

Swindon Borough Council

SuDS vision for New Eastern Villages

Draft Supplementary Planning Document

www.swindon.gov.uk

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1 Introduction

1.1 Purpose of this guide

The Swindon Borough Local Plan Policy EN6 states that all developments will be expected to incorporate sustainable drainage systems, and that SuDS should seek to enhance water quality and biodiversity in line with the Water Framework Directive.

This guide has been created for use by developers and their agents to support pre-application discussions and masterplanning for sites within the Swindon New Eastern Villages development area, in line with Local Plan Policy EN6.

The guide sets out:

- The concept underpinning Sustainable Drainage Systems (SuDS)
- The vision for drainage in the New Eastern Villages
- The engagement and approval process
- How SuDS schemes should work in practice
- Design and construction guidelines

1.2 Structure of this guidance

This guide is divided into four sections which together form the SuDS vision for the Swindon New Eastern Villages.

Section 1: Introduction	Outlines the purpose of this guide and provides an overview of Sustainable Drainage Systems (SuDS), their purpose, techniques and management.
Section 2: SuDS vision	An introduction to the New Eastern Villages area outlining the vision for and objectives of drainage for the development. Specifies drainage principles which developers will be expected follow.
Section 3. SuDS design principles and local considerations	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. Funding and long term maintenance options	Focusses on the adoption of SuDS to allow long term maintenance, providing information on adoption models, the process for adoption and the acceptance criteria for SuDS approval.

The document is supported by a number of annexes containing further detailed information and referenced throughout.

1.3 Why incorporate SuDS?

It is a requirement of the National Planning Policy Framework (NPPF) (2012) that development should give “priority to the use of sustainable drainage systems” (Paragraph 103) and that:

“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 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](#)).”

Sustainable Drainage Systems: what are they?

SuDS are used as an alternative to conventional ways of managing drainage. In new developments they seek to mimic the way rainfall drains in natural systems.

SuDS play a critical role in flood and pollution prevention, add aesthetic and environmental value, and provide attractive natural amenities for the local community.

The Swindon Borough Local Plan Policy EN6 states that all developments will be expected to incorporate sustainable drainage systems, and that SuDS should seek to enhance water quality and biodiversity in line with the Water Framework Directive.

An effectively designed SuDS scheme can provide many additional benefits alongside flood risk management and improved resilience to our changing climate. Successful SuDS enhance the quality

Key requirements of Local Plan and Policy EN6

- A Flood risk assessment will be required for all developments in the New Eastern Villages
- 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 document.

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 increased discharge as a result of new development, but more than this they can draw the aesthetic and environmental character of those watercourses into the urban fabric, creating cohesion between a development and the landscape within which it sits.

The inclusion of source control measures as an integral part of the open space within 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
- Reduced maintenance costs

1.4 SuDS techniques

Sustainable drainage systems 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. Techniques include permeable paving, green roofs and bioretention areas.

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 filter strips and 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 Swindon New Eastern Villages 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.

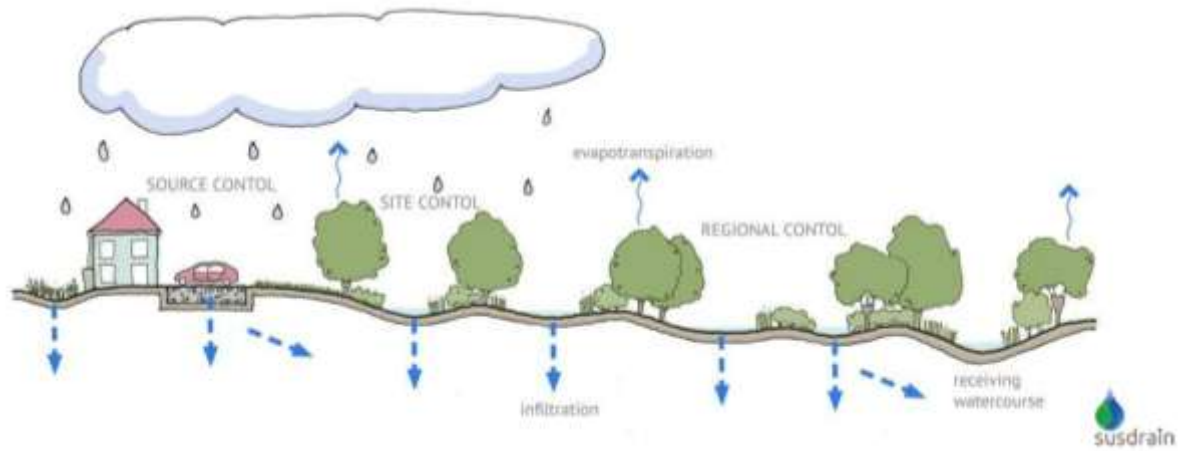


Figure 1 SuDS management train (www.susdrain.org)

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.

Only where water cannot be dealt with locally should excess flows be conveyed to area (site) or regional control such as end of line storage.

2 SuDS vision

2.1 Site location and characteristics

The site of the New Eastern Villages (NEV) development 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 Environment Agency (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 green infrastructure network will include existing watercourses and their



Figure 3 Wetland feature and meadow in new development

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 to 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 these open spaces also provide a sense of connectivity across the wider development, so that the New Eastern Villages 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 New Eastern Villages development

The effective design of drainage for the New Eastern Villages 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 New Eastern Villages; 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.

2.1 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 below summarises the main documents and their relevance to principles of the SuDS vision for Swindon Eastern Villages (further details of relevant legislation and guidance are provided in Appendix B). 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.

SuDS vision for New Eastern Villages

Section 2: SuDS vision

Table 2-1: Legislation and policy in relation to the SuDS vision for Swindon Easter Villages

Document(s)	Type	Summary	Relevance to Swindon New Eastern Villages
Land Drainage Act 1991 / Water Resources Act 1991	Legislation	Prior written consent by the Environment Agency is required for any proposed works or structures in, under, over or within 8m of the top of the bank of a Main river.	<ul style="list-style-type: none"> Consent will be required as appropriate. The Environment Agency seeks to avoid culverting and its consent for such works will not normally be granted.
The Water Framework Directive	Legislation	EU legislation designed to improve and integrate the way water bodies are managed throughout Europe.	<ul style="list-style-type: none"> Impacts of changes on water bodies should be mitigated to prevent deterioration of ecological status. SuDS can help achieve this through maintaining natural flow regime and providing water quality improvements to runoff.
The Water Environment Regulations 2003	Legislation	Implements the Water Framework Directive.	
Floods Directive 2007	Legislation	European Commission (Directive on the assessment and management of flood risks) 2007. Member States required to take adequate and coordinated measure to reduce flood risk	
Flood Risk Regulations 2009	Legislation	Implements the Floods Directive.	<ul style="list-style-type: none"> Take into consideration long term developments, climate change and sustainable land use practices in flood risk management. Regulations outline the roles and responsibilities of authorities in relation to flood risk management.
Future Water 2008	Strategy	Sets out Government vision for effective surface water drainage.	
Thames Catchment Flood Management Plan 2009	Policy	Established flood risk management policies which deliver sustainable flood risk management for the long term.	<ul style="list-style-type: none"> Strategy includes increased use of SuDS and above ground water management. Consideration of flood risk should inform the location, layout and design of new development.
Flood and Water Management Act 2010	Legislation	Creates a comprehensive risk based regime for managing risk of flooding from all sources.	<ul style="list-style-type: none"> Encourages the uptake of SuDS by removing the automatic right to connect to sewers. Provides for Lead Local Flood Authorities to adopt SuDS for new developments and redevelopments. As an LLFA, Swindon Borough Council will be responsible for approving all surface water drainage systems for new developments within a set of national standards set by the Government as well as specific local standards.
Surface Water Management Plan Technical Guidance 2010	Guidance	Guidance to support Local Authorities to assist them during coordination of local flood risk management activities.	<ul style="list-style-type: none"> Provides information on how to assess flood risk and management/mitigation measures.
Green Infrastructure Strategy for Swindon 2010-26 and Green Infrastructure Framework Guiding Principles (East Swindon) 2013	Policy	Plan to protect existing and create new green infrastructure in the Borough. Provides guiding principles for delivering integrated biodiversity, landscape and recreation resources.	<ul style="list-style-type: none"> Green corridor runs through the north of the Eastern Villages, use of SuDS can help protect and enhance this area. SuDS can be incorporated in landscape planning to create multi-purpose spaces.

SuDS vision for New Eastern Villages

Section 2: SuDS vision

Document(s)	Type	Summary	Relevance to Swindon New Eastern Villages
Building Regulations 2010	Legislation	Specifies how rainwater should be discharged.	<ul style="list-style-type: none"> Specifies priority order of rainwater discharge. SuDS can help achieve this.
National Planning Policy Framework 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.	<ul style="list-style-type: none"> 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.
National Planning Policy Framework Guidance	Guidance	Need to reduce the overall flood risk through the layout and form of the development and the appropriate application of sustainable drainage systems.	
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.
Thames River Basin District River Basin Management Plan	Policy	Sets out quality targets for local rivers and water courses and encourages the enhanced use of SuDS.	<ul style="list-style-type: none"> Use of SuDS to improve water quality of runoff should be considered.
Swindon Borough Local Plan 2026	Policy – Local	Main planning policy document for the Borough.	<ul style="list-style-type: none"> 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 (C697)	Guidance	Best practice guidance on planning, design, construction, operation and maintenance of SuDS to facilitate effective implementation.	<ul style="list-style-type: none"> 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.	<ul style="list-style-type: none"> Drainage proposals for NEV should comply with the objectives of the LFRMS, in particular: <ul style="list-style-type: none"> Ensure that actions and measures proposed to manage flood risk deliver multiple benefits, including environmental, social and economic
Swindon Water Cycle Study	Study	Undertaken to ensure proposed growth does not adversely impact on the existing water cycle. Uncertainty identified over the capacity of the river systems to accept an increase in treated effluent without causing water quality failures.	<ul style="list-style-type: none"> Use of SuDS to improve water quality of runoff should be considered.
Strategic Flood Risk Assessment Level 1 2008	Study	Evidence base to help locate new development.	<ul style="list-style-type: none"> Allows Swindon Borough Council to: <ul style="list-style-type: none"> Prepare appropriate policies for the management of flood risk

SuDS vision for New Eastern Villages

Section 2: SuDS vision

Document(s)	Type	Summary	Relevance to Swindon New Eastern Villages
			<ul style="list-style-type: none"> ○ Inform the sustainability appraisal so that flood risk is taken account of when considering options ○ Identify the detail required for site specific flood risk assessments ○ Determine the acceptability of flood risk in relation to emergency planning
Design standards and specifications	Standard	All surface water drainage needs to be designed and delivered in accordance with the latest appropriate British and other recognised standards, specifications and guidance documents.	<ul style="list-style-type: none"> • Design and construction of drainage for the NEV should comply with all relevant standards and specifications, including BS8582:2013.
Swindon TRfD	Policy	Defines the process and the standards to be used by third parties considering developments in the Borough	<ul style="list-style-type: none"> • Reference standards and specifications for developments
BS8582:2013: Code of practice for surface water management for development sites	Code of practice	BS 8582 gives recommendations on the planning, design, construction and maintenance of surface water management systems for new developments and redevelopment sites.	<ul style="list-style-type: none"> • Following BS8582:2013 demonstrates that the SuDS strategy complies with best practice

2.2 Key principles of the SuDS vision

A set of principles have been developed to support the SuDS vision for the New Eastern Villages and aid compliance with the legislative and policy requirements. Application of the principles, set out below, will contribute to achievement of the NEV objectives and enable SuDS to make a positive contribution to the environmental, social and aesthetic character of the development.

- 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
 - Design with the future in mind
 - Use 30% uplift on peak rainfall for climate change
 - Maintain or improve water quality
 - Incorporate water re-use
- Visual impact and amenity
 - Integrate with public spaces
 - Link to wider landscape
 - Enhance visual appeal of development
 - Provide amenity for residents and visitors
 - Offer wider community benefits (education, recreation, engagement)
- Biodiversity and ecology
 - Align with green corridors and local habitats
 - Mimic natural drainage paths
 - Deliver biodiversity benefits during operation, and prevent negative impacts during construction
 - Use low impact materials
 - Use existing ditches and maintain existing ordinary watercourse and main river alignment
 - No negative impact on watercourse hydromorphology both during construction and operation
- Health and safety
 - Use shallow gradients, with a maximum of 1:5
 - 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, and remove the need for specialist machinery for maintenance

2.3 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 summaries of the character of each of the NEV islands with examples of the types of SuDS that would match the character of that island. Further details regarding the types of measures considered appropriate for each island are given in Annex A1 – A6 along with maps of each island.

2.3.1 Great Stall West

Great Stall West lies in the west of the New Eastern Villages and is bounded to the west by the A419 and to the north by the A420. The 71.7 ha development site will be highly visible from the A420 and the A419, so will act as a shop window to the NEV development. Incorporation of visually appealing green infrastructure and SuDS, such as green roof and walls and bioretention cells will help ensure that the front presented to the A420 is attractive and welcoming.

Residential densities in Great Stall West will be among the highest of the NEV development. Apartment blocks are likely to form a proportion of the development in order to achieve the densities required. The types of SuDS used should be suitable for a high density urban environment, making use of 'space saving' options such as green roofs and walls, tree pits or rain gardens, rainwater harvesting and permeable paving. SuDS such as tree pits and linear rain gardens along roads will create attractive streetscapes which will act as strategic gaps in the line of development, drawing the eye into the site making it inviting to passers-by. Roof gardens on apartment blocks create communal outdoor spaces for residents without reducing developable land. Parking spaces should make use of permeable paving with subsurface storage, to which areas unsuitable for such measures (due to higher density traffic) can drain to.

Great Stall West includes a 12 hectare District Centre as well as the main employment allocation for the NEV, so there will be opportunities for the larger roof spaces associated with employment uses to include rainwater harvesting or green roofs, and for permeable paving, filter drains and tree pits to be incorporated in parking or other communal areas.

The flood zone to the south and east of the site as well as a large part to the south of the site lies within a strategic green corridor/ sub regional green infrastructure link. The use of green infrastructure based SuDS (e.g. tree pits, green roofs, swales) throughout the site would serve a dual purpose (thereby reducing land take), contributing to other policy objectives such as creating green corridors and enhancing biodiversity.

2.3.2 Great Stall East

Great Stall East lies in the east of the New Eastern Villages 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 45.24 ha in area (as per NEV land budget) and naturally drains predominantly to the River Cole which runs along the southern edge of the development area.

Great Stall East will be visible from the A420 as it runs along the northern boundary. These parts of Great Stall East will act as a shop window to the development and it is therefore essential that the

right tone is set through high quality design and materials, and visually appealing green infrastructure and SuDS.

Residential densities in Great Stall East will be among the highest of the New Eastern Villages, ranging from 40 to 50 dwellings per hectare in some parts. Apartment blocks are likely to form a proportion of the development in order to achieve the densities required, and green infrastructure based SuDS can be used to help ensure that the front presented to the A420 is attractive and welcoming. The types of SuDS used in these areas should be suitable for a high density urban environment, making use of 'space saving' options such as green roofs and walls, linear tree pits or rainwater harvesting, rain gardens, and permeable paving. This type of feature will help to create a contemporary and attractive design for this part of the development, whilst offering many wider benefits such as reducing noise and air pollution, regulating building temperatures, providing recreational areas for residents and employees, and making a positive contribution to public health and wellbeing. Tree pits and linear rain gardens within roads and parking areas will create attractive streetscapes which will act as strategic gaps in the line of development, drawing the eye into the site making it inviting to passers-by. Roof gardens on apartment blocks create communal outdoor spaces for residents without reducing developable land, and have been shown to improve community cohesion within a development.

Development density will reduce towards the eastern edge of Great Stall East, and SuDS features which help to soften the urban character will be more appropriate here. Larger scale, above ground conveyance and attenuation SuDS features such as swales, rain gardens and basins will help create connected spaces, enabling the urban 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. The north-eastern corner of Great Stall East will form an entry point not only to the New Eastern Villages, but also to Swindon and Wiltshire, and effectively designed SuDS can play a key role here in helping to create an attractive development which is sympathetic to the character of the adjacent green infrastructure.

The flood zone to the south and east of the site as well as a large part of the south of the site lies within a strategic green corridor/ sub regional green infrastructure link. Selection of appropriate SuDS within the green corridor would serve a dual purpose (thereby optimising the land take required), and the use of green infrastructure based SuDS throughout the site would help link the developed area with the green corridor, contributing to other policy objectives such as creating green corridors and enhancing biodiversity.

2.3.3 Upper Lotmead

Upper Lotmead lies in the west of the New Eastern Villages and is bounded to the west by the A419. It lies alongside the historic Roman settlement of Durocornovium which is a scheduled monument. A heritage park, spanning the A419, is intended to help preserve the underground remains of the site. As such 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.

Upper Lotmead will be a residential development and with the A419 to the west and the employment hub to the north it is likely that the properties will face towards the north east, east and south. The placement and landscaping of shallow attenuation areas in the form of wetland areas would help enhance these vistas.

For this entirely residential development the use of SuDS such as linear tree pits, rain gardens, and permeable paving along residential roads will help to create an attractive living space for residents and offer wider benefits such as reducing noise and air pollution, regulating building temperatures and making a positive contribution to public health and wellbeing.

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 and tree pits) within the green corridor would serve a dual purpose (thereby optimising the land take required), and their use throughout the site would help link the developed area with the green corridor, contributing to other policy objectives such as creating green corridors and enhancing biodiversity. A tiered swale within a linear green infrastructure corridor could provide a public right of way cycleway, utility corridor alongside storage, conveyance and biodiversity benefits.

2.3.4 Lotmead

Lotmead lies in the centre of the New Eastern Villages. It is likely to be an inwardly looking development, focussed around the Village Centre and primary school. These facilities will not only serve residents of Lotmead but will draw the residents of Upper Lotmead and Lower Lotmead. Attractive, multifunctional SuDS in these publically owned spaces will benefit not only residents of Lotmead but of those from other development areas who make use of the facilities. Rainwater harvesting systems will be appropriate for use on public buildings, and green infrastructure SuDS which enhance visual appeal should be used in communal areas, for example tree pits, green roofs and walls, and rain gardens. Attractive above ground conveyance features such as cascades should 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.

Strong transport links will be required to link Lotmead to its neighbouring developments and to Great Stall and the A420 in the north. Use of green infrastructure SuDS such as tree pits, linear rain gardens, filter strips, planted channels along roads is recommended to create attractive streetscapes 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.

The northern part of Lotmead lies within a strategic green corridor/sub regional green infrastructure link. Given the River Cole to the north and the Education Campus to the north east, this northern section is likely to be more outward facing. Selection of appropriate SuDS within this green corridor will help to maximise views of the area. SuDS in this area should serve a dual purpose (thereby optimising the land take required), and the use of green infrastructure based SuDS throughout the site will help link the developed area with the green corridor, contributing to other policy objectives such as creating green corridors and enhancing biodiversity.

2.3.5 Lower Lotmead

Lower Lotmead will be a small village in the east of the New Eastern Villages. With a rural setting, it will benefit from views along its eastern edge to open countryside and is likely to be an informally structured village with space between properties to make the most of these vistas. Whilst the development is likely to be more outward focussed to make the most of the views across the countryside it is important that the village sits sensitively within its landscape, so that views back towards Lower Lotmead show a gradual transition between the built and rural environment. 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 urban development; helping 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.

Residents of Lower Lotmead will not be served by a village centre or school within the development, but will rely on facilities within Lotmead to the west. Attractive and safe footpaths and cycle links with Lotmead will need to be provided to encourage residents to travel in an environmentally responsible manner to these facilities. Use of SuDS along the length of these will create attractive streetscape and provide wider benefits including reduction in noise and air pollution from neighbouring road links. Elements such as linear rain gardens and permeable paving are encouraged in these areas. A tiered swale within a linear green infrastructure corridor could provide a public right of way cycleway, utility corridor alongside storage, conveyance and biodiversity benefits.

2.3.6 Redlands

Redlands lies on the south east edge of the New Eastern Villages and is bounded to the southwest by the Wanborough Road. Further west lies Foxbridge, to the north west lies Lotmead, and to the North, Lower Lotmead. One of the smaller plots of the development, Redlands is 13.6 ha in area (as per NEV land budget) and naturally drains to the River Cole via channels running to the east of the Lower Lotmead development area.

Located close the village of Wanborough, Redlands will be a small hamlet that should be discrete and sympathetic to the local landscape. The adopted Landscape Character SPD (2004) will help inform a development which respects its proximity to near neighbours, appears naturally settled within its rural landscape and is spacious enough to allow views to the open countryside. Selective use of SuDS will help to enhance the existing landscape setting; using SuDS as part of an appropriate planting regime, following existing field patterns and hedgerows, will help to enhance biodiversity of the area.

Public realm in the form of village squares and greens are expected to be integral to the hamlet's layout and SuDS in these areas can be used to provide several functions in one space thus optimising land use, not only managing surface water, but adding to the distinctive character of the rural hamlet and providing health and wellbeing benefits as well as reducing air pollution and benefitting biodiversity.

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 serve a dual purpose (thereby optimising the land take required), and would help link the developed area with surrounding landscape, softening the edges of the development and helping to

Section 2. Key principles

protect the character and identity of nearby Wanborough, Bishopstone and Bourton. It would thus contribute to other policy objectives such as creating green corridors, enhancing biodiversity and maintaining the non-coalescence zone as defined in Policy NC3.

2.3.7 Foxbridge

Foxbridge lies at the southern tip of the New Eastern Villages. Along its western edge the site is bounded by the A419. As a result of the proximity to this road significant noise attenuation will be required. Incorporation of green infrastructure type SuDS such as tree pits along this eastern edge would complement the existing vegetation, helping with the noise attenuation, improving air quality and creating an attractive divide between the residential development and the road.

The safeguarded route of the Wilts & Berks Canal (see Figure 4) cuts 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 where supported by Wilts and Berks Canal Trust.

The other key feature of the development is likely to be the primary school. As a building in frequent use, rainwater harvesting is likely to be suitable and could be fed from both roofs and hardstanding.

Green roofs are also encouraged for the school and supporting buildings. Permeable paving should be used for all non-trafficked hardstanding and car parking, and green walls, swales, raingardens, tree pits and planted channels should be incorporated into the landscaping of the area.

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 and walls and tree pits, along this eastern edge would serve a dual purpose (thereby optimising the land take required) helping link the developed area with its rural surroundings and contributing to other policy objectives such as creating green corridors and enhancing biodiversity.

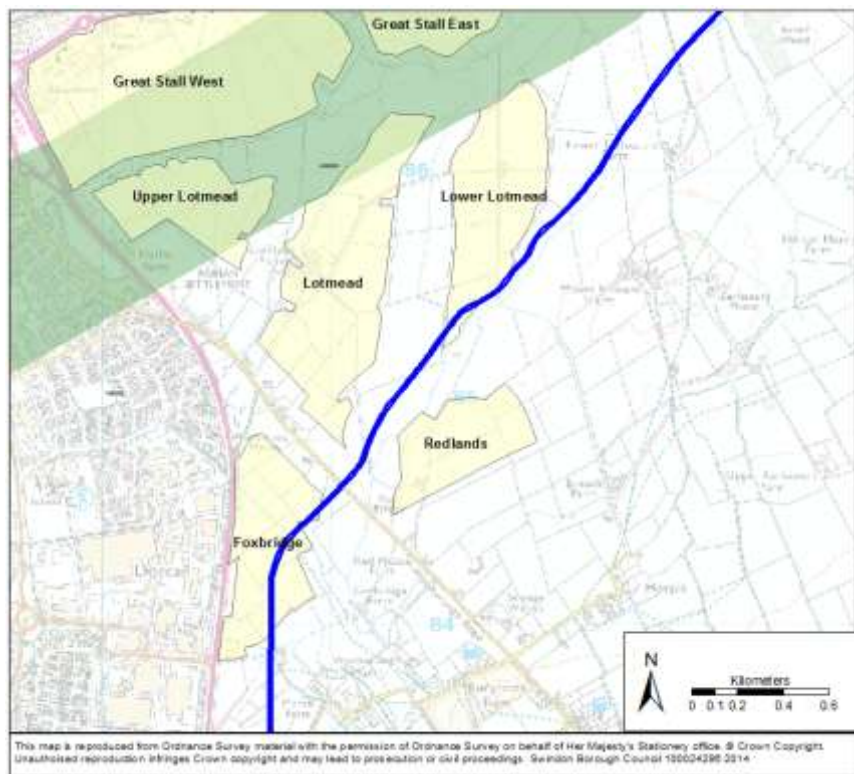


Figure 4 Wilts and Berks Canal safeguarded canal route

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 New Eastern Villages; however, other opportunities for development / redevelopment within the Borough of Swindon are strongly encouraged to follow this approach where practicable.

The SuDS planning and design checklist available from CIRIA C697 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 masterplanning process. It is strongly recommended that the checklist is 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 by the appropriate Case Officer, 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 New Eastern

SuDS should be an integrated component of Masterplans, design frameworks, regulatory plans, design codes and design briefs. The site design process, including the layout and characterisation of its structures and spaces, provides the opportunity and ability to address the sustainable management of water.

The options for, and the layout of, the SuDS scheme should be assessed at the very start of a development project in order to:

- make best use of the topography for routing and storing water;
- maximize opportunities for using space in a multi-functional way;
- enable water storage and conveyance zones to form part of the character of the development;
- provide the greatest opportunity for the drainage system to deliver multiple planning, social and environmental benefits;
- minimise life cycle (including design) costs of the SuDS scheme and development as a whole;
- facilitate the use of the SuDS scheme in supporting future urban adaptability to climate change (Draft BS8582)

The SuDS Manual (CIRIA): SuDS planning and design process (RP992/15)

http://www.susdrain.org/resources/SuDS_Manual.html

Villages.

3.1 Fundamental requirements

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

The drainage design for Swindon NEV must protect people and properties against flooding from all sources; watercourses, overland flows and the drainage system itself.

In accordance with the Swindon 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, outdoor sports and recreation and associated essential facilities such as changing rooms. 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 although (excepting the aforementioned) not located in areas at high or medium risk of flooding (Flood Zones 2 or 3). The necessity to deliver any development within Flood Zones 2 and 3 (including the historic flood map) will need to be fully justified within a Flood Risk Assessment (FRA), and in line with assessments and tests as set out by the NPPF and accompanying Planning Practice Guidance: Flood Risk and Coastal Change.

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

Low rainfall: There should be **no discharge from 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 will retain the 5mm of rainfall will be retained on site, in addition to the other requirements below.

High rainfall: The volume of runoff must not be greater than the greenfield runoff for the 1 in 100 year, 6 hour rainfall event, and the peak flow rate discharged must not be greater than greenfield runoff rate for each of the following:

- 1:1 year rainfall event for all rainfall return periods up to the 1 in 100 year event;
- 1:100 year rainfall event for return periods above the 1 in 100 year event(including climate change)

In complying with these peak flow rate restrictions the critical duration rainfall event for the site drainage must be used in determining the maximum storage volume.

The development is located in an area of low to no infiltration and locally high groundwater levels, so unless local ground investigation proves otherwise it has been assumed that infiltration SuDS features will not play any significant role in the drainage of the NEV. As infiltration will be limited, the long term storage requirement must also be calculated and provided for. Any SuDS strategy that

incorporates infiltration should complete an infiltration assessment checklist as specified in CIRIA C697.

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 flowpaths. Developers must also consider the possibility that their design for surface water may fail and design a backup plan for this eventuality. Overland flow should be routed away from vulnerable areas specified in Flood Risk and Coastal Change Planning Practice Guidance Table 2. For guidance on good practice in designing for exceedance refer to CIRIA report C635 and C738. For acceptable depths and rates of flow refer to FD2320/TR2 'Flood risk assessment for new development phase 2', Environment Agency 2006. Existing surface water or combined sewers within or near a proposal site should not be assumed to have capacity for additional 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 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 in section 3.1 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
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 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 1% (1:100) rainfall event (to be determined in consultation with the Environment Agency) then within 24 hours of top water level being attained in a 1% (1:100) probability flood event the regulation facility must be capable of storing 80% of the additional run-off arising from a 10% (1:10) probability flood. In

addition, the drainage system should be designed to operate without flooding during a surcharged condition.

Developers must demonstrate that runoff water quality 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 must be 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 that water quality is protected during the construction of the drainage system.

Developers must demonstrate that proposals maximise opportunities to improve the drainage arrangements in the area and reduce the risk of flooding to neighbouring communities where practicable. This is particularly pertinent to proposals on the west of the NEV, where land should be made available to reduce the risk of fluvial flooding in existing residential areas of east Swindon. Opportunities must be thoroughly investigated and unless proved impracticable it 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 is not operation/maintenance loaded.

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 C697), in particular:

- Performance – quantity and quality (CIRIA C697 Sections 3.2 and 3.3)
- Visual impact and amenity (CIRIA C697 Section 3.4.3)
- Biodiversity and ecology (CIRIA C697 Section 3.5)
- Health and safety and maintenance (CIRIA C697 Section 3.4.2)

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

Table 2 summarises how the SuDS vision and expectations set out above should be applied in practice.

Table 2 SuDS design expectations

Surface type	Expectations
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¹ <http://www.standardsforhighways.co.uk/dmr/>

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.

SuDS vision for New Eastern Villages

Section 3. SuDS design principles and local requirements

Surface type	Expectations
Residential development (open market and affordable units)	
Roof	<ul style="list-style-type: none"> • Property scale rainwater harvesting and green roofs must be considered for multiple occupancy buildings (flats). • Rainwater harvesting and green roofs should be considered for all residential properties. • If rainwater harvesting is not incorporated, the developer must justify why this is not viable. • Where the above is not 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. • Where neither of the above is feasible (e.g. terraced housing with limited or no garden), rain garden planters should be considered to intercept downpipe flows
Hardstanding	<ul style="list-style-type: none"> • 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. • 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. <p>Section 3.3 provides examples of appropriate SuDS that are appropriate for draining areas of hard standing.</p>
Community assets e.g. Local Centre, District Centre, Leisure/Pool, Others (ToysRus), Truck Stop, Park & Ride	
Roofs	<ul style="list-style-type: none"> • Rainwater harvesting and greywater recycling for toilet flushing must be considered at all community properties in frequent use where there is regular demand for water, including for example community halls, surgeries and schools. This could include recycling runoff from parking and other hardstanding areas. If rainwater harvesting / greywater recycling is not incorporated, the developer must justify why this is not viable • Where available roof area exceeds that required for (usage appropriate) rainwater harvesting, green roofs must be considered for the remainder of the roof area. • Where appropriate, SuDS features associated with community assets and public open space can be oversized to provide regional scale SuDS. • 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

SuDS vision for New Eastern Villages

Section 3. SuDS design principles and local requirements

Surface type	Expectations
	the intended use of the public open space.
Hardstanding	<ul style="list-style-type: none"> • 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 • 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. • 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. <p>Section 3.3 provides examples of appropriate SuDS that are appropriate for draining areas of hard standing.</p>
Commercial (e.g. warehousing)	
Roofs	<ul style="list-style-type: none"> • Rainwater harvesting and greywater recycling for toilet flushing must be considered at all commercial properties in frequent use where there is regular demand for water, including for example offices, or a logistics sites with a large demand for water for vehicle washing. This could include recycling runoff from parking and other hardstanding areas. If rainwater harvesting / greywater recycling is not incorporated, the developer must justify why this is not viable. • Where available roof area exceeds that required for (usage appropriate) rainwater harvesting, green roofs must be considered for the remainder of the roof area. • Should the source control features above not provide enough attenuation, any additional attenuation required must be provided within the curtilage of the site.
Hardstanding	<ul style="list-style-type: none"> • 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 (eg permachannel) to source control features such as bio-retention systems. • Should the source control features above not provide enough attenuation, any additional attenuation required must be provided within the curtilage of the site. <p>Section 3.3 provides examples of appropriate SuDS that are appropriate for draining</p>

SuDS vision for New Eastern Villages

Section 3. SuDS design principles and local requirements

Surface type	Expectations
	areas of hard standing.
Other surface runoff	
Lightly trafficked roads (e.g. cul-de-sacs, small residential roads, courtyards)	<ul style="list-style-type: none"> • Must drain to green spaces adjacent to highway (source control using swales and filter strips or profile roads to planted shrub tree areas/bioretention areas) or permeable paving where light traffic roads make it feasible. Over the edge drainage is preferred, although special consideration Special consideration should be given at low points, or flat areas to ensure highway flooding does not occur. <p>Section 3.3 provides examples of appropriate SuDS for highway drainage.</p>
Public rights of way	<ul style="list-style-type: none"> • 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 Special consideration should be given at low points, or flat areas to ensure highway flooding does not occur. <p>Section 3.3 provides examples of appropriate SuDS for highway drainage.</p>
Other public highway	<ul style="list-style-type: none"> • Must discharge to an overland conveyance system, with an appropriate treatment train • 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. <p>Section 3.3 provides examples of appropriate SuDS for highway drainage.</p>
Car parks – public / communal parking areas	<ul style="list-style-type: none"> • 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 • 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). <p>Section 3.3 provides examples of appropriate SuDS for highway drainage.</p>
Public open space	<ul style="list-style-type: none"> • 100% of 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 • 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. • SuDS should be designed as an integral part of the public open space and

SuDS vision for New Eastern Villages

Section 3. SuDS design principles and local requirements

Surface type	Expectations
	<p>preference should be given to drainage features which positively contribute to amenity, biodiversity and aesthetic value.</p> <ul style="list-style-type: none">• SuDS that provide a shallow waterplay area should be considered as part of Swindon Local Landscape areas for play (as defined in Appendix3 of the SBC Local Plan 2026), subject to an appropriate SuDS treatment train upstream of the play area. <p>Section 3.4 provides examples of appropriate SuDS in public open space.</p>
Underpasses	<ul style="list-style-type: none">• 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.
Flood zones	
Flood zone 3	<p>Flood zone 3, where it is outside the extent of the normal wetted river channel, is suitable for the following uses:</p> <ul style="list-style-type: none">• Open bridge parapets• Natural wetlands and conservation areas used to provide additional treatment for runoff from SuDS outfalls
Flood zone 2	<p>Flood Zone 2 where it is outside the 100yr + climate change flood extent is suitable for the following uses:</p> <ul style="list-style-type: none">• Public rights of way and cycle paths, subject to them being adequately drained to prevent waterlogging in normal weather conditions• Compensatory flood storage for loss of floodplain due to bridge structures located within the 100yr + climate change floodplain

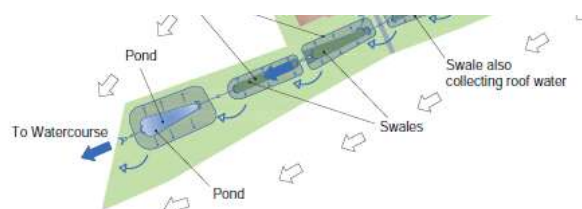
3.2 Integrating SuDS into the built environment

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.

Many features of new developments can be designed to provide a SuDS function in addition to their primary purpose. For this to be effective



Figure 5 Watercourse delineating a row of properties



though, SuDS must be considered at the earliest possible stage in masterplanning. If planned from the outset, much of the highway and green space can also provide a drainage role. Figure 5 shows how an urban watercourse can be integrated into a new development, providing conveyance, biodiversity, water quality and amenity benefits.

Figure 6 shows an example development parcel, highlighting how SuDS can be successfully integrated into the urban environment when masterplanned at an early stage.

3.2.1 Missed opportunities

The examples below show how a poorly designed development fails to make use of opportunities for integrating SuDS into the built environment. Figure 7 shows a raised development with 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 6 Integrated SuDS masterplan

Figure 8 shows a watermeadow and amenity pond. The watermeadow and pond provide significant amenity and biodiversity benefit, but have not been designed to provide a drainage function.



Figure 7 Missed opportunity: SuDS potential in general green space



Figure 8 Missed opportunity: pond

Figure 8 shows a watermeadow and amenity pond. The watermeadow and pond provide significant amenity and biodiversity benefit, but have not been designed to provide a drainage function.

Figure 9 shows a new development with a stone channel along the public highway between the pavement and the road. This discharges into a gully pot on a positive drainage system. The continuation of the strip of land that the stone channel is within becomes a grass verge further down the road. This stone channel could have provided as an underdrained swale within a grass verge, providing water quality and visual amenity benefits over the as constructed system.



Figure 9 Over the edge paved swale

Figure 10 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 filter drain could have been designed to drain the highway as well, removing or reducing the need for a conventional positive drainage in this location.

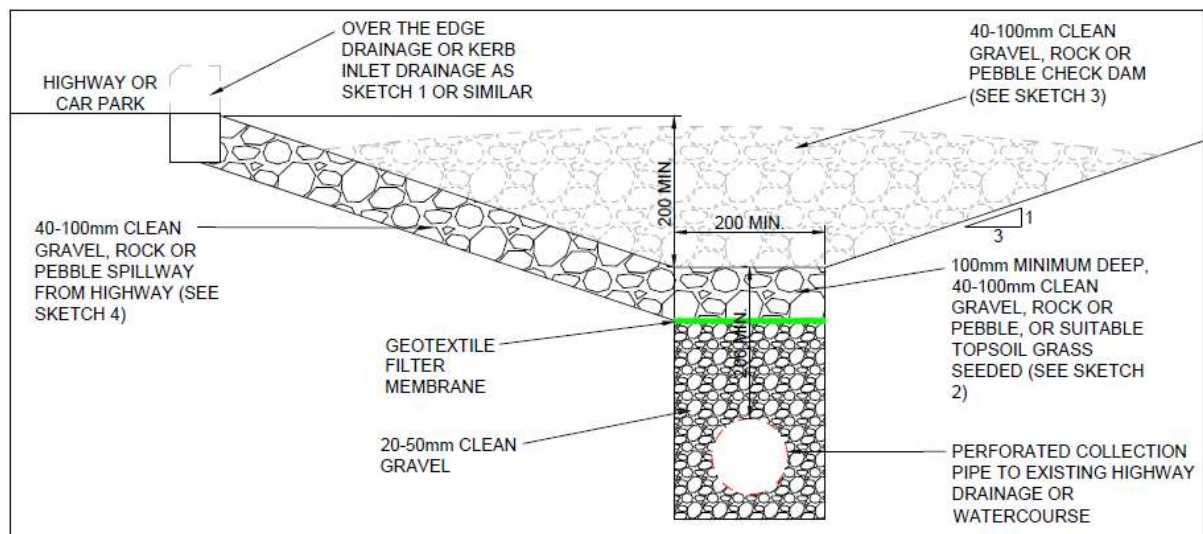


Figure 10 Filter drain not providing drainage for highway

3.3 SuDS, highway drainage and car park drainage

Wherever possible, highway drainage should be provided via underdrained shallow swales with check dams and filter strips. Where groundwater levels are known to be historically high, then the swales will need to be lined to prevent groundwater ingress. Figure 11 shows a cross section detailing SBC's requirements for swales.

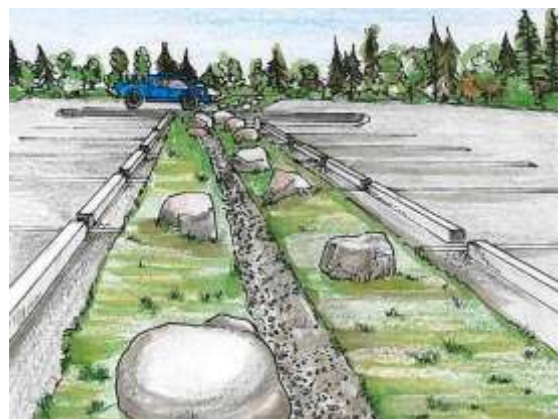
Section 3. SuDS design principles and local requirements



Sketch 1



Sketch 2



Sketch 3



Sketch 4

Figure 11 Example swale detail

Where hard edges are required for the public highway, over the edge drainage into swales is preferred to raised kerbs. Figure 12 shows an example of block paved edging strips being used to provide over the edge drainage.



Figure 12 Inlet Kerb providing over the edge drainage

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 the swale. Figure 13 below shows an example of where drop kerbs are used to provide a simple inlet into the roadside swale.



Figure 13 Use of drop kerb to provide inlet

For public highways in a more rural setting, soft edges with over the edge drainage into swales will be appropriate. Figure 14 shows an example of over the edge drainage on a soft verge.



Figure 14 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 15 below shows examples of bioretention cells and raingardens providing a traffic calming benefit.



Figure 15 SuDS as traffic calming

Roof drainage from residential properties will be permitted into swales draining the highway, subject the roof drainage draining over or through permeable paving. Wherever possible roof drainage should be kept on or near the surface to facilitate it draining into swales and filter strips, as shown in Figure 16.

Alternatively roof drainage can be drained into linear raingardens as shown in Figure 17.



to

Figure 16 Roof drainage onto permeable paving (courtesy of SusDrain)

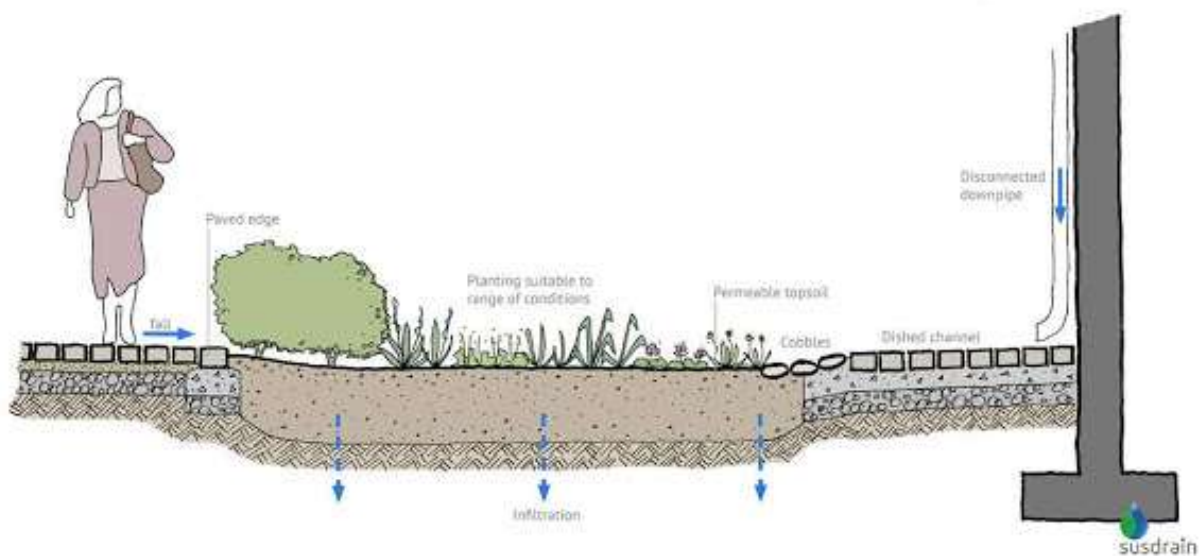


Figure 17 Drainage into linear raingardens (courtesy of SusDrain)

Section 3. SuDS design principles and local requirements

Bioretention 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 (18 and 19) are examples where highway drainage has been or could be 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 18 Example of regional scale swale with concrete channel. This channel could be configured to be a public footpath or cyclepath.



Figure 19 Example of roadside bioretention cell providing biodiversity benefits.

3.4 SuDS and public open space

Flood zone 2 in the New Eastern Villages can be used for outdoor sports facilities and 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. Should underdrainage be required to meet this requirement, downstream attenuation must be provided to ensure no increase in rate of discharge to the watercourse. The banks of any storage area must be no greater than 1:5, and there should be a graduated transition from horizontal to the bank for maintenance reasons. “A good example is shown in Figure 20 below, which comprises a playing fields in Witney, which has a secondary purpose as surface water flood attenuation.”



Figure 20 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 21 below³.

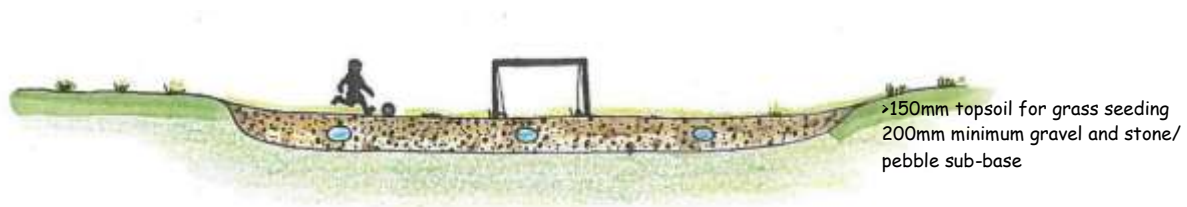


Figure 21 SuDS and recreational areas

If a horizontal playing surface is not required, appropriately spaced shallow underdrained swales would be appropriate, as shown in Figure 20 below

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>

Section 3. SuDS design principles and local requirements

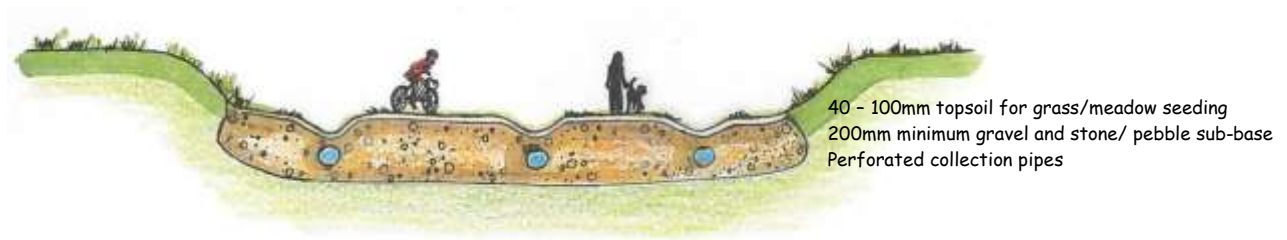


Figure 22 Swales in public open space

Shallow waterplay features, as shown in Figure 23 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.

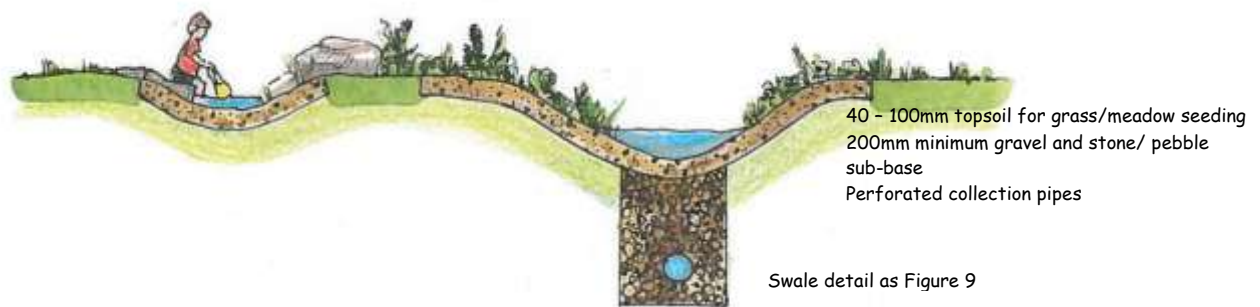


Figure 23 SuDS and waterplay

The planting of any open space drainage features should be considered at an early stage in the masterplanning process. Where the feature is to provide a recreational use function, then a grassed underdrained surface will be required, and the design should ensure access for sit-on grass cutters. If the feature is in general open space and not required to provide a recreational function, the area could be seeded with a more natural meadow mix requiring less or no cutting.



Figure 24 swale/urban watercourse with natural planting providing green infrastructure corridor

Car parking for public open space and community buildings must use permeable surfaces. Where appropriate for the use type, informal surfaces and drainage will be acceptable. Figure 23 shows



railway sleepers and gravel drainage being used for car parking in a country park.

Figure 25 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 26 and 27 below shows examples of new developments where detention ponds or retention basins have been designed to provide amenity value.



Figure 26 Regional scale wetland area providing visual amenity, water quality and biodiversity benefits adjacent to major public open space area.



Figure 27 Regional scale detention basin providing visual amenity, water quality and biodiversity benefits, with public right of way along bank area.

3.5 SuDS design assessment and approval process

The flow charts below (Figures 28 and 29) illustrate the assessment and approval process for SuDS within NEV.

Developers submitting applications relating to the NEV will be expected to comply with Policies NC3 and EN6 from the Swindon 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 C697. The developer must demonstrate adequate consideration of the following matters⁴.

Use of the scheme design assessment checklist provided in CIRIA C697 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

- Available area for surface water management measures
- Hydrogeology of the site

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.

- 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 Environment Agency for any structures in, under, over or within 8 metres of main rivers, and from SBC for any structures (bridges, outfalls, channel modifications) which have the potential to affect the flow in an ordinary watercourse (refer to Local Flood Risk Management Strategy on www.swindon.gov.uk/localfloodrisk for more information).

Developers should demonstrate that adequate SuDS treatment stages have been provided to ensure water quality of receiving waters.

Developers should demonstrate that any required Third Party drainage consents have been approved in principle.

Developers should demonstrate that adequate easements have been made for all future maintenance requirements (including replacement at the end of the assets life).

Developers will be expected to provide full details of any drainage assets associated with their proposal for inclusion on the LLFA flood risk asset register. The data should be provided to the level of detail specified in HD43/04 and provided in an open data format.

Developers should demonstrate that the design of all assets has been optimised based on a whole life cost approach and is not operation/maintenance loaded. This is particularly important for assets that will be adopted.

Section 3. SuDS design principles and local requirements

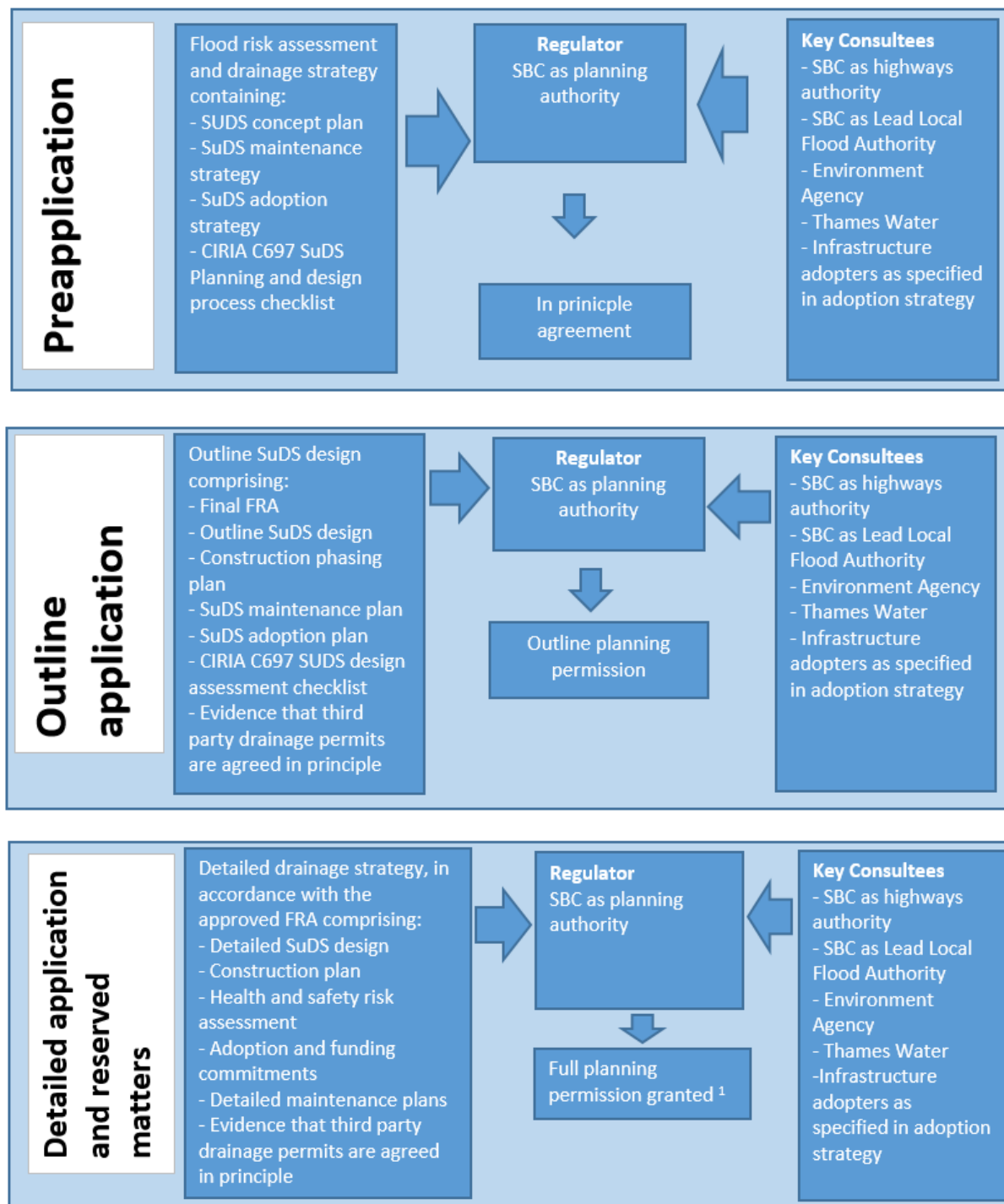


Figure 28 SuDS and planning approval process

(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.

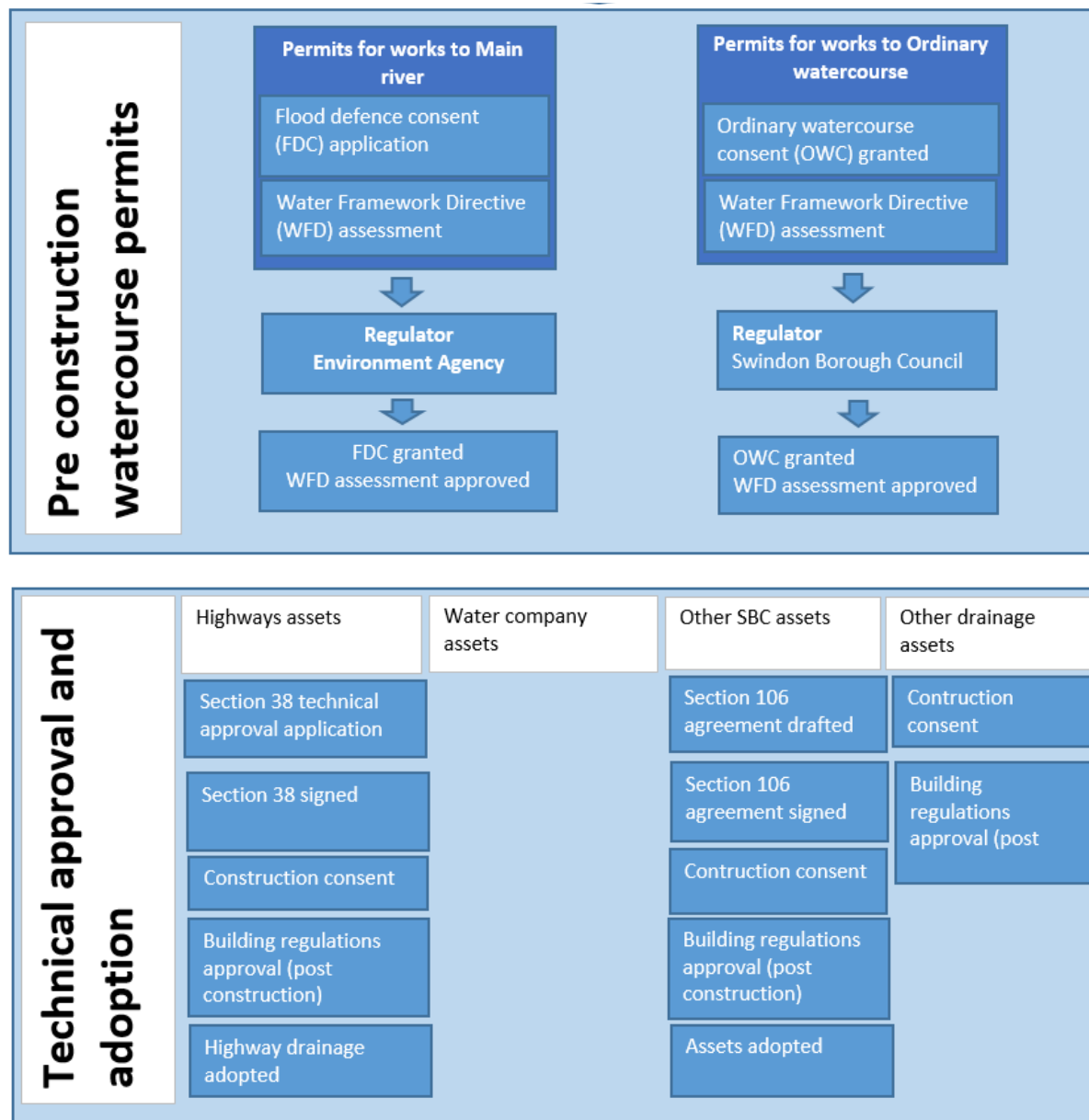


Figure 29 SuDS Permits and technical approvals

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.

Section 3. SuDS design principles and local requirements

- 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 assets) is strongly recommended for all assets, and required for adoptable assets.

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.

3.6 Design standards

3.6.1 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.

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.

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.

Use of the design checklists for each of the SuDS components provided in CIRIA C697 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 these checklist is submitted with the detailed planning application, or as part of the technical approval process.

⁵ <http://www.standardsforhighways.co.uk/dmr/>

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.

Swindon Borough 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 roadside swales and permeable paving as part of the highways drainage infrastructure, and it is likely that these features would also be used to drain runoff from non-highways assets.

Any SuDS features offered for adoption by SBC under Section 38 must be accompanied by the relevant component checklist from CIRIA C697. 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 C697, and a commuted sum to cover future maintenance of the system will be required.

The Swindon transport requirements for new development (TrFD) document is currently being updated, and is due for publication later in 2015. This document will provide further guidance on standards for highways assets.

4 Funding and long term maintenance options

4.1 Why adoption is important?

The adoption of SuDS is important for their continuing effective function and purpose. Appropriate adoption 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 for a development requiring that provision is put in place so that the SuDS to be constructed will be maintained to a minimum level of effectiveness. To be effective a maintenance option must:

- clearly identify who will be responsible for maintaining the sustainable drainage systems and funding for maintenance should be fair for householders and premises occupiers, and
- set out a minimum standard to which the sustainable drainage systems must be maintained.

A suite of potential adoption 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 sustainable drainage systems and sustainable maintenance. The list is not exhaustive so as not to preclude innovation.

It is the developers' responsibility to provide for the long term maintenance of the sustainable drainage systems themselves or to negotiate with, and secure the agreement of, a third party to maintain the sustainable drainage systems for the life of the development.

Swindon Borough Council's preferred option is for one, or a small number of management companies to be set up by the developers. These management companies 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)

4.2 Possible adoption models

4.2.1 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.

Potential funding options:

- 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/Not-for-profit companies which could also serve as Maintenance Companies.
- d. Consider opportunity for Developers to work with SBC, parish councils and Thames Water to set up a 'New Eastern Villages Green Infrastructure Management Company'.
- e. In partnership with SBC and/or parish councils
- f. Bonds to adopt and manage infrastructure

4.2.2 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 includes sustainable drainage systems. The legal basis 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 Thames Water and a developer agreed, the developer could build (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 means 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, all bill payers would benefit. These charges 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 ones billed and the amount would not be regulated by Ofwat.

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

4.2.3 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 provides 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.

Potential Funding Options:

- a. Through business rates
- b. Through 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

Section 4. Funding and long term maintenance options

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 adoption in a number of scenarios.

Type	Features	Adoption/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 her 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: <ul style="list-style-type: none"> • 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 Canals and rills	Will be adopted by Highway Authority (SBC) – maintained through roads contractor

	Permeable paving Communal rainwater harvesting	
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

4.2.4 Private individuals (for single property SuDS features)

The owners/occupiers of properties drained by SuDS that do not also drain other properties should 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).

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

Where the sustainable drainage systems are simple systems involving minimal or no proprietary products, easy to maintain and serving only a small numbers of properties, the owners of those properties should agree to maintain the SuDS collectively.

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

5 Annex A1 – Great Stall West

Great Stall West lies in the west of the New Eastern Villages and is bounded to the west by the A419 and to the north by the A420. To the south of Great Stall West lies the Lot Mead development area and to the east lies Great Stall East. The development site is 71.7 ha in area (as per NEV land budget) 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 A1 illustrates the location of Great Stall West, location of natural drainage paths and the EA flood zones.

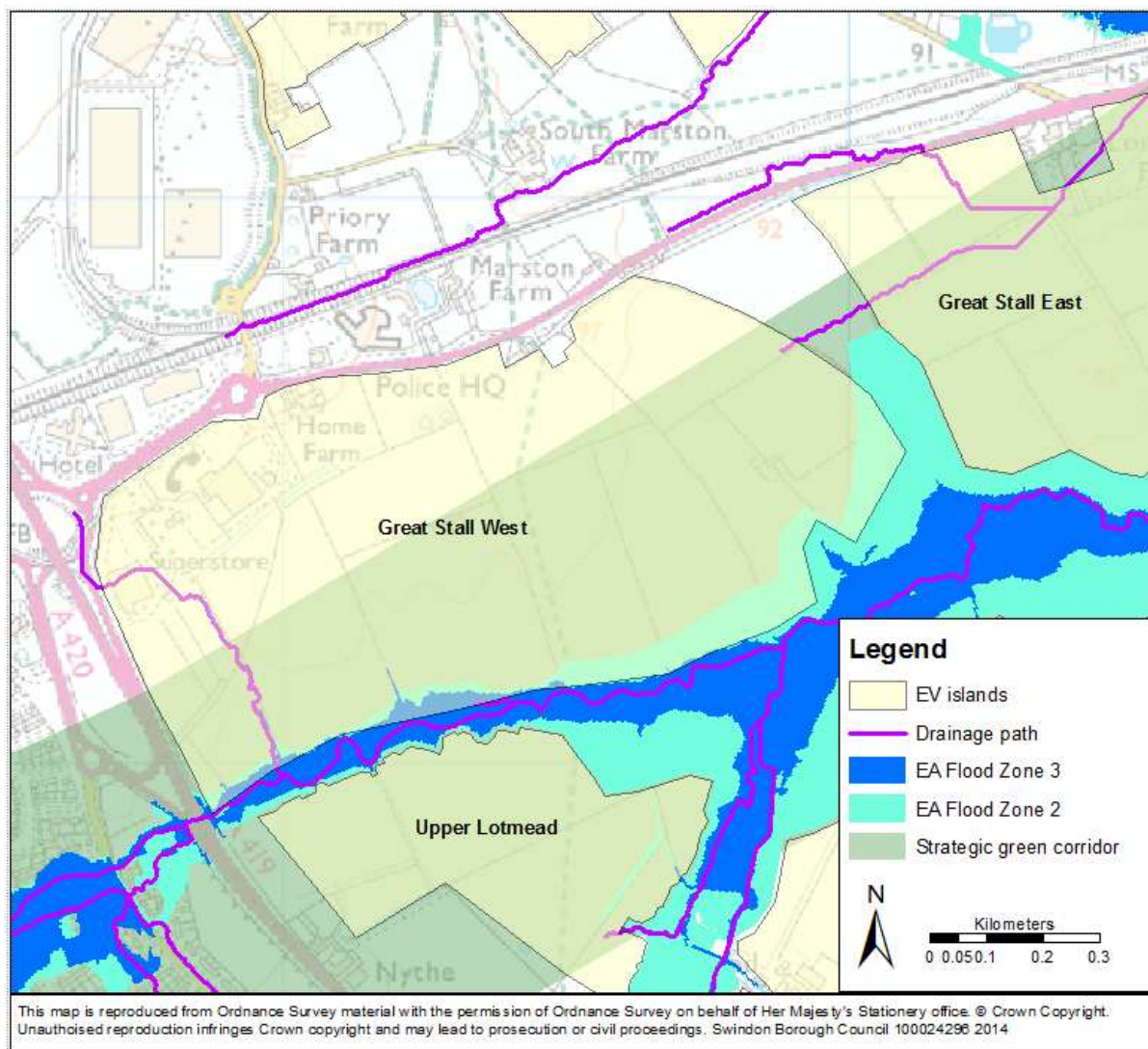


Figure A1: Location of Great Stall West and drainage paths.

Great Stall West has been split into eight natural catchments based on ground levels, these are shown in figure A2. Catchments 1 to 7 drain to the River Cole to the South of the development. Catchment 8 drains to the east.

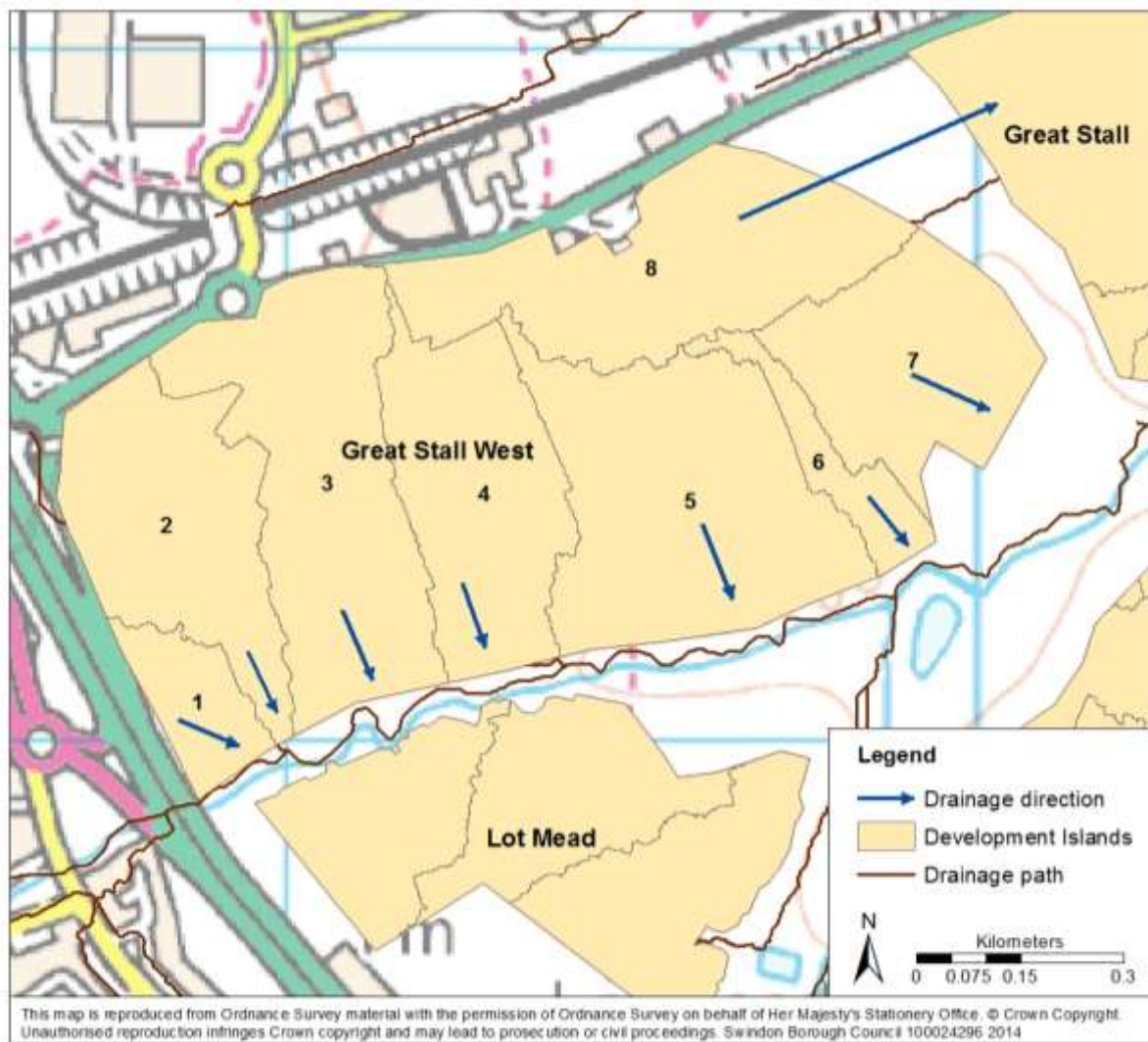


Figure A2 – natural catchments and flow directions

5.1 Interdependencies

Whilst most of Great Stall West drains directly to the River Cole to the South of the site, the natural drainage path for catchment 8 of the site drains through Great Stall before joining the river channel north of the railway line between Priors Farley and Rowborough. It is preferable to maintain natural drainage paths where ever possible, therefore developers of Great Stall and Great Stall West may need to know how the flow through Great Stall from Great Stall West is managed. Alternatively, it may be possible to divert the flow from area 8 to the south, either through area 7 of Great Stall West or draining through the open area between Great Stall and Great Stall West.

5.2 Opportunities and constraints

Great Stall West will be highly visible from the A420 and the A419. As such Great Stall West will act as a shop window to the NEV development and it is therefore important that the right tone is set within this key island through high quality design and materials, and visually appealing green infrastructure and SuDS.

The most compact and high density development in Great Stall West is likely to be along the northern edge given the adjacent A420 spine road. The types of SuDS used in these areas should be

suitable for a high density urban environment, making use of 'space saving' options such as green roofs and walls, linear tree pits or rain gardens, rainwater harvesting and permeable paving. This type of feature will help to create a contemporary and attractive design for this part of the development, whilst offering many wider benefits such as reducing noise and air pollution, regulating building temperatures, providing recreational areas for residents and employees, and making a positive contribution to public health and wellbeing.

Residential densities in Great Stall West will be among the highest of the New Eastern Villages development. Apartment blocks are likely to form a proportion of the development in order to achieve the densities required, and green infrastructure based SuDS can be used to help ensure that the front presented to the A420 is attractive and welcoming. SuDS such as tree pits and linear rain gardens along roads will create attractive streetscapes which will act as strategic gaps in the line of development, drawing the eye into the site making it inviting to passers-by. Roof gardens on apartment blocks create communal outdoor spaces for residents without reducing developable land, and have been shown to improve community cohesion within a development. Parking spaces should make use of permeable paving with subsurface storage, to which areas unsuitable for such measures (due to higher density traffic) can drain.

Great Stall West includes a 12 hectare District Centre as well as the main employment allocation for the NEV, so there will be opportunities for the larger roof spaces associated with employment uses to include rainwater harvesting or green roofs, and for permeable paving, filter drains and tree pits to be incorporated in parking or other communal areas.

5.3 Green infrastructure

The flood zone to the south and east of the site as well as a large part to the south of the site lies within a strategic green corridor/ sub regional green infrastructure link, as shown in figure A3. Selection of appropriate SuDS within the green corridor would serve a dual purpose (thereby optimising the land take required), and the use of green infrastructure based SuDS throughout the site would help link the developed area with the green corridor, contributing to other policy objectives such as creating green corridors and enhancing biodiversity.

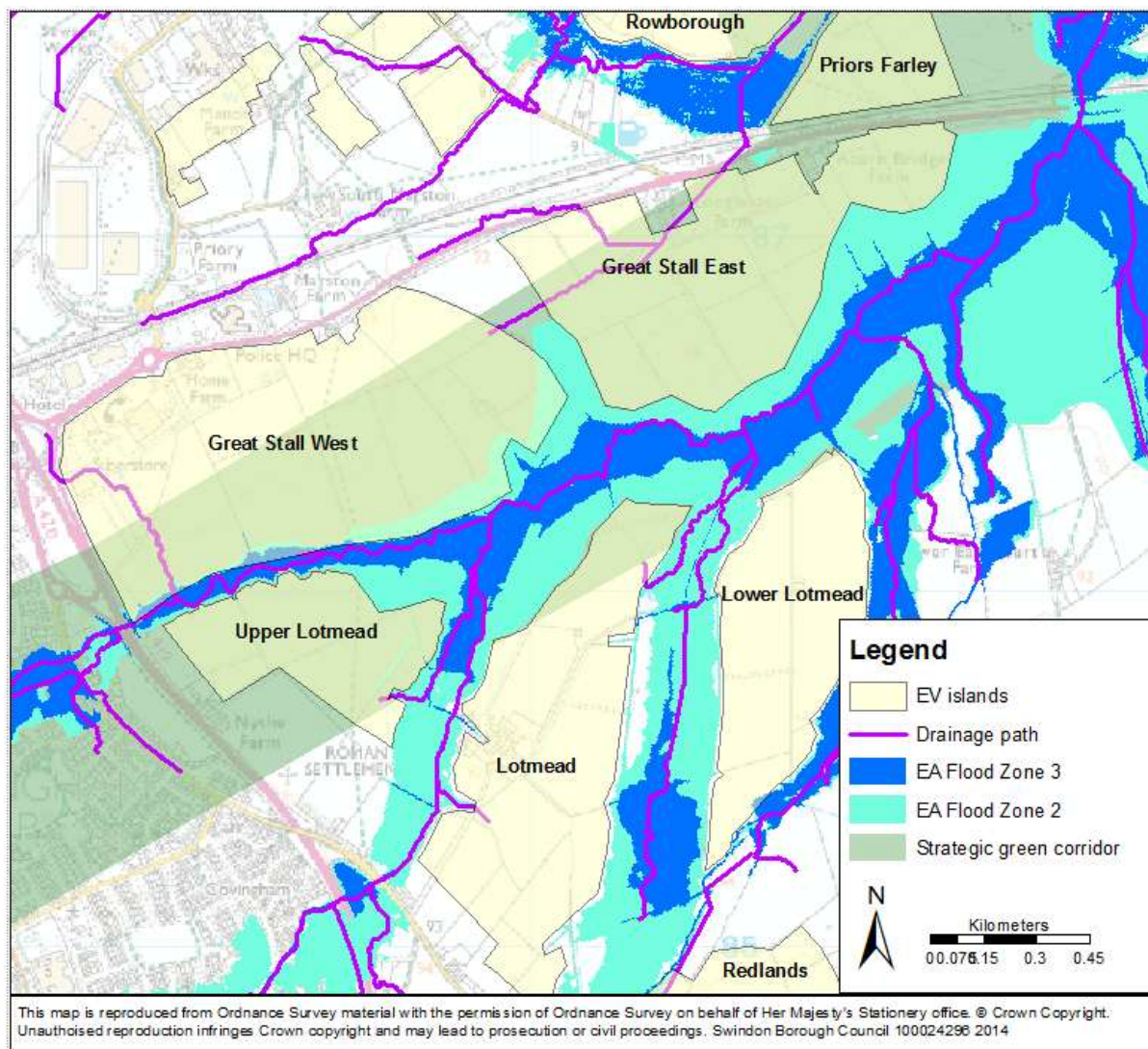


Figure A3: Green corridor

5.4 Multi-purpose spaces

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. 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. See section 3, Table 2 for further guidance.

The table below shows a breakdown of the land budget allocated for public open space for Great Stall West which could be considered for inclusion of SuDS.

SuDS vision for New Eastern Villages

Annex A. Village specific data

Table A1: Public open space allocation

Land use	Area allocated (ha)	Suitable for SuDS
Children's Play	0.64	Yes – shallow play areas
General Rec MOS LOS	2.14	Yes – if compliant Section 3, table 2
Playing Pitches	2.57	Yes – if compliant Section 3, table 2
Outdoor Sports	0.86	Yes – if compliant Section 3, table 2
Allotments	0.64	No

6 Annex A2 – Great Stall East

Great Stall East lies in the east of the New Eastern Villages 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 45.24 ha in area (as per NEV land budget) and naturally drains predominantly to the River Cole which runs along the southern edge of the development area. Figure A4 illustrates the location of Great Stall East, location of natural drainage paths and the EA flood zones.

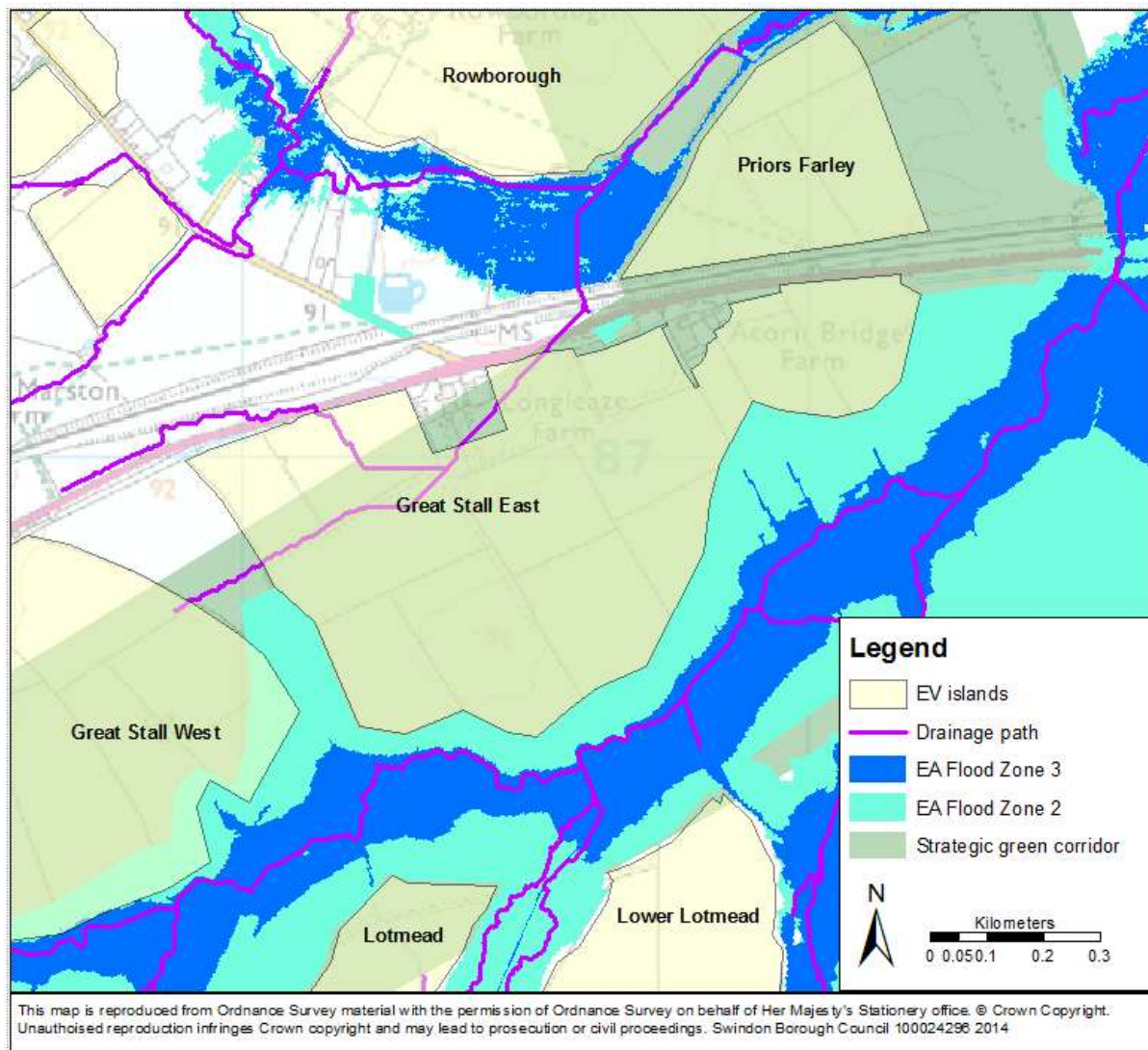


Figure A4: Location of Great Stall and drainage paths.

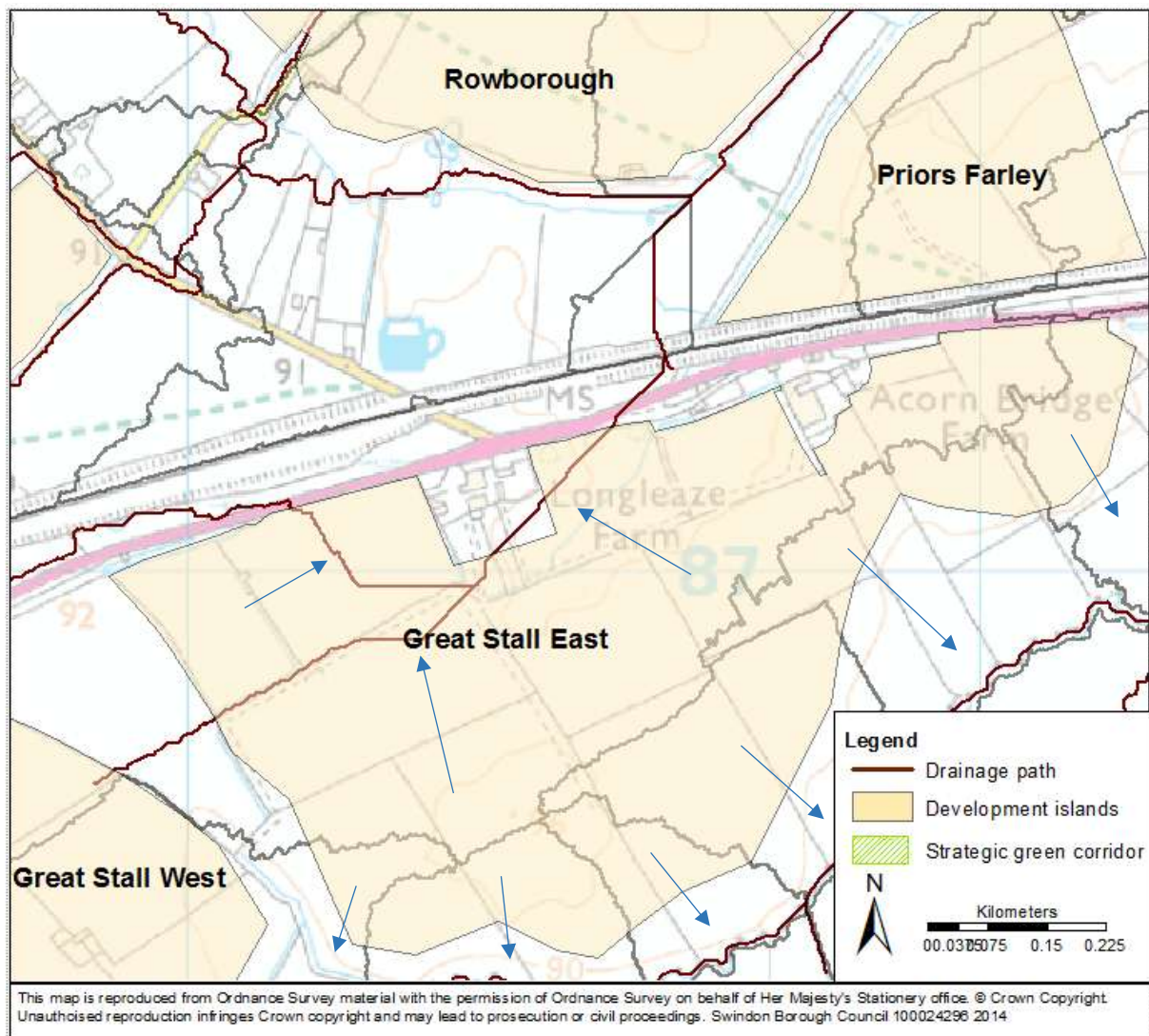


Figure A5– natural catchments and flow directions

6.1 Interdependencies

Most of Great Stall East drains north through the culvert near Longleaze Farm to a tributary of the South Marston Brook near to Priors Farley. The drainage from catchment 8 of Great Stall West drains through Great Stall Great Stall East before joining the river channel north of the railway line between Priors Farley and Rowborough. It is preferable to maintain natural drainage paths where ever possible, therefore developers of Great Stall and Great Stall West may need to know how the flow through Great Stall from Great Stall West is managed. The catchments to the South of Great Stall East drain south or south east to the River Cole.

6.2 Opportunities and constraints

Great Stall East will be visible from the A420 as it runs along the northern boundary. These parts of Great Stall East will act as a shop window to the development and it is therefore essential that the right tone is set through high quality design and materials, and visually appealing green infrastructure and SuDS.

Residential densities in Great Stall East will be among the highest of the New Eastern Villages, ranging from 40 to 50 dwellings per hectare in some parts. Apartment blocks are likely to form a proportion of the development in order to achieve the densities required, and green infrastructure based SuDS can be used to help ensure that the front presented to the A420 is attractive and welcoming. The types of SuDS used in these areas should be suitable for a high density urban environment, making use of 'space saving' options such as green roofs and walls, linear tree pits or rain gardens, and permeable paving. This type of feature will help to create a contemporary and attractive design for this part of the development, whilst offering many wider benefits such as reducing noise and air pollution, regulating building temperatures, providing recreational areas for residents and employees, and making a positive contribution to public health and wellbeing. Tree pits and linear rain gardens within roads and parking areas will create attractive streetscapes which will act as strategic gaps in the line of development, drawing the eye into the site making it inviting to passers-by. Roof gardens on apartment blocks create communal outdoor spaces for residents without reducing developable land, and have been shown to improve community cohesion within a development.

Development density will reduce towards the eastern edge of Great Stall East and SuDS features which help to soften the urban character will be more appropriate. Larger scale, above ground conveyance and attenuation SuDS features such as swales, rain gardens and basins will help create connected spaces, enabling the urban 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. The north-eastern corner of Great Stall East will form an entry point not only to the New Eastern Villages, but also to Swindon and Wiltshire, and effectively designed SuDS can play a key role here in helping to create an attractive development which is sympathetic to the character of the adjacent green infrastructure.

6.3 Green infrastructure

The flood zone to the south and east of the site as well as a large part of the south of the site lies within a strategic green corridor/ sub regional green infrastructure link, as shown in figure A6. Selection of appropriate SuDS within the green corridor would serve a dual purpose (thereby optimising the land take required), and the use of green infrastructure based SuDS throughout the site would help link the developed area with the green corridor, contributing to other policy objectives such as creating green corridors and enhancing biodiversity.

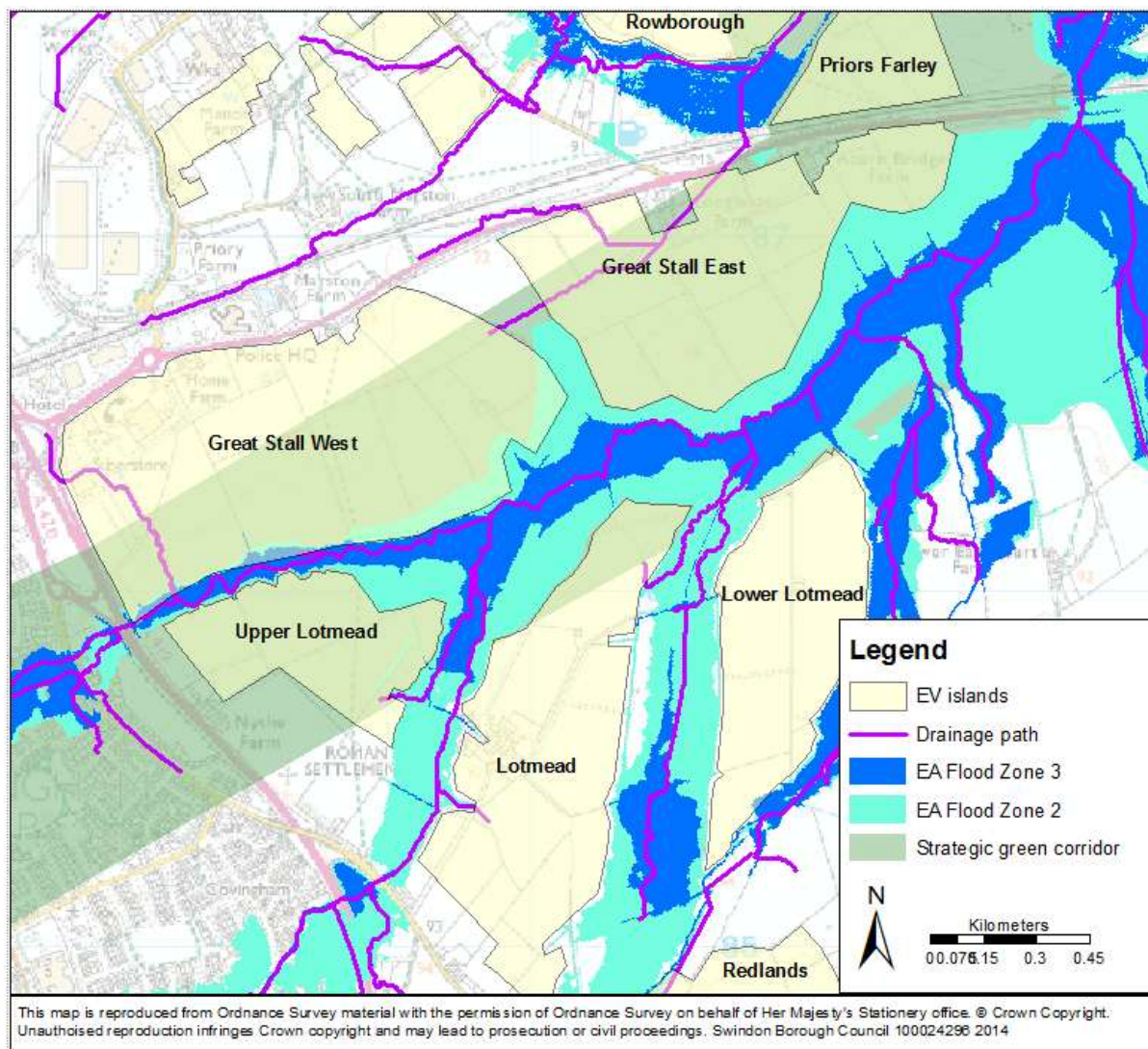


Figure A6: Green corridor

6.4 Multi-purpose spaces

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. 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. See section 3, Table 2 for further guidance.

The table below shows a breakdown of the land budget allocated for public open space for Great Stall which could be considered for inclusion of SuDS.

SuDS vision for New Eastern Villages

Annex A. Village specific data

Table A2: Public open space allocation

Land use	Area allocated (ha)	Suitable for SuDS
Children's Play	0.79	Yes – shallow play areas
General Rec MOS LOS	2.62	Yes – if compliant Section 3, table 2
Playing Pitches	3.14	Yes – if compliant Section 3, table 2
Outdoor Sports	1.05	Yes – if compliant Section 3, table 2
Allotments	0.79	No

7 Annex A3 - Upper Lotmead

Upper Lotmead lies in the west of the New Eastern Villages 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 20 ha in area (as per NEV land budget) and naturally drains predominantly to the River Cole which runs along the northern edge of the development area, with parts of the area draining into the River Cole via a channel to the east of the development area. Figure A7 illustrates the location of Upper Lotmead, location of natural drainage paths and the EA flood zones.

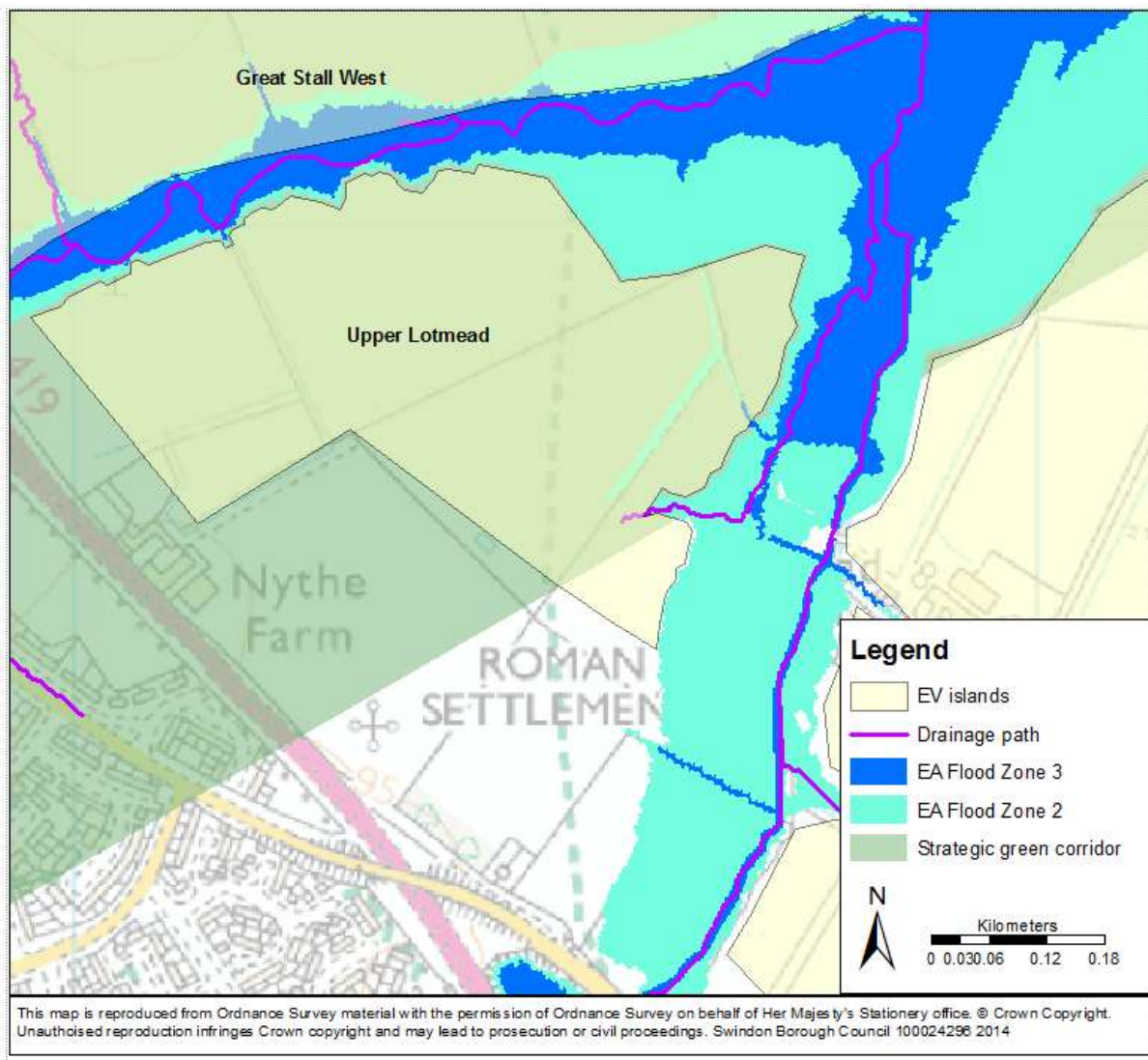


Figure A7: Location of Upper Lotmead and drainage paths.

Upper Lotmead has been split into three natural catchments based on ground levels, these are shown in figure A8. Catchments 1 and 2 appear to drain directly into the River Cole to the north of the development area. Catchment 3 drains to the River Cole via a channel which flows to the east of the development area.

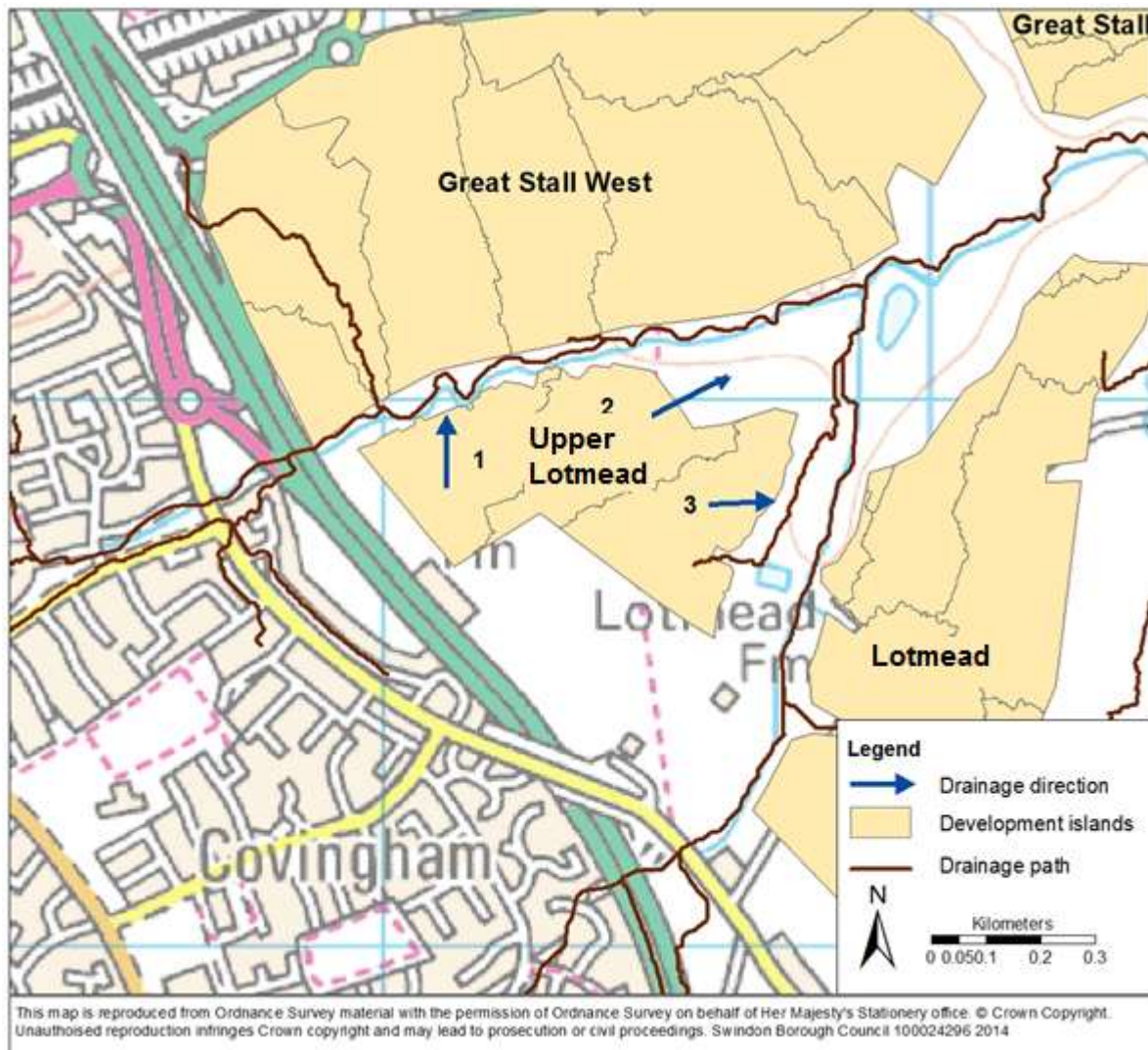


Figure A8 – natural catchments and flow directions

7.1 Interdependencies

Parts of both Upper Lotmead and Lotmead drain into the channel flowing between the two development areas. Developers of these two sites may therefore wish to jointly consider how to manage flow through this channel.

7.2 Opportunities and constraints

Upper Lotmead lies alongside the historic Roman settlement of Durocornovium which is a scheduled monument. A heritage park, spanning the A419, is intended to help preserve the underground remains of the site. As such 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.

Upper Lotmead will be a residential development and with the A419 to the west and the employment hub to the north it is likely that the properties will face towards the north east, east and south. The placement and landscaping of a storage area within these areas would help improve these vistas.

For this entirely residential development the use of SuDS such as linear tree pits or rain gardens, and permeable paving along residential roads will help to create an attractive living space for residents and offering many wider benefits such as reducing noise and air pollution, regulating building temperatures and making a positive contribution to public health and wellbeing.

7.3 Green infrastructure

Nearly all of the Upper Lotmead development lies within a strategic green corridor/ sub regional green infrastructure link, as shown in figure A9. Selection of appropriate SuDS within the green corridor would serve a dual purpose (thereby optimising the land take required), and the use of green infrastructure based SuDS throughout the site would help link the developed area with the green corridor, contributing to other policy objectives such as creating green corridors and enhancing biodiversity.

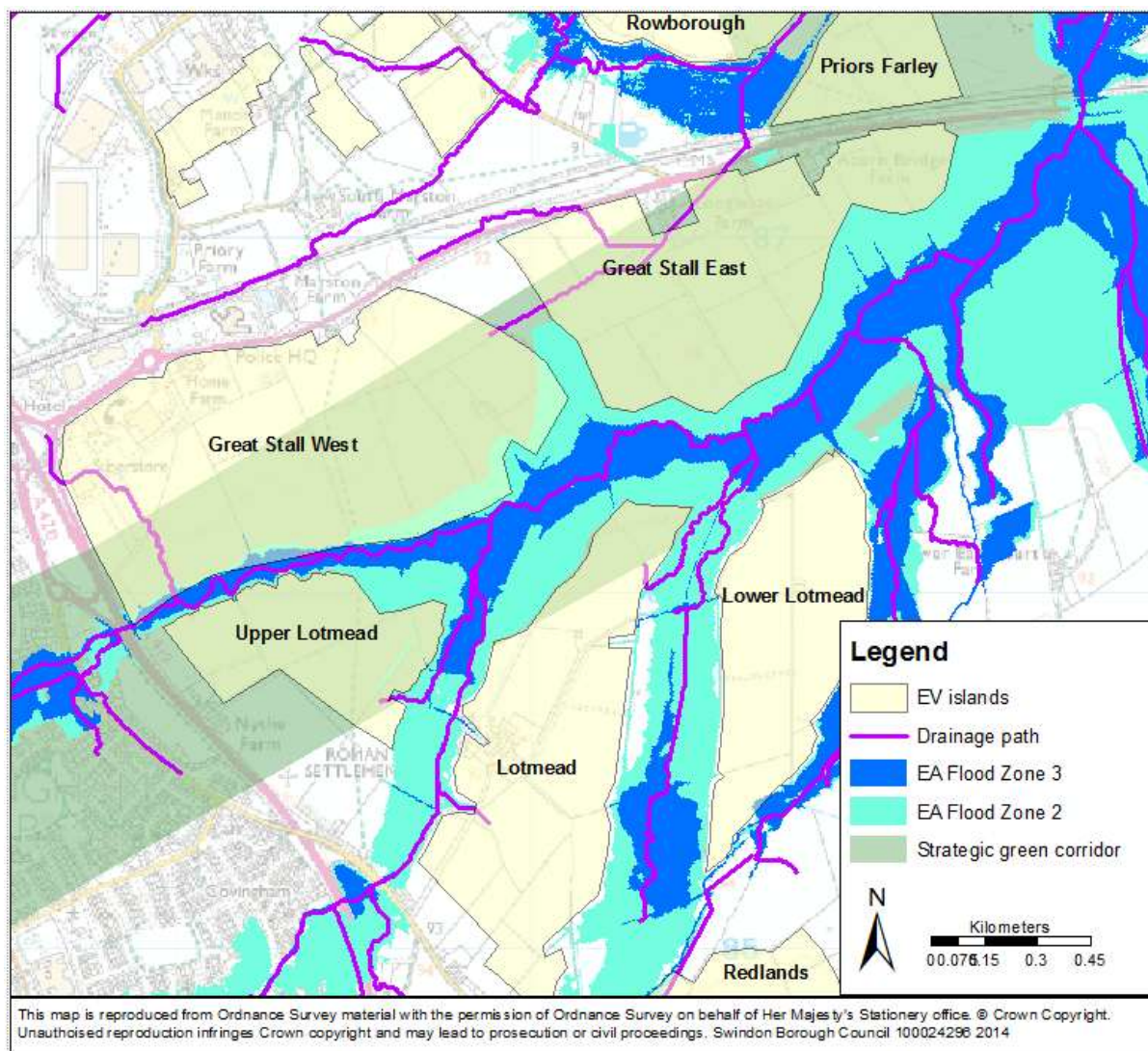


Figure A9: Green corridor

7.4 Multi-purpose spaces

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. 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. See section 3, Table 2 for further guidance.

The table below shows a breakdown of the land budget allocated for public open space for Upper Lotmead which could be considered for inclusion of SuDS.

Table A3: Public open space allocation

Land use	Area allocated (ha)	Suitable for SuDS
Children's Play	0.54	Yes – shallow play areas
General Rec MOS LOS	1.79	Yes – if compliant Section 3, table 2
Playing Pitches	2.14	Yes – if compliant Section 3, table 2
Outdoor Sports	0.71	Yes – if compliant Section 3, table 2
Allotments	0.54	No

8 Annex A4 – Lotmead

8.1 Introduction

Lotmead lies in the centre of the New Eastern Villages. 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. The Wanborough road runs along the southern edge of Lotmead. The development site is 47 ha in area (as per NEV land budget) and naturally drains predominantly toward the River Cole in the north along drainage paths running to the east and west of the area. Figure A10 illustrates the location of Lotmead, location of natural drainage paths and the EA flood maps.

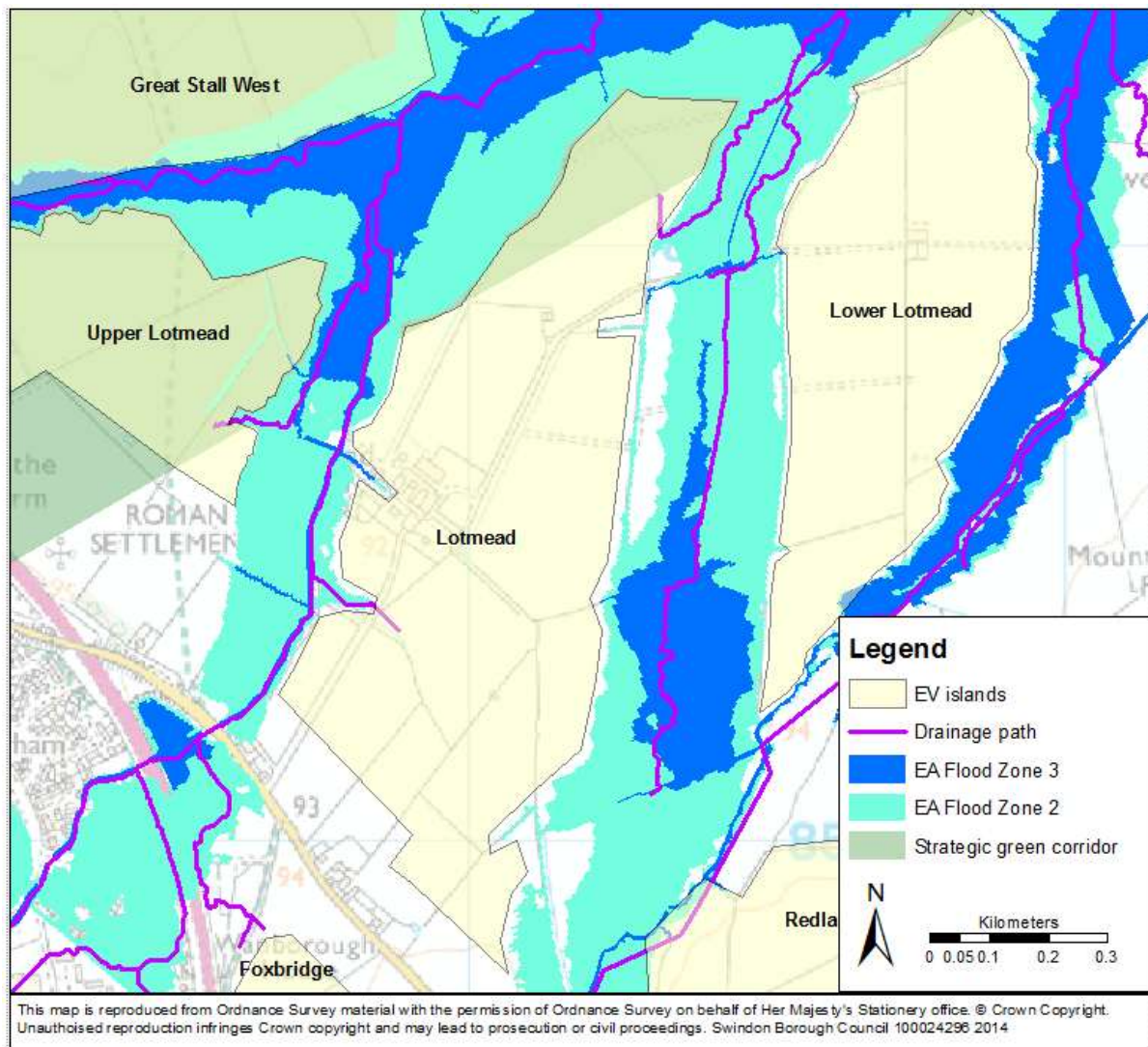


Figure A10: Location of Lotmead and drainage paths.

Lotmead has been split into seven natural catchments based on ground levels, these are shown in figure A1. Catchments 1 and 7 (made up of 7a and 7b) drain directly to the River Cole to the north of the site. Catchments 2, 3, 4 and 5 drain along drainage paths to the east of the site before joining the River Cole. Catchment 6 (made up of 6a and 6b) drains to the channel to the west of Lotmead before joining the River Cole.

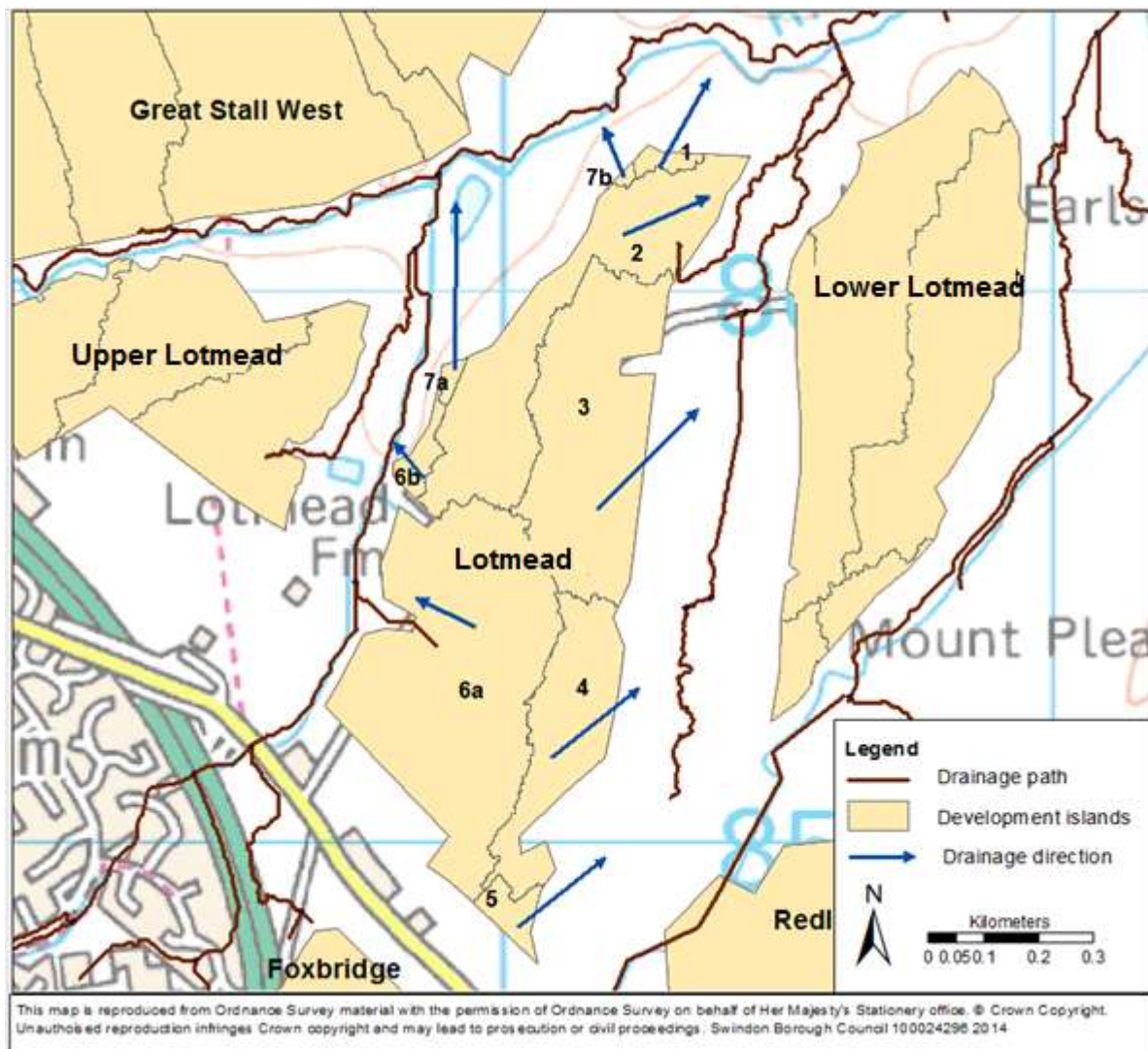


Figure A11 – natural catchments and flow directions

8.2 Interdependencies

In addition to draining Lotmead, the channels running to the east and west of the development area also drain Lower Lotmead and Upper Lotmead (respectively). Developers of these sites may therefore wish to jointly consider how to manage flow through these channels.

8.3 Opportunities and constraints

Lotmead is likely to be an inwardly looking development, focussed around the Village Centre and primary school which will be located near the existing farm buildings. These facilities will not only serve residents of Lotmead but will draw the residents of Upper Lotmead and Lower Lotmead. Attractive, multifunctional SuDS in these publically owned spaces will benefit both residents of Lotmead and those from other development areas who make use of the facilities. Rainwater harvesting systems will be appropriate for use on public buildings, and green infrastructure SuDS which enhance visual appeal should be used in communal areas, for example tree pits, green roofs and walls, and rain gardens. Attractive above ground conveyance features such as cascades should 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.

Strong transport links will be required to link Lotmead to its neighbouring developments and to Great Stall and the A420 in the north. Use of green infrastructure SuDS, such as tree pits, linear rain gardens, filter strips and planted channels along 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.

8.4 Green infrastructure

The northern part of Lotmead lies within a strategic green corridor/ sub regional green infrastructure link, as shown in figure A12. Given the River Cole to the north and the Education Campus to the north east, this northern part of the development area is likely to be more outward facing. Selection of appropriate SuDS within this green corridor will help to maximise views of the area and to Great Stall beyond. SuDS in this area would serve a dual purpose (thereby optimising the land take required), and the use of green infrastructure based SuDS throughout the site will help link the developed area with the green corridor, contributing to other policy objectives such as creating green corridors and enhancing biodiversity.

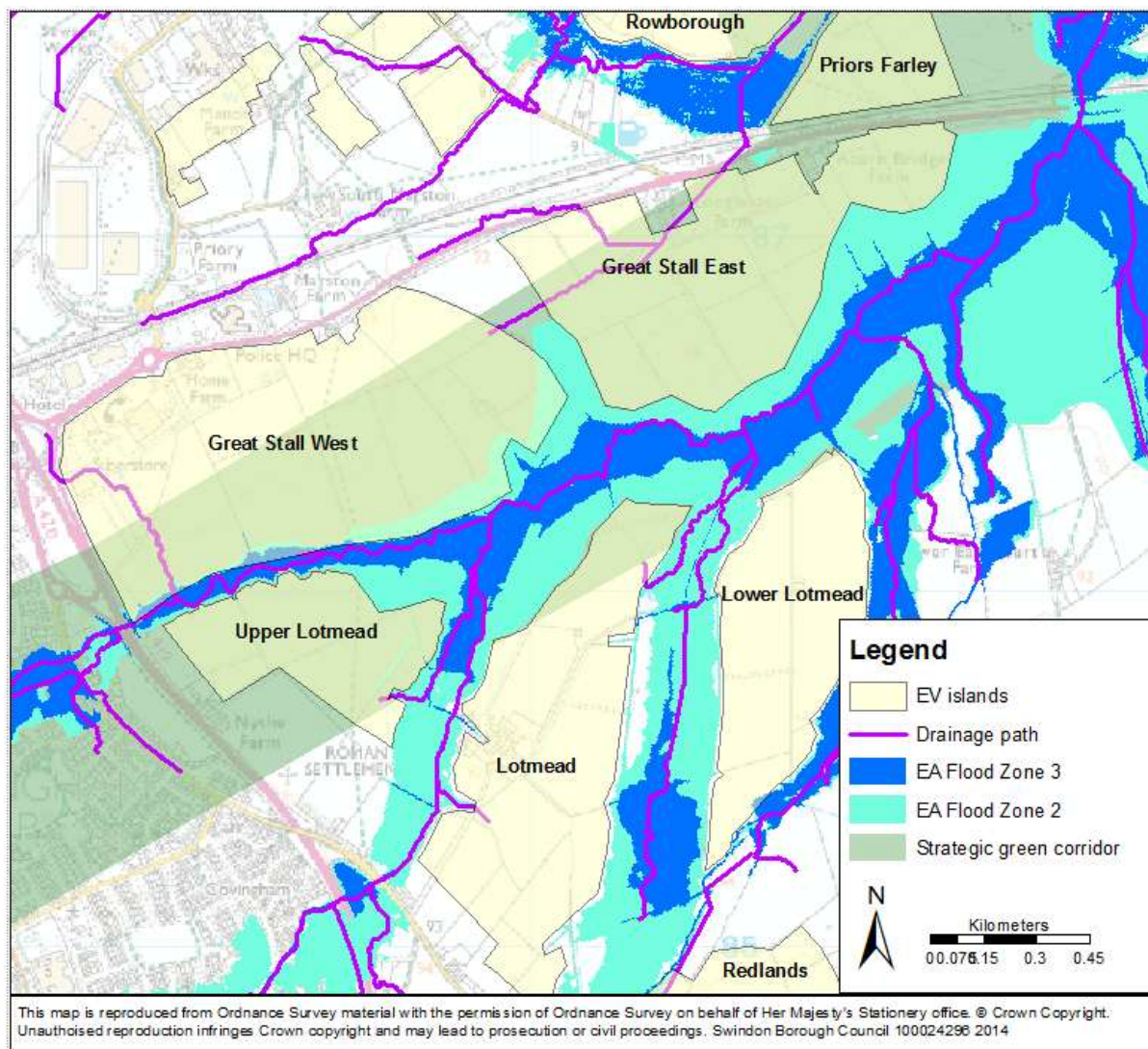


Figure A12: Green corridor

8.5 Multi-purpose spaces

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. 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. See section 3, Table 2 for further guidance.

The table below shows a breakdown of the land budget allocated for public open space for Lotmead which could be considered for inclusion of SuDS.

SuDS vision for New Eastern Villages

Annex A. Village specific data

Table A4: Public open space allocation

Land use	Area allocated (ha)	Suitable for SuDS
Children's Play	1.11	Yes – shallow play areas
General Rec MOS LOS	3.69	Yes – if compliant Section 3, table 2
Playing Pitches	4.43	Yes – if compliant Section 3, table 2
Outdoor Sports	1.48	Yes – if compliant Section 3, table 2
Allotments	1.11	No

9 Annex A5 – Lower Lotmead

Lower Lotmead lies in the east of the New Eastern Villages. To the north of Lower Lotmead lies the Great Stall development area, to the west the Lotmead development area and to the south the Redlands development area. The development site is 30 ha in area (as per NEV land budget) and naturally drains toward the River Cole in the north along drainage paths running to the east and west of the area. Figure A13 illustrates the location of Lower Lotmead, location of natural drainage paths and the EA flood maps.

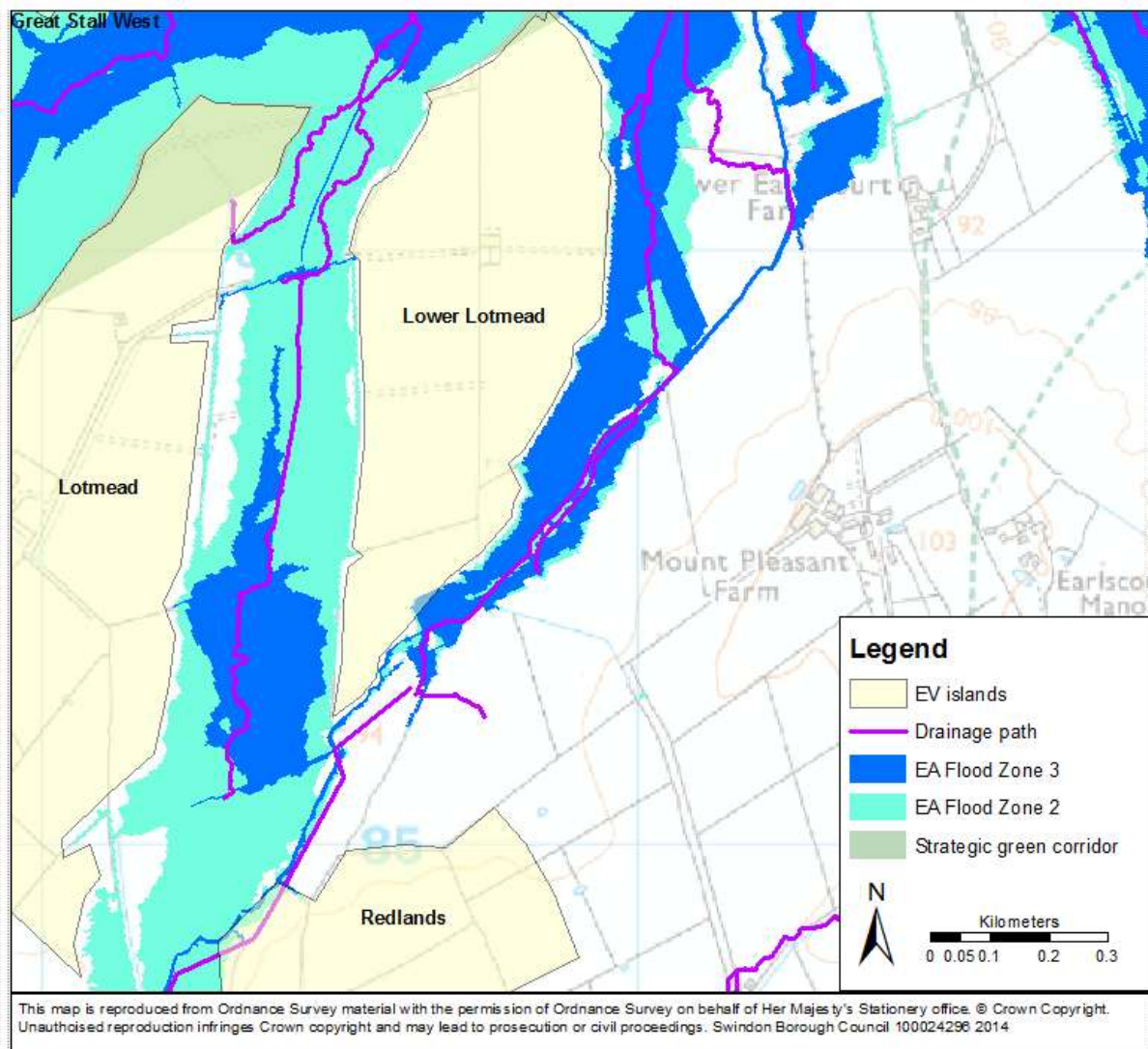


Figure A13: Location of Lotmead and drainage paths.

Lower Lotmead has been split into five natural catchments based on ground levels, these are shown in figure A14. Catchment 1 drains north directly into the River Cole. Catchment 2 drains along a drainage path to the west of the development area towards its confluence with the River Cole. Catchments 3a, 3b and 3c drain to a channel running to the east of the development area towards its confluence with the River Cole to the north of Lower Lotmead.

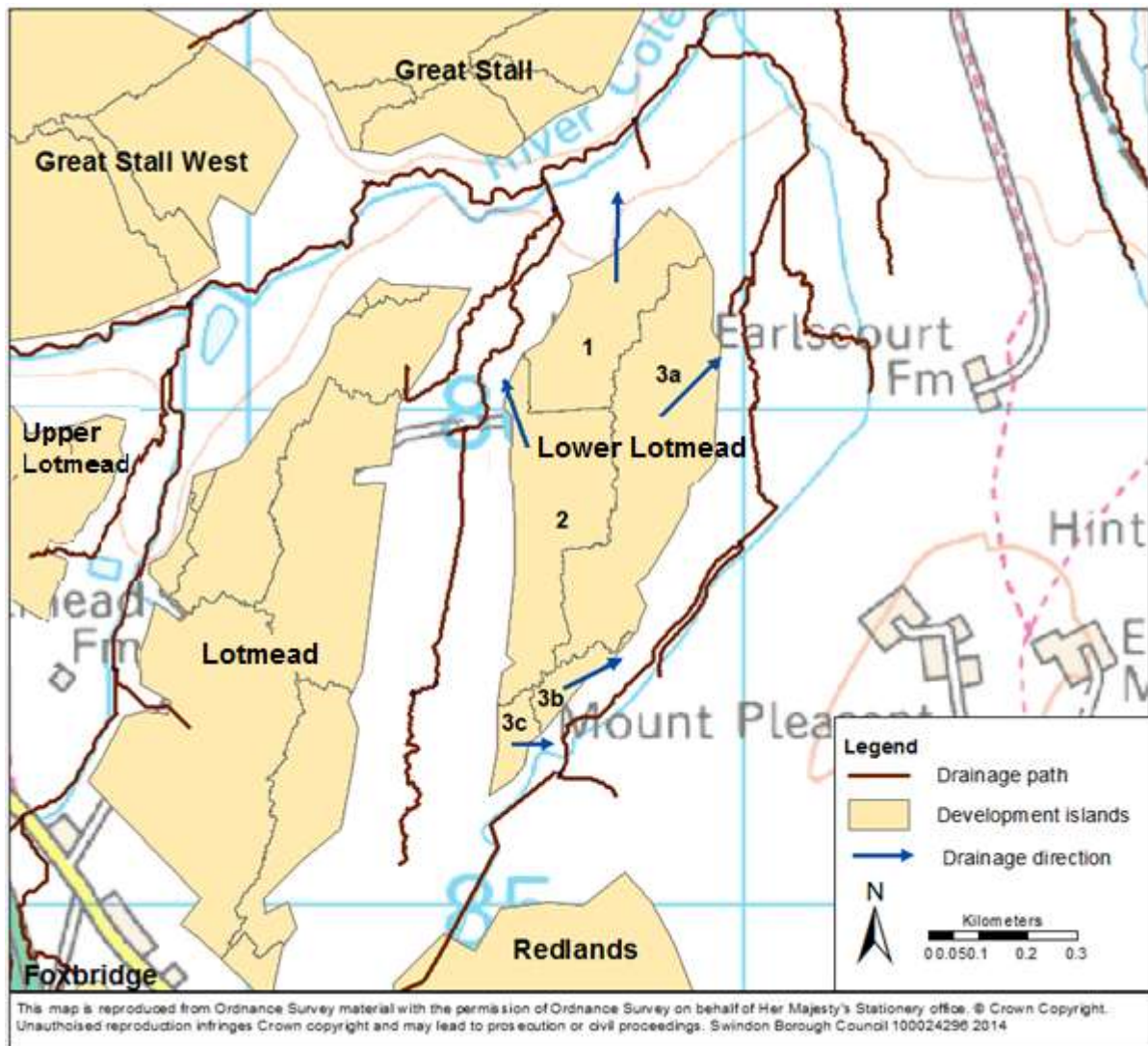


Figure A14 – natural catchments and flow directions

9.1 Interdependencies

In addition to draining Lower Lotmead, the channel running to the west of the development area also drains Lotmead. Developers of these sites may therefore wish to jointly consider how to manage flow through these channels.

9.2 Opportunities and constraints

Lower Lotmead will be a small village in the east of the New Eastern Villages. With a rural setting, it will benefit from views along its eastern edge to open countryside and is likely to be an informally structured village with space between properties to make the most of these vistas. Whilst the development is likely to be more outward focussed to make the most of the views across the countryside it is important that the village sits sensitively within its landscape, so that views back towards Lower Lotmead show a gradual transition between the built and rural environment. 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 urban development; helping 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.

Residents of Lower Lotmead will not be served by a village centre or school within the development, but will rely on facilities within Lotmead to the west. Attractive and safe footpaths and cycle links with Lotmead will need to be provided to encourage residents to travel in a sustainable manner to these facilities. Use of SuDS along the length of these will create attractive streetscape and provide wider benefits including reduction in noise and air pollution from neighbouring road links. Elements such as linear rain gardens and permeable paving are encouraged in these areas.

9.3 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/sub regional green infrastructure link, as shown in figure A15, 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 (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.

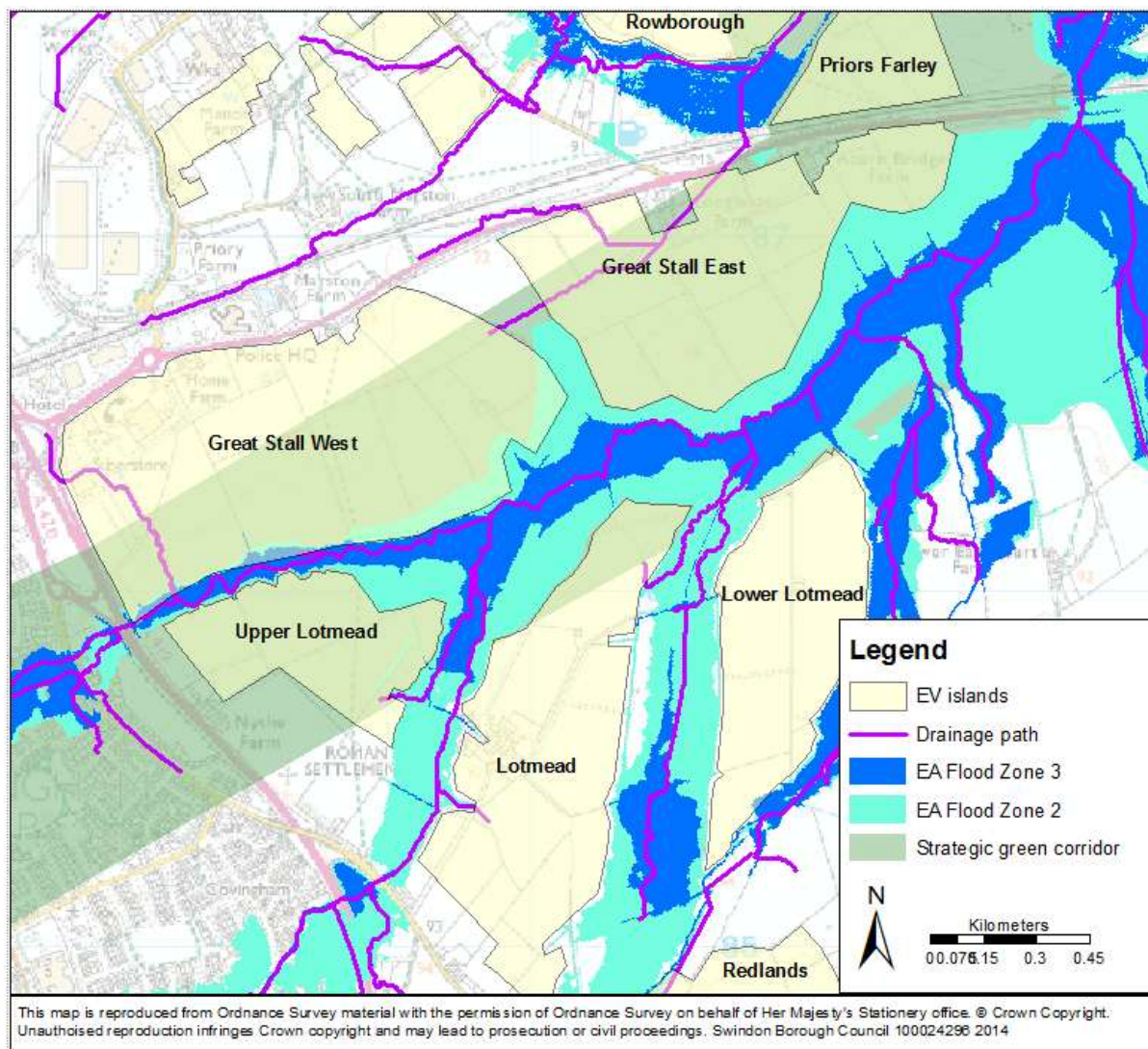


Figure A15: Green corridor

9.4 Multi-purpose spaces

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. 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. See section 3, Table 2 for further guidance.

The table below shows a breakdown of the land budget allocated for public open space for Lower Lotmead which could be considered for inclusion of SuDS.

SuDS vision for New Eastern Villages

Annex A. Village specific data

Table A5: Public open space allocation

Land use	Area allocated (ha)	Suitable for SuDS
Children's Play	0.61	Yes – shallow play areas
General Rec MOS LOS	2.02	Yes – if compliant Section 3, table 2
Playing Pitches	2.43	Yes – if compliant Section 3, table 2
Outdoor Sports	0.81	Yes – if compliant Section 3, table 2
Allotments	0.61	No

10 Annex A6 – Foxbridge

Foxbridge lies at the southern tip of the New Eastern Villages 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 26 ha in area (as per NEV land budget) and naturally drains to the north through tributaries of the River Cole. Figure A16 illustrates the location of Foxbridge, location of natural drainage paths and the EA flood maps.

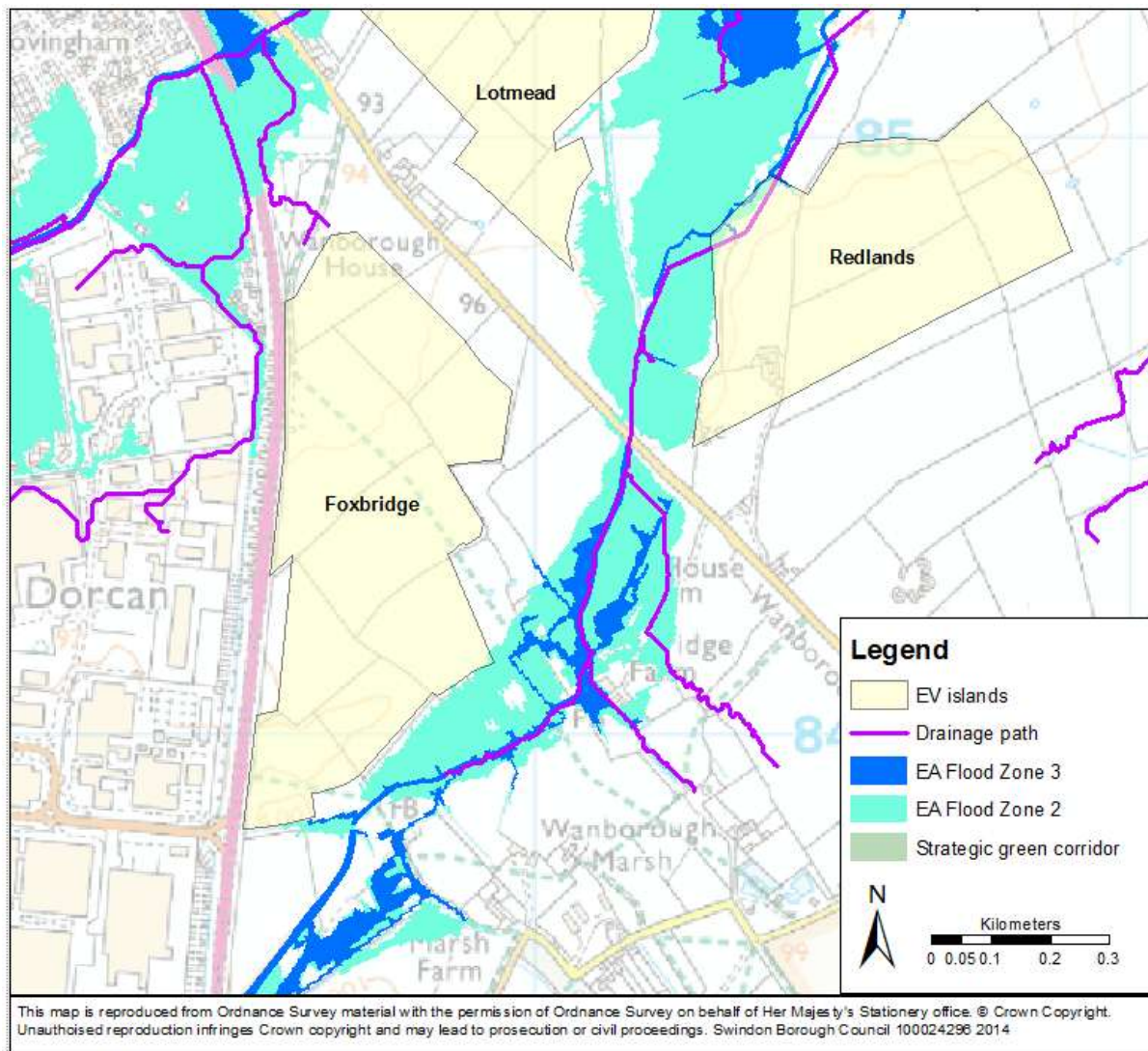


Figure A16: Location of Foxbridge and drainage paths.

Foxbridge has been split into four natural catchments based on ground levels, these are shown in figure A17. Catchment 1 drains into a channel to the north of the development area before draining along the west edge of Lotmead into the River Cole. Catchments 3 and 4 drain into a channel to the east of the development which flows under the Wanborough road and between Redlands and Lower Lotmead before joining the River Cole. The ground levels indicate that catchment 2 drains into a channel running between Lotmead and Lower Lotmead, however given the uncertainty in catchment delineation in this relatively flat area it appears likely that it drains into the same channel as catchments 3 and 4.

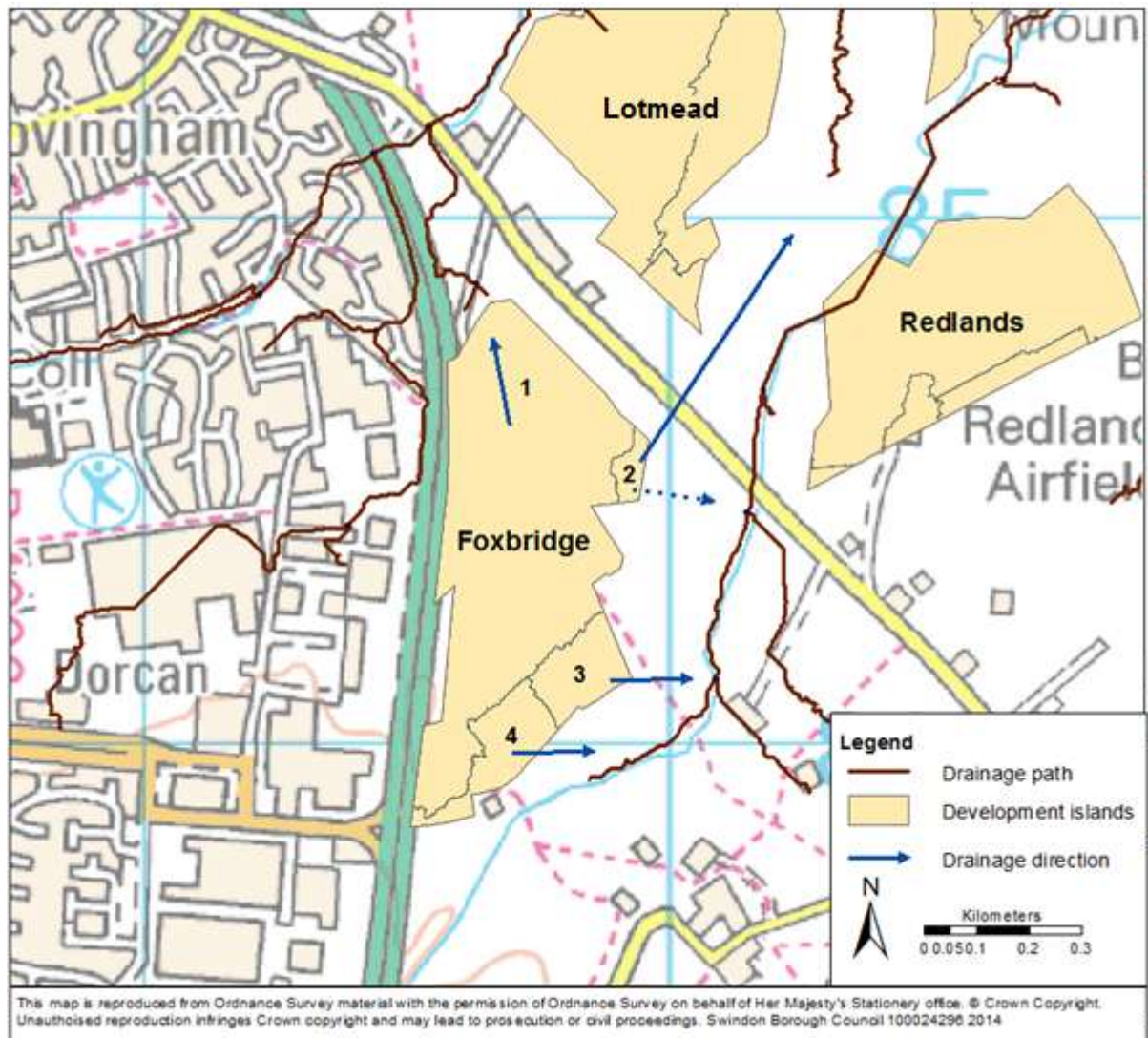


Figure A17 – natural catchments and flow directions

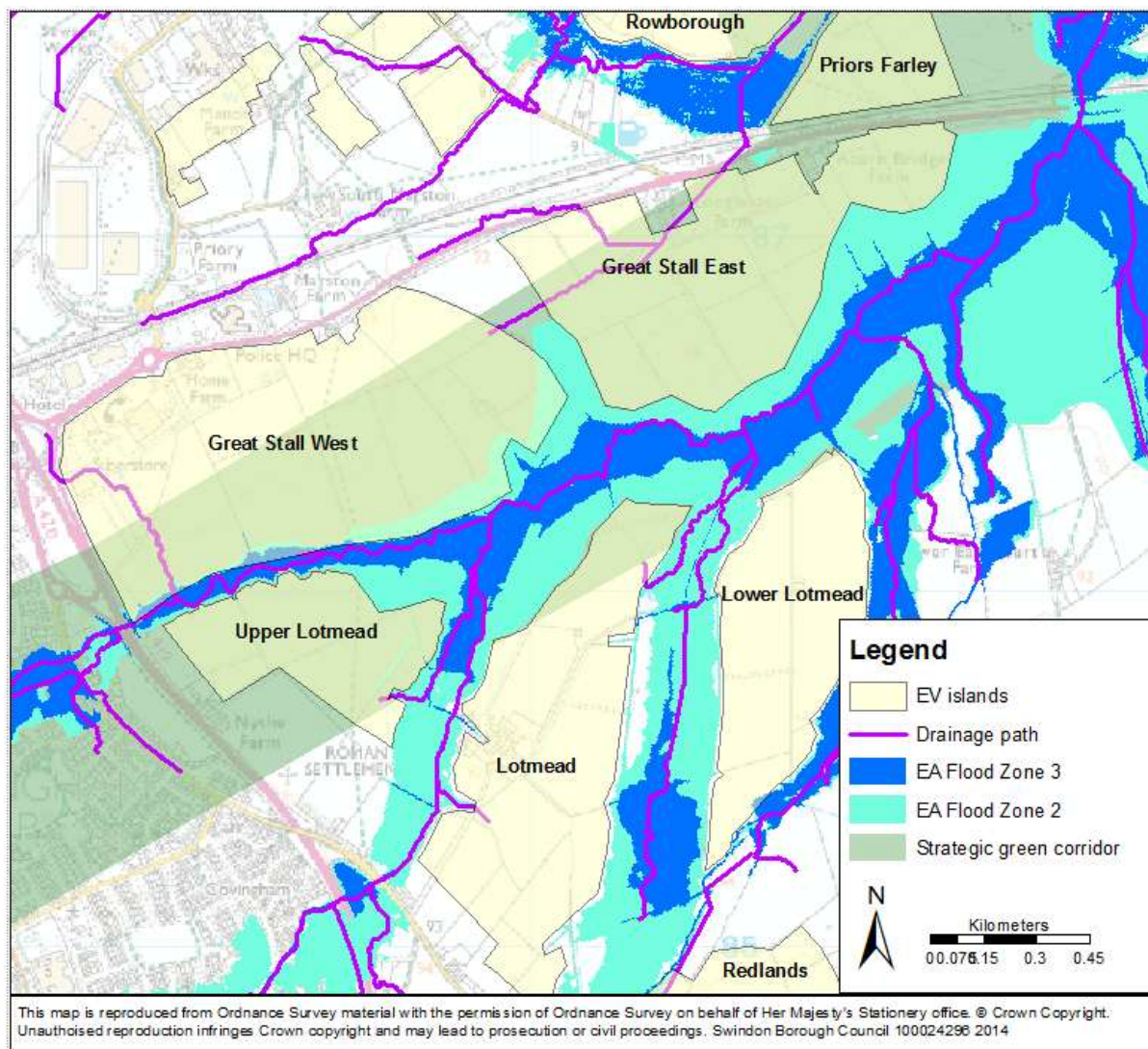


Figure A18: Green corridor

10.1 Interdependencies

Foxbridge drains into channels upstream of the development areas of Redlands, Lotmead, Lotmead and Lower Lotmead. Developers of Foxbridge, Lotmead and Lotmead may wish to jointly consider flow management through the channel to the west of Lotmead and the developers of Foxbridge, Redlands and Lower Lotmead may wish to jointly consider flow management of the channel running to the east of Foxbridge and between Redlands and Lower Lotmead.

10.2 Opportunities and constraints

Along its western edge Foxbridge is bounded by the A419. As a result of the proximity to this road significant noise attenuation will be required. Incorporation of SuDS along this eastern edge could complement the existing vegetation, adding to the noise attenuation, improving air quality and creating an attractive divide between the residential development and the road. In addition incorporation of SuDS in landscaping the southern part the development will help to advertise the area, encouraging residents into the area.

The safeguarded route of the Wilts & Berks Canal cuts 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 where supported by Wilts and Dorset Canal Trust.

The other key feature of the development is likely to be the primary school. As a building in frequent use, rainwater harvesting is likely to be suitable and could be fed from both roofs and hardstanding. Green roofs are also encouraged for the school and supporting buildings. Permeable paving should be used for all non-trafficked hardstanding and car parking areas, and green walls, swales, raingardens, tree pits and planted channels should be incorporated into the landscaping of the area.

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 and walls and tree pits, along this eastern edge would serve a dual purpose (thereby optimising the land take required) helping link the developed area with its rural surroundings and contributing to other policy objectives such as creating green corridors and enhancing biodiversity.

10.3 Green infrastructure

The strategic green corridor (Figure A18) 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 appropriate SuDS along this eastern edge would serve a dual purpose (thereby optimising the land take required), and the use of green infrastructure based SuDS throughout the site would help link the developed area with its rural surroundings, contributing to other policy objectives such as creating green corridors and enhancing biodiversity.

10.4 Multi-purpose spaces

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. 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. See section 3, Table 2 for further guidance.

Table A6: Public open space allocation

Land use	Area allocated (ha)	Suitable for SuDS
Children's Play	0.50	Yes – shallow play areas
General Rec MOS LOS	1.67	Yes – if compliant Section 3, table 2
Playing Pitches	2.00	Yes – if compliant Section 3, table 2
Outdoor Sports	0.67	Yes – if compliant

SuDS vision for New Eastern Villages

Annex A. Village specific data

		Section 3, table 2
Allotments	0.50	No

11 Annex A7 – Redlands

Redlands lies on the south east edge of the New Eastern Villages and is bounded to the southwest by the Wanborough Road. Further west lies Foxbridge, to the north west lies Lotmead, and to the North, Lower Lotmead. One of the smaller plots of the development, Redlands is 13.6 ha in area (as per NEV land budget) and naturally drains to the River Cole via channels running to the east of the Lower Lotmead development area. Figure A19 illustrates the location of Redlands, location of natural drainage paths and the EA flood maps.

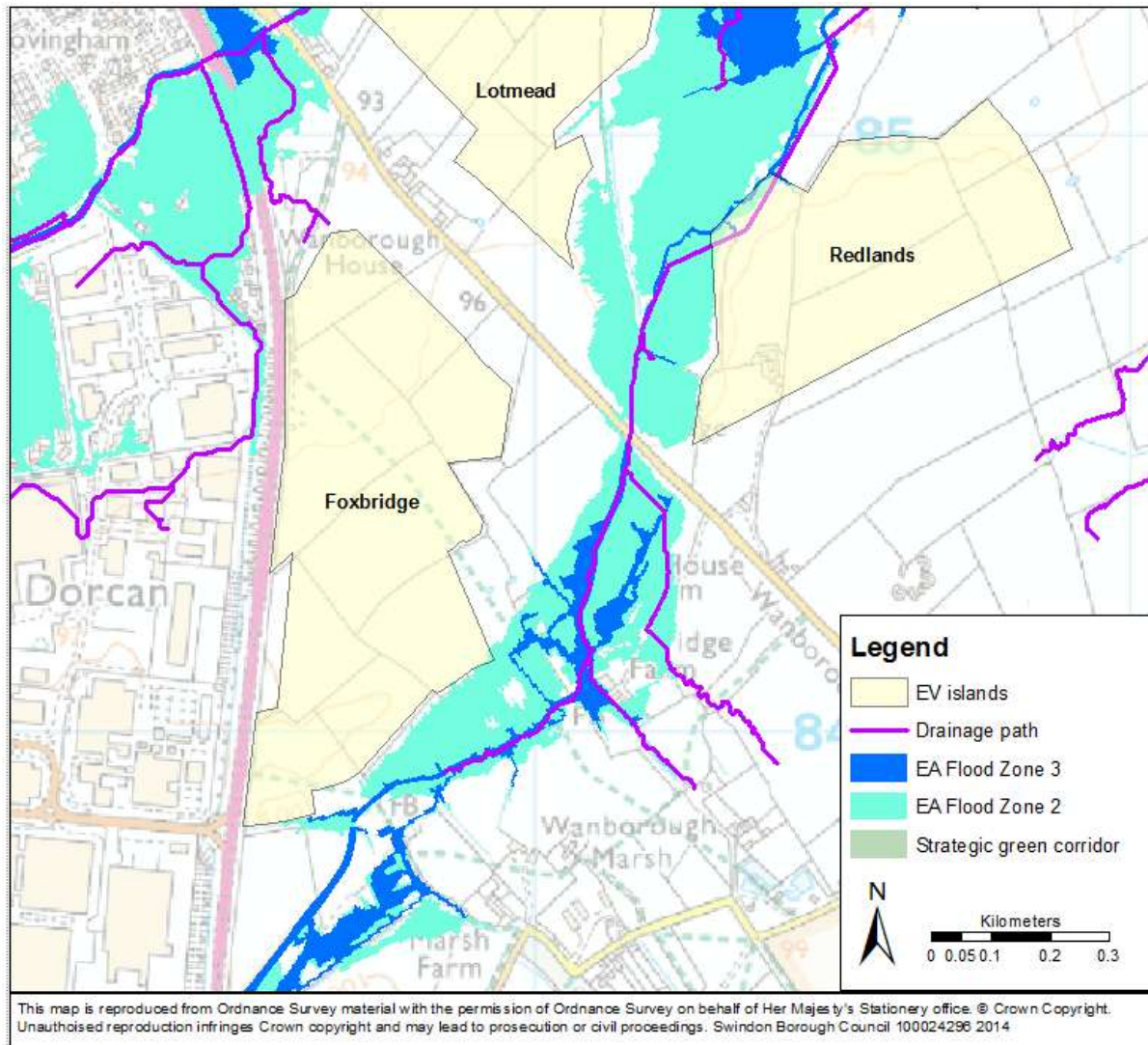


Figure A19: Location of Redlands and drainage paths.

Redlands is split into three natural catchments based on ground levels, these are shown in figure A20. Catchment 1 drains to the channel to the north of the development area and catchment 3 (annotated as 3a and 3b in the figure) drains to the further upstream to same channel. This channel then flows along the eastern edge of Lower Lotmead to its confluence with the River Cole. Catchment 2 drains to another channel to the east of Redlands which flows towards its confluence with the River Cole under the railway embankment and A420 to the east of Great Stall development area.

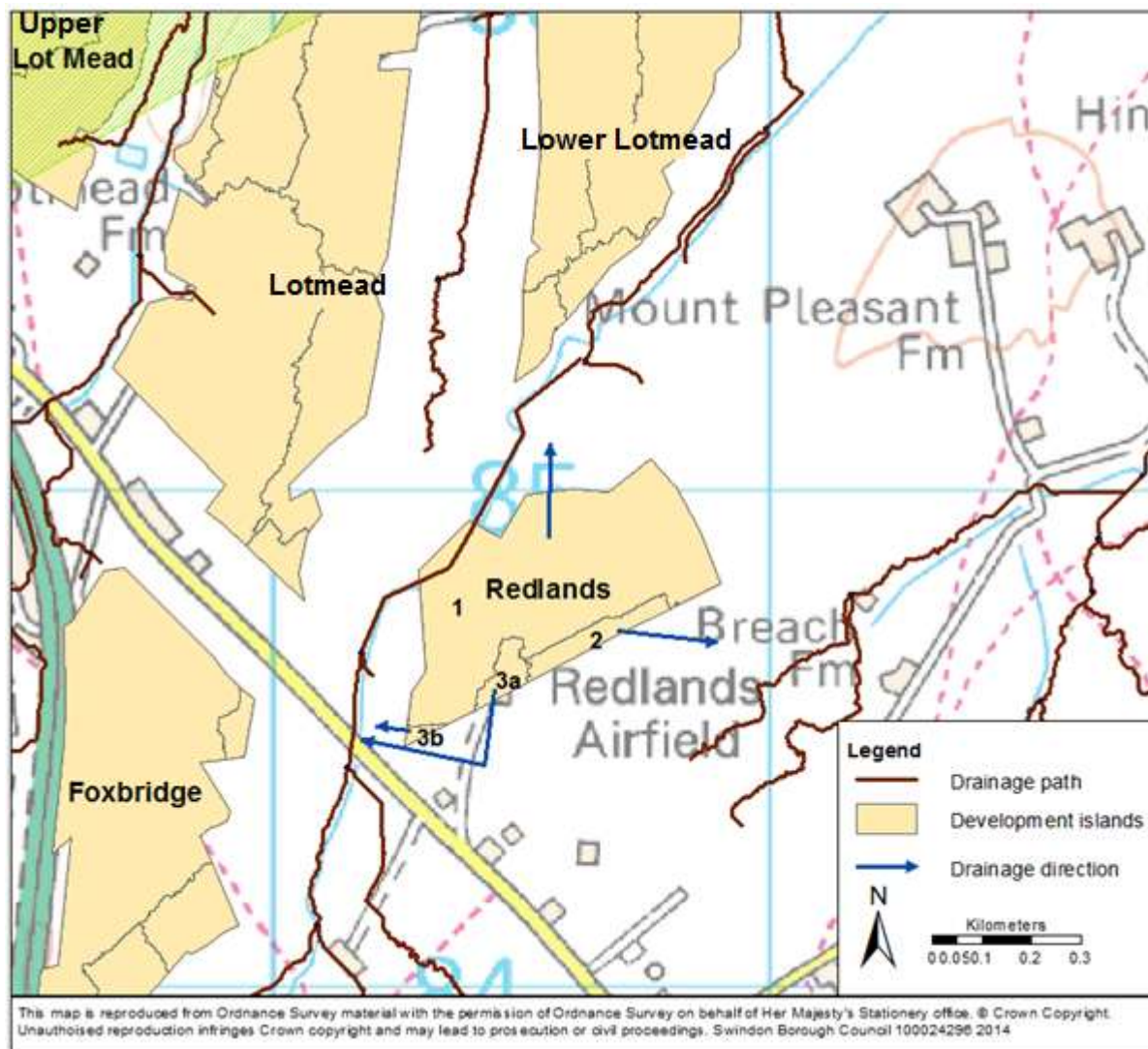


Figure A20 – natural catchments and flow directions

11.1 Interdependencies

Both Redlands and Lower Lotmead development areas drain into the channel running to the east of Lower Lotmead. Therefore developers of Redlands and Lower Lotmead may wish to jointly consider how flow through this channel is managed.

11.2 Opportunities and constraints

Located close the village of Wanborough, Redlands will be a small contained hamlet that should be discrete and sympathetic to the local landscape. The adopted Landscape Character SPD (2004) will help inform a development which respects its proximity to near neighbours, appears naturally settled within its rural landscape and is spacious enough to allow views to the open countryside. Selective use of SuDS will help to enhance the existing landscape setting; using SuDS as part of an appropriate planting regime, following existing field patterns and hedgerows, will help to enhance biodiversity of the area.

Public realm in the form of village squares and greens are expected to be integral to the hamlet's layout and SuDS in these areas can be used to provide several functions in one space thus optimising

land use, not only managing surface water, but adding to the distinctive character of the rural hamlet and providing health and wellbeing benefits as well as reducing air pollution and benefitting biodiversity.

11.3 Green infrastructure

Although not directly linked to the strategic green corridor (figure A21) 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 serve a dual purpose (thereby optimising the land take required), and would help link the developed area with surrounding landscape, softening the edges of the development and helping to protect the character and identity of nearby Wanborough, Bishopstone and Bourton. It would thus contribute to other policy objectives such as creating green corridors, enhancing biodiversity and maintaining the non-coalescence zone as defined in Policy NC3.

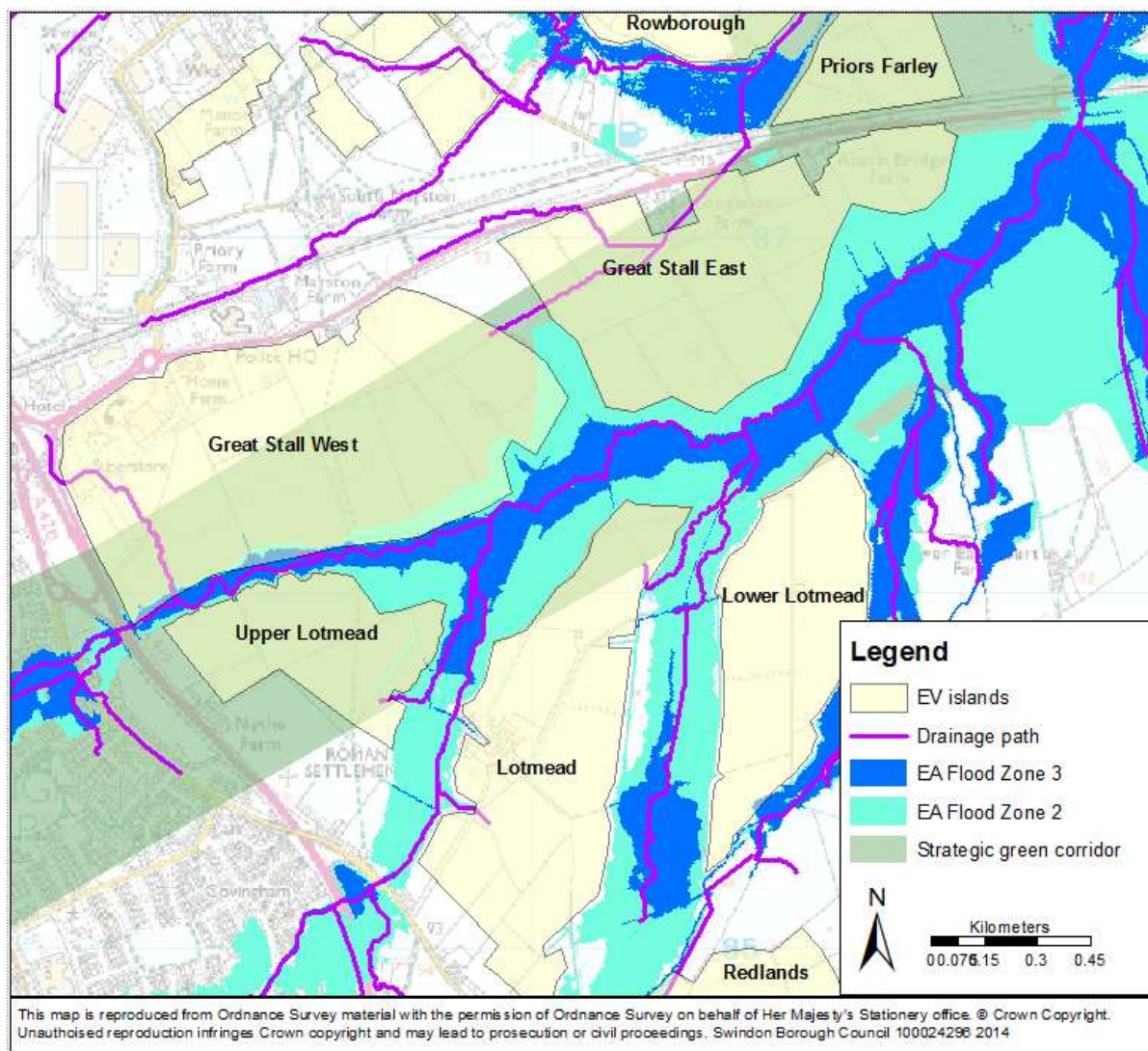


Figure A21: Green corridor

11.4 Multi-purpose spaces

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. 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. See section 3, Table 2 for further guidance.

Table A7: Public open space allocation

Land use	Area allocated (ha)	Suitable for SuDS
Children's Play	0.11	Yes – shallow play areas
General Rec MOS LOS	0.36	Yes – if compliant Section 3, table 2
Playing Pitches	0.43	Yes – if compliant Section 3, table 2
Outdoor Sports	0.14	Yes – if compliant Section 3, table 2
Allotments	0.11	No

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

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

changes to either drainage basins or river corridors therefore need to be considered 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 2003⁸ 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 2009⁹ - 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 2010¹⁰ 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 sustainable drainage systems (SuDS) by removing the automatic right to connect

⁷ http://eur-lex.europa.eu/legal-content/EN/TXT/?ELX_SESSIONID=4pFTJGIBynd9kWY0KdMrNhsl1Z96pFBDRnnKIHHJtsJj11HNQxGm!-297897114?uri=CELEX:32007L0060

⁸ <http://www.legislation.gov.uk/ukxi/2003/3242/contents/made> and as pdf: http://www.legislation.gov.uk/ukxi/2003/3242/pdfs/ukxi_20033242_en.pdf and http://www.persona.uk.com/bexhill/Core_docs/CD-03/CD-03-12.pdf

⁹ <http://www.legislation.gov.uk/ukxi/2009/3042/made>

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

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 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 2014¹¹). 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 Environment Agency'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 1991¹³/Water Resources Act 1991¹⁴: Under the terms of the Water Resources Act 1991 and the Land Drainage Byelaws, the prior written consent of the Environment Agency 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 Environment Agency under the terms of the Land Drainage Act 1991/Water Resources Act 1991. The Environment Agency 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 Disposal¹⁵ 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

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

- 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.
- Making Space for Water¹⁷ (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 Environment Agency 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.
- National Planning Policy Framework (NPPF) 2012¹⁹: 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

¹⁶ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69346/pb13562-future-water-080204.pdf

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 consultation 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

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 sustainable drainage systems.

- 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

- River Basin Management Plan: Thames River Basin District²⁰ (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

- Swindon Borough Local Plan 2026²², Swindon: Planning for the Future. Pre-submission Document, December 2012: The Swindon Borough Local Plan 2026 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

²⁰ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/289937/gether0910bswa-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>

strategy. Developments will be expected to incorporate sustainable drainage systems 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): New Eastern Villages - 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 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 National Planning Policy Framework and the Swindon Borough 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 consultation²⁴ and LFRMS Summary document²⁵). 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

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](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)

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)

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 2011²⁷. 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.
- NPPF guidance: Detailed guidance was issued with the NPPF (2012) (see above) in an accompanying document, the Technical Guidance to the National Planning Policy Framework, 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 pages²⁸. 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 sustainable drainage systems.
- The SuDS Manual, CIRIA (C697)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 Environment Agency 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

²⁷ See: Natural England Publications on green infrastructure:
<http://publications.naturalengland.org.uk/category/49002>.

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

²⁹ <http://www.hackney.gov.uk/Assets/Documents/The-SuDS-Manual-C697.pdf>

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](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)

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 Reports³¹. 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.
- Strategic Flood Risk Assessment³²: 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.

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>

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

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 (C697)
- 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)
- 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.

