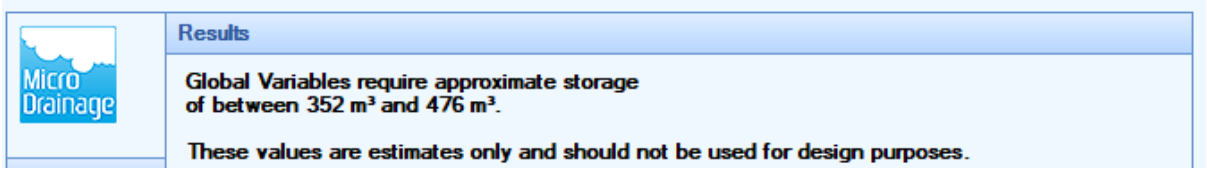
100 YEAR RETURN PERIOD STORM EVENT + 20% CLIMATE CHANGE





100 YEAR RETURN PERIOD STORM EVENT + 40% CLIMATE CHANGE





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APPENDIX M: OVERLAND FLOOD FLOW ROUTING PLANS

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DO NOT SCALE

LEGEND

TOTAL SITE AREA- 2.197ha
DEVELOPMENT AREA- 1.415ha

OVERLAND FLOW ROUTES

REV	DATE	BY	DESCRIPTION	CHK
B	20.09.18	MB	UPDATED PLANNING LAYOUT	KW
A	05.04.18	MB	PRELIMINARY FOR ISSUE	KW

DRAWING STATUS: PRELIMINARY

BETTS HYDRO CONSULTING ENGINEERS
Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire, CH5 2LY
Tel: 01244 288178 enquiries@betts-associates.co.uk

HSL | HOLLINS STRATEGIC LAND

PROJECT: OXFORD ROAD BODICOTE

TITLE: PRE-DEVELOPMENT OVERLAND FLOW PLAN

DATE:	SCALE @ SIZE:	DRAWN:	CHECKED:
05.04.18	1:1@A1	MB	DK

PROJECT No:	DRAWING No:	REV:
HYD317	102	B

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DO NOT SCALE

LEGEND

TOTAL SITE AREA- 2.197ha
DEVELOPMENT AREA- 1.415ha

OVERLAND FLOW ROUTES

REV	DATE	BY	DESCRIPTION	CHK
B	20.09.18	MB	UPDATED PLANNING LAYOUT	KW
A	05.04.18	MB	PRELIMINARY FOR ISSUE	KW

DRAWING STATUS: PRELIMINARY

BETTS HYDRO CONSULTING ENGINEERS
Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire, CH5 2LY
Tel: 01244 288178 enquiries@betts-associates.co.uk

HSL HOLLINS STRATEGIC LAND

PROJECT: OXFORD ROAD BODICOTE

TITLE: POST-DEVELOPMENT OVERLAND FLOW PLAN

DATE:	SCALE @ SIZE:	DRAWN:	CHECKED:
05.04.18	1:1@A1	MB	DK

PROJECT No:	DRAWING No:	REV:
HYD317	202	B

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APPENDIX N: TYPICAL SUDS DETAILS

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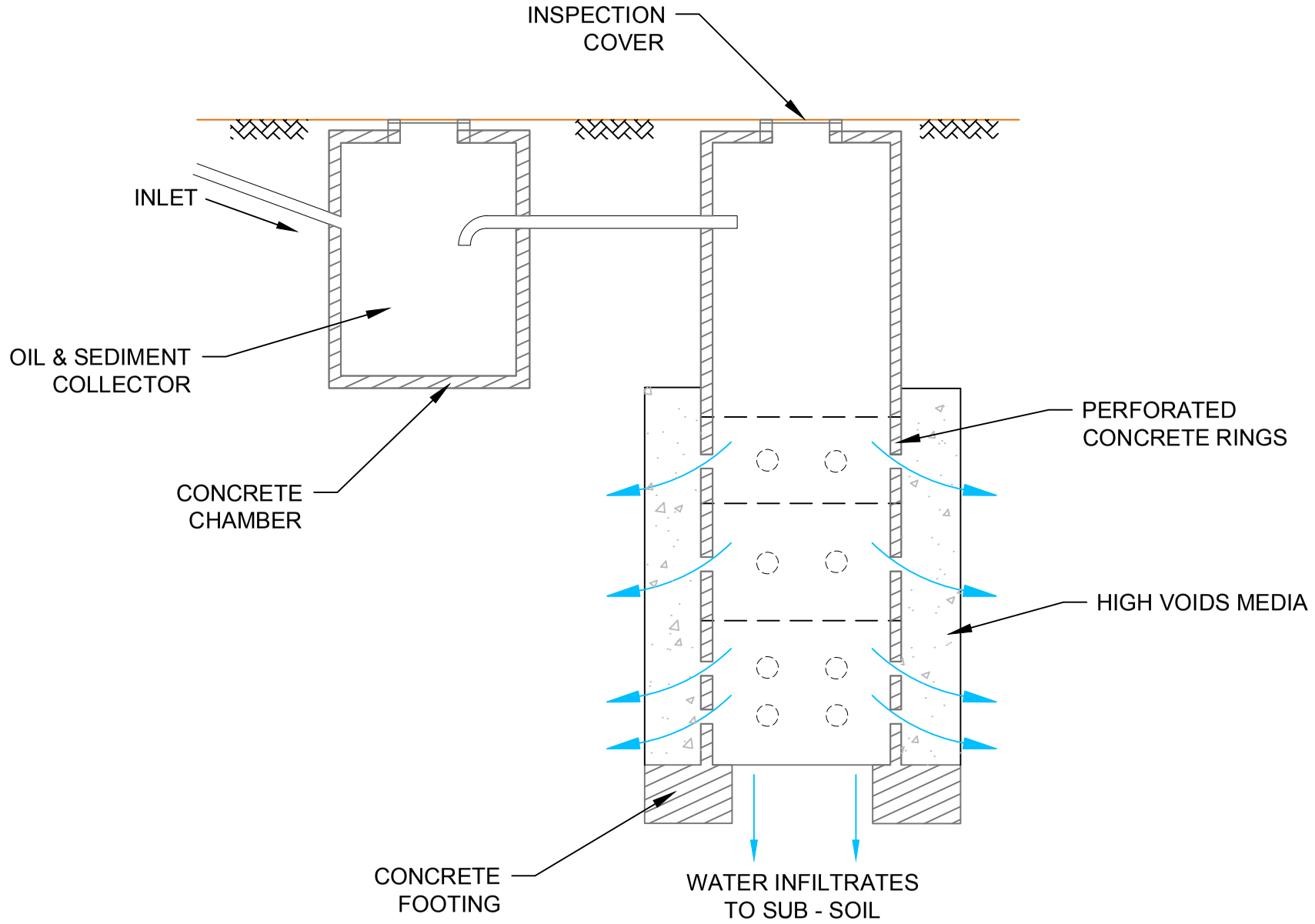


SOAKAWAY DETAILS (INCLUDING PRE-TREATMENT DEVICE)

REV	DATE	BY	DESCRIPTION	CHK

DRAWING STATUS: PRELIMINARY

BETTS ASSOCIATES
CIVIL AND STRUCTURAL ENGINEERS
Unit 6, Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire CH5 2LY
Tel: 01244 288178 Fax: 01244 288516 enquiries@betts-associates.co.uk

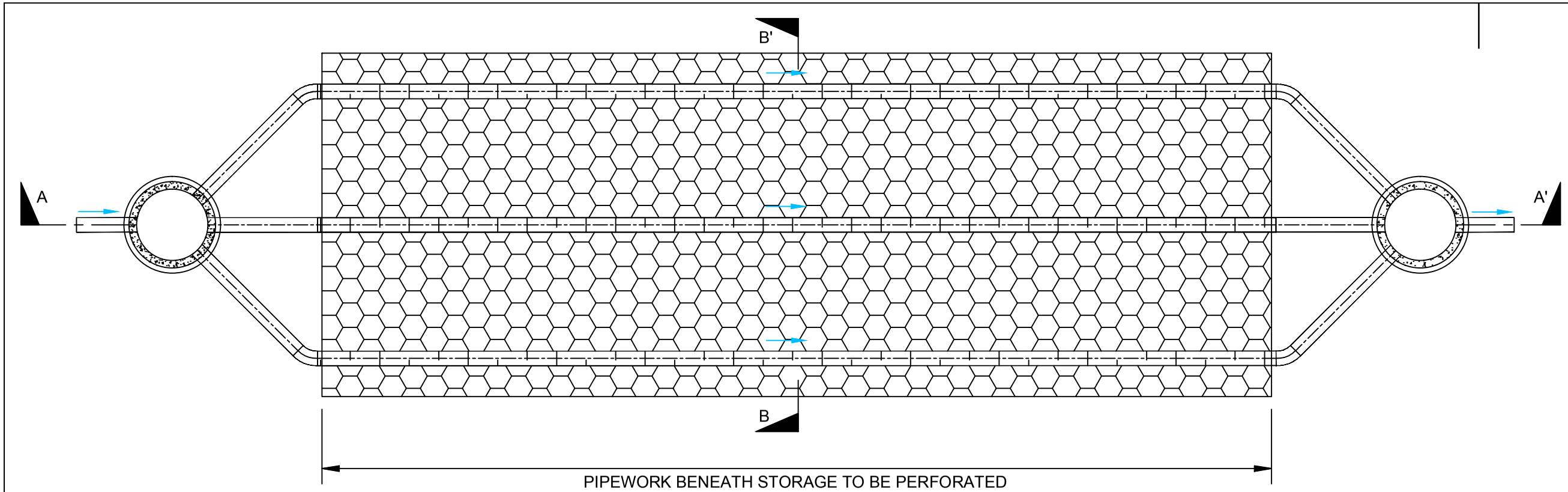
PROJECT: TYPICAL SUDS DETAIL

TITLE: SOAKAWAYS

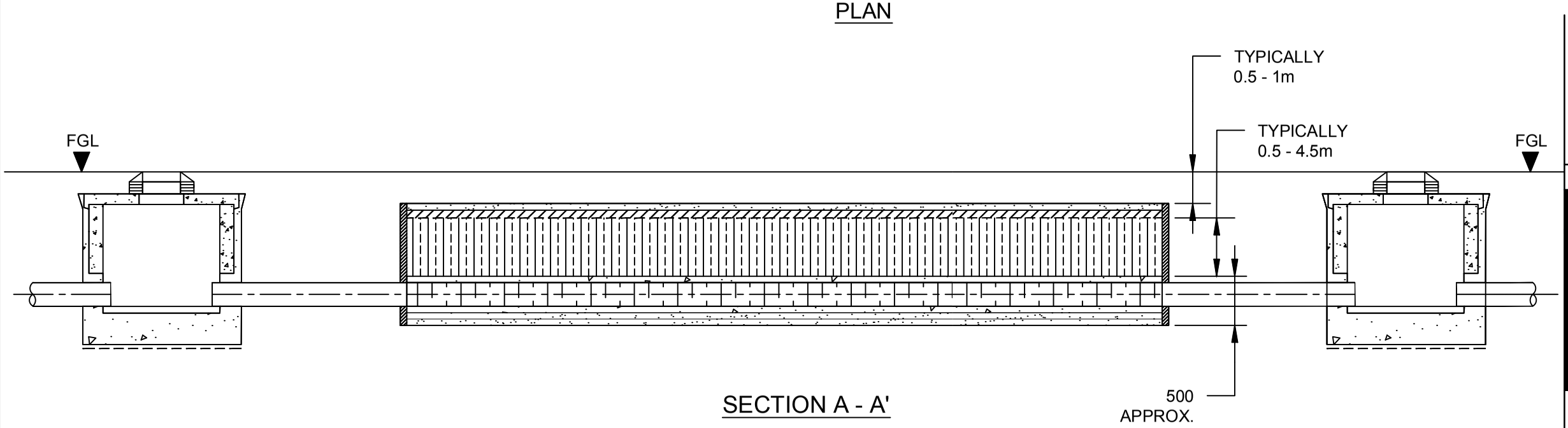
DATE:	SCALE @ SIZE:	DRAWN:	CHECKED:
SEP 2014	@ A3	CP	RDN

PROJECT No:	DRAWING No:	REV:
BETTS	108	A

DO NOT SCALE

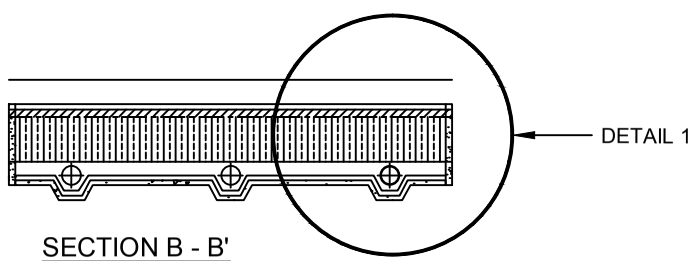


PLAN

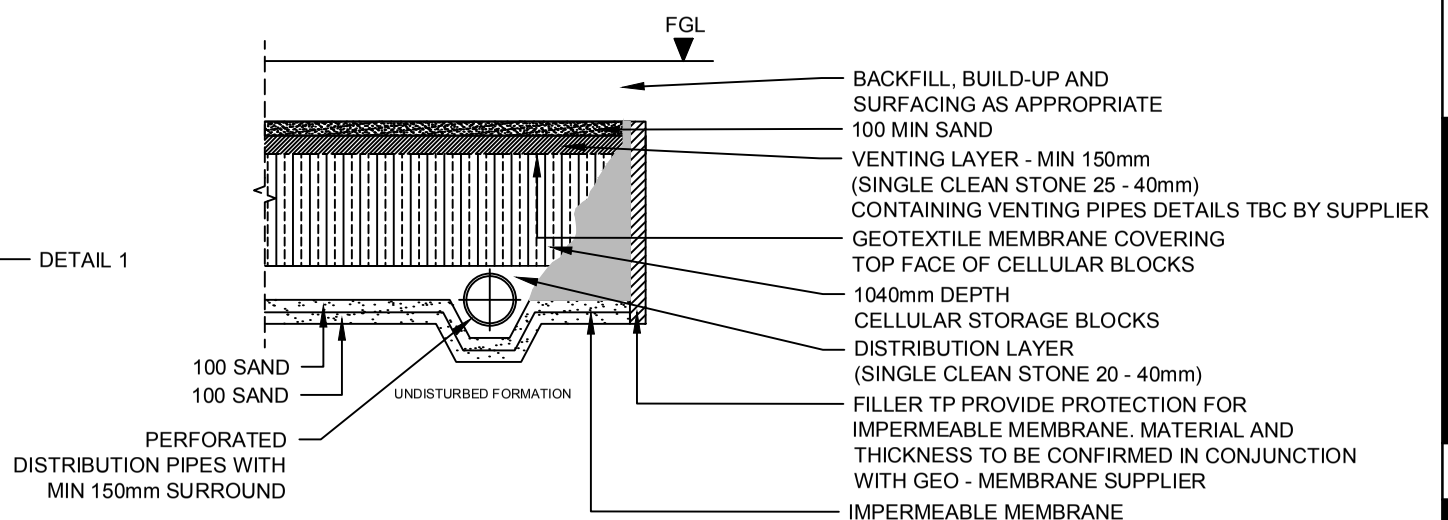


SECTION A - A'

ALL DIMENSIONS AND DEPTHS DEPENDENT ON REQUIRED VOLUME AND LOCAL GROUND CONDITIONS



SECTION B - B'



DETAIL 1

REV	DATE	BY	DESCRIPTION	CHK

DRAWING STATUS: PRELIMINARY

BETTS ASSOCIATES
CIVIL AND STRUCTURAL ENGINEERS
Unit 6, Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire CH5 2LY
Tel: 01244 288178 Fax: 01244 288516 enquiries@betts-associates.co.uk

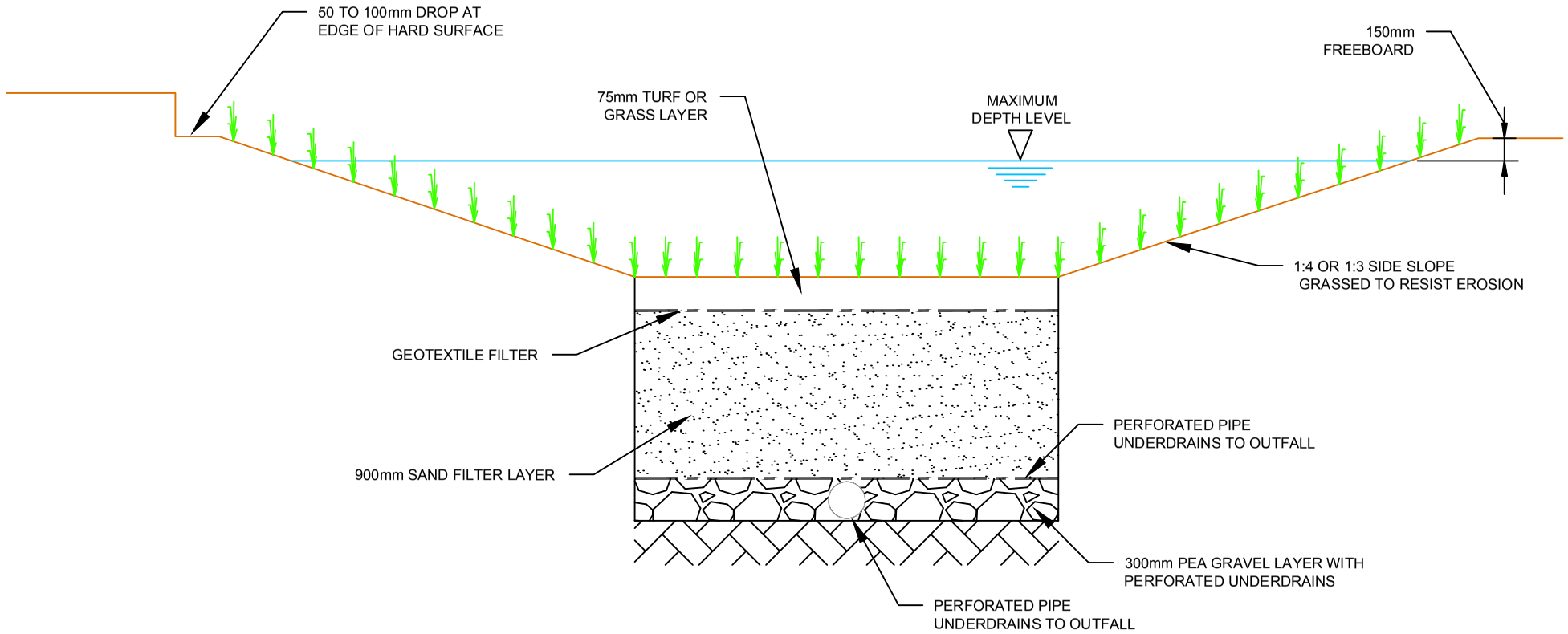
PROJECT: TYPICAL SUDS DETAIL

TITLE: CELLULAR STORAGE

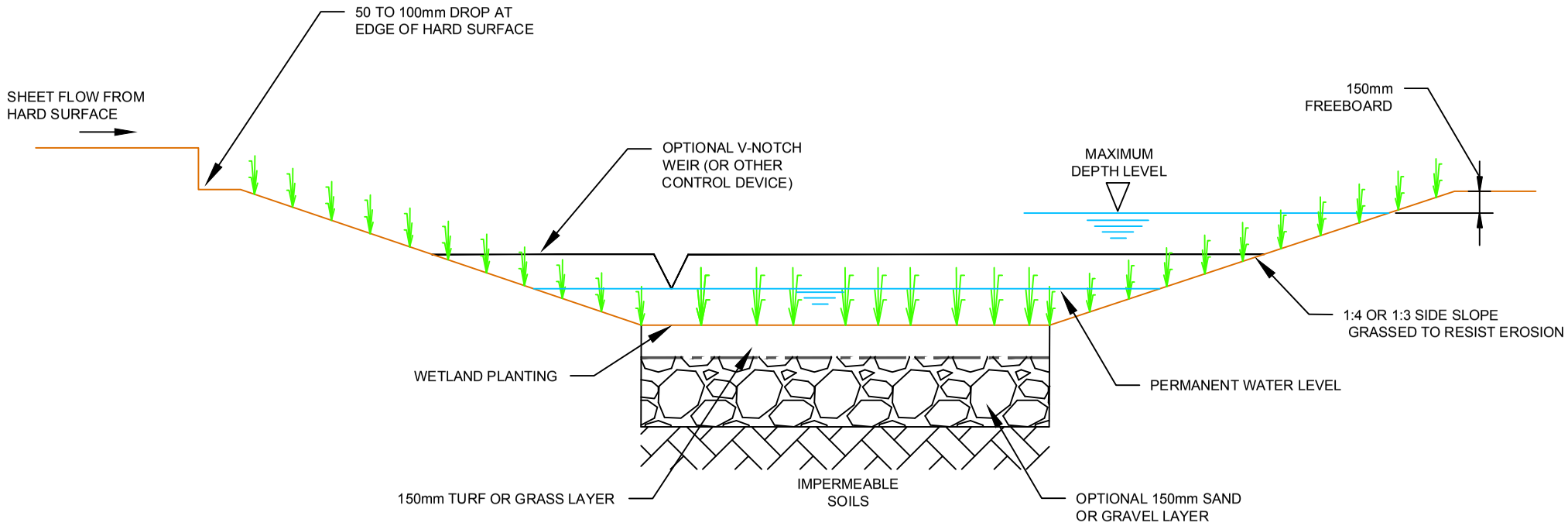
DATE:	SCALE @ SIZE:	DRAWN:	CHECKED:
SEP 2014	@ A3	CP	RDN

PROJECT No:	DRAWING No:	REV:
BETTS	113	A

DO NOT SCALE



DRY SWALE



WET SWALE

REV	DATE	BY	DESCRIPTION	CHK

DRAWING STATUS: PRELIMINARY

BETTS ASSOCIATES
CIVIL AND STRUCTURAL ENGINEERS
Unit 6, Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire CH5 2LY
Tel: 01244 288178 Fax: 01244 288516 enquiries@betts-associates.co.uk

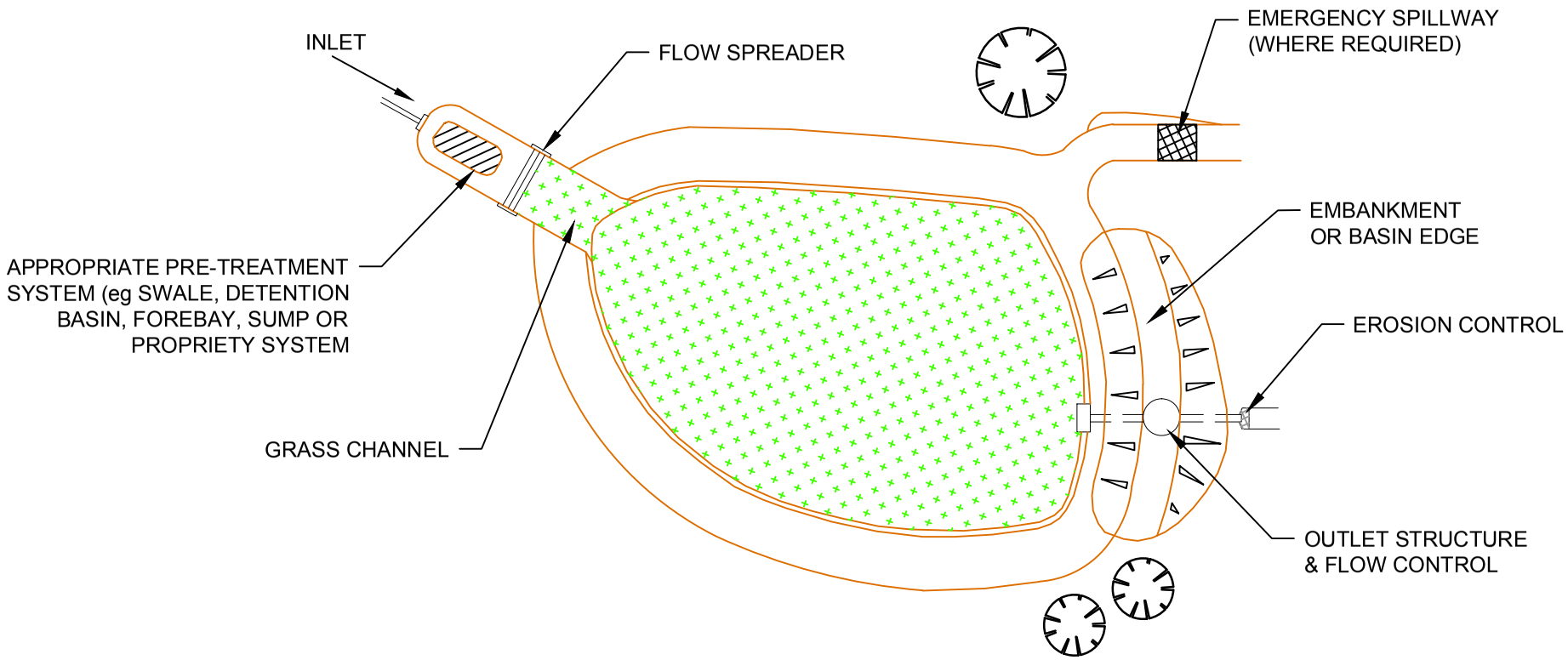
PROJECT: TYPICAL SUDS DETAIL

TITLE: SWALES (1 of 2)

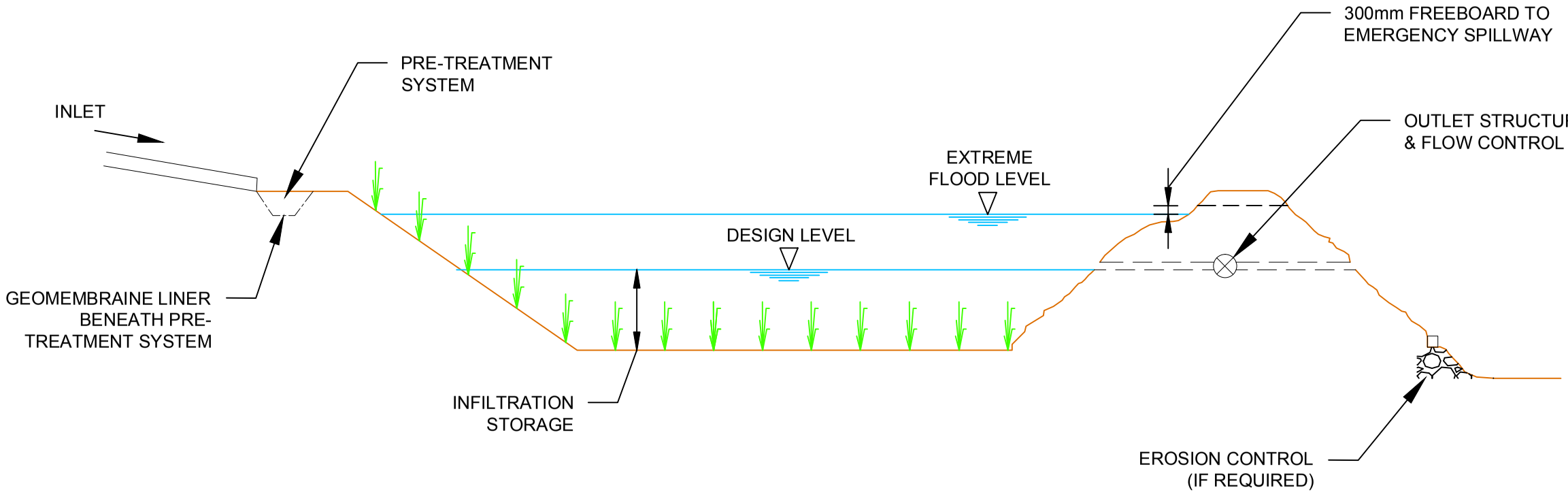
DATE:	SCALE @ SIZE:	DRAWN:	CHECKED:
SEP 2014	@ A3	CP	RDN

PROJECT No:	DRAWING No:	REV:
BETTS	103	A

DO NOT SCALE



PLAN VIEW



ELEVATION

REV	DATE	BY	DESCRIPTION	CHK

DRAWING STATUS: PRELIMINARY

BETTS ASSOCIATES
CIVIL AND STRUCTURAL ENGINEERS
Unit 6, Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire CH5 2LY
Tel: 01244 288178 Fax: 01244 288516 enquiries@betts-associates.co.uk

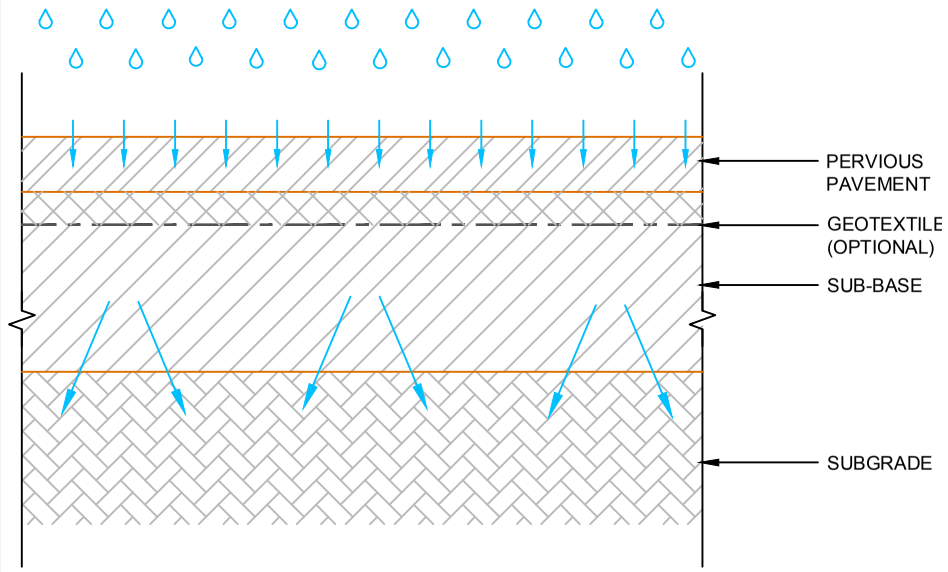
PROJECT: TYPICAL SUDS DETAIL

TITLE: INFILTRATION BASINS

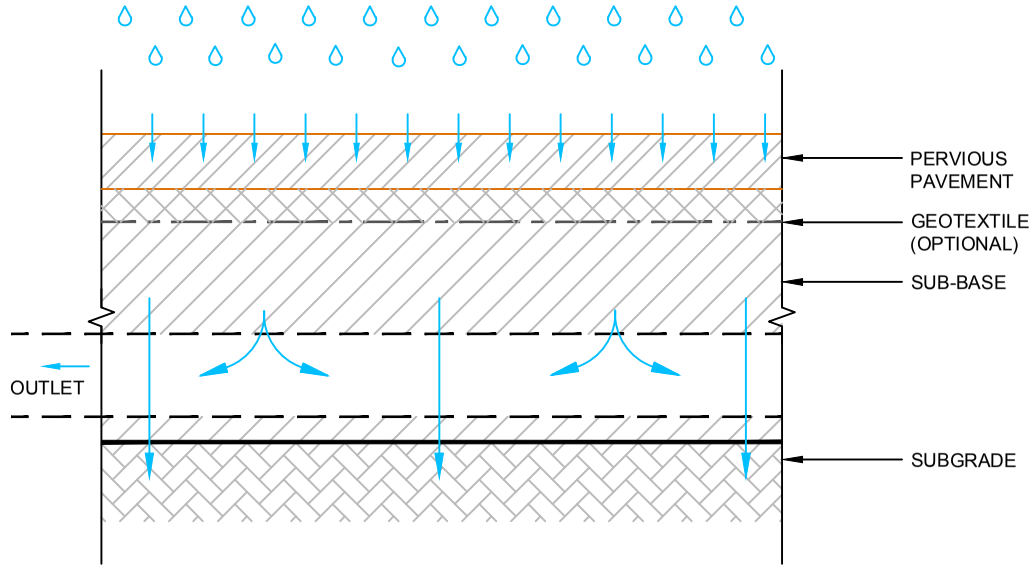
DATE:	SCALE @ SIZE:	DRAWN:	CHECKED:
SEP 2014	@ A3	CP	RDN

PROJECT No:	DRAWING No:	REV:
BETTS	109	A

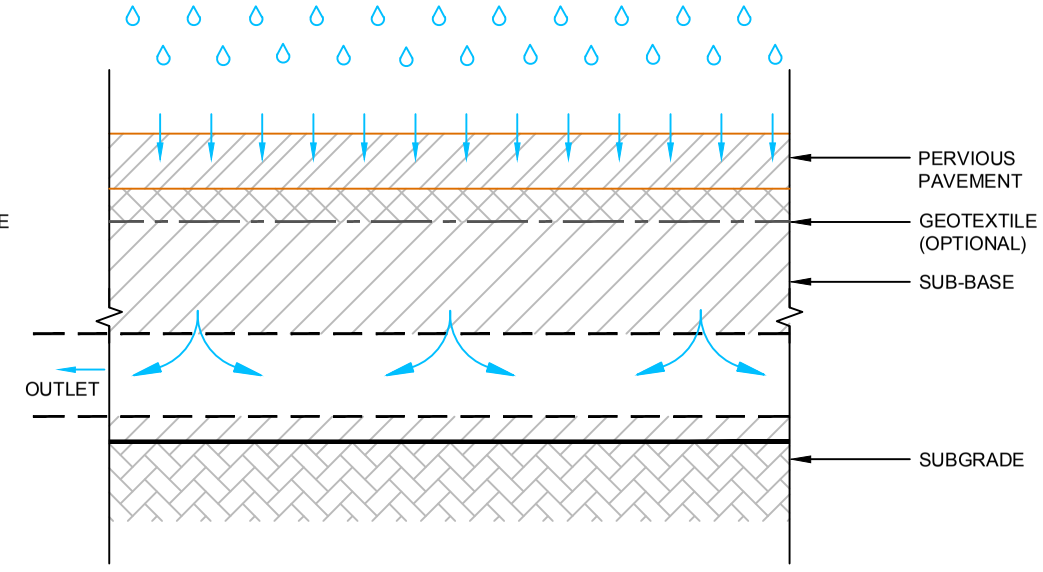
DO NOT SCALE



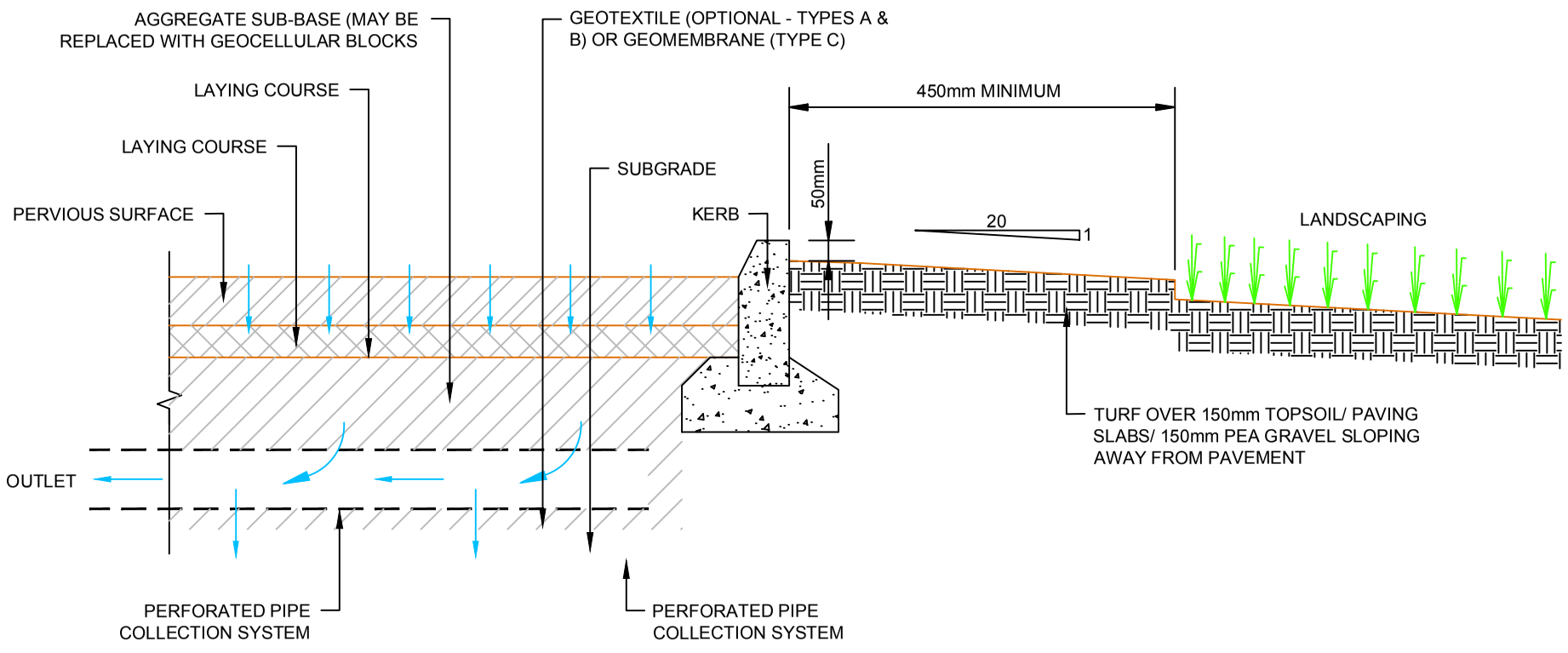
TYPE A: TOTAL INFILTRATIPN



TYPE B: PARTIAL INFILTRATION



TYPE C: NO INFILTRATION



LANDSCAPING DETAIL

REV	DATE	BY	DESCRIPTION	CHK

DRAWING STATUS: PRELIMINARY

BETTS ASSOCIATES
CIVIL AND STRUCTURAL ENGINEERS
Unit 6, Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire CH5 2LY
Tel: 01244 288178 Fax: 01244 288516 enquiries@betts-associates.co.uk

PROJECT: TYPICAL SUDS DETAIL

TITLE: PERVIOUS PAVEMENTS

DATE:	SCALE @ SIZE:	DRAWN:	CHECKED:
SEP 2014	@ A3	CP	RDN

PROJECT No:	DRAWING No:	REV:
BETTS	105	A

APPENDIX O: NOTES OF LIMITATIONS

The data essentially comprised a study of available documented information from various sources together with discussions with relevant authorities and other interested parties. There may also be circumstances at the site that are not documented. The information reviewed is not exhaustive and has been accepted in good faith as providing representative and true data pertaining to site conditions. If additional information becomes available which might impact our conclusions, we request the opportunity to review the information, reassess the potential concerns, and modify our opinion if warranted.

It should be noted that any risks identified in this report are perceived risks based on the available information.

This report was prepared by Betts Hydro Ltd for the sole and exclusive use of the titled client in response to particular instructions. Any other parties using the information contained in this report do so at their own risk and any duty of care to those parties is excluded.

This document has been prepared for the titled project only and should any third party wish to use or rely upon the contents of the report, written approval from Betts Hydro Ltd must be sought.

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