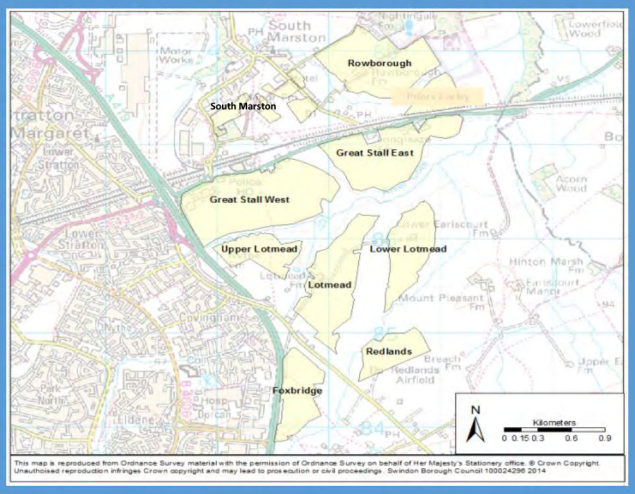
Swindon Borough Council

Sustainable Drainage Systems (SuDS) Vision for New Eastern Villages (NEV)

Supplementary Planning Document (SPD)

www.swindon.gov.uk/spd

February 2017



Swindon Borough Council

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1 Introduction

1.1 Purpose of this guide

This guide has been created for use by developers and their agents to support pre-application discussions, develop masterplanning for sites within the New Eastern Villages (NEV) development area and to inform planning applications. This document aligns with current policy and guidance, including specific requirements which are set out in the Adopted Swindon Borough Local Plan 2026 (adopted March 2015) (Local Plan).

The guide focuses solely on the management of surface water by the use of Sustainable Drainage Systems (SuDS) and sets out:

- The concept underpinning SuDS,
- The vision for drainage in the NEV,
- The engagement and approval process,
- How SuDS schemes should work in practice,
- Design and construction guidelines, and
- Potential maintenance and management models.

This document does not provide guidance on fluvial flood risk (river flooding), as this falls outside the jurisdiction of Swindon Borough Council (SBC) and their role of Lead Local Flood Authority.

1.2 Structure of this guidance

This guide is divided into five sections which together form the SuDS vision for the NEV.

Section 1: Introduction	Outlines the purpose of this guide and provides an overview of SuDS, their purpose, techniques and management.
Section 2: SuDS vision and local considerations	An introduction to the NEV development area, outlining the vision for and objectives of drainage and specifies drainage principles which developers will be expected to follow.
Section 3: SuDS design principles	Sets out the practical measures by which developers can achieve compliance with the principles set out in section 2, including fundamental requirements, design standards and what is expected from developers.
Section 4: Design assessments and approval process	Outlines the design assessment process to obtain approval for SuDS.
Section 5: Funding and long term maintenance options	Discusses the requirement for developers to make provision for the long term maintenance of SuDS and provides information on possible maintenance models.

1.3 Why incorporate SuDS?

There are a number of main rivers crossing the NEV development area and large areas are shown to be with Flood Zones 2 & 3. Although the main development areas (islands) may be outside Flood Zones 2 & 3, there are vast areas that are shown to be at risk of surface water flooding. Also these development islands are between or adjacent to the river flood zones and will have linkages between which will be crossing them. There are also known existing flooding issues to communities neighbouring the NEV development area. Therefore the NEV development area must be considered as an area at risk of flooding.

The Sustainable Drainage Systems (SuDS) Policy (Written Statement HCWS161), which came into force on the 6th April 2015, ensures that sustainable drainage systems for the management of run-off are put in place, unless demonstrated to be inappropriate, on all applications relating to major development, as defined in Part 1, Section 2 of the Town and Country Planning (Development Management Procedure) (England) Order 2010 This is also an expectation of Policy EN6 of the SBC Local Plan 2026.

As well as dealing with surface water runoff, SuDS can provide water quality, biodiversity and amenity benefits to meet other policy requirements of the Local Plan, as well as National and European Legislation such as the Water Framework Directive.

The SuDS Policy also implemented changes to the Town and Country Planning (Development Management Procedure) (England) Order 2010, to make the Lead Local Flood Authority (LLFA) a statutory Consultee for Major Applications in relation to surface water drainage. This was implemented in place of the SuDS Approval Bodies (SAB's) proposed in Schedule 3 of the Flood and Water Management Act 2010.

SuDS are a requirement from the National Planning Policy Framework (NPPF) where proposed development is located in an area at risk of flooding; Development must only be considered in areas at risk of flooding if *"it gives priority to the use of sustainable drainage systems"* (NPPF Paragraph 103)

"New development should only be considered appropriate in areas at risk of flooding if priority has been given to the use of sustainable drainage systems. Additionally, and more widely, when considering major development, as

CIRIA report C753 The SuDS Manual (2015)

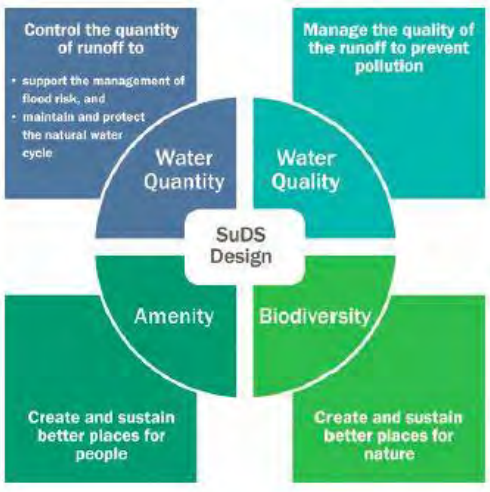
Why SuDS?

Surface water should be managed for maximum benefit now and in the future. By working together we can integrate surface water management into the design of our towns and cities protecting our environment and creating high quality places for future generations.

What are SuDS?

SuDS are designed to maximise the opportunities and benefits we can secure from surface water management.

There are four main categories of benefits that can be achieved by SuDS: water quantity, water quality, amenity and biodiversity. These are referred to as the four pillars of SuDS design.



defined in the Town and Country Planning (Development Management Procedure) (England) Order 2015, sustainable drainage systems should be provided unless demonstrated to be inappropriate (Planning Practice Guidance, para 079).”

Key requirements of the Local Plan, specifically Policy EN6:

- A Flood Risk Assessment will be required for all developments in the NEV.
- A site specific drainage strategy will be required, and SuDS are expected to manage runoff rates to predevelopment or greenfield rates.
- SuDS should seek to enhance water quality and biodiversity.
- A complete and functional SuDS design should be provided at Outline application stage, and early engagement with the SBC is essential.

See Policy EN6: Flood Risk, and pages 194 – 198 of the adopted Local Plan.

Local Plan Policy EN6 states that all developments will be expected to incorporate SuDS, and that SuDS should seek to enhance water quality and biodiversity in line with the Water Framework Directive. Policy NC3 (NEV) requires that the risk of flooding from the development is minimised, both within the development and at existing neighbouring communities in accordance with Policy EN6.

The installation of SuDS features may also help development address other policy considerations in the Local Plan. An example of this may be by designing SuDS systems which utilise and enhance existing drainage features on site, to obviate direct and indirect negative impacts upon biodiversity and geodiversity. The provision of sufficient buffers around these features can promote ecological connectivity with the wider environment and ensure that the existing biodiversity and geodiversity is protected and enhanced in compliance with Policy EN4: Biodiversity and Geodiversity of the Local Plan.

A further example of the means by which SuDS features may integrate with other policies in the Local Plan may be seen by considering Policy EN11: Heritage Transport which requires development to safeguard the indicative Canal route as shown on the Local Plan Policies Map by;

- ensuring that development protects the integrity of the canal alignment and its associated structures; and
- ensuring that where the canal is affected by development, the alignment is protected or an alternative alignment is provided; and
- ensuring associated infrastructure of development does not prejudice the delivery of the canal.

Where the alignment of the proposed Canal route passes through or adjacent to proposed developments, and the topography allows a gravity connection, outfalls from the proposed SuDS systems could outfall to the canal and utilise the storage within the Canal as attenuation if it is being delivered as part of the development. However, it must be demonstrated that there is no unacceptable risk to ecology, flood risk, water resource and water quality to be in accordance with part c) of Policy EN11.

An effectively designed SuDS scheme can provide many additional benefits alongside flood risk management and improve resilience to our changing climate. Successful SuDS enhance the quality of life for people living in a community, by increasing the aesthetic, environmental and recreational value of their everyday outdoor spaces. SuDS help to protect local watercourses from pollution and an increase surface water runoff, as a result of new development, but furthermore they can draw upon the aesthetic and environmental character of watercourses into the urban fabric, creating cohesion between a development and the landscape within which it sits. The inclusion of source control measures throughout a development, to improve capture and slow down the flow of water, can reduce the required end-of-line attenuation volume and thus increase the available space for development. Furthermore, a well-designed SuDS system demonstrates to neighbouring communities that the development has been designed to manage flood risk and reduce the risk to those communities.

Other benefits of a successful SuDS scheme include:

- Water storage – providing long and short term storage of water during a storm event, ensuring that development does not increase the risk of flooding to downstream areas
- Water reuse – reducing future demand for water by reusing rainfall runoff
- Pollutant treatment – effective treatment of polluted runoff
- Recreation – open space and water features available for leisure activities
- Visual amenity – providing attractive features which enhance the urban landscape
- Biodiversity – increasing the variety of plants and wildlife
- Silt removal – removing suspended sediments in water
- Education – learning opportunities around biodiversity and water management
- Climate change resilience and adaptability – easily changed for additional future capacity
- Reduce maintenance costs

CIRIA report C753 The SuDS Manual (2015)

SuDS can deliver multiple benefits

The philosophy of SuDS is about maximising the negative impacts of surface water runoff from developed areas.

The SuDS approach involves slowing down and reducing the quantity of surface water runoff from a developed area, to manage downstream flood risk, and reducing the risk of that runoff causing pollution. This is achieved by harvesting, infiltrating, slowing, storing, conveying and treating runoff on site and, where possible, on the surface rather than underground. Water then becomes a much more visible and tangible part of the built environment, which can be enjoyed by everyone.

By adopting this approach, SuDS have the opportunity to deliver and enhance the green space within developments and link to wider green networks, supporting the provision of habitats and places for wildlife to live and flourish. The benefits to the community of using SuDS are also numerous, including improvements in health, well-being, and quality of life (liveability) for both individuals and communities, which in turn can increase the value of property and the prosperity of the local economy.

To maximise these benefits, surface water management should be considered from the beginning of the development planning process and throughout – influencing site layout and design, and the use and characteristics of open spaces. So it is important that, where appropriate, an interdisciplinary team (including planners, landscape architects, architects and drainage engineers) should work together from the outset.

1.4 SuDS techniques

SuDS employ drainage techniques which mimic natural drainage to manage water at or near the surface. These techniques are used in series to manage water flow and help treat pollution in a process known as the management train (see Figure 1). Each part of the management train contributes to controlling the quantity and quality of water entering the wider environment.

Source control measures occur at the beginning of the management train and involve managing surface water runoff as close as possible to where it rains. As such, source control measures are put in place throughout a development, and normally include measures which allow water to percolate through a surface to be stored and slowly released. They can also provide the benefits of a number of other techniques explained in this section and will ensure that accumulation rates are low, minimising the need for large and deep attenuation features.

Conveyance techniques are the next step in the train. These techniques move water through the landscape whilst using vegetation to help clean and filter water as well as slowing its flow. These techniques typically include swales.

Infiltration techniques can also be included within the management train. These methods reduce overland flow and help treat runoff by allowing water to soak into the ground. Infiltration techniques can either be specifically designed for that purpose or incorporated into other conveyance and source control techniques. Infiltration depends largely on the ground conditions of the development; initial investigations in NEV indicate that they are unlikely to be suitable for the area due to seasonally high groundwater levels and the underlying geology.

Attenuation features can be located throughout the SuDS management train as ponds, wetlands or normally dry basins that collect and store water before it is released into the environment. Attenuation can also be located as below ground storage, but this does not provide the amenity, biodiversity or pollution control benefits of above ground attenuation.

Treatment components can be incorporated throughout the management train which are required to maintain and improve water quality and prevent pollution to groundwater and receiving watercourses during and after the construction of developments. The SuDS Manual (C753) states

CIRIA report C753 The SuDS Manual (2015)

The SuDS Design Philosophy

SuDS should not be thought of as an individual component (such as a filter strip, swale or detention pond) but as an interconnected system designed to manage, treat and make best use of surface water, from where it falls as rain to the point at which it is discharged into the receiving environment beyond the boundaries of the site.

Wherever possible, runoff should be managed at source (i.e. close to where it falls) with residual flows then conveyed downstream to further storage or treatment components, where required. The passage of water between individual components of the Management Train should be, wherever possible, through the use of above-ground conveyance systems (e.g. swales and rills) although pipework and subsurface proprietary products may prove more efficient for specific schemes, especially where space is limited such as in a redevelopment. Pre-treatment (the removal of litter and sediment) and maintenance are vital to ensure the long-term and sustained effectiveness of all SuDS components. Overland flow routes will also be required to convey and control floodwater safely during extreme events.

that where practical, surface water runoff should be managed close to its source and treated on the surface to keep pollutant levels and accumulation rates low. Surface treatment will allow UV light, photolysis & volatilisation processes to be used and allow sediment to be easily removed. These treatment processes can be delivered within the same techniques explained above and may not require extra cost or land take.

Some components combine a number of the techniques described above and may provide significant cumulative benefit. An example of this is by utilising permeable paving as a source control measure as it also provides many of the benefits of attenuation, infiltration and treatment measures. Measures such as swales and filter strips can be combined and located adjacent to highways to act as source control measures, and can also provide attenuation and a level of treatment requirements.

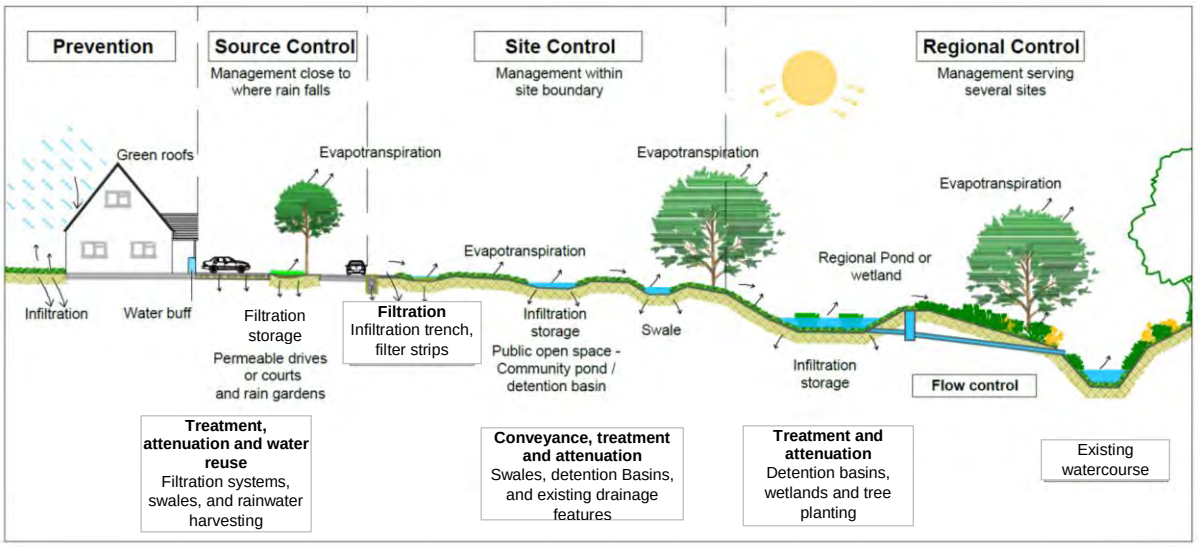


Figure 1 SuDS management train

1.5 SuDS management areas

The SuDS management train, seen in Figure 1 above, incorporates the principle of dealing with water as locally as possible. To support this principle it can be helpful to divide the development area into SuDS management areas; sub-catchments each with different land uses and drainage characteristics. Water should then be dealt with locally, through source control measure and returned to the water cycle as near to where the rain falls as possible.

Due to the location of the NEV and the majority of the proposed development areas being islands with connectivity crossing designated flood plain (flood zones 2 & 3), SBC will not accept a drainage strategy that seeks to use traditional gully and pipe systems discharging to large attenuation features close to the final discharge point.

The Council will expect source control measures to be incorporated into the development which will ensure water is discharged throughout the management train at greenfield runoff rates. Water should be conveyed and controlled through the development using shallow above ground conveyance systems to mimic the natural drainage features of the site.

Therefore it is important that existing ditches are utilised along with the creation of swales where required to maintain the existing drainage paths through the development site. This will also help to ensure that biodiversity and geodiversity at the site will be protected and enhanced, and any existing surface water flow routes that serve neighbouring land can be maintained through the site to ensure flood risk is not increased elsewhere in compliance with the Local Plan. Drainage paths which do not follow existing ditches and watercourses can be identified using the Environment Agency (EA) surface water flood maps or by interpolating LiDAR data and undertaking detailed topographical surveys.

By incorporating source control measures wherever possible and utilising the existing drainage paths throughout the site, SBC consider that all final attenuation requirements can be accommodated outside flood zones 2 & 3 and as a result will not be affected by existing flood levels. (i.e. invert levels are above the 1 in 100 year plus climate change flood level).

2 SuDS vision

2.1 Site location and characteristics

The NEV is currently an area of relatively low lying open fields and flood plains. The surrounding countryside is of a high quality with the North Wessex Downs Area of Outstanding Natural Beauty (AONB), a landscape of national importance and a considerable asset, located beyond the site to the south. Topographically, the site is located mainly within the Upper Thames Clay Vale Landscape Character Area (NCA 108), and is an open landscape with gentle undulations and a localised high point at Mount Pleasant Farm. Variations in topography across the area are subtle, enabling long views. The NEV must be sympathetically developed to retain the aesthetic and environmental value of the landscape in which it is set.

The site includes a network of river corridors, streams, brooks and tributaries including the River Cole, Liden Brook, Dorcan Stream and South Marston Brook. These river and stream routes draw meandering paths across the site forming field boundaries and influencing vegetation patterns. As a result, parts of the NEV lie within medium and high risk flood zones as defined by the EA (Flood Zones 2 and 3 respectively). The flood risk zones and river corridors provide an opportunity to extend habitats and green corridors through the site, and the potential biodiversity of these areas must be fully realised.

Figure 2 SuDS swale forming soft boundary of new development (courtesy of SUSDRAIN and CIRIA)

The river corridors running through the NEV provide important habitat for wildlife. Within the NEV the River Cole and its tributaries are established as a County Wildlife Site. The presence of Great Crested Newts has been identified as well as a number of other protected species including those set out in the UK Biodiversity Action Plan (BAP). Maintaining and enhancing the Green Infrastructure network and associated biodiversity must therefore be a key design consideration for the development. The wider GI network will include existing watercourses and their associated wetland, and meadows within flood risk zones, as well as more formal open spaces and leisure facilities, woodland and biodiversity areas both within and surrounding the villages. Historic assets will also feature as integral parts of the development. Sympathetically developing the NEV to include consideration and enhancement of existing green spaces and biodiversity, and incorporating Green Infrastructure into the design, will help define the edges of the individual villages. This will enhance the diversity and individuality of the component parts of the development. It is important that

Figure 3 Wetland feature and meadow in new development

these open spaces also provide a sense of connectivity across the wider development, so that the NEV and their residents are connected through their relationship with and use of the Green Infrastructure. In addition to providing for leisure activities, connectivity and biodiversity, the large areas of informal Green Infrastructure space will also perform important flood alleviation and water storage functions.

2.2 Objectives for drainage within the NEV development

The effective design of drainage for the NEV development will enhance the development, helping to create sustainable, well-designed places where people want to live, work and spend time. The drainage design for the NEV should help the development to:

- be a high quality, sustainable development with strategic infrastructure that benefits Swindon as a whole;
- sensitively and positively respond to the existing landscape context, natural and historic assets and the character and identity of the surrounding villages as well as enhancing biodiversity and Green Infrastructure;
- comprise new distinct villages with individual identities and characters linked together by green spaces that integrate with the existing urban area and wider landscape setting;
- create vibrant, attractive places that are functional, durable and capable of adapting to accommodate changing lifestyles in line with sustainable communities;
- conserve and enhance natural systems, watercourses, biodiversity and landscape settings, including integration with Green Infrastructure to help mitigate and facilitate adaptation to climate change;
- encourage walking and cycling within the development and ensure high levels of accessibility and connectivity within and beyond the NEV; and,
- enhance the image of Swindon by maximising place-making opportunities particularly around key nodes, gateways and frontages.

SuDS within the NEV should make a positive contribution to the environmental, social and aesthetic character of the development. Integration is key, so that drainage features interact with the urban landscape and blend with the design of buildings and open spaces. Systems which make a feature of water as it is collected and transported can draw people together in communal areas and enhance the quality of life of residents.

2.3 Legislation and policy

The implementation of SuDS is covered by a variety of legislation and policy including European Directives, national legislation, high level Government strategy and local policies. This is supported by extensive guidance which facilitates implementation and develops technical understanding.

Table 2.1 summarises the main key documents and their relevance to principles of the SuDS vision for the NEV (further details of these and other relevant legislation and guidance are provided in Appendix A). This should not be considered an exhaustive list. In particular, other sources of technical guidance are available which will be useful to all those involved in the design, construction and future maintenance of SuDS.

Table 2.1: Key Legislation and policy in relation to the SuDS vision for Swindon Easter Villages

Document(s)	Type	Summary	Relevance to NEV
Land Drainage Act 1991 / Water Resources Act 1991	Legislation	Prior written consent by the EA is required for any proposed works or structures in, under, over or within 8m of the top of the bank of a Main river.	• Consent will be required as appropriate. • The EA seeks to avoid culverting and its consent for such works will not normally be granted.
Flood and Water Management Act 2010	Legislation	Creates a comprehensive risk based regime for managing risk of flooding from all sources.	• Encourages the uptake of SuDS by removing the automatic right to connect to sewers. • Proposed Lead Local Flood Authorities adopt SuDS for new developments and redevelopments. (Schedule 3 which was not implemented fully but partly by the Ministerial Statement from the House of Commons in April 2015
NPPF (2012)	Policy	Sets out planning policies for England. Seeks to avoid inappropriate development in areas at risk of flooding. Development in areas at higher risk should be made safe without increasing flood risk elsewhere.	• Swindon Eastern Villages Development should not increase flood risk elsewhere. • Requires use of SuDS to be given priority. • SuDS should be designed to reduce overall flood risk and to conserve and enhance biodiversity. • Layout and form of development should seek to reduce overall flood risk.
Planning Practice Guidance	Guidance	Need to reduce the overall flood risk through the layout and form of the development and the appropriate application of SuDS.	
Ministerial Statement to the House of Commons April 2015 on FWMA implementation	Policy	All new developments should use the recently published National Standards (March 2015), and implement SuDS restricting discharges to greenfield rates (approx.).	SBC as LLFA now a statutory consultee on all planning applications with responsibility to enforce the National Standards. This document is consistent with the National Standards.
Swindon Borough Local Plan 2026	Policy – Local	Main planning policy document for the Borough.	• Requirement for developments to provide a drainage strategy. • Developments expected to incorporate SuDS. • Developments to ensure that run-off rates are attenuated to greenfield run-off rates.
The SuDS manual, CIRIA (C753)	Guidance	Best practice guidance on planning, design, construction, operation and maintenance of SuDS to facilitate effective implementation.	• Provides guidance when considering choice of SuDS in Swindon Eastern Villages.
Swindon Local Flood Risk Management Strategy	Policy and strategy	As LLFA for Swindon Borough, the Council has developed a Local Flood Risk Management Strategy setting out objectives and proposed measures for managing local flood risk within the Borough.	• Drainage proposals for NEV should comply with the objectives of the LFRMS, in particular: o Ensure that actions and measures proposed to manage flood risk deliver multiple benefits, including environmental, social and economic
Swindon TRfD	Policy	Defines the process and the standards to be used by third parties considering developments in the Borough	• Reference standards and specifications for developments

2.4 Key principles of the SuDS vision

A set of principles have been developed to support the SuDS vision for the NEV and aid compliance with the legislative and policy requirements. Application of the principles, set out below, will contribute to the achievement of the NEV objectives and enable SuDS to make a positive contribution to the environmental, social and aesthetic character of the development. These are based around the four pillars of SuDS design from C753 SuDS Manual, Water Quantity, Water Quality, Amenity and Biodiversity. Application of the principles will also promote health, safety and resilience.

- Performance (quantity and quality)
    - Protect people and property on the site from flooding
    - Manage frequency, rate and volume of discharges from the development to within greenfield equivalent
    - Ensure the development does not exacerbate flood risk elsewhere
    - Minimise end-of-line storage requirements
    - Allow for future considerations during design
    - Use adequate uplift on peak rainfall for climate change in accordance with EA Guidance
    - Maintain or improve water quality
    - Incorporate water re-use
- Visual impact and amenity
    - Integrate with public spaces using space in a multi-functional way where practical
    - Link to wider landscape
    - Enhance visual appeal of development
    - Provide amenity opportunities for residents and visitors
    - Offer wider community benefits (education, recreation, engagement)
- Biodiversity and ecology
    - Align with green corridors and local habitats
    - Maintain and enhance existing ditches / watercourses and natural drainage paths
    - Deliver biodiversity benefits during operation, and prevent negative impacts during construction
    - Use low impact materials
    - No negative impact on watercourse hydromorphology both during construction and operation
- Health and safety
    - Use shallow gradients, SBC's preference for the NEV will be 1:5 or shallower but slopes for all drainage features must be designed in-line with HSE guidance.
    - Avoid very deep or stagnant water
    - Use area appropriate features and designs
    - Provide clear, effective signage
    - Minimise maintenance requirements, and ensure safe access and egress
    - Favour simple, above ground features, removing the need for specialist maintenance

2.5 Adapting the principles to the character of each village

Each of the NEV islands will have a distinct identity dictated by its location, housing density and property mix. The types of SuDS appropriate to each island will vary depending predominantly on how they support the character of each development, and site specific constraints.

This section presents the character of each of the NEV islands and constraints which need to be considered, with examples of the types of SuDS that would match the character of that island. Many types of SuDS, such as attenuation ponds, swales and wetlands, can form part of public open spaces providing that appropriate health and safety considerations are observed (e.g. signage, shallow gradients). This can help to optimise the land available for development by combining several functions in one space. For example swales and rain gardens can make attractive features for parks and other public recreational areas, and playing pitches/outdoor sports areas can be designed to serve as attenuation during high rainfall events (i.e. above the 1 in 30 year rainfall event). However, the features must be carefully designed to ensure that they do serve a recreational or amenity function. SuDS features that do not provide any amenity or recreational function will not be permitted in public open space.

2.5.1 Great Stall West

Great Stall West lies in the west of the NEV and is bounded by the A419 to the west and by the A420 to the north. To the south of Great Stall West lies Lotmead and Lower Lotmead and to the east lies Great Stall East. The development site is circa 78ha in area and naturally drains predominantly to the River Cole which runs along the southern edge of the development area, with parts of the area draining through Great Stall East to the east. Figure 4 illustrates the location of Great Stall West, mapped watercourses and the EA flood zones.

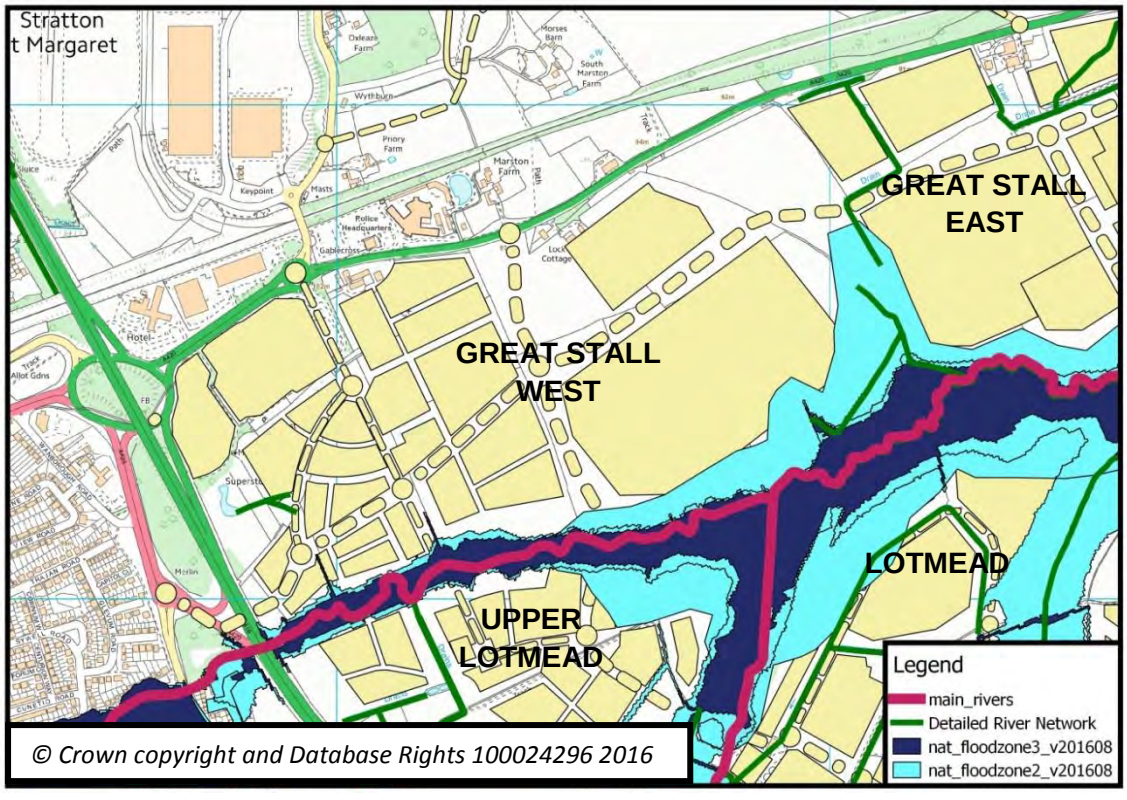


Figure 4: Location of Great Stall West and Environment Agency Flood Zones.

The southern part of the Great Stall West development area drains to the River Cole to the South of the development via a network of existing drainage ditches. The northern part of the development area drains primarily in an eastern direction, via a watercourse flowing through Great Stalls East that is culverted under the A420 and the railway line before outfalling into the South Marston Brook which is a tributary of the River Cole. The mapped watercourses and EA surface water flood maps are shown on the Figure 5 below.

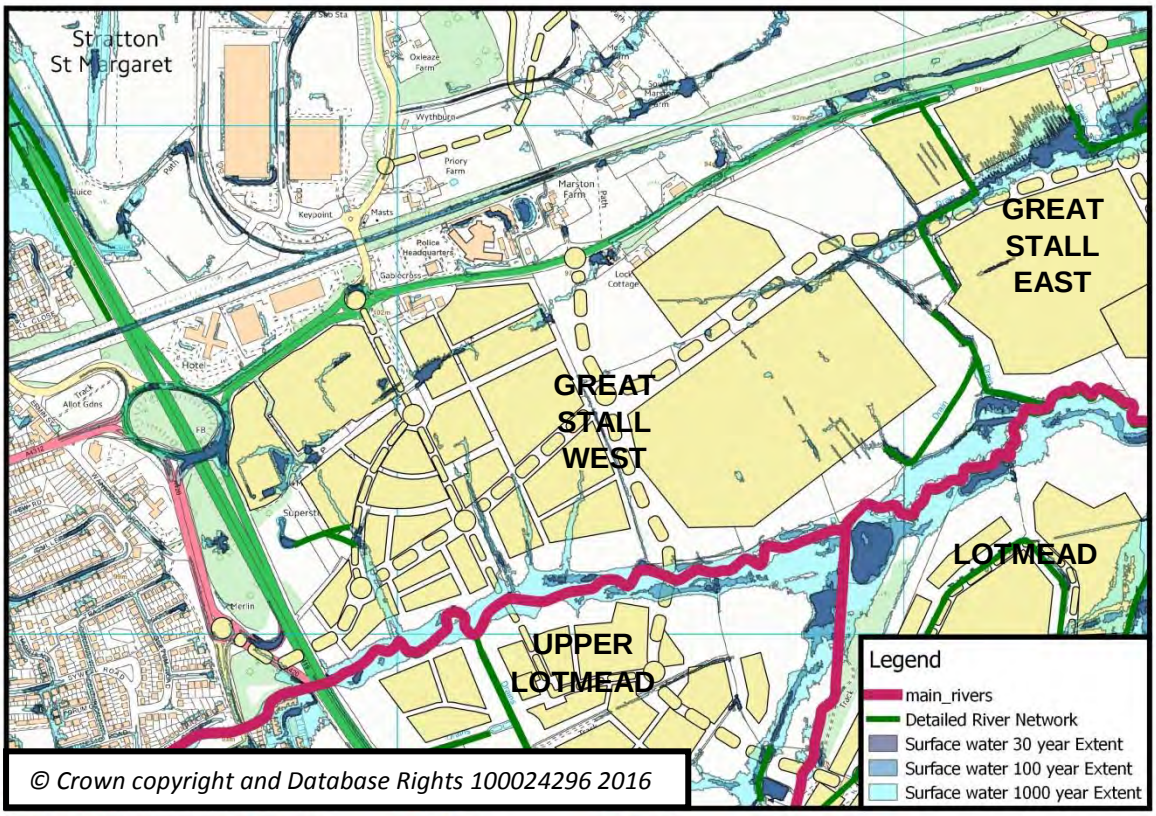


Figure 5 – Surface Water Flood Maps

Interdependencies

The River Cole is Main River and under the jurisdiction of the EA and it is on their annual maintenance programme. Although the river is under the jurisdiction of the EA, the ownership and maintenance responsibilities fall to the landowners (riparian owners) either side of it (responsible up to the centreline of the river). It is important that the River Cole is included in the maintenance management plan for the development as there is no long term commitment from the EA to maintain it and developers in this area may wish to liaise with other riparian owners to ensure the responsibility is shared.

Opportunities and constraints

It is preferable to maintain natural drainage paths wherever possible however, there are known flooding issues associated with the watercourse that flows through Great Stalls East in the vicinity of where it is culverted under the A420. There are also further known flooding issues affecting the A420 in the vicinity of the proposed main access to the development area and to the NEV. Therefore drainage in this area needs to be fully understood and any proposals must provide mitigation wherever possible.

Residential densities are likely to be amongst the highest in the NEV. The types of SuDS used should therefore reflect the densities proposed by making use of 'space saving' options such as green roofs, linear tree pits, rain gardens, rainwater harvesting , linear swales and permeable paving. This type of features will help to create a contemporary and attractive design for this part of the development, whilst offering many wider benefits such as providing recreational areas for residents and employees. Great Stall West includes a District Centre as well as the main employment allocation for the NEV, so there will be opportunities for the buildings with larger roof spaces to include rainwater harvesting or green roofs.

Parking spaces must make use source control measures such as permeable paving with subsurface storage which can be increased to serve further areas unsuitable for such measures. Alternatively they can be drained over the edge to other measures such as linear swales and filter strips where this is more practical.

2.5.2 Great Stall East

Great Stall East lies in the east of the NEV and is bounded to the north by the A420. To the south of Great Stall East lie Lotmead and Lower Lotmead, and to the west lies Great Stall West. Great Stall East is circa 50ha in area and naturally drains predominantly to the River Cole which runs along the southern edge of the development area. Figure 6 illustrates the location of Great Stall East, location of mapped watercourses and the EA flood zones.

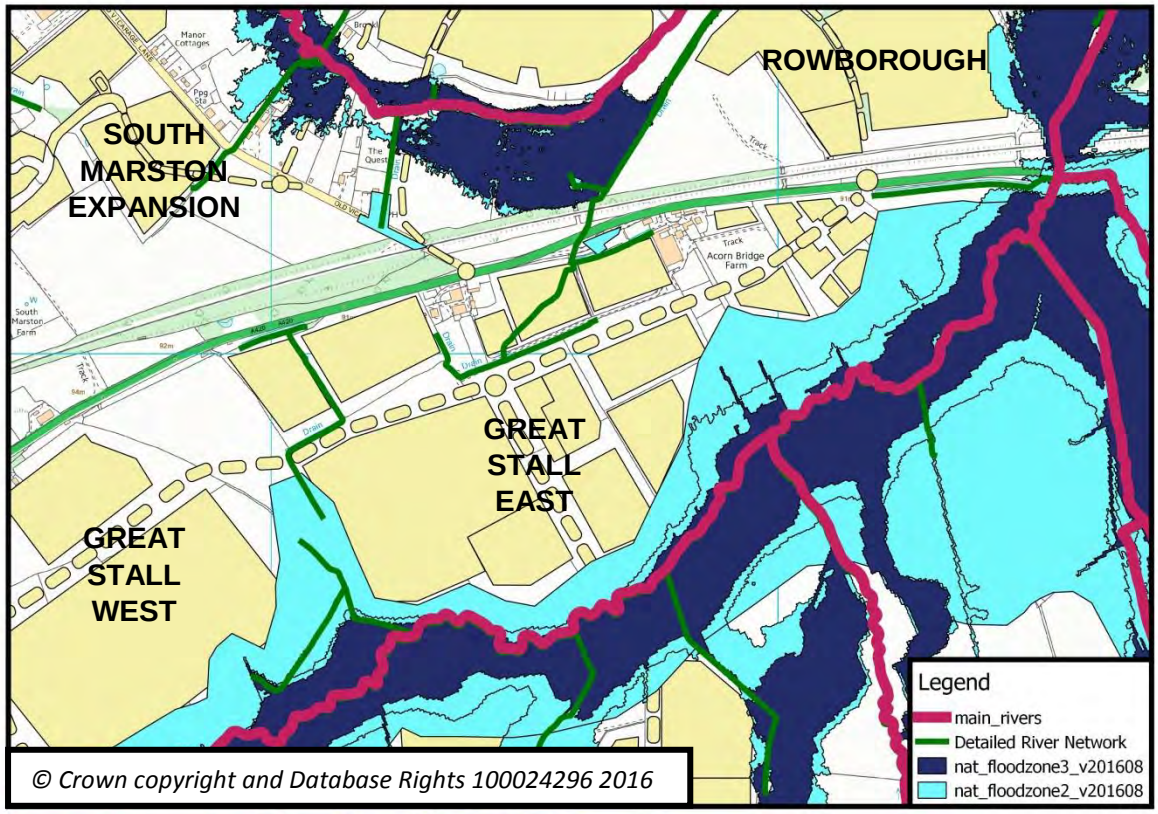


Figure 6: Location of Great Stall and Environment Agency Flood Zones.

The northern catchment area of Great Stall East drains north-east through a watercourse flowing through the site. The watercourse is then culverted under the A420 and the railway line before outfalling into the South Marston Brook which is a tributary of the River Cole. The catchment area to the South of Great Stall East drains south or south east to the River Cole. The mapped watercourses and EA surface water flood maps are shown on the Figure 7 below.

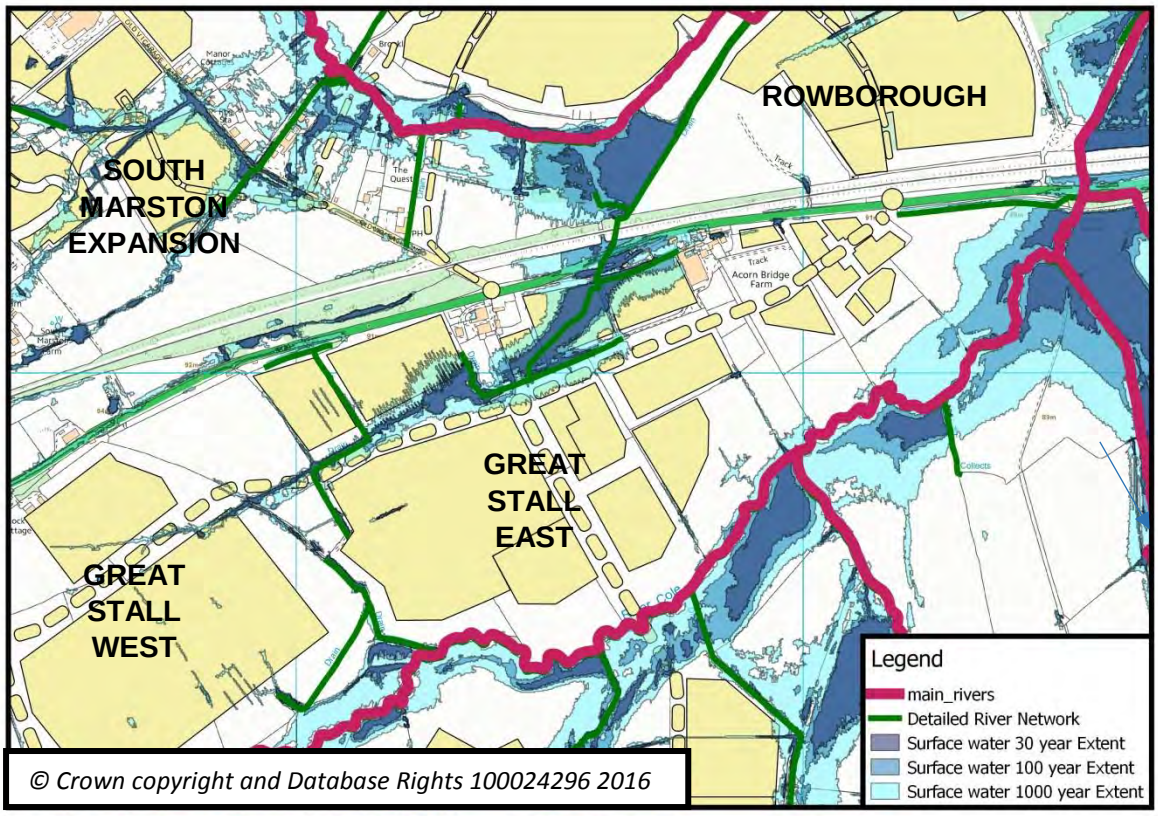


Figure 7 – Surface Water Flood Maps

Interdependencies

The River Cole is Main River and under the jurisdiction of the EA and it is on their annual maintenance programme. Although the river is under the jurisdiction of the EA, the ownership and maintenance responsibilities fall to the landowners (riparian owners) either side of it (responsible up to the centreline of the river). It is important that the River Cole is included in the maintenance management plan for the development as there is no long term commitment from the EA to maintain it and developers in this area may wish to liaise with other riparian owners to ensure the responsibility is shared.

Opportunities and constraints

It is preferable to maintain natural drainage paths wherever possible however, there are known flooding issues associated with the watercourse that flows through Great Stalls East, especially in the vicinity of where it is culverted under the A420 which is highlighted by the Surface Water Flood Maps in Figure 7. Therefore drainage in this area needs to be fully understood and any proposals must provide mitigation wherever possible.

Great Stall East is likely to have a range of residential densities from higher in the west to lower in the east. 'Space saving' options such as green roofs, linear tree pits, rainwater harvesting, rain gardens, linear swales and permeable paving are likely to be appropriate. This type of feature will help to create an attractive design for this part of the development, whilst offering many wider benefits such as providing recreational areas for residents and employees. Linear rain gardens and swales within roads and parking areas will create attractive streetscapes

Development density will reduce towards the eastern edge of Great Stall East and SuDS features which help to soften the character. Larger scale, above ground conveyance and attenuation SuDS features such as swales, rain gardens and basins will help create connected spaces, enabling the design to respond positively to the adjacent parkland and open countryside. These types of SuDS offer opportunities to create multifunctional spaces combining recreation and biodiversity benefits.

As a relatively large building with high occupancy, the Education Campus is likely to be a suitable facility for the incorporation of green roof technology and rainwater harvesting systems which could be fed from the roofs and hardstanding areas. Permeable paving could also be used for all non-trafficked hardstanding and car parking areas, and swales, rain gardens, tree pits and planted channels could be incorporated into the landscaping of the area. SuDS could be designed to be visual to exploit educational opportunities.

Green Infrastructure

The flood zone to the south and east of the site lies within a strategic green corridor. Appropriate SuDS within the green corridor would help link the developed area with the green corridor, contributing to other policy objectives such as creating green corridors and enhancing biodiversity.

2.5.3 Upper Lotmead

Upper Lotmead lies in the west of the NEV and is bounded to the west by the A419. To the north of Upper Lotmead lies the Great Stall West development area and to the south and east lies the Lotmead development area. The development site is 21ha in area and naturally drains predominantly to the River Cole which runs along the northern edge of the development area, with parts of the area draining towards the Dorcan Brook to the east of the development area. Figure 8 illustrates the location of Upper Lotmead, location mapped watercourses and the EA flood zones.

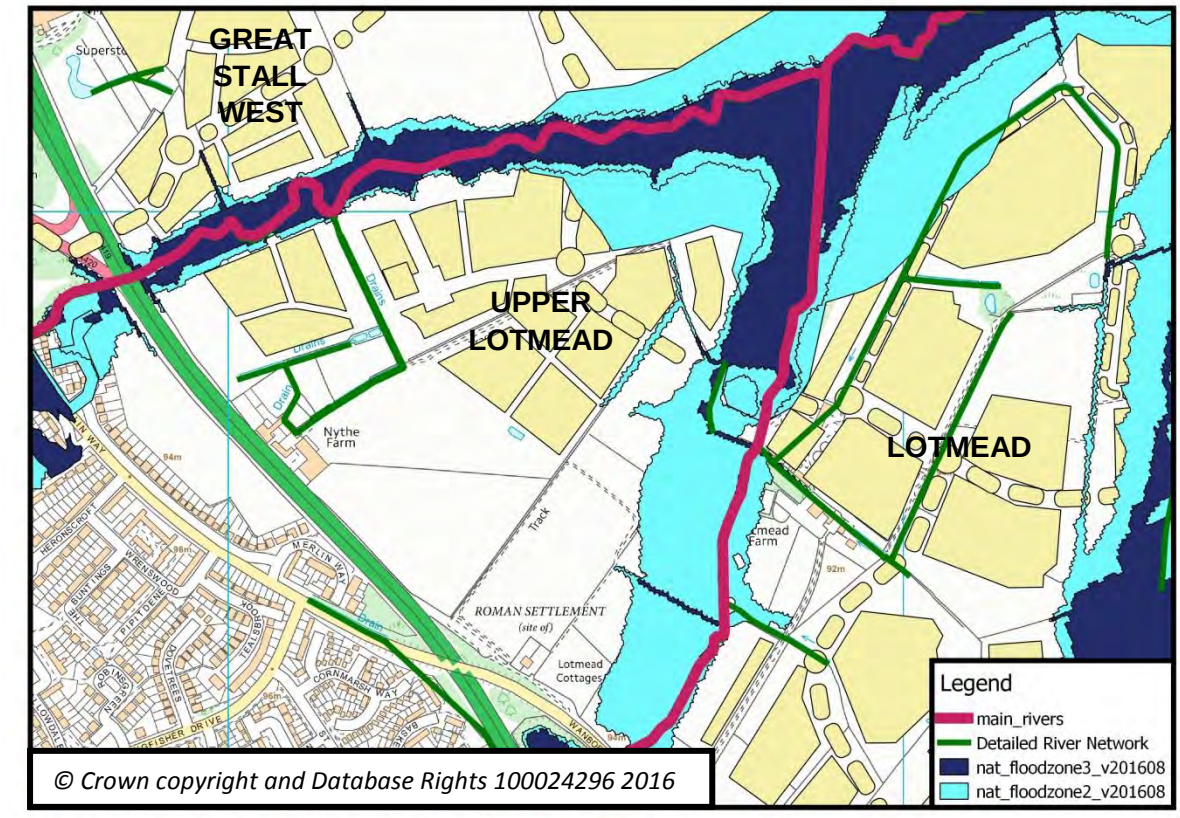


Figure 8: Location of Upper Lotmead and Environment Agency Flood Maps.

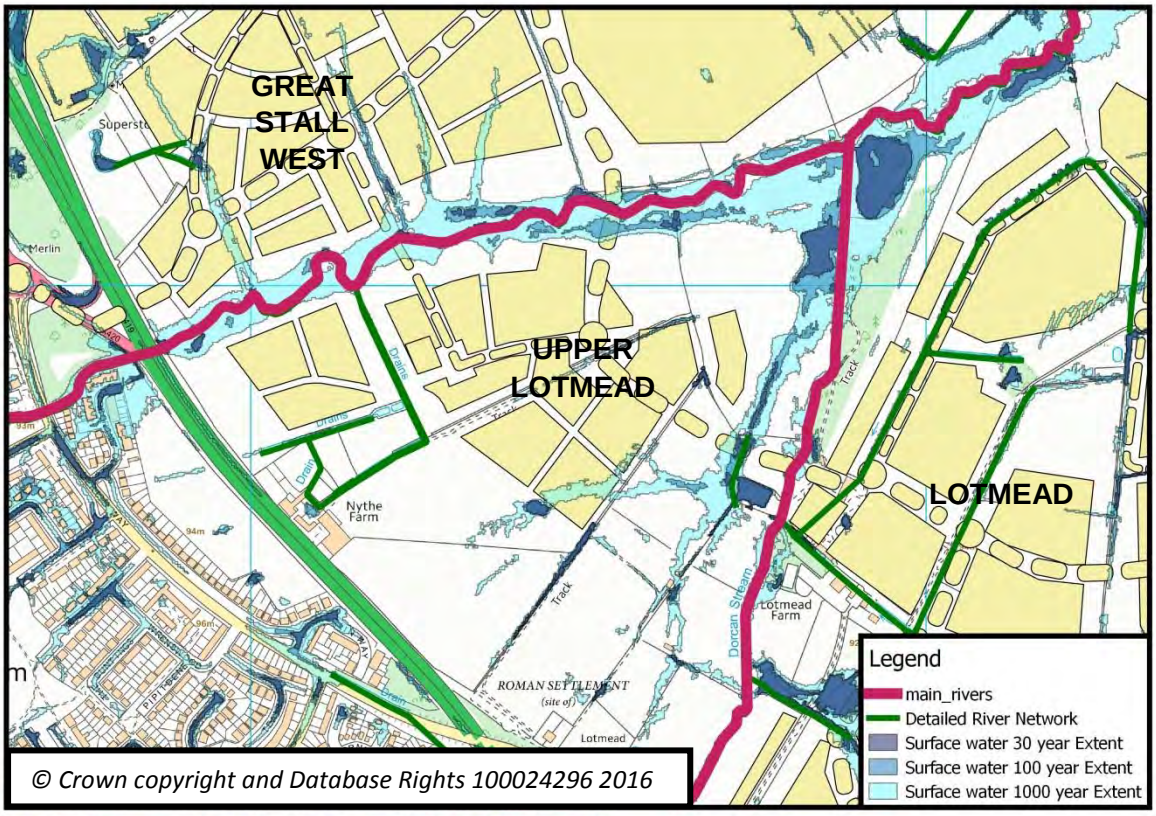


Figure 9 – Environment Agency Surface Water Flood Maps

Interdependencies

Upper Lotmead is located between the River Cole and the Dorcan Brook and the watercourses confluence to the north east of the development area. Both watercourses are classed as Main River which fall under the jurisdiction of the EA and both are on their annual maintenance programme. Although the rivers are under the jurisdiction of the EA, the ownership and maintenance responsibilities fall to the landowners (riparian owners) either side of them(responsible up to the centreline of the rivers). It is important that the rivers are included in the maintenance management plan for the development as there is no long term commitment from the EA to maintain them and they may wish to liaise with other riparian owners to ensure the responsibility is shared.

Opportunities and constraints

There are a number of watercourses and drainage ditches flowing through the development area which serve existing properties including Nythe Farm and it is essential that they are maintained post development to ensure flood risk is not increased in the area.

Upper Lotmead lies alongside the historic Roman settlement of Durocornovium which is a Scheduled Monument. The precise boundaries of the Upper Lotmead development area will be determined following a detailed Environment Impact Assessment. This EIA may help to further inform where SuDS can be best used to enhance and preserve the environment of Upper Lotmead.

For this residential development the use of SuDS such as linear tree pits, rain gardens, swales and permeable paving along residential roads will help to create an attractive living space for residents.

Green Infrastructure

Nearly all of the Upper Lotmead development lies within a strategic green corridor/ sub regional Green Infrastructure link. Selection of Green Infrastructure type SuDS (such as green roofs, swales and tree pits) would provide multiple benefits and contribute to other policy objectives by providing an effective drainage solution and optimising land use by linking the developed area to the surrounding landscape through a green corridor to enhance the permeability of the development and biodiversity. A tiered swale within this linear Green Infrastructure corridor could provide a public right of way; cycleway and utility corridor in addition to storage; conveyance and biodiversity benefits.

2.5.4 Lotmead

Lotmead lies in the centre of the NEV. To the north of Lotmead lie Great Stall West and Great Stall East, to the west lies Upper Lotmead, to the east lies Lower Lotmead and to the south, Foxbridge and Redlands. Wanborough road runs along the southern edge of Lotmead. The development site is 47 ha in area and naturally drains towards the River Cole in the north and the Dorcan Brook to the west via a number of drainage ditches throughout and adjacent to the site. Figure 10 illustrates the location of Lotmead, location of mapped watercourses and the EA flood maps.

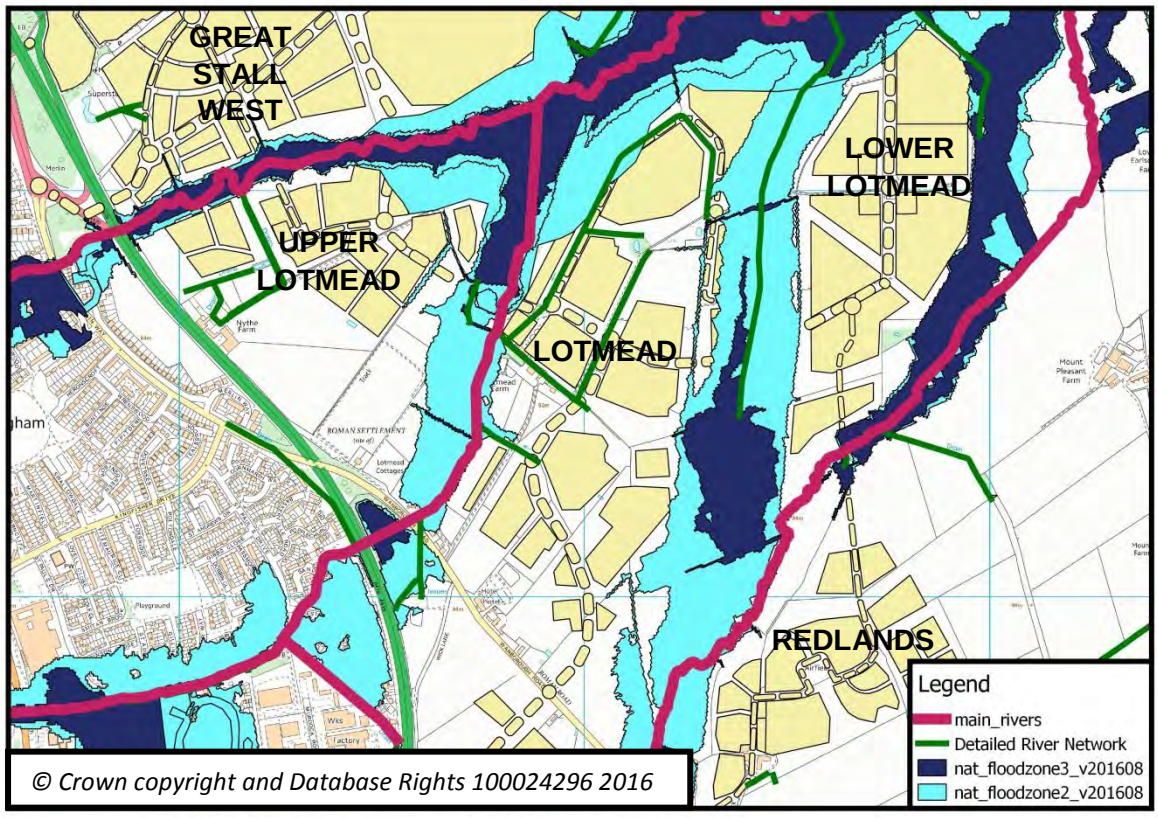


Figure 10: Location of Lotmead and Environment Agency Flood Zones.

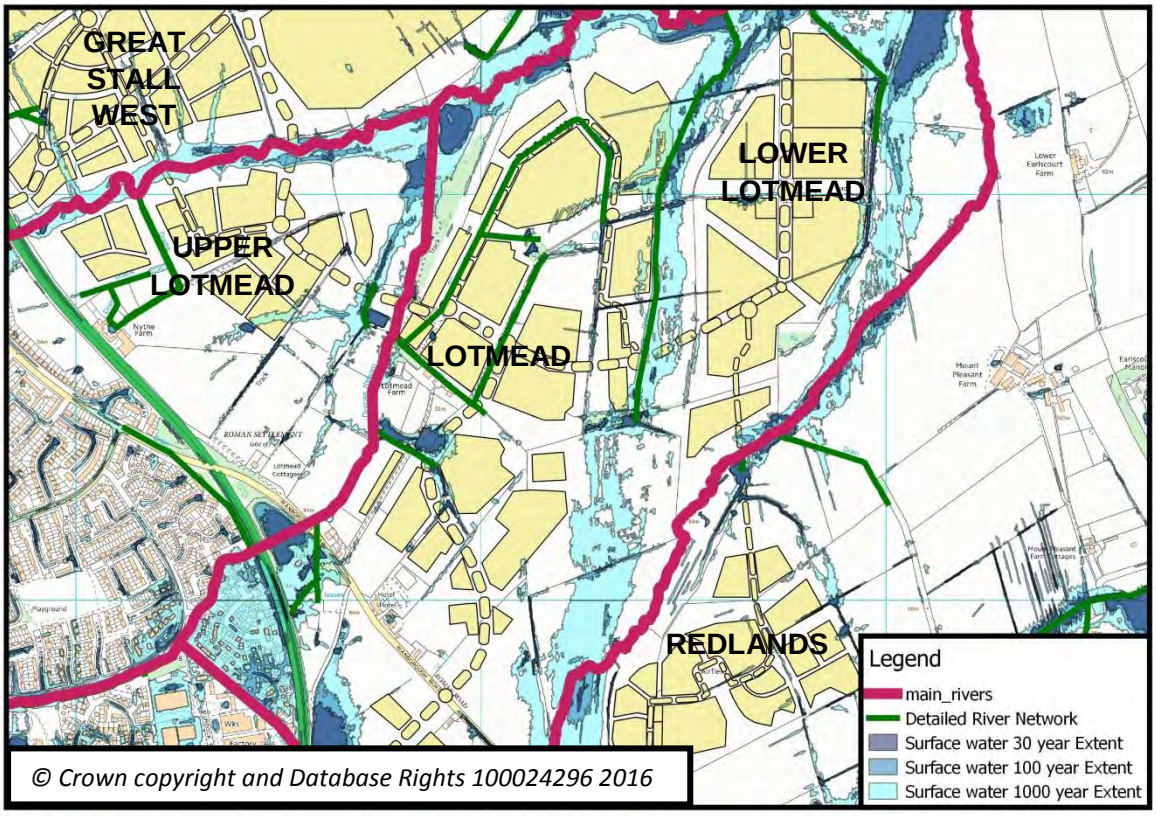


Figure 11 – Environment Agency Surface Water Flood Maps

Interdependencies

Parts of both Upper Lotmead and Lotmead drain into the Dorcan Brook flowing between the two development areas. The Dorcan Brook is Main River and under the jurisdiction of the EA and it is on their annual maintenance programme. Although the brook is under the jurisdiction of the EA, the ownership and maintenance responsibilities fall to the landowners (riparian owners) either side of it (responsible up to the centreline of the brook). It is important that the brook, along with the drainage channel to the east of the development area, is included in the maintenance management plan for the development as there is no long term commitment from the EA to maintain it and the developer may wish to liaise with other riparian owners to ensure the responsibility is shared.

Opportunities and constraints

Attractive, multifunctional SuDS in publically owned spaces will benefit both residents of Lotmead and those who make use of the facilities. Rainwater harvesting systems may be appropriate for use on public buildings and must be considered, and Green Infrastructure SuDS, which enhance visual appeal, such as tree pits, green roofs, rain gardens and swales should be used in communal areas. Attractive above ground SuDS features such as cascades and water plazas could also be considered for communal spaces such as public squares. Use of permeable paving with subsurface storage in public open space and car parking facilities will provide benefits with no additional land take.

The use of Green Infrastructure SuDS, such as tree pits, linear rain gardens, swales and filter strips alongside roads will create attractive streetscape and provide wider benefits including reduction in noise and air pollution resulting from traffic through the development.

With a mixed range of housing the opportunities for SuDS in residential areas are varied. Rain gardens and other Green Infrastructure SuDS will make residential areas more inviting. Permeable paving can be used for parking bays and other residential hardstanding, whilst roof gardens, collection pools and rainwater planters can be used for higher density apartments to create green outdoor spaces and water features for residents without reducing developable land.

Green Infrastructure

The northern part of Lotmead lies within a strategic green corridor. Given the River Cole to the north and the Education Campus to the north east, SuDS (such as green roofs, swales and tree pits) would provide an effective drainage solution whilst providing other environmental and biodiversity benefits.

2.5.5 Lower Lotmead

Lower Lotmead lies in the east of the NEV. To the north of Lower Lotmead lies the Great Stall East development area, to the west the Lotmead development area and to the south the Redlands development area. The development site is 31ha in area and naturally drains towards the River Cole to the north of the development and the Liden Brook (also Main River) to the east of the development via a number of drainage ditches flowing through the site. Figure 12 illustrates the location of Lower Lotmead, location of the mapped watercourses and the EA flood maps.

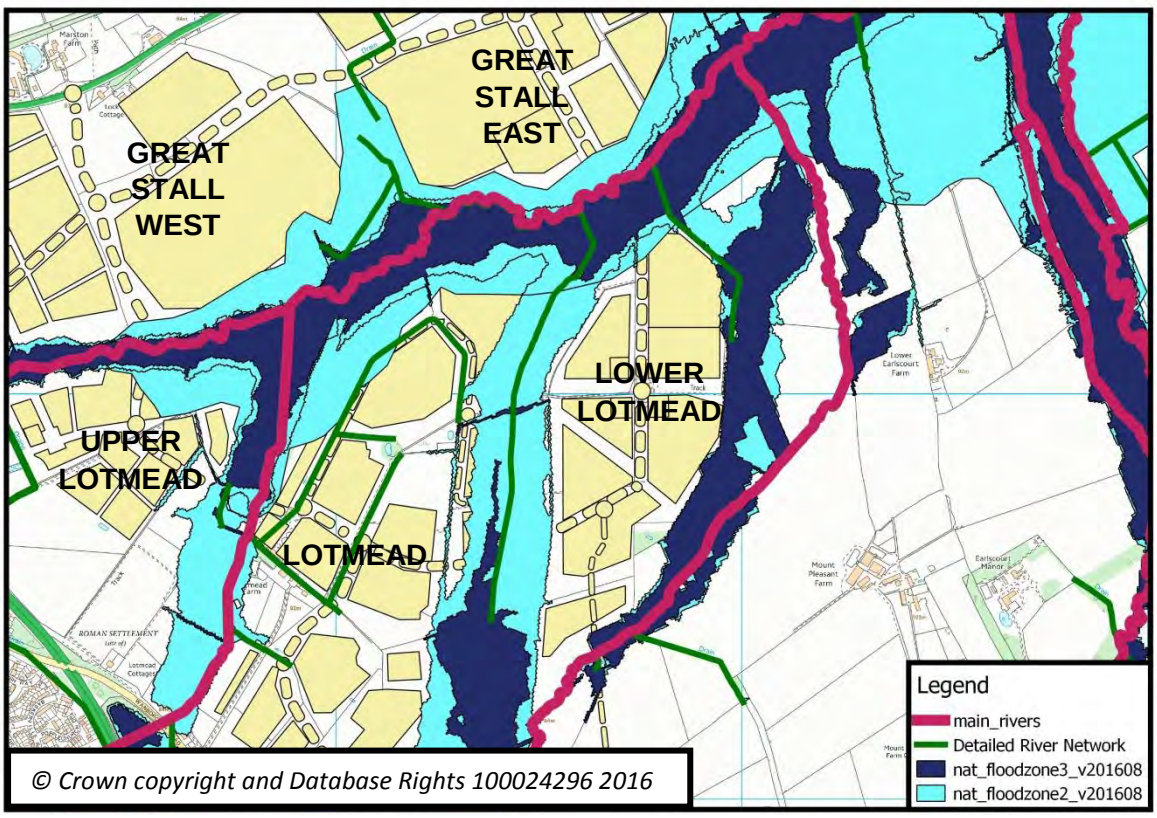


Figure 12: Location of Lotmead and Environment Agency Flood Zones

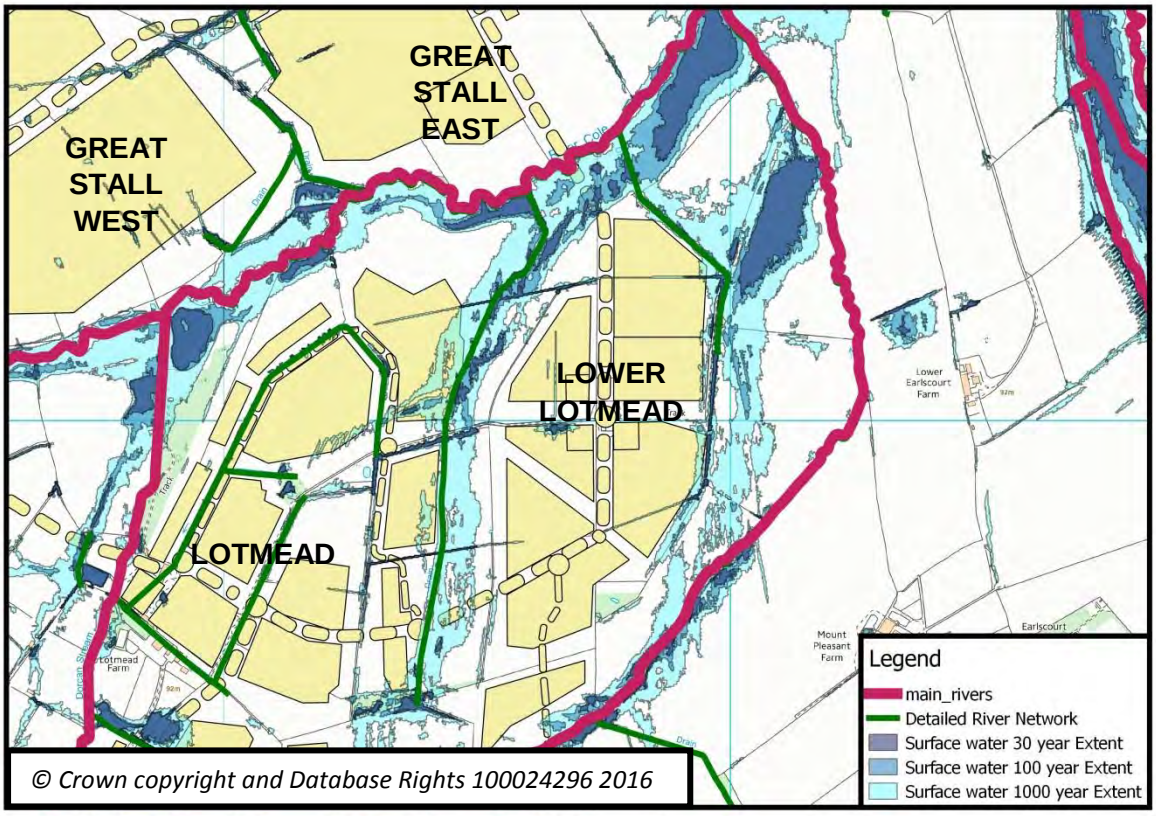


Figure 13 – natural catchments and flow directions

Interdependencies

In addition to draining Lower Lotmead, the channel running to the west of the development area also drains Lotmead. The Liden Brook also flows along the south eastern edge of the site with a section of it between Lower Lotmead and Redlands. Liden Brook is Main River and under the jurisdiction of the EA, however the ownership and maintenance responsibilities fall to the landowners (riparian owners) either side of it (responsible up to the centreline of the brook). It is important that the brook, along with the drainage channel to the west of the development area, is included in the maintenance management plan for the development as there is no long term commitment from the EA to maintain it and they may wish to liaise with other riparian owners to ensure the responsibility is shared. The ownership and maintenance responsibilities fall to the landowners (riparian owners) either side of the watercourse (responsible up to the centreline of the watercourse). It is important that this drainage channel is included in the maintenance management plan for the development and the developer may wish to liaise with other riparian owners to ensure the responsibility is shared.

Opportunities and constraints

Lower Lotmead will be a small village in the east of the NEV with a rural setting. Use of low profile Green Infrastructure SuDS such as wetlands and swales will create a subtle edge to the development. These features will help to integrate it into the landscape and contributing to other policy objectives such as creating green corridors and enhancing biodiversity. Any parking areas associated with the residential properties should incorporate permeable paving.

Attractive and safe footpaths and cycle links with Lotmead, Great Stall East and Redlands will need to be provided to encourage residents to travel short distances in an environmentally responsible manner. Use of SuDS along the length of these will create an attractive streetscape. Elements such as linear rain gardens and swales are encouraged in these areas. A tiered swale within a linear Green Infrastructure corridor could provide a public right of way; cycleway and utility corridor in addition to storage; conveyance and biodiversity benefits.

The safeguarded route of the Wilts & Berks Canal (see figure 14) is shown through the southern part of the development area and within the green corridor to the east of the development area which may give opportunities to physically link SuDS systems such as swales; bio-retention areas and treatment systems such as reed beds into the canal. This may provide some identity within the area and SBC will consider any proposals to do so in consultation with the Wilts and Berks Canal Trust. However, it must be demonstrated that there is no unacceptable risk to ecology, flood risk, water resource and water quality to be in accordance with part c) of Policy EN11 from the Swindon Local Plan 2026.

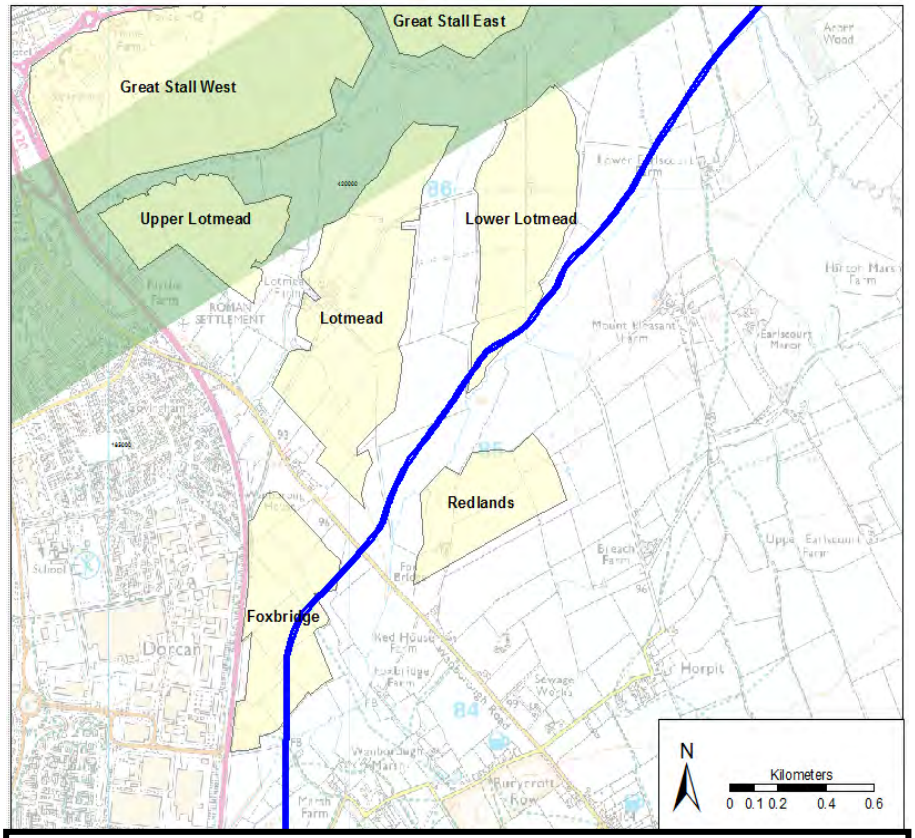


Figure 14 Wilts and Berks Canal safeguarded canal route

Green Infrastructure

As one of the more rural development areas in the Swindon Eastern Villages development, Lower Lotmead has a rural setting and is surrounded by Green Infrastructure. A strategic green corridor lies to the north of Lower Lotmead along the course of the River Cole. SuDS around the edges of Lower Lotmead will serve a dual purpose, providing a link to the wider rural landscape as well as managing surface water. The use of Green Infrastructure based SuDS throughout the site would help link the developed area with the surrounding rural area, contributing to other policy objectives such as creating green corridors and enhancing biodiversity.

2.5.6 Foxbridge

Foxbridge lies at the southern tip of the NEV and is bounded to the west by the A419 and to the north by the Wanborough Road. To the north east of Foxbridge lie the development areas of Lotmead and Redlands. The development site is circa 27ha in area. The majority of the site naturally drains to the north where the connectivity to existing watercourses in this area is not confirmed. Some southern and eastern parts naturally drain to the Liden Brook. Figure 15 illustrates the location of Foxbridge, location of the mapped watercourses and the EA flood maps.

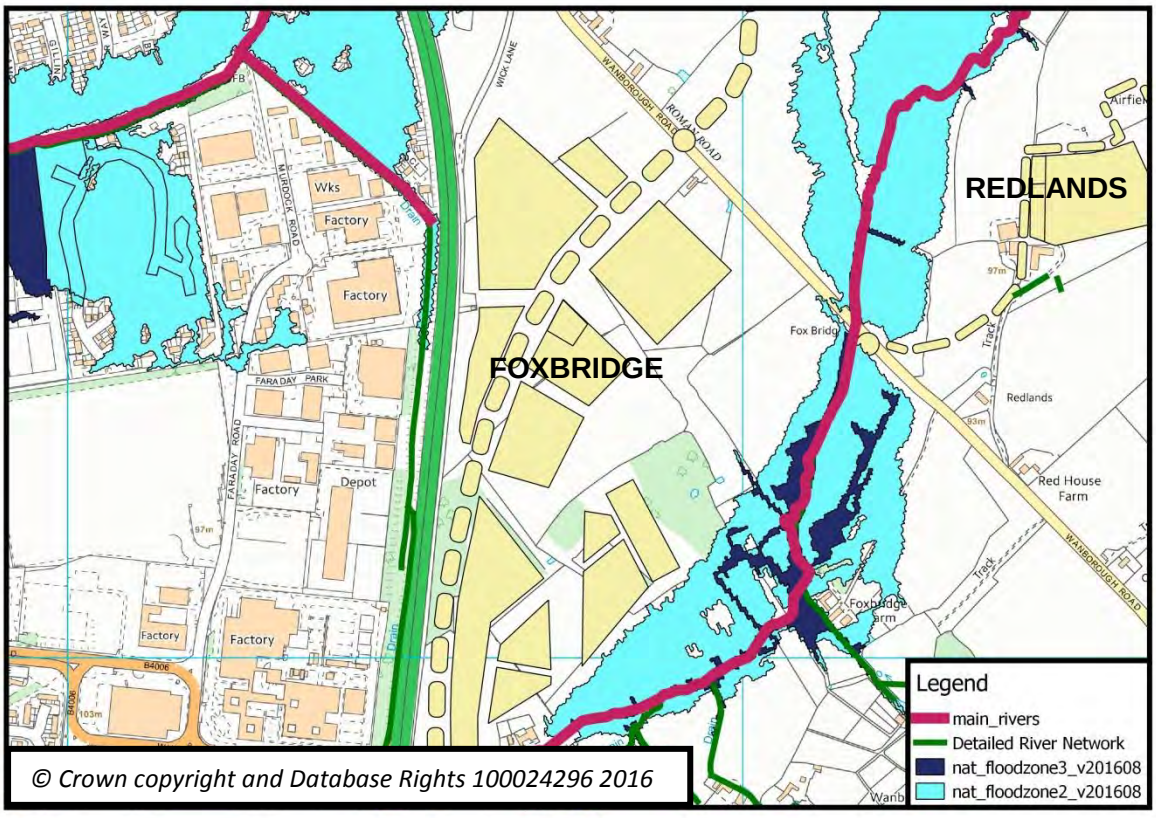


Figure 15: Location of Foxbridge and Environment Agency Flood Zones.

A large area of Foxbridge drains to the north of the development area to a low point and this is highlighted in Figure 16 below. The drainage in this area is not fully understood.

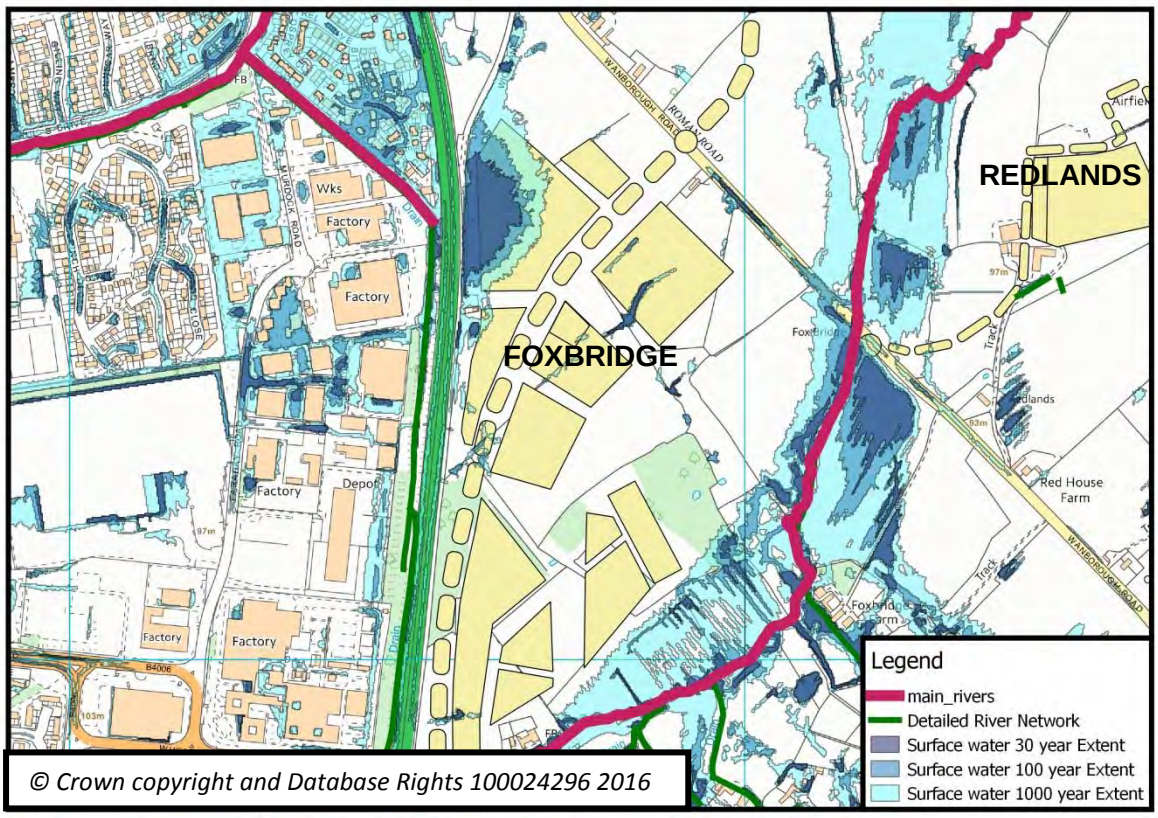


Figure 16 – Environment Agency Surface Water Flood Maps

Interdependencies

The Liden Brook flows along the south eastern edge of the site. It is Main River and under the jurisdiction of the EA. Although the brook is under the jurisdiction of the EA, the ownership and maintenance responsibilities fall to the landowners (riparian owners) either side of it (responsible up to the centreline of the brook). It is important that the brook is included in the maintenance management plan for the development as there is no long term commitment from the EA to maintain it, and the developer may wish to liaise with other riparian owners to ensure the responsibility is shared.

Opportunities and constraints

The safeguarded route of the Wilts and Berks Canal (see figure 14 in Lower Lotmead above) is shown through the development area and once in place will provide a strong identity for the island. Visually linking the canal into SuDS features such as linear rain gardens along streets would strengthen this identity throughout the development. There may be opportunities to physically link the drainage system into the canal, and SBC will consider proposals to do so in consultation with the Wilts & Berks Canal Trust. However, it must be demonstrated that there is no unacceptable risk to ecology, flood risk, water resource and water quality to be in accordance with part c) of Policy EN11.

The majority of the site slopes to the north to an area which is confirmed by LiDAR data as a localised low point. The EA surface water flood maps, which can be viewed on their website, show a

large part of the site at this location to be at high risk of surface water flooding. The drainage in this area is not confirmed, the historic drainage paths show this area draining to the north to a designated flood storage area on the Dorcan Brook. This is known to be at full capacity and a large area of Covingham to the north-west of the development was affected by flooding in July 2007. Therefore the drainage in this area will need to be fully understood and source control measures must be incorporated into the development as well as further attenuation features to ensure final discharge rates are minimal.

LiDAR level data suggests that only land within the development area falls to this low point. This will need to be investigated and fully understood but if this is the case, there may be an opportunity to re profile this area to utilise storage within the canal if it is delivered as part of the development.

Along its western edge Foxbridge is bounded by the A419. Incorporation of SuDS along this eastern edge could complement the existing vegetation and create an attractive divide between the residential development and the road.

Permeable paving should be considered for all non-trafficked hardstanding and car parking areas and green walls; swales; rain gardens; tree pits and planted channels should be incorporated into the landscaping of the area.

Green Infrastructure

The strategic green corridor runs some way to the north of Foxbridge so the development is unlikely to have a direct impact on this. However, Foxbridge is bounded on its eastern sides by a rural landscape and the neighbouring village of Wanborough. Selection of Green Infrastructure based SuDS, such as rain gardens; green roofs; green walls and tree pits along this eastern edge would provide multiple benefits and contribute to other policy objectives by optimising land use by linking the developed area to the surrounding landscape through a green corridor to enhance the permeability of the development and biodiversity.

2.5.7 Redlands

Redlands lies on the south east edge of the NEV and is bounded to the southwest by the Wanborough Road; further west by Foxbridge; to the northwest by Lotmead and to the north by Lower Lotmead. As one of the smaller plots of the development, Redlands is circa 19ha in area and the majority of the site naturally drains via a number of drainage ditches and natural channels to the Liden Brook (Main River) to the north-west of the development site, with a small part on the southern edge of the site naturally draining to the Earlscourt Brook (Main River) to the east of the development site. Figure 17 illustrates the location of Redlands, location of the mapped watercourses and the EA flood maps.

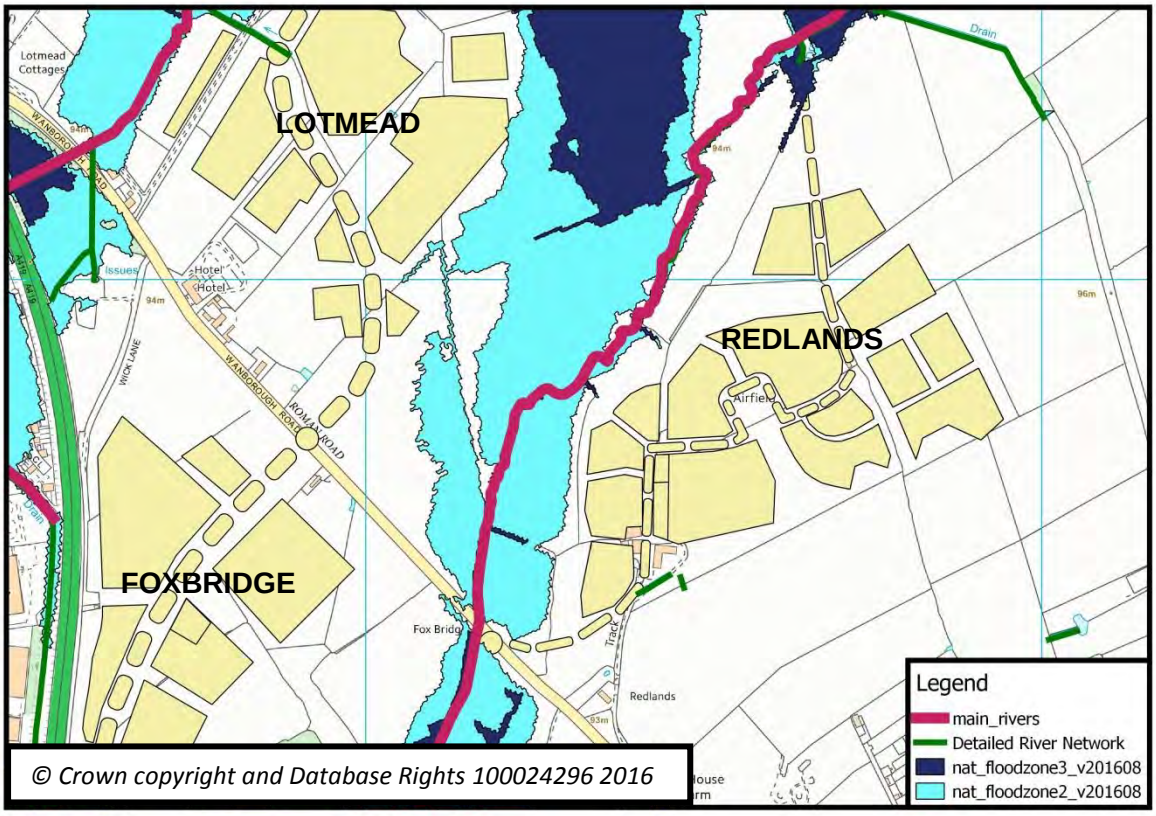


Figure 17: Location of Redlands and Environment Agency Flood Zones.

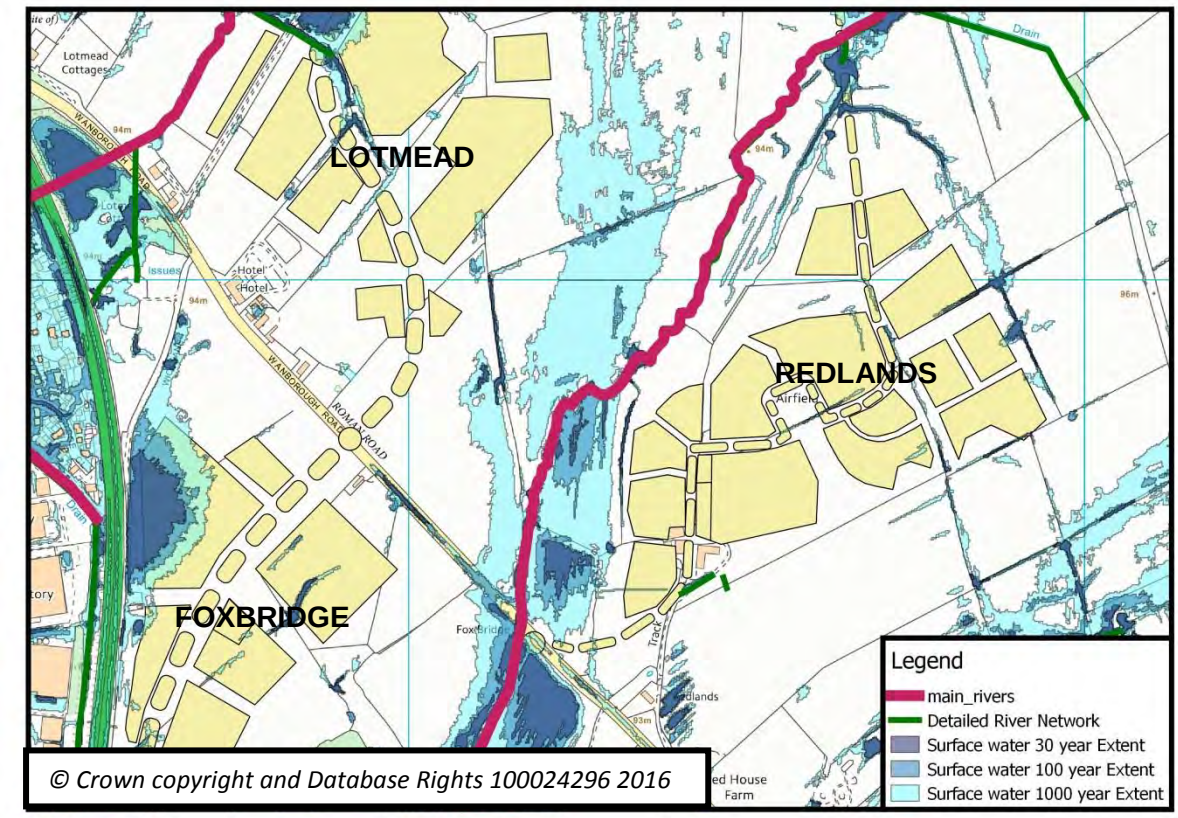


Figure 18 – Environment Agency Surface Water Flood Maps

Interdependencies

The Liden Brook flows between Redlands and Lotmead and Lower Lotmead to the north of the development site. The Liden Brook is Main River and under the jurisdiction of the EA. Although the brook is under the jurisdiction of the EA, the ownership and maintenance responsibilities fall to the landowners (riparian owners) either side of it (responsible up to the centreline of the brook). It is important that the brook is included in the maintenance management plan for the development as there is no long term commitment from the EA to maintain it and the developer may wish to liaise with other riparian owners to ensure the responsibility is shared.

Opportunities and constraints

There are known flooding issues affecting the Wanborough Road in the vicinity of the proposed main access to the development area. Therefore drainage in this area needs to be fully understood and any proposals must provide mitigation wherever possible.

Selective use of SuDS will help to enhance the existing landscape and should include an appropriate planting regime following existing field patterns and hedgerows to enhance biodiversity of the area.

Public realm features in the form of village squares and greens are expected to be part of the layout and SuDS in these areas can be used to provide multiple benefits in addition to managing surface water. These may include contributing to other policy objectives and optimise use of the land by adding to distinctive character of the rural village.

Green Infrastructure

Although not directly linked to the strategic green corridor, Redlands is located in a rural setting with views over countryside to the east. The use of Green Infrastructure based SuDS throughout the site would provide multiple benefits and contribute to other policy objectives by linking the developed area to the surrounding landscape; softening the edges of the development and helping to protect the character and identity of nearby Wanborough; Bishopstone and Bourton. The green corridors that would be created would enhance biodiversity and maintain the non-coalescence zone as defined in Policy NC3.

2.5.8 South Marston Expansion

The proposed extension to South Marston is to the south of the village. The development site is formed by five land parcels with an area of circa 18ha. As a whole the proposed development area currently drains via a number of natural watercourses and swales towards the South Marston Brook to the east of the development area. Figure 19 illustrates the location of South Marston, the location of mapped watercourses and the EA flood map.

The proposed expansion to South Marston village will comprise of a development of 500 dwellings, primarily on land to the south and east of the existing village. Additional homes may be delivered though available brownfield sites where appropriate. The proposed expansion seeks to contribute towards an integrated village with a distinct and separate identity from Swindon. A new village centre and expansion to the existing primary school will be delivered as part of the expansion to offer essential facilities for the existing and future residents of the village. The development densities of the proposed expansion areas would be broadly similar to the more recent residential developments within the village, to ensure the existing character and context is maintained.

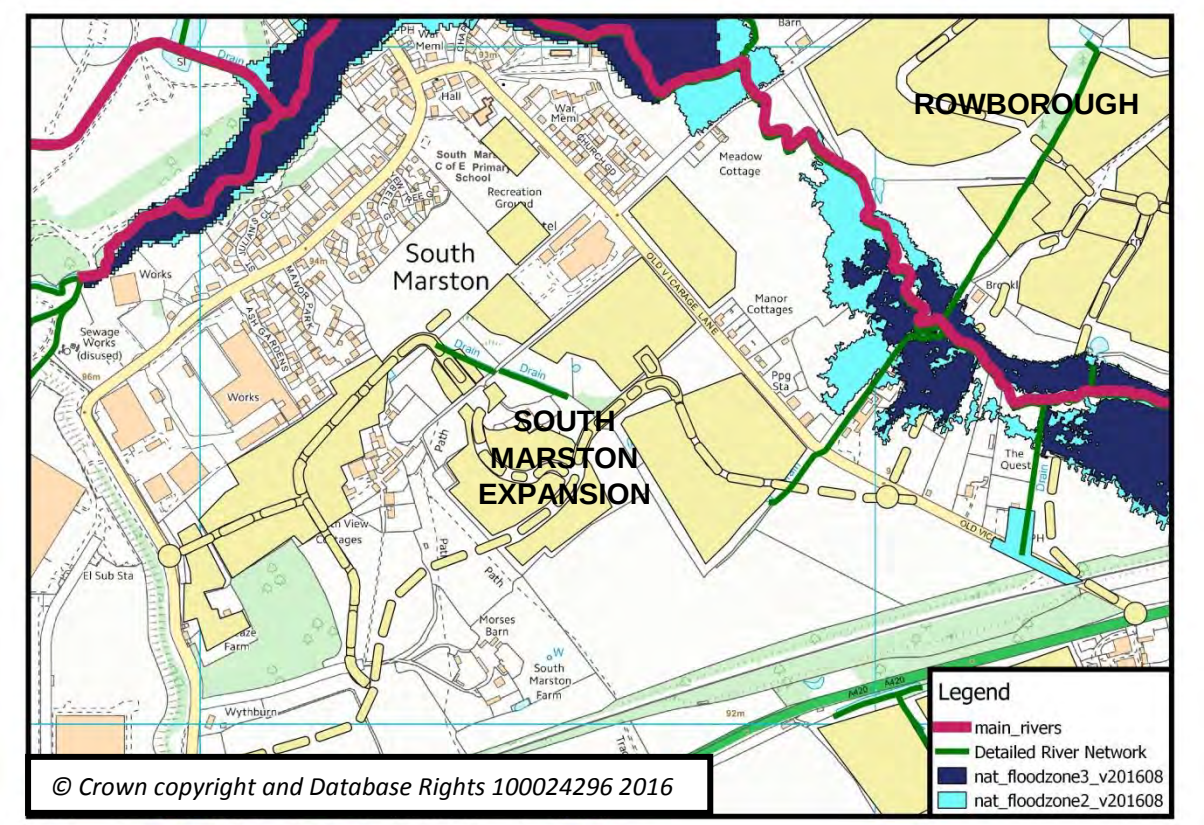


Figure 19: Location of South Marston and Environment Agency Flood Maps

The development areas drain, via a number of natural watercourses and swales, towards the South Marston Brook to the east of the proposed development areas. Figure 20 below, which shows the EA Surface Water Flood Maps, highlights the existing flow routes through the development area.

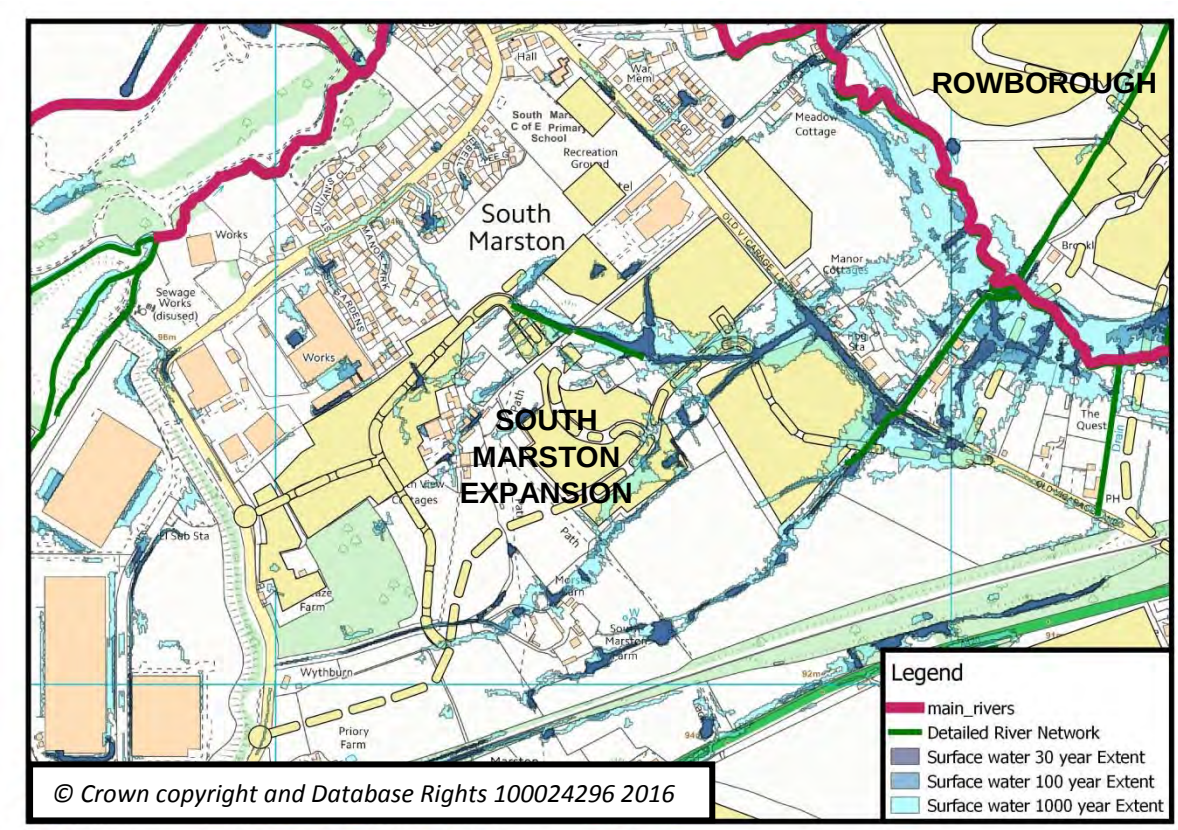


Figure 20 – Environment Agency Surface Water Flood Maps

Interdependencies

The South Marston Brook flows between the north-east edge of the proposed development area and Rowborough North. The Brook is Main River and under the jurisdiction of the EA. Although the brook is under the jurisdiction of the EA, the ownership and maintenance responsibilities fall to the landowners (riparian owners) either side of it (responsible up to the centreline of the brook). It is important that the brook is included in the maintenance management plan for the development as there is no long term commitment from the EA to maintain it and the developers may wish to liaise with other riparian owners to ensure the responsibility is shared.

Opportunities and constraints

The extension to South Marston will be a largely residential area and there is the opportunity to integrate well with the existing residential areas to the north. Largely constrained by existing urban areas to the north and east and A420 to the south and the Rowborough development to the east, it will benefit greatly from the enhancement of Green Infrastructure around the proposed development areas.

The village of South Marston to the north of the development areas was affected by flooding in July 2007. There are a number of existing watercourses and swales through the proposed development area that take flows from South Marston.

The EA surface water flood maps shown in Figure 20, highlight there are a number of existing surface water flow routes through the development area. These flow routes need to be maintained and by retaining the existing watercourses and swales in this area as well as introducing new SuDS such as

swales and attenuation basins, this will maintain and control the flow routes safely through the development to ensure flood risk is not increased elsewhere.

Green Infrastructure

Using these SuDS measures through the green corridors will help to create a subtle edge to the urban development; helping to integrate it into the landscape and contributing to other local policy objectives such as enhancing the identity of South Marston and maintaining its rural identity.

2.5.9 Rowborough

Rowborough will be one of the larger villages proposed and will be located north of the railway line and A420, in the north-east corner of the NEV development boundary. It will form a new neighbouring community to the east of the expanded South Marston village, separated by a comprehensive network of landscaping and Green Infrastructure. The character and identity of the circa 64ha village will be reflected by its rural location and proximity to Nightingale Wood, with the varying development density from the centre of the village towards the natural backdrop and setting of Nightingale Wood.

The South Marston Brook, a Main River, flows between Rowborough North and Rowborough South and both parts of the development area drain to the Brook. Figure 21 illustrates the location of Rowborough, location of the mapped watercourses and the EA flood maps.

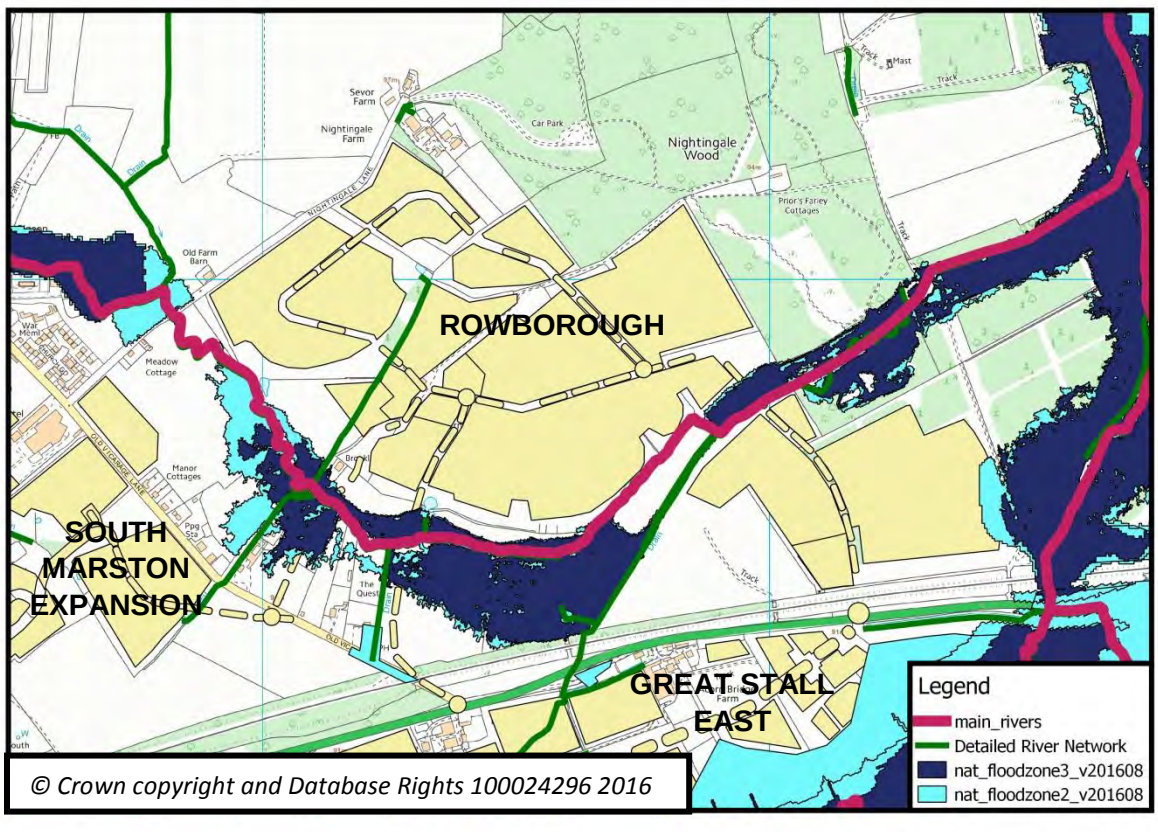


Figure 21: Location of Rowborough and Environment Agency Flood Zones.

Rowborough South drains to the South Marston Brook and a tributary draining to it, which flow on the North West edge of the development area. Rowborough North also drains to the South Marston Brook, with a tributary flowing through the western part of the development area. This tributary is shown in Figure 22 below which includes the EA surface water flood maps.

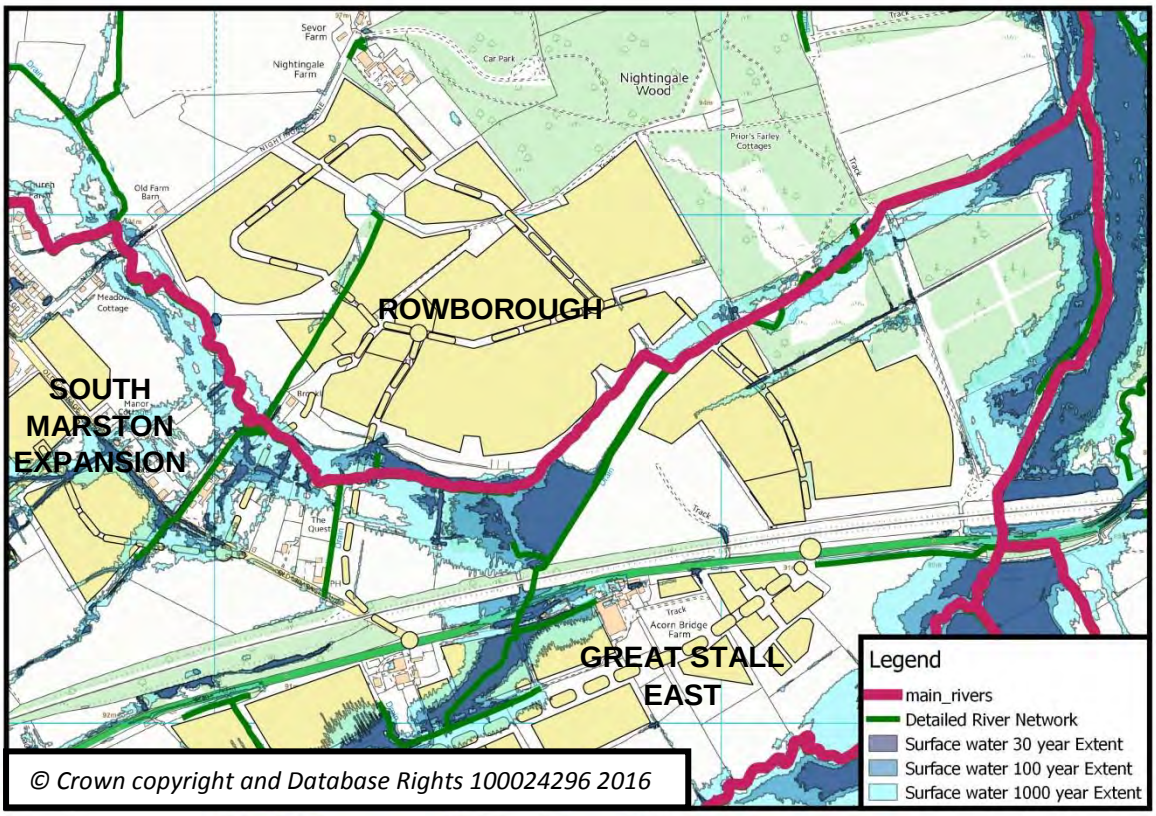


Figure 22 – Environment Agency Surface Water Flood Maps

Interdependencies

The South Marston Brook flows between Rowborough North and Rowborough South. The Brook is Main River and under the jurisdiction of the EA. Although the brook is under the jurisdiction of the EA, the ownership and maintenance responsibilities fall to the landowners (riparian owners) either side of it (responsible up to the centreline of the brook). It is important that the brook is included in the maintenance management plan for the development as there is no long term commitment from the EA to maintain it and the developers may wish to liaise with other riparian owners to ensure the responsibility is shared.

Opportunities and constraints

The north and eastern parts of the development area are surrounded by largely rural and wooded land including the Nightingale Wood. Use of low profile Green Infrastructure SuDS such as wetlands and swales will help frame views out of the village, whilst also creating a subtle edge to the development; helping to integrate it into the landscape and contributing to other policy objectives such as creating green corridors and enhancing biodiversity.

Rowborough will contain a school and retail/community hub. Rainwater harvesting systems may be appropriate for use on public buildings and must be considered, and Green Infrastructure SuDS, which enhance visual appeal, such as tree pits, green roofs, rain gardens and swales should be used in communal areas. Attractive above ground SuDS features such as cascades and water plazas could also be considered for communal spaces such as public squares. Use of permeable paving with subsurface storage in public open space and car parking facilities will provide benefits with no additional land take.

Green Infrastructure

All of Rowborough South and the eastern half of Rowborough North fall within the Strategic Green Corridor which crosses the South Marston Brook river corridor. SuDS within and adjacent to this green corridor will serve a dual purpose (thereby optimising the land take required), providing a link to the wider rural landscape as well as managing surface water. The use of Green Infrastructure based SuDS throughout the site would help link the developed area with the surrounding rural area, contributing to other policy objectives such as creating green corridors and enhancing biodiversity.

3 SuDS design principles and local requirements

This chapter develops the high level SuDS vision and principles established in Chapter 2 by setting out the practical measures by which developers can achieve compliance.

The principles set out here apply specifically to the NEV; however, other opportunities for development / redevelopment elsewhere within the Borough are strongly encouraged to follow this approach where practicable.

> The SuDS planning and design checklist available from CIRIA C753 provides a simple method for developers to demonstrate at pre-application stage that SuDS principles have been taken into account at the earliest stage of the master-planning process. This checklist can be completed and provided to SBC and key stakeholders as part of the pre-application process.

These principles provide guidance only and the specific requirements for each application will be set out, depending on the nature of the proposal.

The SuDS design should provide an effective drainage solution that is fully integrated with, and enhances the character and functionality of the development which it serves. In order for this to happen, drainage must be considered alongside the development planning process from the earliest stage of concept planning. This is a fundamental premise of the SuDS vision for the NEV.

SuDS should be integrated into development masterplans, design frameworks, regulatory plans, design codes and design briefs. The site design process, including the layout and characterisation of structures and open spaces, provides the opportunity and ability to address the sustainable management of water.

SuDS design should be based on the following, as much as possible, in order to maximise benefits:

- use surface water runoff as a resource
- manage rainwater close to where it falls (at source)
- manage runoff on the surface (above ground)
- allow rainwater to soak into the ground (infiltration)
- promote evapotranspiration
- slow and store runoff to mimic natural runoff rates and volumes
- reduce contamination of runoff through pollution prevention and by controlling the runoff at source
- treat runoff to reduce the risk of urban contaminants causing environmental pollution.

Depending on the characteristics of the site and local requirements, these may be used in combination and varying degrees.

CIRIA report C753 The SuDS Manual

3.1 Fundamental requirements

Observance of the principles outlined in chapter 2 will help to ensure that individual developers' proposals are aligned with SBC's strategic vision for sustainable drainage for the overall development. Developers submitting applications relating to the Eastern Villages sites will be expected to comply with Policies NC3 (NEV – including Rowborough and South Marston Village Expansion), RA3 (South Marston), EN6 (Flood Risk) and any other relevant policies from the Local Plan, as well as the requirements of the Swindon Borough NEV Green Infrastructure Strategy draft SPD.

In accordance with the Local Plan, no development will be permitted within Flood Zone 2 or 3, with the exception of; essential infrastructure, amenity open space, nature conservation and biodiversity. SuDS may be permitted for the drainage of these features within flood zone 2, but these must not be relied upon to provide drainage for any other element of the development. SuDS should be well integrated with the Green Infrastructure network (excepting the aforementioned) but should not be located in areas at high or medium risk of flooding (Flood Zones 2 or 3 and EA surface water flood maps where this is demonstrated to be a strategic surface water flow route taking off site flows).

Any developer who considers development within Flood Zones 2 and 3 (including the historic flood map) to be a necessity will need to fully justify their proposal within a Flood Risk Assessment (FRA), with the approval of the EA at the pre-application stage.

The developments drainage system should be designed for the following peak flow rate and volume standards:

Low rainfall: There should be **no discharge from the development for the first 5mm of any rainfall event**. Green roofs and permeable surfaces will be considered to discharge this requirement for roof and road runoff without further analysis. If these options are not applied, the developer's site FRA should indicate how source control measures for the first 5mm of rainfall will be retained on site, in addition to the other requirements below.

High rainfall: The volume of surface water runoff must not exceed the greenfield runoff for the 1 in 100 year, 6 hour rainfall event. In addition, the peak flow rate discharged must not be greater than greenfield runoff rate for each of the following scenarios:

- 1:1 year greenfield runoff rate for all rainfall return periods up to the 1 in 100 year event;
- 1:100 year greenfield runoff rate for return periods above the 1 in 100 year event and up to the 1 in 100 year event including climate change allowance.

In order to comply with these restrictions to the peak flow rate, the critical duration rainfall event for the site drainage must be used to determine the maximum storage volume.

The entire NEV development is located in an area with low to no infiltration and high groundwater levels. As a consequence, the assumption has been made that SuDS features that rely upon infiltration will not play any significant role in the drainage of the NEV and any SuDS strategy that incorporates infiltration will not be acceptable without an extensive ground investigation report including infiltration tests to BRE 365 and extensive ground water monitoring over the winter period. As the opportunities for infiltration are likely to be negligible, the quantity of surface-water to be stored in the long-term must be calculated and provided for within each development parcel.

A development design life of 100yrs+ should be assumed for climate change purposes.

Exceedance flows must be considered within the drainage design and masterplans should include clearly marked exceedance flow paths. Developers must consider the possibility that their design for surface water may fail and design a backup plan for this eventuality. Overland surface water flows should be routed away from any vulnerable areas designated in the Flood Risk and Coastal Change Planning Practice Guidance Table 2. Guidance on good practice in designing for exceedance may be found by referring to CIRIA reports C635 and C738 and guidance concerning acceptable depths and rates of flow may be found in FD2320/TR2 'Flood risk assessment for new development phase 2', Environment Agency 2006.

Existing surface water or combined sewers within or near a proposed site should not be assumed to have capacity to manage any additional surface water runoff. Developers must demonstrate that they have followed the destination of drainage hierarchy set out below. If the use of existing surface water or combined sewers is considered to be the only practicable option, SBC will require the Developer to demonstrate at the outline planning application stage that a strategy for providing the necessary capacity has been agreed with Thames Water (or relevant third party where private drainage is present) . The discharge into the sewer must still meet the peak discharge rate and volume requirements set out above for the entire catchment which it serves.

Destination of drainage hierarchy

The following receptors must be considered for surface runoff in order of preference:

1. Discharge by infiltration into the ground (assumed not to be practical within the NEV)
2. Discharge to an open surface water body
3. Discharge to a surface water sewer
4. Discharge to a combined sewer

Discharge to a foul sewer will ***not*** be permitted, and discharge to combined sewer will ***only*** be permitted if:

- It can be shown that there are no other practicable options for discharge of surface water runoff
- Thames Water have confirmed that they have capacity within the combined drainage network, and
- It can be demonstrated through modelling that that there will be no increase in the frequency or volume of discharge from intermittent storm discharges, or any increase in foul flooding downstream of the development site

If the outfall of any proposed attenuation facility is likely to be submerged in a 1% (1:100) probability rainfall event, as determined in consultation with the EA, then within 24 hours of top water level being attained the facility must be capable of storing a further 80% of additional surface water run-off discharged during a secondary 10% (1:10) probability rainfall event. In addition, the drainage system should be designed to operate without flooding during a surcharged condition.

Developers must demonstrate that the quality of surface water runoff will be controlled to an acceptable standard through a designed SuDS treatment train to protect against potential contamination of watercourses, and the treatment train defined in the SuDS manual has been adhered to. A Water Framework Directive assessment will be required to accompany any application for a flood defence consent or permit for works to ordinary watercourse unless otherwise agreed with SBC (for ordinary watercourses) and the EA (for main river) during pre-application discussions. Developers must also demonstrate how water quality is to be protected during the construction of the drainage system.

Developers must demonstrate that their proposals maximise the opportunities for improving drainage in the area and reduce the risk of flooding to neighbouring communities where practicable. This requirement is particularly pertinent to any proposed development areas and their associated infrastructure where there are existing watercourses or flow routes flowing through them which provide a drainage function to neighbouring land and sufficient corridors must be provided to maintain, control and enhance existing flood flow routes to reduce the risk of flooding to existing residential areas. Opportunities must be thoroughly investigated and unless proved impracticable they must be incorporated into the relevant outline planning application(s) for the NEV.

Developers should demonstrate that the design of any assets likely to be adopted by SBC (or other organisations) has been optimised based on a whole life cost approach and will not impose an excessive burden for the long term operation and maintenance of these assets.

Developers must demonstrate that sufficient space has been allowed to provide adequate easement for all future maintenance activities, including asset replacement at the end of the asset life.

All SuDS should be designed and constructed in accordance with the best practice technical guidance provided in BS 8582:2013, Code of practice for surface water management for development sites, and the SuDS Manual (CIRIA C753), in particular:

- Performance – quantity and quality
- Visual impact and amenity
- Biodiversity and ecology
- Health and safety and maintenance

Drainage assets that form part of the highway drainage network must comply with the Department for Transport Design Manual for Roads and Bridges (DMRB)[1], with particular reference to Volume 4, section 2.[2]

The table below illustrates how the SuDS Vision and pursuant design principles set out above should be applied for a variety of surface types and identifies the measures that must be investigated and implemented where feasible. In any situations where these measures are not considered feasible it must be demonstrated that they have been considered in detail and any alternative control measures must be fully justified to prove adequacy.

Surface type	Expectations
Residential development (open market and affordable units)	
Roof	• Property scale rainwater harvesting and green roofs / blue roofs must be considered for multiple occupancy buildings (flats). • Rainwater harvesting and green roofs should be considered for all residential properties, where a group of properties are under one single ownership (such as a Housing Association), or where it is promoted and will be maintained by a Water Authority or other Body • Interception of downpipe flows to drain via rain garden planters or permeable paving should also be considered.

[1] http://www.standardsforhighways.co.uk/dmrb/

[2] All drainage assets that form part of the highway drainage network require the written approval of the highway authority at an early stage, and a commuted sum to cover future maintenance of the system will be required. Chapter 4 considers the funding requirements in more detail.

Surface type	Expectations
	• The drainage strategy must investigate the above measures and if no adequate source control measures are proposed then it must be fully justified why these are not viable. Where none of the above is feasible, rainwater butts should be fitted to all properties with a garden. The size of the water butt should be appropriate for the roof area and the expected occupancy of the house. Dual use wall mounted water butts such as RainCatcher™ are encouraged.
Hardstanding	• 100% of car parking area must be drained via a permeable surface, or via overland flow/above ground conveyance to source control features such as bio-retention systems, swales and filter strips. • Access routes will wear more than parking bays. Consideration should be given to draining access routes to permeable parking bays rather than installing permeable paving across whole car parks, to maximise product design life. This will also reduce maintenance costs but still provide the source pollution control benefits. • Consideration should be given to using car parks for above ground attenuation in extreme events (flood to less than 200mm depth and above 1 in 30 year). • Consideration should also be given to using the collected water for grey water recycling. • Should the source control features above not provide enough attenuation, any additional attenuation must be provided within the curtilage of the development parcel, or in adjacent public open space where appropriate. Section 3.3 provides examples of appropriate SuDS that are appropriate for draining areas of hard standing.
Community assets e.g. Local Centre, District Centre, Leisure/Pool, Others (ToysRus), Truck Stop, Park & Ride	
Roofs	• Rainwater harvesting and greywater recycling for toilet flushing must be considered for all community properties in frequent use where there is regular demand for water, including community halls, surgeries and schools. This could include recycling runoff from parking and other hardstanding areas. If rainwater harvesting / greywater recycling are not incorporated, the developer must justify why this is not viable. • Where it is more appropriate and the opportunity is available, such as for a roof terrace, green roofs / blue roofs can be considered instead of or in conjunction with the water recycling systems. • Should the source control features above not provide enough attenuation, any additional attenuation must be provided within the curtilage of the site, or within any adjacent public open space, provided that it does not negatively impact on the intended use of the public open space. • Where appropriate, SuDS features associated with community assets and public open space can be oversized to provide regional scale SuDS.
Hardstanding	• 100% of car park area must be drained via a permeable surface, or via overland flow/above ground conveyance to source control features such as bio-retention systems, swales and filter strips. • Access routes will wear more than parking bays. Consideration should be given to draining access routes to permeable parking bays rather than installing permeable

Surface type	Expectations
	paving across whole car parks to maximise product design life. This will also reduce maintenance costs but still provide the source pollution control benefits. • Consideration should be given to using car parks for above ground attenuation in extreme events (flood to less than 200mm depth and above 1 in 30 year or 1 in 100 year + cc event). • Consideration should also be given to using the collected water for grey water recycling. • Should the source control features above not provide enough attenuation, any additional attenuation must be provided within the curtilage of the site, or within any adjacent public open space. Section 3.3 provides examples of appropriate SuDS that are appropriate for draining areas of hard standing.
Commercial (e.g. warehousing)	
Roofs	• Rainwater harvesting and greywater recycling for toilet flushing must be considered for all commercial properties in frequent use where there is regular demand for water, including offices, or logistics sites with a large demand for water to wash vehicles. This could include recycling runoff from parking and other hardstanding areas. If rainwater harvesting / greywater recycling are not incorporated, the developer must justify why this is not viable. • Where it is more appropriate and the opportunity is available, such as for a roof terrace, green roofs / blue roofs can be considered instead of or in conjunction with the water recycling systems. Should the source control features above not provide enough attenuation, any additional attenuation required must be provided within the curtilage of the site.
Hardstanding	• Permeable paving should be used wherever vehicle loadings permit. It is for the developer to determine appropriate loading standards for the employment land, and demonstrate why permeable paving has not been used. • Consideration should also be given to using car parks for above ground attenuation in extreme events (flood to less than 200mm depth and above 1 in 30 year or 1 in 100 year + cc event). • Consideration should also be given to using the collected water for grey water recycling. • Where permeable paving is not possible runoff must be drained via overland flow/conveyance, or shallow channel systems (e.g. permachannel) to source control features such as bio-retention systems, swales and filter strips. • Should the source control features above not provide enough attenuation, any additional attenuation required must be provided within the curtilage of the site. Section 3.3 provides examples of appropriate SuDS that are appropriate for draining areas of hard standing.
Other surface runoff	
Primary and Secondary Roads	• Must discharge to an overland conveyance system, with an appropriate treatment train

Surface type	Expectations
	• Multiple dispersed attenuation features located close to source should be used in preference to a single end of system attenuation pond. • Swales adjacent to highway, incorporating filter drains and suitable planting where practical can provide treatment as well as the attenuation requirements and must be considered. Section 3.3 provides examples of appropriate SuDS for highway drainage.
Tertiary roads or as appropriate	• Must drain to green spaces adjacent to highway (source control using swales and filter strips or profile roads to planted shrub tree areas/bio-retention areas) or permeable paving where light traffic roads make it feasible. Over the edge drainage is preferred, although special consideration should be given at low points, or flat areas to ensure highway flooding does not occur. Section 3.3 provides examples of appropriate SuDS for highway drainage.
Car parks – public / communal parking areas	• 100% of car park area must be drained via a permeable surface, or via overland flow/above ground conveyance to source control features such as bio-retention systems, swales and filter strips. • Access routes will wear more than parking bays. Consideration should be given to draining access routes to permeable parking bays rather than installing permeable paving across whole car parks to maximise product design life. This will also reduce maintenance costs but still provide the source pollution control benefits. • Consideration should be given to using car parks for above ground attenuation in extreme events (flood to less than 200mm depth and above 1 in 30 year or 1 in 100 year + cc event). • Consideration should also be given to using the collected water for grey water recycling (e.g. for toilet flushing within nearby buildings). Section 3.3 provides examples of appropriate SuDS for highway drainage.
Underpasses	• The drainage of any underpasses must be designed to prevent flooding in all rainfall events up to a 1 in 100 plus climate change event.
Public rights of way	• Public rights of way and cycle routes should be drained over the edge wherever feasible, without collecting flows. Over the edge drainage is preferred, although special consideration should be given at low points, or flat areas to ensure highway flooding does not occur. Section 3.3 provides examples of appropriate SuDS for highway drainage.
Public open space	• Infrastructure in public open space must be drained via a permeable surface, or via overland flow/above ground conveyance to source control features such as bio-retention systems, swales and filter strips. • Consideration should also be given to using public open space for above ground attenuation in extreme events (flood to less than 200mm depth and above 1 in 30 year or 1 in 100 year + cc event). • Consideration can be given to using public open space to drain surrounding impermeable areas, subject to the SuDS being designed to provide amenity and recreational value, and ensuring suitable access to any SuDS feature claimed as public open space.

Surface type	Expectations
	• SuDS should be designed as an integral part of the public open space and preference should be given to drainage features which positively contribute to amenity, biodiversity and aesthetic value. • SuDS that provide a shallow water-play area should be considered as part of Swindon Local Landscape areas for play (as defined in Appendix 3 of the Local Plan), subject to an appropriate SuDS treatment train upstream of the play area. Section 3.4 provides examples of appropriate SuDS in public open space.
Flood Zones	
Flood Zone 2	Flood Zone 2 where it is outside the 100yr + climate change flood extent is suitable for the following SuDS expectations : • Natural wetlands and nature conservation areas used to provide additional treatment for runoff from SuDS outfalls • Compensatory flood storage for loss of floodplain due to bridge structures located within the 100yr + climate change floodplain
Flood Zone 3	Flood zone 3, where it is outside the extent of the normal wetted river channel, is suitable for the following SuDS expectations: • Natural wetlands and conservation areas used to provide additional treatment for runoff from SuDS outfalls

3.2 Integrating SuDS into the built environment

SuDS within the NEV should make a positive contribution to the environmental, social and aesthetic character of the development. Integration is key, so that drainage features interact with the urban landscape and blend with the design of buildings and open spaces. Systems which make a feature of water as it is collected and transported can draw people together in communal areas and enhance the quality of life of residents.

Figure 24 Watercourse delineating a row of properties

Many features of new developments can be designed to provide a SuDS function in addition to their primary purpose. For this to be effective though, SuDS must be considered at the earliest possible stage in materplanning. If planned from the outset, much of the highway and green space can also provide a drainage role. Figure 24 is a good example of how an urban watercourse can be integrated into a new development, providing conveyance, biodiversity, water quality and amenity benefits.

Figure 25 shows an example development parcel, highlighting how SuDS can be effectively integrated into the urban environment when masterplanned at an early stage.

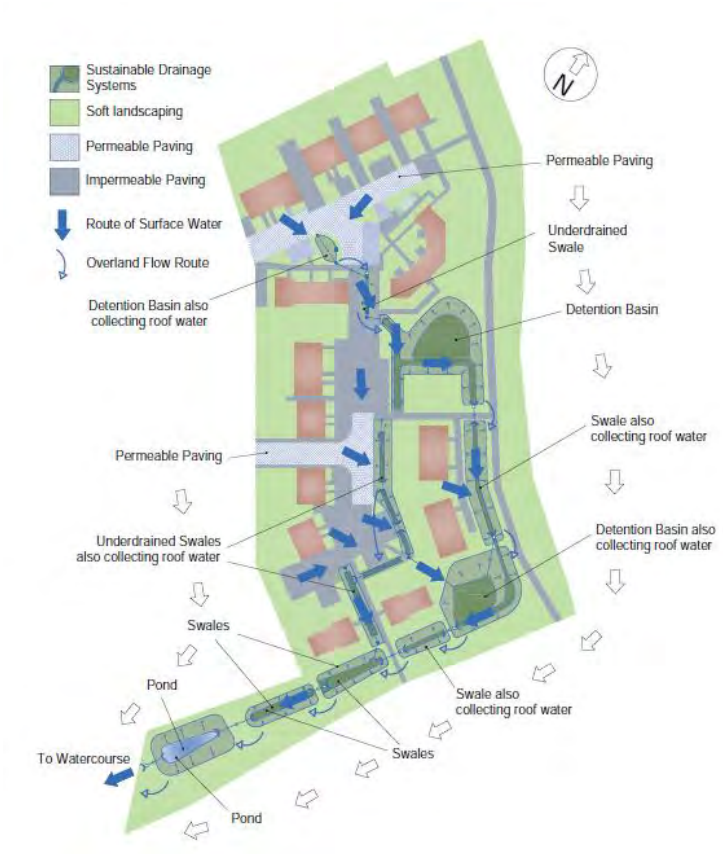


Figure 25 Integrated SuDS masterplan

3.2.1 Best Practice

The examples below show how a development can optimise land use by integrating SuDS into green open space at the masterplanning stage. Figure 26 shows a development with raised grass verges above the road and property level. If these verges had been lowered below the property and highway level, it would have been possible to integrate the drainage into the grass verges to provide improved amenity, water quality and biodiversity. This is shown as an artist's impression in the second image.

Figure 26 SuDS potential in general green space

Figure 27 Best Practice: ponds

Figure 27 shows a deep pond which has significant biodiversity benefit and some amenity benefit, but has not been designed to optimise land take or integrated within the surrounding open space. The second photo shows how a pond can be designed to be multi-functional and an integral part of the open space by providing a permanently wet swale/channel through it. The gradual slopes that have been provided allow a significant area of land to remain usable all year round whilst retaining the capacity to store flood waters in significant events (i.e. above a 1 in 30 year event). The amenity has also been designed for minimal maintenance requirements and still provides significant biodiversity benefits.

Figure 28 shows a new development with a stone channel along the public highway between the pavement and the road which discharges into a gully pot connected to a positive drainage system. Although this uses the principle of over the edge drainage to provide a shallower drainage system, the design could have been improved by using an under-drained permeable surface system, or swale and filter drain within a grass verge. These source control measures could have provided additional treatment and attenuation benefits and also improved the value of the amenity.

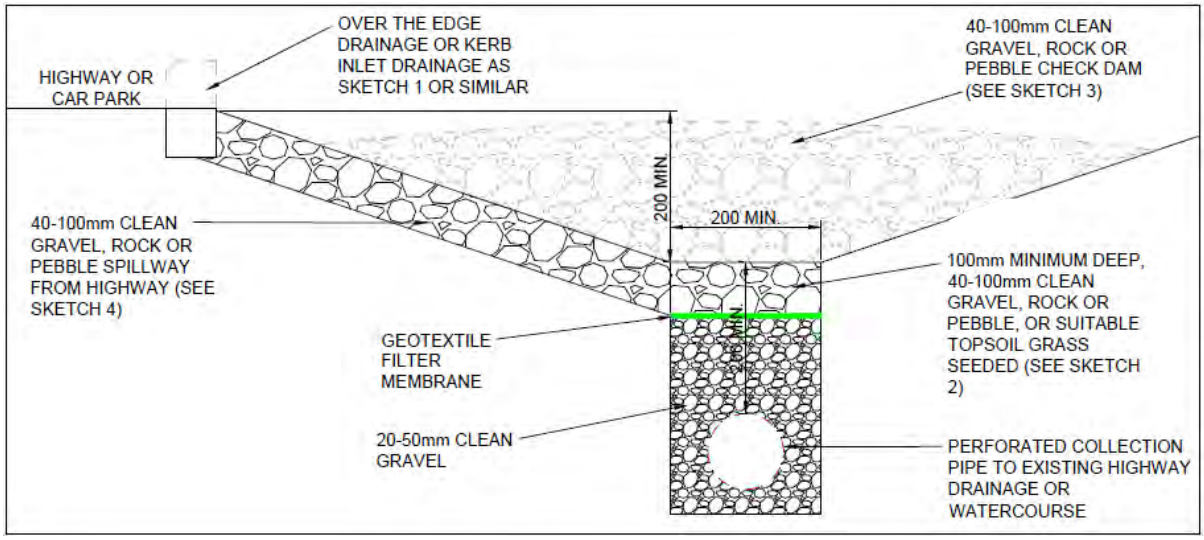
Figure 28 Over the edge paved swale

Figure 29 below shows a filter drain along the edge of a highway. The filter drain provides drainage for the open space and embankment to the right of the drain, but provides no drainage for the highway itself, which drains to a positive drainage system. The highway could have been designed to drain over the edge to the filter drain, removing the requirement for a conventional positive drained system in this location. A swale could also be incorporated at this location to provide the attenuation requirements for the water draining off the highway to minimise the requirement for further attenuation and more land take downstream.

Figure 29 Filter drain not providing drainage for highway

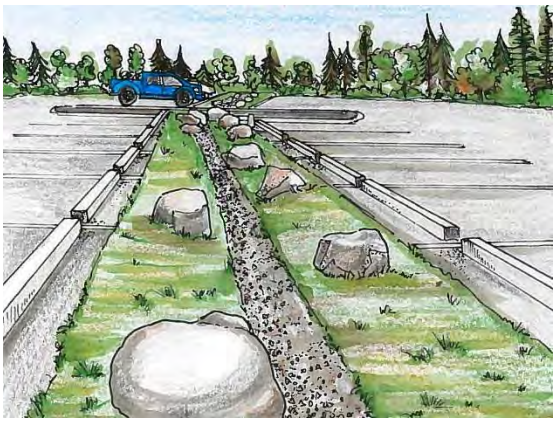
3.3 SuDS, highway drainage and car park drainage

Highways and car parks must be drained using source control techniques, either using a permeable surface or over the edge drainage to under-drained shallow swales to mimic natural drainage systems and maintain water quality. Where groundwater levels are known to be historically high, then the permeable sub-base storage and swale systems will need to be lined with an impermeable membrane to prevent groundwater ingress. Figure 30 provides examples of typical swale details.



Sketch 1

Sketch 2



Sketch 3

Sketch 4

Figure 30 Example swale detail

Designing highways to drain over the edge to existing or proposed drainage features is preferred to conventional gully and pipe systems. Where raised kerbs are essential for the separation of traffic and pedestrians / cyclists, then appropriately spaced drop kerbs should be used to provide an inlet into existing or proposed drainage features. Figure 31 shows an example of where drop kerbs are used to provide a simple inlet into the roadside swale.

Figure 31 Use of drop kerb to provide inlet

An alternative solution may be to use kerb inlet gullies to maintain a continuous kerbed up-stand to the carriageway edge which may drain through chutes to the swale.

For public highways located in a more rural setting, an up-stand may not be required to the kerbs to maintain the safety of users of the highway. In these situations, surface water could be drained over the edge of the carriageway into a swale located in a soft verge as illustrated in Figure 32.

Figure 32 Over the edge drainage on a soft verge

SuDS can be designed as traffic calming features as an integral part of the highway's design, and this is encouraged. Figure 33 below shows examples of bio-retention cells and rain-gardens providing a traffic calming benefit.

Figure 33 SuDS as traffic calming

Bio-retention cells, swales and shallow attenuation areas providing highway drainage can form part of public open space, if appropriately designed to allow the feature to provide an amenity or recreational purpose. The figures below (34 and 35) are examples where highway drainage has been configured to provide multifunctional benefits. Such features can also form part of the Green Infrastructure (GI) network where they are designed to provide biodiversity benefits.

Figure 34 Example of regional scale swale with concrete channel, gradually sloped for ease of maintenance and visual amenity benefit.

Figure 35 Example of roadside bio-retention cell providing biodiversity benefits.

3.4 SuDS and public open space

Flood Zone 2 in the NEV can be used in some instances for general recreational areas, although developers will need to ensure that the surface will be available for its intended purpose in most conditions and that waterlogging of the surface does not detract from its intended recreational purpose. If drainage is required under the surface of the facility to meet this requirement, downstream attenuation must be provided to ensure that the rate of discharge to the watercourse is not increased. SBC's preference for the banks of any drainage features within the NEV is 1:5 or shallower and must be designed in-line with HSE guidance. It also should be a graduated transition from horizontal to the bank to facilitate maintenance. An example of a drainage facility within the open space is shown in Figure 36, where playing fields have also been designed to provide above ground surface water flood attenuation.

Figure 36 Use of Major open space as flood storage

Outdoor sports facilities, local open spaces and major open spaces can be used to provide shallow surface water attenuation storage for rainfall events greater than the 1 in 30. Developers will need to ensure that surface will be available in most conditions and demonstrate that waterlogging of the surface does not detract from its intended recreational purpose. Gravel underdrainage can be used to meet this requirement, although if high groundwater conditions are present, then the underdrainage must be lined with a waterproof membrane, as shown in Figure 37 below[3].

Figure 37 SuDS and recreational areas

If a horizontal playing surface is not required, appropriately spaced shallow under-drained swales would be appropriate, as shown in Figure 38 below.

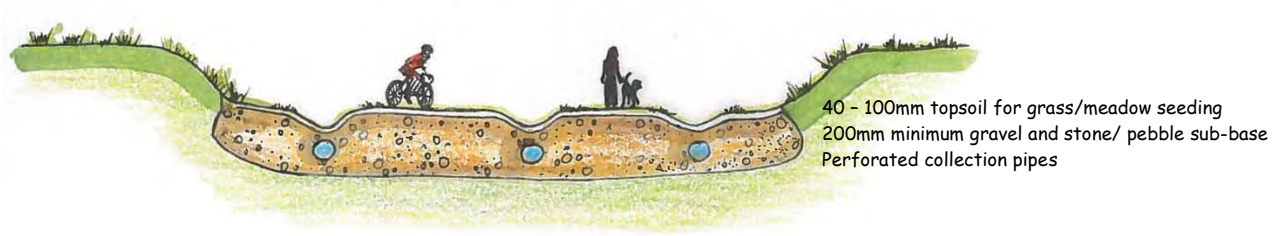


Figure 38 Swales in public open space

[3] Where a surface is intended to be a formal sports surface, Sport England guidance should be followed: http://www.sportengland.org/media/30865/Natural-turf-for-sport.pdf

Shallow water-play features, as shown in Figure 39 below are encouraged for Swindon Local landscaped area for play, subject to any highway drainage upstream of the play area having drained through at least three treatment stages, and roof and permeable area runoff having passed through at least one treatment stage.

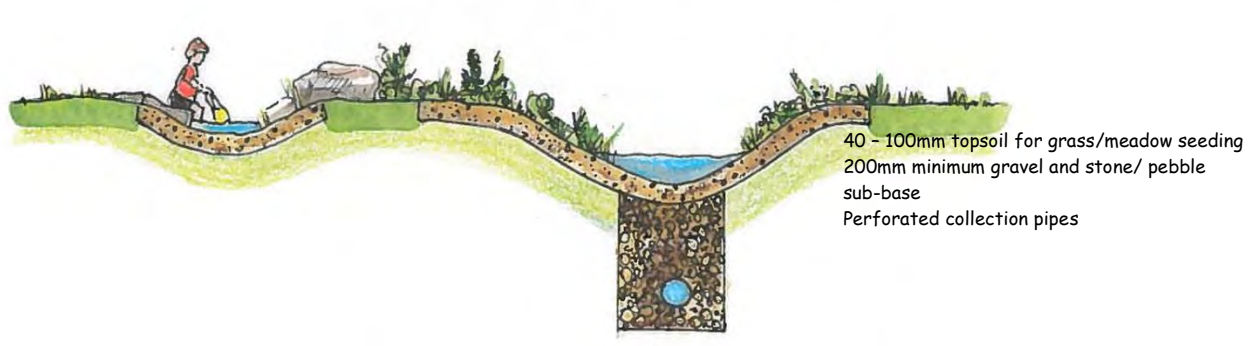


Figure 39 SuDS and water-play

The planting of any open space drainage features should be considered at an early stage in the masterplanning process. Where the feature is to be used for recreational purposes, a grassed under-drained surface will be required and the design should ensure access for ride-on grass mowers. If the feature is in general open space and not intended for a recreational function, the area could be seeded with a more natural meadow mix requiring less or no cutting as shown in Figure 40.

Figure 40 swale/urban watercourse with natural planting providing Green Infrastructure corridor

Car parking for public open space and community buildings must use permeable surfaces. Informal surfaces draining to SuDS will also be acceptable. Figure 41 shows railway sleepers and gravel drainage being used for car parking in a country park.

Figure 41 Gravel permeable drainage for low use public parking in country park

The use of source control features should significantly reduce the volume of regional scale attenuation required. However, where regional scale attenuation features are required, these can be provided within the public open space, subject to the features being designed only operate in a greater than 1 in 30 year return period event, and subject to them providing visual or recreational

amenity value. Figures 42 and 43 show examples of new developments where detention ponds or retention basins have been designed to provide amenity value.

Figure 42 Regional scale wetland area providing visual amenity, water quality and biodiversity benefits adjacent to major public open space area.

Figure 43 Regional scale detention basin providing visual amenity, water quality and biodiversity benefits, with public right of way along bank area.

Trees and woodlands can also be incorporated into the open space and be part of an overall SuDS scheme to help control surface water runoff. They also provide significant Water Quality, Amenity and Biodiversity benefits. The Woodland Trust has published many guidance documents including the publication, Woodland actions for biodiversity and their role in water management (pdf) - https://www.woodlandtrust.org.uk/mediafile/100263208/rr-wt-71014-woodland-actions-for-biodiversity-and-their-role-in-water-management.pdf?cb=001108c3a78944299140a996b2cd7ee8

Wetland creation and woodland planting may be an essential part of the SuDS schemes in areas with high commercial and industrial densities, as a number of treatment processes will be required to ensure water quality is maintained.

4 SuDS design assessment and approval process

4.1 assessment and approval Process

The flow charts (Figures 44 and 45) illustrate the assessment and approval process for SuDS within the NEV.

Use of the scheme design assessment checklist provided in CIRIA C753 will help developers to demonstrate that the scheme has been designed according to best practice, and assist the regulator and statutory consultees assess the application. It is strongly recommended that this checklist is submitted with the outline application and FRA.

Developers submitting applications will be expected to comply with Policies NC3 and EN6 from the Local Plan, as well as the requirements of the Swindon Borough Green Infrastructure Strategy. All SuDS should be designed in accordance with the best practice technical guidance set in CIRIA C753. The developer must demonstrate adequate consideration of the following matters[4].

- Available area for surface water management measures
- Existing drainage features
- Existing flood flow routes
- Biodiversity characteristics of the site
- Proximity of appropriate receptors (watercourse/surface water sewer in accordance with the sustainable drainage hierarchy)
- Conveyance and exceedance routes to appropriate receptor(s)
- Requirement for easements for drainage routes across third party land
- Capacity within existing drainage systems
- Location of development and drainage features in relation to flood zones
- The SuDS management train
- Water quality

Developers must obtain consent from the EA for any structures in, under, over or within 8 metres of main rivers. They should obtain Land Drainage consent from SBC for any structures including bridges, outfalls and channel modifications which have the potential to affect the flow of water in an ordinary watercourse (refer to Local Flood Risk Management Strategy on www.swindon.gov.uk/localfloodrisk for more information).

A surface water management strategy will be required at outline planning application stage. The strategy must be in accordance with the Non-statutory technical Standards for sustainable drainage systems and the SuDS Manual (C753). It is important that the strategy demonstrates that;

- Proposed flows from the site will discharge at or below greenfield runoff rates, or as close as practical for any areas that have been previously developed;
- The impact upon the existing drainage systems is mitigated by discharging the flow throughout the management train rather than relying upon a single point of discharge;

[4] If SBC and other relevant authorities deem that adequate investigation has been undertaken and the evidence provided shows that it is not reasonably practicable to comply with a specific requirement of this guidance, then an alternative agreement may be reached.

- SuDS Source Control measures to manage water quantity and maintain water quality have been implemented wherever possible and throughout the management train so the development is not reliant upon large attenuation features close to the points of discharge;
- Proposed SuDS have been selected to provide a wide range of benefits including amenity, biodiversity and maintaining water quality;
- During construction, adequate measures are proposed to control pollution to existing watercourses and groundwater;
- The strategy mimics the existing drainage characteristics of the site by retaining and utilising any existing drainage features;
- If any existing drainage features such as existing watercourses (including ditches) are proposed to be removed or culverted, the applicant has agreed this with the LLFA by obtaining Land Drainage Consent or the EA for any main rivers;
- Existing flood flow routes through the site (check the EA surface Water flood maps here) have been maintained or where they will be affected, adequate measures to intercept and safely control flows through the site have been provided to ensure flood risk is not increased elsewhere;
- If infiltration is proposed, an extensive ground investigation report has been carried out to support infiltration, including infiltration tests to BRE 365 and extensive ground water monitoring over the winter period;
- If infiltration is proposed, it is implemented in manner that does not create an offsite impact particularly if there are reports of groundwater flooding in the area;
- The strategy has demonstrated surface water can be safely managed within the proposed development, up to and including a 1 in 100 year plus climate change event;
- All proposed drainage features are outside flood zones 2 and 3 and are not located within any existing surface water flood flow routes taking offsite flows (check EA surface water flood maps here). Where drainage features are located adjacent to flood zones 2 and 3, they must be above the 1 in 100 year plus climate change flood level. This information can be obtained from the EA;
- Details have been provided of how the proposed and existing drainage features on the site will be maintained and managed after completion with confirmation from the relevant authority that they will adopt any systems that are being offered for adoption;
- Confirmation that the applicant has consent for any outfalls from the proposed drainage systems into a public sewer or other drainage system not owned by the applicant.

The requirements for each stage of the planning approval process are shown in the flowcharts below. These highlight the key documents required but are not exclusive lists and must include further information to demonstrate the requirements listed above.

Ciria C753 SuDS Manual planning and design checklist, Scheme design assessment checklist and H&S risk assessment checklist must also be included at the relevant stage of the process.

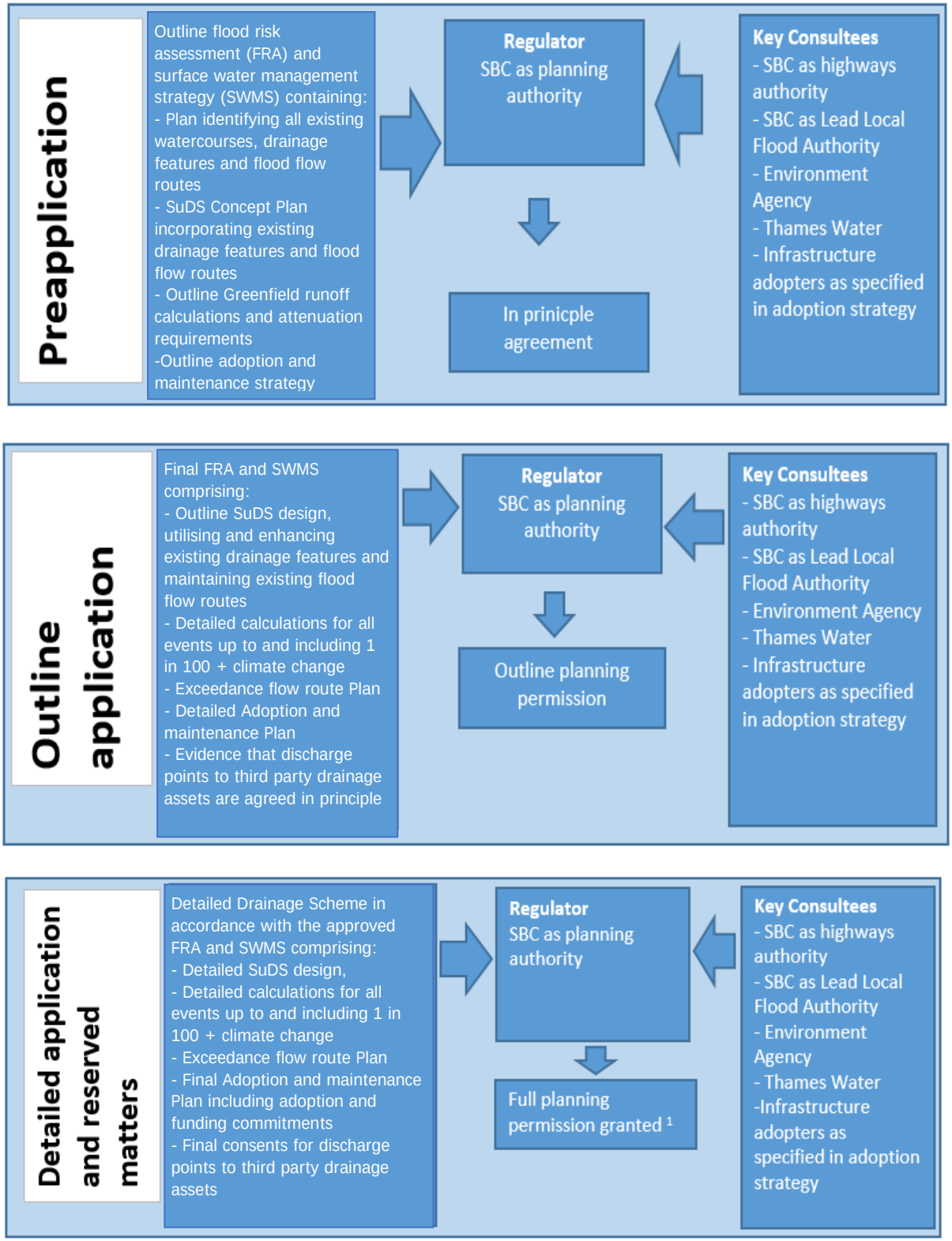


Figure 44 SuDS and planning approval process

(1) If conditional consent is given, then all conditions relating to the drainage strategy or flood risk assessment should be discharged before preconstruction permits or technical approval are sought.

Figure 45 SuDS Permits and technical approvals

Maintenance plans should be prepared in accordance with the SuDS manual (http://www.susdrain.org/resources/SuDS_Manual.html). In particular they should:

- Demonstrate how the features have been designed to promote use of the open space.
- Describe how the scale and frequency of maintenance activities has been balanced with the ability of the public to enjoy the open spaces and the promotion of biodiversity.
- State how the design and maintenance regime has been designed to preserve the performance of SuDS features with the minimum amount of intervention.

- Reflect changes to the site environment throughout the phases of construction and occupation.
- Indicate how maintenance personnel, plant and equipment may safely access the features and carry out maintenance activities.
- Advise how the occupiers of properties will be made aware of the SuDS design and requirement for maintenance.

The completion of the SuDS Manual maintenance plan checklist and the adoption handover checklist (for adoptable and non-adoptable assets) is strongly recommended and will be required if any assets are accepted for adoption.

Construction plans should be prepared in accordance with the SuDS Manual (http://www.susdrain.org/resources/SuDS_Manual.html). In particular they should:

- Advise how the SuDS features will be monitored and maintained throughout the construction and stabilisation process.
- Advise how construction activities will be phased to limit the amount of sediment and pollutants.
- Identify areas where construction activities are prohibited to preserve existing biodiversity and maintain the performance of SuDS features.
- Provide a contingency plan of how the SuDS features will be protected and remediated in the event of environmental incidents.

The completion of the SuDS Manual construction checklist is strongly recommended for all assets, and required for adoptable assets.

4.2 Design standards

4.2.1 Highway drainage assets

Drainage assets that form part of the highway drainage network must comply with the Department for Transport Design Manual for Roads and Bridges (DMRB)[5], with particular reference to Volume 4, section 2.

Use of the design checklists for each of the SuDS components provided in CIRIA C753 will help developers to demonstrate that the scheme has been designed according to best practice, and assist the regulator and statutory consultees assess the application. It is strongly recommended that this checklist is submitted with the detailed planning application, or as part of the technical approval process.

A satisfactory system of drainage must be provided for the collection and disposal of surface water from all areas to be adopted by the highway authority within the development area. Due to the hydromorphology of the NEV, highway drainage must be kept on or near the surface.

[5] http://www.standardsforhighways.co.uk/dmrb/

It is absolutely essential that the means of disposal of surface water be investigated with the Highway Authority at the preliminary stage of all development schemes. It cannot be assumed that permission will automatically be granted by the Highway Authority for connection to the existing highway drainage system within adjacent maintained roads.

The developer is required to make adequate and satisfactory outfall arrangements for his development in accordance with this document.

SuDS features must comply with the requirements of DMRB where they are to be used for highway drainage. By way of examples as to the flexibility of this approach the following are considered suitable as potential outfalls for a highway drainage system:

- Watercourses
- Swales/basins
- Existing highway drains
- Existing public surface water sewers

All of the above systems require the written approval of the Highway Authority at an early stage, and a commuted sum to cover future maintenance of the system will be required. Chapter 4 considers the funding requirements in more detail.

The Council's current position with respect to adoption of SuDS infrastructure is that only highways drainage infrastructure will be adopted. A well designed SuDS concept would rely on over the edge drainage to roadside swales as part of the highways drainage infrastructure.

Any SuDS features offered for adoption by SBC under Section 38 must be accompanied by the relevant component checklist from CIRIA C753. Where SuDS components will not be adopted by SBC, but drain into assets to be adopted by SBC, the component design checklist must also be included in the section 38 approval for those components.

If, by negotiation, non-highways assets are to be adopted by SBC through Section 106 negotiations, these must be accompanied by the relevant component checklist from CIRIA C753, and a commuted sum to cover future maintenance of the system will be required.

The Swindon Transport Requirements for Development (TRFD) document is currently being updated, and is due for publication in late 2016. This document will provide further guidance on standards for highways assets.

5 Funding and long term maintenance options

5.1 Why maintenance is important?

It is important that a maintenance management plan is developed for SuDS to ensure that they continue to function effectively in perpetuity. Appropriate maintenance management approaches will:

- Provide for long term maintenance;
- Identify and secure clear lines of responsibility;
- Ensure design standards are met and maintained;
- Support public safety.

SBC will require conditions to be attached to a planning permission requiring SuDS to be constructed and maintained to a minimum level of effectiveness. To be effective a maintenance option must:

- Clearly identify who will be responsible for maintaining the SuDS and funding for maintenance should be fair for householders and premises occupiers, and
- Set out a minimum standard to which the SuDS must be maintained.

A suite of potential maintenance models are set out in section 4.2, all of which offer viable maintenance options for developers to consider and enable them to satisfy a planning condition requiring effective SuDS and sustainable maintenance. The list is not exhaustive so as not to preclude innovation.

It is the developers' responsibility to either directly maintain SuDS or to negotiate with, and secure the agreement of, a third party to maintain the SuDS for the life of the development.

The Council's preferred option is for a single management company to be set up by the developers. The management company must be incorporated such that they can adopt the assets, and a business plan with a discounted cash flow model must be provided to demonstrate that these companies are fully funded for their maintenance liabilities over the lifetime of the development (100 years).

5.2 Possible maintenance models

5.2.1 Service management companies

Developer initiated Management Companies are often set up to manage public spaces on new developments and maintenance of SuDS could be added to their remit.

<u>Potential funding options:</u>

a. Through service charge: Householders and premises occupiers to pay for SuDS maintenance as part of the annual service charge or equivalent outdoor space service charges that they pay to cover a range of activities. Developers will need to ensure that any requirement to pay fees is binding.
b. Through model agreement and commuted sums paid by the developer to the Maintenance Company. Any commuted sums would need to be consistent with the need for the site to be viable overall.

c. Through Charitable Trusts or Not-for-profit companies which could also serve as Maintenance Companies.
d. By working with SBC, parish councils and Thames Water to set up a 'NEV Green Infrastructure Management Company'.
e. In partnership with SBC and/or parish councils
f. Securing bonds to adopt and manage infrastructure

5.2.2 Water and sewerage companies

Water and Sewerage Companies already have duties and can make charges relating to water and there is an association between their current activities and any new arrangements relating to managing surface water from properties. Notably, Water and Sewerage Companies may construct, maintain and operate drainage systems which relieve the public sewer. This empowerment includes SuDS. The legal basis for is set out in section 114A of the Water Industry Act 1991 (as amended by the Water Act 2014). The Water Company operating in SBC's area is Thames Water.

If a developer secured an agreement with Thames Water, they could construct or contribute towards the construction of a SuDS that Thames Water would subsequently own. The sustainable drainage system would be included within Thames Water's ordinary charging scheme, and maintenance costs would be funded through the surface water drainage element of household water bills. This arrangement would ensure that all those bill payers in Thames Water's area paying for surface water management would share the cost burden. Given that the cost of maintaining SuDS is generally cheaper than traditional pipework, this option may be to the benefit of all bill payers and the levy would be regulated by Ofwat.

Alternatively, Thames Water could offer its services as a Service Management Company (as above). In this instance it would not be exercising its statutory function so could not spread its charges amongst all its bill payers for those services. Instead the beneficiaries of the service would be the parties charged for the service and the amount would not be regulated by Ofwat.

Thames Water currently will not adopt SuDS serving developments of less than 2,500 properties, and will consider developments of >2,500 on a case by case basis.

5.2.3 Local government (SBC)

SBC will take on responsibility for the maintenance of some SuDS as part of their wider public open space and amenity management function and/or where the SuDS provide advantages for the wider community. This option can be linked to the adoption of green spaces and Green Infrastructure.

Under this option, SBC would need to charge to fund their activities in maintaining SuDS which may be levied through:

a. Business rates
b. An SBC/Parish partnership – by setting up new 'management' company
c. Combination of SBC and developer service management company (to share costs)
d. New Burdens Doctrine (Note: The New Burdens Doctrine only applies where central government requires or exhorts authorities to do something new or additional. Action to ensure that they adequately fulfil a role, for which they are already funded, is not a new burden.)

The table below summarises the position of SBC in relation to SuDS maintenance in a number of scenarios.

Type	Features	maintenance/ownership models
SuDS in public open space	Ponds and wetland Infiltration and retention basins Filter strips Swales Rain gardens (bio-retention) Filter drains Canals and rills Permeable paving Communal rainwater harvesting	Maintained through parks contractor, landscape management company Will be adopted by SBC if located in public open space, only where the public open space is being adopted by SBC. Where SBC adopts any feature, it will also adopt all control structures that are located in the open space (providing they are designed to current best practice and meet the requirements of the SuDS Manual).
SuDS on community property (e.g. schools, community halls)	Green roofs Permeable driveways and parking Soakaways Proprietary treatment systems Rainwater harvesting Geo-cellular storage (preferably combined with rainwater harvesting) Swales Rain gardens Rills	Managed and maintained through facilities management company Will only be adopted by SBC where agreed as part of S106 agreement, or where SBC will own the property that the SuDS drain.
Private SuDS – within the boundaries of private properties	Green roofs Permeable driveways and parking Soakaways Proprietary treatment systems Rainwater harvesting Geo-cellular storage (preferably combined with rainwater harvesting) Swales Rain gardens Rills	**Will not be adopted by SBC** Located in privately owned land**:** • Single property drainage: • SuDS in private property serving more than one property Responsibility with: Developer/Property Owner/Landowner, Management Company The requirement to maintain the SuDS feature must be included within the property deeds. Note: Management responsibility must be identified and agreed if discharging into SuDS adopted by SBC.
SuDS in public roads	Filter strips Swales Rain gardens (bio-retention) Filter drains Permeable paving	May be adopted by Highway Authority (SBC) subject to approved design and construction, and maintenance implications being mitigated.
SuDS in private roads	Swales Rain garden Permeable paving Communal rainwater harvesting	**Will not be adopted by SBC** Responsibility with: Developer/Property Owner/Landowner, Management company

5.2.4 Private individuals (for single property SuDS features)

The owners/occupiers of properties drained by SuDS that do not also drain other properties should be assigned responsibility to maintain their own system.

The developer would need to provide the owner or owners with full instructions on the maintenance of the SuDS including repair and replacement requirements, and the property deeds must contain a covenant requiring the property owner to maintain the features according to the requirements. There should be information on how these components function and to reduce the risk of unintentional damage (through alterations to the property or DIY).

5.2.5 Private individuals (for SuDS features serving a small number of properties)

Some SuDS may be simple systems involving minimal or no proprietary products, minimal maintenance and serving only a small numbers of properties. In such instances, the owners of the properties served, should be assigned responsibility to maintain the SuDS collectively.

Similarly, the developer would need to provide the owners with full instructions on the maintenance of the SuDS including repair and replacement requirements.

Legislation and Policy

The implementation of SuDS is covered by a variety of legislation and policy ranging from European Directives, national legislation, high level Government strategy to local policies. This is supported by extensive guidance which facilitates implementation and develops technical understanding. The following definitions provide context.

Legislation: The body of law enacted by a legislative body. This includes European Directives, Acts of Parliament and UK Regulations. UK legislation may cover the whole of the UK, England and Wales or England alone, depending upon the legislation concerned.

Strategy: An overarching plan or approach developed to facilitate achievement of overall goals and objectives. In the context of this document, this includes local plans.

Policy: A statement of intent which helps to guide decisions and direction. It is implemented through a procedure or protocol.

Guidance: Information provided to assist in the implementation of tasks and actions to best achieve the desired results. Guidance is not strategy or policy but facilitates implementation and achievement of these.

The qualifiers:

- National – applies to the whole of the UK, England and Wales or England alone depending upon the legislation/strategy concerned
- Regional – applies to a broad geographic area which is explicitly defined only with additional context e.g. The South West of England (collection of named Counties), the Thames Basin and similar
- Local – applies to a narrow geographic area which is explicitly defined only with additional context e.g. the area covered by Swindon Borough Council, the area within the boundary of the Swindon Eastern Villages development area and similar

Presented below are summaries of the principal relevant documents. This should not be considered an exhaustive list. In particular, other sources of guidance are available and these will be useful to all those involved in the design, construction and future maintenance of SuDS.

Legislation

The principal relevant legislation for SuDS matters is as follows:

- The Water Framework Directive (WFD)[6] –The WFD is EU legislation designed to improve and integrate the way water bodies are managed throughout Europe. The WFD establishes a strategic framework for managing the water environment through the concept of river basin management. The Directive requires Member States to prepare River Basin Management Plans, including a programme of measures. All water bodies must achieve good ecological status by the end of 2027, unless it is disproportionately expensive or technically infeasible. If either of these two derogations apply, then alternative, lower, objectives may be set. Any changes to either drainage basins or river corridors therefore need to be considered

[6] http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32000L0060 and as pdf: http://www.doeni.gov.uk/wfd.pdf

carefully to ensure any impacts which could impact the ecological status of the water course are effectively mitigated.

- European Commission (EC) Directive on the assessment and management of flood risks (Directive 2007/60/EC)[7] . This 'Floods Directive' requires Member States to assess if all water courses and coast lines are at risk from flooding, to map the flood extent and assets and humans at risk in these areas and to take adequate and coordinated measures to reduce this flood risk. Its aim is to reduce and manage the risks that floods pose to human health, the environment, cultural heritage and economic activity. Member States are to take into consideration long-term developments, including climate change, as well as sustainable land use practices in the flood risk management cycle addressed in this Directive.

- The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003[8] These Regulations made provision for the purpose of implementing the Water Framework Directive. The Regulations require a new, strategic planning process to be established for the purposes of managing, protecting and improving the quality of water resources through river basin management.

- The Flood Risk Regulations 2009[9] - The purpose of the Flood Risk Regulations is to transpose the 'Floods Directive' into domestic law and to implement its provisions. The Regulations outline the roles and responsibilities of the various authorities consistent with the Flood and Water Management Act 2010 (see below) and provide for the delivery of the outputs required by the Directive. The Directive requires EC member states to develop and update a series of tools for managing all sources of flood risk.

- The Flood and Water Management Act 2010[10] provides extensive management of flood risk for people, homes and businesses. The Act brings together the recommendations of the Pitt Review and previous policies, to improve the management of water resources and create a more comprehensive and risk-based regime for managing the risk of flooding from all sources. The act introduces the Lead Local Flood Authority (LLFA) role and encourages the uptake of SuDS by removing the automatic right to connect to sewers and provides for LLFAs to adopt SuDS for new developments and redevelopments. As a LLFA, Swindon Borough Council will take on new powers and responsibilities introduced by the Act. Schedule 3 to the Act makes Swindon Borough Council the SuDS Approving Body (SAB) for its administrative area, responsible for approving all surface water drainage systems for new

[7] http://eur-lex.europa.eu/legal-content/EN/TXT/;ELX_SESSIONID=4pFTJGlBynd9kWY0KdMrNhsl1Z96pFBDRnnKlHHJtsJj11HNQxGm!-297897114?uri=CELEX:32007L0060

[8] http://www.legislation.gov.uk/uksi/2003/3242/contents/made and as pdf:

http://www.legislation.gov.uk/uksi/2003/3242/pdfs/uksi_20033242_en.pdf and

http://www.persona.uk.com/bexhill/Core_docs/CD-03/CD-03-12.pdf

[9] http://www.legislation.gov.uk/uksi/2009/3042/made

[10] http://www.legislation.gov.uk/ukpga/2010/29/pdfs/ukpga_20100029_en.pdf

developments in line with a set of National Standards set out by government as well as any specific local standards. ***Note:*** National standards and specified criteria for sustainable drainage have been drafted (Defra/DCLG consultation document: Delivering Sustainable Drainage Systems, Sept 2014[11]). However, until Schedule 3 of the Act is enacted, SBC will have an interim approach to approvals and adoption which will be negotiated through the planning application process.

- Water Act (May 2014)[12] The focus of this act is primarily the water industry and its purpose ranges across licensing of the water industry, infrastructure adoption and regulation for the water supply and sewerage industry, the EA's (and Natural Resources Wales') duties with regard to maintaining the main river maps, provision of flood insurance for household premises, procedures for internal drainage boards and amendments for Regional Flood and Coastal Committees. The act will serve to reform the water industry to make it more innovative and responsive to customers and to increase the resilience of water supplies to natural hazards such as drought and floods.

- Land Drainage Act 1991[13]/Water Resources Act 1991[14]: Under the terms of the Water Resources Act 1991 and the Land Drainage Byelaws, the prior written consent of the EA is required for any proposed works or structures in, under, over or within 8m of the top of the bank of the main river, this includes any headwalls. Any culverting or works affecting the flow of a watercourse requires the prior written consent of the EA under the terms of the Land Drainage Act 1991/Water Resources Act 1991. The EA seeks to avoid culverting, and its consent for such works will not normally be granted except as a means of access.

- The Building Regulations, Part H, Drainage and Waste Disposal[15] requires that rainwater shall discharge to one of the following, listed in priority order: (a) an adequate soakaway or some other adequate infiltration system, or, where that is not reasonably practicable, (b) a water course, or, where that is not reasonably practicable, (c) a sewer.

Policy and Strategy

This area includes strategy plans and policy statements.

National

- Future Water (Defra, February 2008)[16], the Government's Water Strategy for England, sets out a vision for effective surface water drainage, taking account of climate change and housing development. This includes surface water management solutions which will involve increased use of SuDS and surface water flow routes, thereby making optimum use of the capacity of the landscape to store and convey surface water, taking demand off the below-ground systems.

[11] https://consult.defra.gov.uk/water/delivering-sustainable-drainage-systems/supporting_documents/20140912%20SuDS%20consult%20doc%20finalfinal.pdf
[12] http://www.legislation.gov.uk/ukpga/2014/21/contents/enacted. (as pdf: http://www.legislation.gov.uk/ukpga/2014/21/pdfs/ukpga_20140021_en.pdf)
[13] http://www.legislation.gov.uk/ukpga/1991/59/contents
[14] http://www.legislation.gov.uk/ukpga/1991/57/contents
[15] http://www.planningportal.gov.uk/uploads/br/BR_PDF_AD_H_2010.pdf
[16] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69346/pb13562-future-water-080204.pdf

- Making Space for Water [17] (MSfW) (published on 29th July 2004 as a consultation document) is the cross-Government programme which sets out a holistic approach to take forward the development of a new strategy for flood and coastal erosion in England. The Government will, over the 20-year lifetime of the strategy, implement a more holistic approach to managing flood and coastal erosion risks in England. The approach involves taking account of all sources of flooding, embedding flood and coastal risk management within a range of Government policies and reflecting other relevant Government policies in the policies and operations of flood and coastal erosion risk management.

- National flood and coastal erosion risk management strategy for England18 (2011). This strategy provides the overarching framework for future action by all risk management authorities to tackle flooding and coastal erosion in England with a focus on understanding the risks, empowering communities and building resilience. It has been prepared by the EA with input from Defra, to ensure it reflects Government policy. Localism is at the heart of the new strategy, recognising that there is a limit to what Government and national bodies can achieve alone, and that national priorities are only part of the picture.

- NPPF[19]: The NPPF sets out the Government's planning policies for England and how these are expected to be applied. The Framework condensed over two-dozen previously issued planning policy statements (PPS) and planning police guidance (PPG). It supports the objective of the planning system to contribute to the achievement of sustainable development. It provides a framework within which local people and their accountable councils can produce their own distinctive local and neighbourhood plans, which reflect the needs and priorities of their communities. The flood risk policy is contained in Chapter 10 of the NPPF (titled: 'Meeting the challenge of climate change, flooding and coastal change'). The NPPF and its associated Practice Guidance (see below) retain the principles of PPS25 (Development and Flood Risk Practical Guide) in seeking to avoid inappropriate development in areas at risk of flooding and to direct development away from areas of highest risk. Where new development is necessary in areas of higher risk, it should be made safe, without increasing flood risk elsewhere. Clause 103 (Chapter 10) requires developments to give priority to SuDS.

- NPPF (reference as above) Chapter 11. Conserving and enhancing the natural environment requires that when determining planning applications, local planning authorities should aim to conserve and enhance biodiversity.

Regional

[17] (HM Treasury, Office of the Deputy Prime Minister, Department for Transport and Defra, March 2005) http://webarchive.nationalarchives.gov.uk/20060214013227/http://defra.gov.uk/corporate/consult/waterspace/consultation.pdf
The first Government response to the consolation is published: http://archive.defra.gov.uk/environment/flooding/documents/policy/strategy/strategy-response1.pdf. See also: http://archive.defra.gov.uk/environment/flooding/policy/strategy/

[18] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/228898/9780108510366.pdf

[19] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/6077/2116950.pdf

- River Basin Management Plan: Thames River Basin District[20] (Water for Life and Livelihoods) published by Defra/Environment Agency: The Thames River Basin District covers an area of 16,133 square kilometres from the source of the River Thames in Gloucestershire through London to the North Sea. The Management Plan sets down quality targets for local rivers and watercourses and encourages the enhanced use of SuDS. Swindon is identified as one of six growth points in the basin which form the focus for targeted housing growth, regeneration and economic development.

- Thames Catchment Flood Management Plan (CFMP) (December 2009)[21]: The role of the CFMP is to establish flood risk management policies which will deliver sustainable flood risk management for the long term. Swindon falls into Sub Area 7 categorised as 'Expanding towns in flood zone locations'. The preferred policy for Sub Area 7 is Policy 4 which states that these are areas of low, moderate or high flood risk where we are already managing the flood risk effectively but where we may need to take further actions to keep pace. Managing the consequences of flooding will be the main feature of future flood risk management in these places. The proposed expansion of these places will need flood risk to be considered and inform the location, layout and design of new development.

Local

- Local Plan[22], Swindon: Planning for the Future. Pre-submission Document, December 2012: The Local Plan is the main planning policy document for the Borough. It sets out how much housing, employment and retail development the Borough needs up to the year 2026 and where this should be. The plan also sets out what infrastructure will be needed to enable this development to take place. Policy EN6: Flood Risk states: 'All development shall be required to provide a drainage strategy. Developments will be expected to incorporate SuDS and ensure that run-off rates are attenuated to greenfield run-off rates. Higher rates would need to be justified and the risks quantified.' The Swindon Eastern Villages is included specifically in the Local Plan as Policy NC3 (New Communities 3): NEV - including Rowborough and South Marston Village Expansion.

- A Green Infrastructure Strategy for Swindon 2010-26: Revised Consultation Document (2011) [23] provides a comprehensive plan for the protection of existing and the creation of new Green Infrastructure in the Borough.

- Green Infrastructure Framework (GIF) Guiding Principles (Oct 2013) – East Swindon. This document, sub-titled: The delivery of integrated biodiversity, landscape and recreational

[20] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/289937/geth0910bswa-e-e.pdf

[21] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/293903/Thames_Catchment_Flood_Management_Plan.pdf

[22] http://www.swindon.gov.uk/localplan (webpages) and as pdf: http://www.swindon.gov.uk/ep/ep-planning/planningpolicy/ep-planning-localdev/Documents/Local%20Plan%20Pre-Submission%20draft.pdf

[23] http://www.swindon.gov.uk/ep/ep-planning/planningpolicy/ep-planning-localdev/localplanexamination/Documents/CD%208.6%20-%20A%20Green%20Infrastructure%20Strategy%20for%20Swindon%202010-2026%20Revised%20Consultation%20Document%20(SBC).pdf

resources, sets out the overarching guiding principles for East Swindon's GIF. It provides a mechanism in which to secure a high quality GIF and it is anticipated that the document will be used as a template for the detailed landscape design stage. The document sets out the plan in the context of national and Local policies and guidance including Green Infrastructure Guidance (Natural England) (NE176) October 2011, the NPPF and the Local Plan.

- Local Flood Risk Management Strategy: Swindon Local Flood Risk Management Strategy (LFRMS) aims to manage flood risk in a way that will benefit people, property and the environment (Web link for SBC local flood risk management strategy consultation[24] and LFRMS Summary document[25]). The Strategy is consistent with the Environment Agency's National Strategy for Flood and Coastal Erosion Risk Management. The Strategy covers the period to 2019 with a formal review in 2018. The Action Plan that forms part of the LFRMS will be reviewed annually and an update published along with a progress report.

Guidance and supporting documents

National

- Surface Water Management Plan (SWMP) Technical Guidance (Defra, March 2010)[26]. This SWMP Guidance provides a framework allowing different organisations such as local authorities and water companies, to work together and develop suitable solutions to surface water flooding problems. The SWMP Guidance has been written for local authorities, in order to assist them during co-ordination of local flood risk management activities. The Guidance outlines preferred surface water management strategy in a given location. It also outlines Water Management Plans; for example, who to involve, how to assess flood risk and management/mitigation measures, and how to develop a strategy and action plan.

- Green Infrastructure Guidance (Natural England) (NE176) October 2011[27]. In this document Natural England state that Green Infrastructure makes a contribution to one of their strategic outcomes (a healthy natural environment). Well planned Green Infrastructure encompassing new and enhanced sites and habitats contributes to high quality and accessible landscapes and plays an essential role in maintaining and enhancing the health of the natural environment and its ability to provide a wealth of 'ecosystem services'. Section 3 contains information on: The value of planning for Green Infrastructure. This section demonstrates how Green Infrastructure contributes to spatial planning and sustainability objectives, the functions it fulfils, with a concise identification of resulting benefits in relation to Government policy priorities.

[24] http://www.swindon.gov.uk/floodrisk

[25] http://www.swindon.gov.uk/cd/Council%20and%20Democracy%20Document%20Library/Information%20-%20Consultation%20-%20LFRMS%20Summary.pdf

[26] https://www.gov.uk/government/publications/surface-water-management-plan-technical-guidance (pdf: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69342/pb13546-swmp-guidance-100319.pdf. Annexes: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69343/pb13546-swmp-guidance-annex-100319.pdf)

[27] See: Natural England Publications on Green Infrastructure: http://publications.naturalengland.org.uk/category/49002.

- NPPF guidance: Detailed guidance was issued with the NPPF (see above) in an accompanying document, the Technical Guidance to the NPPF, which in March 2014 was superseded by more extensive guidance in the Flood Risk and Coastal Change Planning Practice Guidance issued in the form of linked web pages[28]. The guidance makes repeated reference to the need for reducing the overall level of flood risk in the area through the layout and form of the development and the appropriate application of SuDS.

- The SuDS Manual, CIRIA (C753)[29] provides best practice guidance on the planning, design, construction, operation and maintenance of SuDS to facilitate their effective implementation within developments. A hierarchy or sequential approach to drainage planning – a 'SuDS Management Train' – is advised. SuDS designs should aim to reduce runoff by integrating storm water controls throughout the site in small, discrete units. Through effective control of runoff at source, the need for large flow attenuation and flow control structures should be minimised.

Local

- Swindon Water Cycle Study (January 2014)[30] (with Thames Water and the EA as project partners): This water cycle study was undertaken to ensure that proposed growth does not adversely impact on the existing water cycle environment and that new water services infrastructure can be planned for and provided alongside new development in a sustainable and cost-effective manner. The two primary concerns raised in the water cycle study were uncertainty over water resources environmental capacity and uncertainty over the capacity of the river systems to accept an increase in treated effluent without causing water quality failures.

- Sustainability Appraisal Reports[31]. Two documents are relevant:
    - Core Strategy & Development Management Policies - Proposed Submission Document: Sustainability Appraisal incorporating Strategic Environmental Assessment, July 2009
    - Eastern Villages Supplementary Planning Document: Sustainability Appraisal Report incorporating Strategic Environmental Assessment, July 2013.

[28] http://planningguidance.planningportal.gov.uk/blog/guidance/flood-risk-and-coastal-change/

[29] http://www.ciria.org/Resources/Free_publications/SuDS_manual_C753.aspx

[30] http://www.swindon.gov.uk/ep/ep-planning/planningpolicy/ep-planning-localdev/localplanexamination/Documents/CD%208.36%20-%20Swindon%20Water%20Cycle%20Study%20(CH2MHILL).pdf

[31] http://www.swindon.gov.uk/ep/ep-planning/planningpolicy/ep-planning-localdev/Documents/proposedsubmissionsustainabilityappraisal.pdf and

http://www.swindon.gov.uk/ep/ep-planning/planningpolicy/ep-planning-localdev/Documents/Eastern%20Villages%20Sustainability%20Appraisal%20Report.pdf

- Strategic Flood Risk Assessment[32]: Swindon Borough Council Strategic Flood Risk Assessment Level 1 SFRA - Final Report (Volume I), August 2008. This SFRA feeds directly into the preparation of Local Development Documents, including the Core Strategy and Site Allocation DPDs. In addition, the SFRA allows Swindon Borough Council to:
    - Prepare appropriate policies for the management of flood risk
    - Inform the sustainability appraisal so that flood risk is taken account of when considering options and in the preparation of strategic land use policies
    - Identify the level of detail required for site-specific Flood Risk Assessments (FRAs);
    - Determine the acceptability of flood risk in relation to emergency planning capability.

Design

All surface water drainage needs to be in accordance with the latest appropriate British and other recognised standards, and other relevant specifications and guidance documents, including, but not limited to the list below.

The following definitions may be helpful:

Standard: A Standard is something considered by an authority or by general consent as an approved model. It is an established norm or requirement for technical systems. It is usually in the form of a formal document that establishes uniform engineering or technical criteria, methods, processes and practices.

Specification: A Specification is an explicit set of requirements to be satisfied by a material, design, product, or service.

- Civil Engineering Specification for the Water Industry (7th edition)
- BS EN 752: 2008 Design of Sewers Outside Buildings
- Sewers for Adoption (7th edition)
- SuDS Manual – CIRIA (C753)
- Planning for SuDS, making it happen – CIRIA (C687)
- Site handbook for the construction of SuDS – CIRIA (C698)
- SuDS retrofitting – Retrofitting to manage surface water – CIRIA (C713), 2012
- HR Wallingford Report SR 640: Kellagher RBB and Lauchlin CS. Use of SuDS in high density developments, defining hydraulic performance criteria.
- HR Wallingford Report SR 666: Kellagher RBB and Lauchlin CS. Use of SuDS in high density developments, guidance manual.
- Designing for exceedance in urban drainage – good practice – CIRIA (C635)
- Building greener. Guidance on the use of green roofs, green walls and complementary features on buildings – CIRIA (C644)
- Rainwater and greywater reuse in buildings: best practice guidance – CIRIA (C539)

[32] http://www.swindon.gov.uk/ep/ep-planning/planningpolicy/ep-planning-localdev/Documents/swindon_sfra_level_1_sfra_report_28aug08[1].pdf

- Environment Agency Green roof tool kit.
- Environment Agency Pollution Prevention Guideline PPG3, Use and design of oil separators in surface water drainage systems.
- Structural design of modular geocellular drainage tanks – CIRIA (C680)
- British Standard BS 7533-13: 2009. Pavements constructed with clay, natural stone or concrete pavers – Part 13: Guide for the design of permeable pavements constructed with concrete paving blocks and flags, natural stone slabs and setts and clay pavers
- Source control using constructed pervious surfaces – CIRIA (C582)
- Interpave - Guide to the Design, Construction and Maintenance of Concrete Block Permeable Pavements
- Interpave - Understanding Permeable Paving
- All relevant Health and Safety Legislation, Codes of Practice and other relevant guidelines for the purposes of the safe operation and maintenance of the installations
- BS7671: 1992 Requirements for Electrical Installations
- IEE Wiring Regulations

As noted above, National standards and specified criteria for sustainable drainage have been drafted. This guide follows current best practice in the design and construction of SuDS. When the standards are formally implemented, this guide will be reviewed and updated if necessary.

This document is available on the internet at www.swindon.gov.uk/spd

It can be produced in a range of languages and formats (such as large print, Braille or other accessible formats) by contacting the Customer Services Department.

Tel: 01793 445500 Fax: 01793 463331 E-mail: customerservices@swindon.gov.uk

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