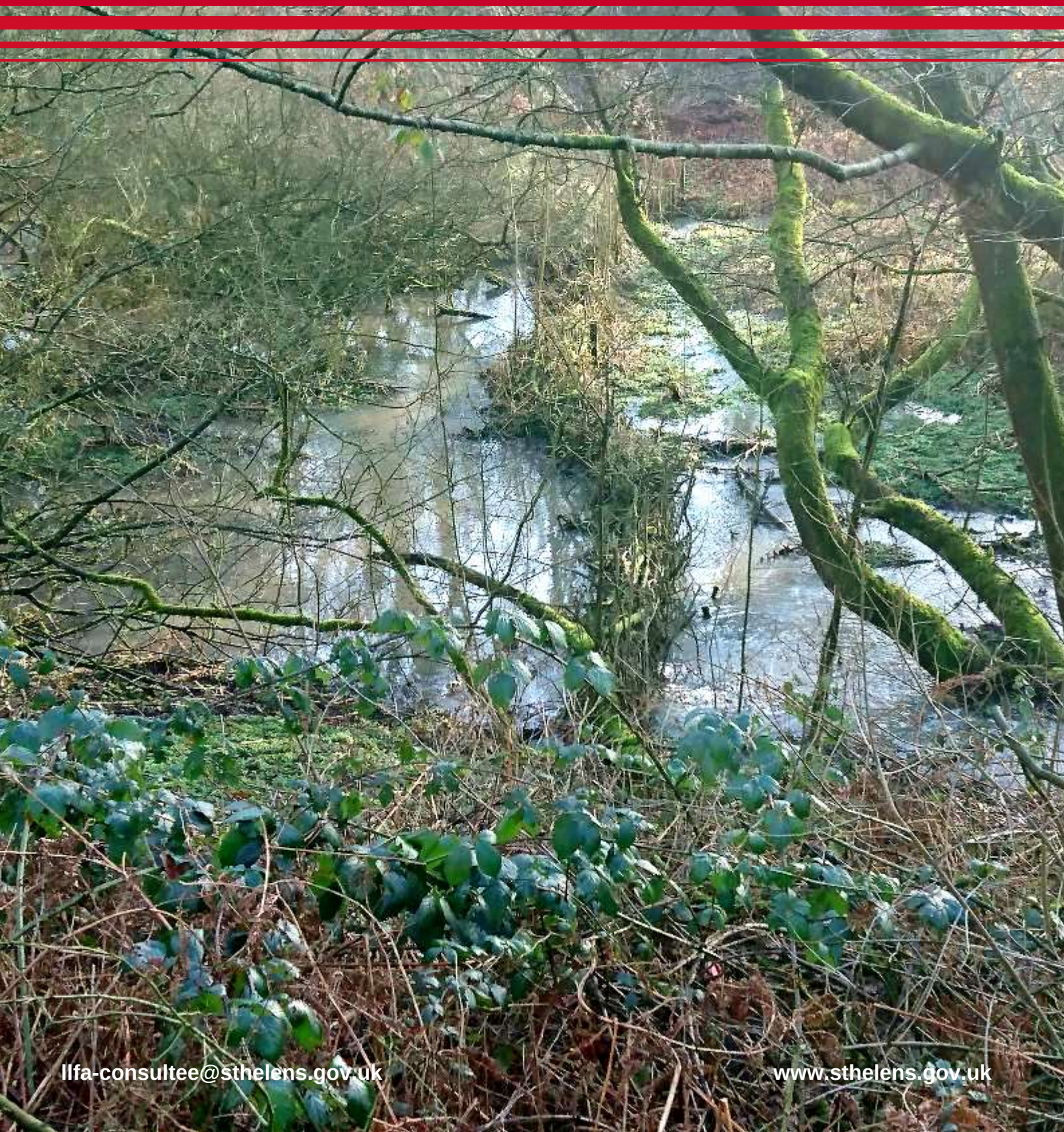
St.Helens Council

Sustainable Drainage Systems (SuDS) 2020

Design and Technical Guidance

Flood and Water Management Act 2010



llfa-consultee@sthelens.gov.uk

www.sthelens.gov.uk

Document Information

This document has been produced by St Helens Council and JBA Consulting for the purpose of assessing the drainage element in planning applications and providing guidance to the developers. With the enactment of the final part of the FWMA 2010 on the 15th April 2015 the Council Lead Local Flood Authority (LLFA) are designated as statutory consultee for major developments which encompass surface water or other local flooding impacts. New policies and standards for drainage have been released with effect from 6th April 2015 within the National Planning Policy Framework and the applicant is advised to ensure any drainage design meets these standards to avoid delays and changes to any submitted drainage designs.

Every care has been taken to produce this document to latest Government Guidelines and Flood Mapping data. This document may contain errors, please notify St Helens Council on the contact details below with any errors that are present and where the errors are located using the referencing system. Please contact using (01744) 676789, email using llfa-consultee@sthelens.gov.uk or through the website on www.sthelens.gov.uk.

JBA Consulting accepts no responsibility or liability for any use made of this document other than St Helens Council. This document is a live ongoing review process and will be reviewed with changes in legislation or standards. This document should be used in conjunction with the Legislative Flood and Water Management Act 2010, the Flood Risk Regulations 2009, the National Planning Policy Framework (NPPF) and St Helens Council Local Plans. This document will also be referenced and support the Council duties in the Flood and Water Management Act 2010 and Planning Policy.

Acknowledgments

St Helens Council thanks JBA Consulting and their representatives for their input and development of the suite of Sustainable Drainage Systems Guidance documents St Helens Council LLFA commissioned JBA Consulting to carry out the development of this guidance document. The document was prepared by Ed Blackburn (Senior Analyst) and Reviewed by Howard Keeble MPhil BEng BSc CEng CEnv CSci CWEM MICE MCIWEM MCMI (Technical Director). Below provides a list of the amendments made to this document at the time of writing.

Date	Personnel (with initials)		Areas of Amendment
12/08/2015	MC	Matthew Catherall	Council 1st revision (send to consultants)
01/09/2015	-	JBA Consulting	JBA SuDS Guidance 1st Draft (2 volumes)
14/03/2016	MC	Matthew Catherall	Council 1st revision (send to consultants)
22/11/2016	-	JBA Consulting	JBA SuDS Guidance 2nd Draft (2 volumes)
06/02/2017	JS / RR	John Sheward	Internal Review and combination of volumes
30/10/2018	MC	Matthew Catherall	Final review and rewrite
20/05/2020	MC	Matthew Catherall	Final review after public consultation

Review

Below provides a list of the final sign-off to this document.

Published	Originator	Checked By	Reviewed By	Approved By
Name	Matthew Catherall	John Sheward	John Sheward	Council Cabinet
Date:	12/06/2018	12/06/2018	12/06/2018	27/05/2020
	M.Catherall	JSheward	JSheward	-
Document Status	Final Adopted Version			

Contents

1. INTRODUCTION 6
1.1 Vision for St.Helens 6
1.2 What are SuDS? 6
1.3 When should SUDS be considered? 6
1.4 Who is the Guide for? 7
1.5 How to use this guide 7
1.6 Why has the guidance been produced? 7
1.7 The SuDS Submission Application Process 8
1.8 The SuDS Checklist 8
1.9 Submission Validation and Assessment 9
1.10 The SuDS Management Train 10
1.11 National Monitoring of SuDS Applications 10

2. BACKGROUND AND POLICY 11
2.1 Purpose of SuDS 11
2.2 SuDS Philosophy 12
2.3 SuDS Guidance Icons 12
2.4 National Policy Context 13
2.5 Local Policy Context 14
2.6 Key Benefits of SuDS 15
2.7 Biodiversity and Habitat Corridors 16
2.8 Topography, Geology and Soil Type 16
2.9 Importance of Water Resources 17
2.10 Sankey Catchment Action Plan 17

3. APPROVAL PROCESS 18
3.1 The Approval and Adoption Process 18
3.2 Responsibility Designation 19
3.3 Master Planning 20
3.4 Pre-application 20
3.5 Application Submission 20
3.6 Development and Flood Risk 21
3.7 Consultation Development and Flood Risk 22
3.8 Adoption Process Stage 22
3.9 Other Consents 23
3.10 Frequently asked questions? 25

4. SUDS COMPONENTS AND CONSIDERATIONS 26
4.1 National SuDS standards 26
4.2 The SuDS Management Train 26
4.3 The SuDS Design Philosophy 27
4.4 Prioritisation of Runoff Destination 28
4.5 Calculations for surface water runoff 28
4.6 SuDS Design Process 28
4.7 Design considerations 29
4.8 Hazards levels and stages of treatment 29
4.9 SuDS Design Process Flow Chart 30

5. SUDS AREA SUITABILITY 31
5.1 Choosing SuDS Components 31
5.2 Discharge considerations and Local SuDS Zones 31
5.3 Local SuDS Zones 32
5.4 Why use SuDS in St.Helens 32
5.5 Sand and Gravel Soils 32
5.6 Peat and Glacial Deposits 33
5.7 Other Soils 34

5.8 Site Challenges 34
5.9 Brownfield sites 34
5.10 Contaminated Land 34
5.11 Natural and Historic Site Drainage Pattern 35
5.12 Acceptable Suds components in St Helens 35
5.13 Not favoured Suds components in St Helens 35

6. SUDS COMPONENTS AND DESIGN CONSIDERATIONS 36
6.1 Design Submission Acceptance 36
6.2 Design Philosophy 36
6.3 General Design Requirements 37
6.4 Drawings, calculations and manhole records 37
6.5 Surface Water Drainage Design 37
6.6 Urban Creep 38
6.7 Attenuation Storage 39
6.8 Sewers 40
6.9 Peak flow rate and volume 40
6.10 Exceedance 41
6.11 Land Take 41
6.12 Good Urban Design 42
6.13 Planting 42
6.14 Designing for Maintenance and Safety 43
6.15 Good Urban Design 44
6.16 Surface Water 45
6.17 Historic Environment 46
6.18 Delivering Multiple Benefits 46
6.19 Landscape 47
6.20 Public Open Space and Amenity 47
6.21 Wildlife and Biodiversity 47
6.22 Trees 48
6.23 Key Water Framework Directives Objectives 48
6.24 River Basin Objectives 48
6.25 Role of SuDS in Meeting Water Framework Directive 49
6.26 Designation of SuDS Constructed on Third Party Land 49
6.27 Riparian Responsibilities 49
6.28 Local Standards 50

7. TECHNICAL DESIGN REQUIREMENTS 52
7.1 SuDS Components 52
7.2 Source Control 52
7.3 Site and Regional Control 52
7.4 Seed Grass Mixes 52
7.5 Treatment Control 52
7.6 Filter Drain / Infiltrator Drain (Source Control) Overview 53
7.7 Filter Strip (Source Control) Overview 54
7.8 Filter Strips / Infiltrator Trenches (Technical Requirements) 55
7.9 Swales (Source Control) Overview 56
7.10 Swales (Technical Requirements) 57
7.11 Bio-retention (Source Control) Overview 58
7.12 Bio-retention (Technical Requirements) 59
7.13 Underground Storage (Site Control) Overview 60
7.14 Underground Storage (Technical Requirements) 61
7.15 Detention Basin (Site Control) Overview 62
7.16 Detention Basin (Technical Requirements) 63
7.17 Retention Basin (Regional Control) Overview 65
7.18 Retention Basin (Technical Requirements) 66
7.19 Vortex System (Pre Treatment Options) Overview 68
7.20 Vortex System (Technical Requirements) 68

7.21 Oil and Sediment Separator (Pre Treatment Options) Overview 69
7.22 Oil and Sediment (Technical Requirements) 69

8. SUDS MAINTENANCE 70
8.1 SuDS Management Plan 70
8.2 Responsibility for Maintenance 71
8.3 Maintenance of SuDS Components....71
8.4 Construction and Waste Management for SuDS....72

9. APPENDICES 73

A. APPLICATION CHECKLIST FOR SUDS ASSESSMENT (APPENDIX A) 74
A.1 Process Summary....74
A.2 Pre-Application....74
A.3 Master Planning 75
A.4 Outline Planning Application 75
A.5 Full Planning Application....76
A.6 Check List 76
A.7 File Submission....76

B. RUNOFF CALCULATOR GUIDE (APPENDIX B) 77
B.1 Process Summary....77

C. SUDS SUITABILITY SELECTION MATRIX (APPENDIX C) 78
C.1 Matrix Selection....78

D. SUDS INDICATIVE SCHEMATICS AND MAPPING (APPENDIX D) 79
D.1 Appendices D: Figure D1 - Filter Drain / Infiltration Trench 80
D.2 Appendices D: Figure D2 - Detention Filter Strip....81
D.3 Appendices D: Figure D3 - Swales 82
D.4 Appendices D: Figure D4 – Bio-retention 83
D.5 Appendices D: Figure D5 - Retention Basin 84
D.6 Appendices D: Figure D6 - Detention Basin 85
D.7 Appendices D: Figure D7 - Underground Storage....86
D.8 Appendices D: Figure D8 - Sand and Gravel Soil 87
D.9 Appendices D: Figure D9 - Peat and Glacial Deposits 88
D.10 Appendices D: Figure D10 - Other Soils....89
D.11 Appendices D: Figure D11 - Topography 90

E. USEFUL RESOURCES (APPENDIX E) 91

F. DOCUMENT REFERENCES (APPENDIX F)....94

1. Introduction

Sustainable Drainage Systems (SuDS)

SuDS are a sustainable management approach to surface water, where water is drained more naturally than traditional methods. SuDS provide opportunity to address continuing pressures on the environment, by reducing the causes and impacts of flooding; removal of pollutants etc.

What this section will cover:

- The approach to SuDS;
- What are SuDS components;
- When should SuDS be considered;
- Introduction to the SuDS guidance documents;
- SuDS Application Checklist;
- How to use this guidance.

1.1 Vision for St.Helens

1.1.1 Water is a defining feature of the St.Helens landscape and historic heritage, from the St.Helens Canal and Carr Mill Dam, to the many man made and smaller watercourses that join to become the start of the Sankey River and catchment. The management of water resources in St.Helens is therefore a necessary part of everyday life for both people and the environment. As St.Helens urban areas expand and grow so to do the challenges faced in the effective management of surface water runoff and drainage.

1.1.2 The key challenges are as follows:

- Reduction in green spaces;
- Increasing risk of flooding and erosion;
- Increasing pressure on existing infrastructure;
- Effective management of impermeable soils on brownfield land;
- Effective management of wider impacts on catchment surface water drainage.

1.1.3 Development and redevelopment of land has the potential to increase existing flood risk. The cumulative impacts of development on flood risk, if left unmanaged, may result in a significant deleterious impact on the local environment. Development planning, ensuring effective use of Sustainable Drainage Systems (SuDS) to manage and reduce surface water runoff, is considered an essential aspect of all new development proposals.

1.1.4 It is intended that the Checklist and processes outlined in this Guidance are used by Developers and stakeholders as the basis of the SuDS approval process. SuDS provide an approach to surface water management where water is drained in a more sustainable way than traditional methods.

1.2 What are SuDS?

1.2.1 SuDS provides the opportunity to address pressures on the water environment by establishing systems which aim to control surface water run off close to where it falls. SuDS also aim to slow the rate of run-off and improve infiltration by mimicking the natural processes of interception, infiltration and conveyance both to the ground and existing rivers and streams. This reduces the risk of “flash-flooding” which occurs when rainwater rapidly flows into the public sewerage and drainage systems. SuDS therefore provides valuable opportunities to:

- Reduce the causes and impacts of flooding;
- Remove pollutants from urban run-off at source;
- Combine water management with green space with benefits for amenity, recreation and wildlife.

1.3 When should SUDS be considered?

1.3.1 The National Planning Policy Framework (NPPF) defines that the decision as to whether a sustainable drainage system should be considered will depend on the proposed development and its location. For example, SuDS may be considered appropriate for areas currently at risk of flooding and new development will only be considered appropriate if priority has been given to the use of sustainable drainage systems.

1.4 Who is the Guide for?

1.4.1 This guidance is intended to provide a standardised approach to the selection of appropriate SuDS and identify the information required from the Developer to enable the Local Authority and Statutory Consultees to effectively review the planning applications. It is intended that this guidance is used by:

- Developers, Drainage Engineers, Architects, Landscape Designers and Urban Planners;
- Local Authority Stakeholders, Planners, Building Control, Highways Maintenance and Design Engineers;
- The Lead Local Flood Authority (LLFA) as a Statutory Consultee in their assessment of SuDS proposals;
- Other Statutory Consultees involved in the assessment of SuDS proposals (Water Companies etc.).

1.4.2 This guidance will look to follow a 6 stage process in dealing with planning applications, as follows:

- Stage 1: Provide a clear and consistent approach to implementing SuDS within the administrative area;
- Stage 2: Enable developers to complete efficient site assessment, SuDS selection and detailed design;
- Stage 3: Provide an organised structure for developer applicants to the Local Planning Authority;
- Stage 4: Enable officers to identify the key design specification requirements and legislation issues;
- Stage 5: Allow efficient assessment of submitted SuDS proposals through the planning process;
- Stage 6: Facilitate successful operation and maintenance.

1.5 How to use this guide

1.5.1 The information provided in this document aims to be comprehensive and accessible guide to SuDS and their applicability to the St.Helens area. The guidance describes the SuDS application submission process and the information that the Council requires to enable them to evaluate and subsequently validate SuDS as part of the Planning process. This guide is not intended to reproduce or replace the CIRIA SuDS Manual which should be consulted for detailed guidance on the design and construction of SuDS. This guidance document is divided into eight colour coded sections which outline the 6 stage process in dealing with planning applications, as follows:

- Part 1: Introduction;
- Part 2: Background and Policy;
- Part 3: Approval Process;
- Part 4: SuDS Components and Considerations;
- Part 5: SuDS Area Suitability;
- Part 6: General Design Requirements;
- Part 7: Technical Design Requirements;
- Part 8: SuDS Maintenance.

1.5.2 At the start of each section of the guidance there is a summary box which highlights the key topics under discussion in more detail. Throughout this guidance numerous 'marker' boxes can be found as follows, providing further information or highlighting standards:

MARKER

Example Marker Box Containing…

- Specific Local SuDS Standards;
- Legislation and / or Supporting Documents links;
- National Standards in line with Defra's 'Non-statutory technical standards for sustainable drainage systems' – March 2015.

1.6 Why has the guidance been produced?

1.6.1 Section 10 of the National Planning Policy Framework (NPPF) sets out the expectation that Local Planning Authorities (LPA's) as part of their function of determining planning applications should avoid flood risk to people and property and should manage any residual risk. The expectation is clear that SuDS must be provided in new developments and that approval for all SuDS for 'major developments' must be granted through the planning system.

1.7 The SuDS Submission Application Process

1.7.1 The SuDS Submission Application and Approval Checklist (the SuDS Checklist), included as Appendix A, identifies the SuDS related information which should be provided by the Developer in support of the Planning Application. The Developer is required to provide all the information identified in the Checklist including specific links to key plans, calculations and supporting documents where required.

1.7.2 The requirements, and the level of detail needed is dependent on the current stage of the application, as well as the scale of the proposed Major development (Pre Application, Outline and Full). The Local Planning Authority looks to reduce the amount of Pre commencement conditions for each application, however some information may be allowed as a pre commencement upon discussion with the Individual Planning case Officers. The definition of "Major Development is within marker 1.1.

MARKER 1.1

Definition of "Major Development" (as set out in Article 2(1) of the Town and Country Planning (Development Management Procedure) (England) Order 2010) means development involving any one or more of the following:

a) the winning and working of minerals or the use of land for mineral-working deposits;
b) waste development;
c) the provision of dwelling houses where:
   i. the number of dwelling houses to be provided is 10 or more; or
   ii. the development is to be carried out on a site having an area of 0.5 hectares or more and it is not known whether the development falls within sub-paragraph (c)(i);
d) the provision of a building or buildings where the floor space to be created by the development is 1,000 square metres or more; or
e) development carried out on a site having an area of 1 hectare or more.

Changes to the National Planning Policy Framework (NPPF) came into effect on 06 April 2015 which made Lead Local Flood Authorities (LLFA) statutory consultees in planning applications for "Major Development" in relation to SuDS and Drainage. The Development Management Procedure Order was also amended, designating Councils as the Lead Local Flood Authority, and therefore each Council is now a statutory consultee within the planning process on the management of surface water.

1.8 The SuDS Checklist

1.8.1 The SuDS Checklist identifies the information required as a series of questions and includes references to this Guidance where further information can be found. The checklist is in five sections:

- Application Details;
- General Details and SuDS Proposals;
- Hydraulic Assessment of SuDS Proposals;
- SuDS Discharge Proposals and Agreements;
- SuDS Maintenance and Management Proposals.

MARKER 1.2

How to Complete the SuDS Submission Application and Approval Checklist (The SuDS Checklist)

The SuDS Checklist is in the form of an Excel spreadsheet which is included in Appendix A of this guidance document. The Checklist is designed for the Applicant to provide a response to each indicated questions, appropriate to the stage and type of the planning application (either minor or major development).

The Applicants response should include a reference to their submitted reports, drawings and calculations where information to support their answer can be found. Developers are to submit all SuDS information as a package (hard & soft copy). The applicant will be required to confirm that the SuDS documentation submitted above complies with the Council's SuDS Guidance Documentation, Local Planning Policies and all relevant National Legislation, Policies and Guidance.

1.9 Submission Validation and Assessment

1.9.1 Currently, for planning applications, only Major Applications (which have a 13 week consideration period) require SuDS proposals. Changes to the National Planning Policy Framework (NPPF) came into effect on 6th April 2015 which made SuDS a material consideration when determining planning applications for major development.

1.9.2 Planning applications may be made either as a, Pre Application, an Outline Application (with one or more matters reserved for later determination) or as a Full Application. The level of information which would need to be submitted for each type of application or stage within the planning process will vary depending on the size of the development, flood risk, constraints and proposed sustainable drainage system. The Developer shall be wholly responsible for the design and construction of SuDS systems.

1.9.3 The Developer and / or their designer shall certify that their design complies with Council Guidance and accept liability for compliance through their professional indemnity insurance. These responsibilities / liabilities shall not be discharged to Council following a satisfactory audit of their design. Following receipt of the SuDS Checklist the Local Planning Authority will validate the information provided on the SuDS Checklist and Supporting Documents. The Council will therefore assess SuDS applications to ensure proposed minimum standards of operation are appropriate and through the use of planning conditions or planning obligations that there are clear arrangements in place for ongoing maintenance of SuDS over the lifetime of the development.

MARKER 1.3

Defra SuDS Non Statutory Technical Standards

The government have issued new policies and standards for sustainable drainage which make changes to the planning framework; the applicant is advised to design the drainage system in accordance with the new planning framework: Non-statutory technical standards for the design, maintenance and operation of sustainable drainage systems.

https://www.gov.uk/government/publications/sustainable-drainage-systems-non-statutory-technical-standards

1.9.4 Sustainable drainage systems may not be practicable for some forms of development (for example mineral extraction). The decision as to whether a sustainable system would be inappropriate in relation to a particular development proposal is a matter of judgement for the Local Planning Authority. In making this judgement the Local Planning Authority will seek advice from the relevant flood risk management bodies, principally the Lead Local Flood Authority, including on what sort if of sustainable drainage system they would consider to be reasonably practicable.

1.9.5 The judgement of what is reasonably practicable will be by reference to the SuDS technical standards published by the Department for Environment Food and Rural Affairs (DEFRA) and take into account design and construction costs. It should be noted that the Councils currently have no duty to adopt SuDS (and are not currently adopting new SuDS) and provision for the disposal and maintenance of runoff remains the responsibility of the Developer. A satisfactory audit by St.Helens Council does not authorise any activities by the Developer which may be in contravention of any enactment or any order, regulation or other instrument made, granted, or issued under any enactment, or in contravention of any rule, byelaw or in breach of any agreement or legal rights.

1.9.6 The LLFA strongly recommend that they are involved in early pre-application discussions alongside other key stakeholders when the development of a site is initially being considered. Pre-application discussions will help to ensure that SuDS are considered at the appropriate time, ahead or as part of the production of the preliminary development layouts, and that they are fully integrated into the final development layout. Appendix B of the CIRIA SuDS Manual (C753) sets out suggested material to inform pre-application discussion. Evidence of, and outcomes from, pre-application discussions will be used by the LLFA when considering the suitability of the information submitted with the planning application. If the pre-application advice is heeded it is more likely that the LLFA will not object to the SuDS proposals or request more information thereby avoiding delays on the grounds that a proposed SuDS scheme needs to be revised.

1.10 The SuDS Management Train

1.10.1 Individual SuDS, located both in public and private areas, should accounted for in the context of a Management Train that reinforces and, where possible, follows the natural pattern of drainage. The Management Train incorporates a hierarchy of techniques:

- Prevention- use of good site design/housekeeping measures on individual sites to prevent runoff/pollution;
- Source control – control of runoff at, or very near, its source;
- Site control – management of water from several sub-catchments;
- Regional control – management of runoff from several sites.

1.10.2 For small developments, consideration must be given to prevention and source controls, as site or regional controls such as detention ponds may not be practical. The reduction of runoff and the treatment of runoff at source should provide the required treatment levels as required by Section 4 and 5 of this guidance document. The requirements for drainage should be considered when determining the overall layout of the development as the natural features of the site, such as topography, will often dictate some aspects of the drainage system design and should be incorporated as green infrastructure.

1.10.3 The Developer shall liaise with the stakeholders identified in Section 3 of this guidance document. This guide does not cover a specific process for the consent of pumping stations. The Developer shall undertake the design and preparation of drawings in accordance with the principles outlined in Section 4 and 5 of this guidance document. When undertaking the design using the guidance provided, the Developer should take cognisance that pumped surface water systems are not considered to be sustainable and pumping stations which accessories are belonging to a sewer shall be shown on the drainage plan.

1.11 National Monitoring of SuDS Applications

1.11.1 All LLFAs, as statutory consultees, where required to submit an annual report to the Secretary of State (DCLG) as prescribed under; The Town and Country Planning Order (2015) section 23. Updates to the SuDS process in 2017 states there is no national monitoring to the uptake of SuDS (under number of current SUDS Schemes). Assessment of monitoring is currently being revised by the government.

MARKER 1.4

Monitoring Review Update 2017

https://publications.parliament.uk/pa/cm201617/cmselect/cmenvfru/990/99005.htm#footnote-061

http://data.parliament.uk/writtenevidence/committeeevidence.svc/evidencedocument/environment-food-and-rural-affairs-committee/postlegislative-scrutiny-flood-and-water-management-act-2010/written/47208.pdf

The Town and Country Planning (Development Management Procedure) Order (2015)
http://www.legislation.gov.uk/uksi/2015/595/article/23/made

23.—(1) Each consultee who is, by virtue of section 54 of the 2004 Act and article 22, under a duty to respond to consultation, must give to the Secretary of State, not later than 1st July in each year, a report as to that consultee's compliance with section 54(4) of the 2004 Act. (2) The report must relate to the period of 12 months commencing on 1st April in the preceding year ("the report year"). (3) The report must contain, in respect of any report year—

(a) a statement as to the number of occasions on which the consultee was consulted by a person other than a local planning authority;
(b)a statement as to the number of occasions on which a substantive response was given to a person other than a local planning authority within the period referred to in section 54(4) of the 2004 Act;
(c) a statement as to the number of occasions on which the consultee was consulted by a local planning authority;
(d) a statement as to the number of occasions on which a substantive response was given to a local planning authority within the period referred to in section 54(4) of the 2004 Act; and
(e) in relation to occasions on which the consultee has given a substantive response outside the period referred to in section 54(4) of the 2004 Act, a summary of the reasons why the consultee failed to comply with the duty to respond within that period.

2. Background and Policy

Policy Context

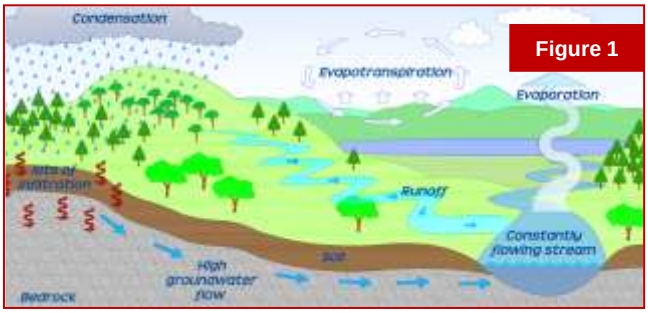
The revision of SuDS National Standards (November 2015) provides the opportunity to address pressures on the water environment by establishing systems which aim to mimic the natural processes of interception, infiltration and conveyance to the ground and existing rivers / streams whilst also realising additional benefits.

What this section will cover:

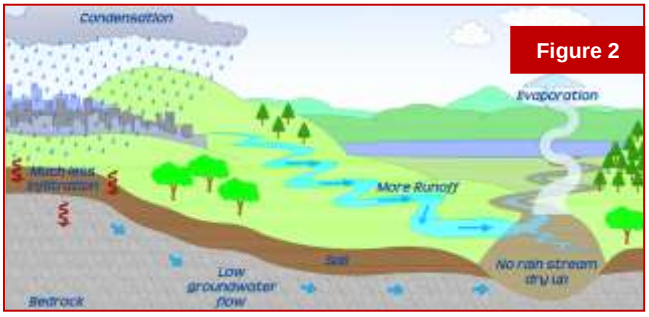
- What is a Sustainable Drainage System;
- The purpose and philosophy of SuDS;
- Legislation and Policy Context;
- Key benefits of incorporating SuDS
- St.Helens Council Geology, Ecology
- Why SuDS in St.Helens

2.1 Purpose of SuDS

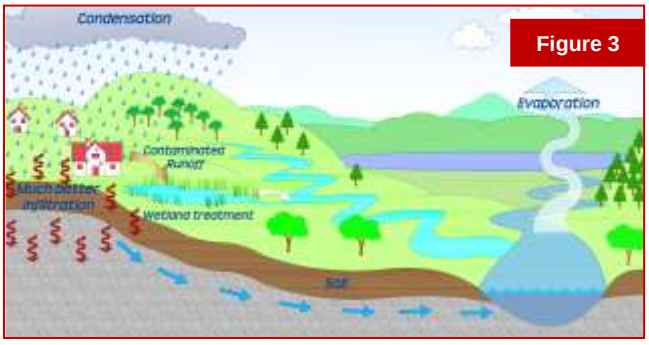
2.1.1 The key purpose of SuDS is to mimic where possible the natural water cycle of the environment, the following figures 1-3 identify the base line cycle (1), with Urban Expansion (2) and with SuDS (3). The SuDS philosophy is to replicate the drainage conditions which existed at a site prior to development. The variety of components means that SuDS are applicable for sites of any size, condition, topography, or environmental condition.



2.1.2 Impervious areas such as roads, footpaths, roofs, and car parks are traditionally connected to sewer systems that transport runoff away from urban areas quicker than natural, vegetated conveyances. This can cause disruption to the natural water cycle as flows in downstream waterways peak faster and in greater quantities than pre-developed conditions. This exacerbates, or creates new, surface water flood risks which can also increase pollution in our waterways.



2.1.3 SuDS aim to manage rainfall and surface runoff by allowing rainfall to be intercepted or absorbed into the ground through vegetation and specially designed landscape features. SuDS also conveys any additional flows to the nearest surface water body (for example, groundwater, stream, river or drain) where it is discharged at the same rate and, where feasible, the same volume as would occur if the site was undeveloped. SuDS can also be used to provide biodiversity improvements to developed areas.



❖ *Image Figures 1-3 Source reference; The SuDS Manual, CIRIA 2015 (19/01/2018)*

MARKER 2.1

SuDS (Sustainable Drainage Systems)
An approach to water management designed to drain surface water in a more sustainable way than traditional methods.

CIRIA SuDS Manual (C753)
Additional guidance on the design and implementation of SuDS can be found in the CIRIA SuDS manual. http://www.ciria.org/Memberships/The_SuDs_Manual_C753_Chapters.aspx

2.2 SuDS Philosophy

2.2.1 The SuDS philosophy is to replicate the drainage conditions which existed at a site prior to development. The variety of components means that SuDS are applicable for sites of any size, condition, topography or environmental condition. It is important to note that these elements of SuDS philosophy are interrelated and that any SuDS proposal does not simply seek to address runoff but considers other benefits which can be delivered. The types of benefits that can be achieved by SuDS fit into four categories. These are referred to in the CIRIA SuDS Manual as the Four Pillars of SuDS Design.

MARKER 2.2

The Four Pillars of SuDS Design

- **WATER QUANTITY - Control the quantity of runoff to support flood risk management;**
  - Maintain and protect the natural water cycle;
- **WATER QUALITY - Manage the quality of runoff to prevent pollution;**
- **AMENITY - Create and sustain better places for people;**
- **BIODIVERSITY - Create and sustain better places for nature.**

2.2.2 The CIRIA SuDS Manual is now established as the definitive technical resource for the planning, design, construction and operation of SuDS and is referenced widely in both national policy and local authority guidance. The core of the CIRIA SuDS Manual retains the following fundamental reasons for managing surface water management within any infrastructure development (highway, industry, housing, utility services) and any wider improvements in restoration and land improvement.

2.2.3 These fundamental reasons are outlined as follows:

- Surface Water Flooding - Runoff can cause flooding if it cannot be drained away quickly enough;
- Sewer Flooding- Runoff draining to underground pipes can become blocked, causing flooding;
- River Flooding – Local and downstream risk is increased if too much runoff drains into a river too quickly;
- Erosion - Faster river flows can cause erosion, altering riverbank profile and affecting plants and animals;
- Diffuse Pollution - Surface Runoff washes pollutants into rivers, affecting water quality and bio-diversity.

2.2.4 The National Planning Policy Framework (NPPF) defines that the decision as to whether SuDS should be considered will depend on the proposed development and its location. For example, SuDS may be considered appropriate for areas currently at risk of flooding and new development will only be considered appropriate if priority has been given to the use of sustainable drainage systems.

2.3 SuDS Guidance Icons

2.3.1 Throughout this document, the following icons have been used to highlight the benefits and opportunities of each SuDS method. These can be used to identify and realise the maximum potential of incorporating SuDS within development.

2.4 National Policy Context

2.4.1 The following markers provide information on national planning and policy level effecting SuDS:

MARKER 2.3

Flood and Water Management Act 2010 & Pitt Review

The Flood and Water Management Act (FWMA) 2010 aims to provide for better, more comprehensive management of flood risk for people, homes and businesses, safeguarding community groups from unaffordable rises in surface water drainage charges, and protect water supplies to the consumer. Serious flooding can happen at any time and climate projections suggest that extreme weather will happen more frequently in the future. The Act aims to reduce the flood risk associated with extreme weather by implementing the recommendations of the Pitt Review.

https://www.legislation.gov.uk/ukpga/2010/29/contents

https://webarchive.nationalarchives.gov.uk/20100702215619/http://archive.cabinetoffice.gov.uk/pittreview/thepittreview/final_report.html

MARKER 2.4

National Flood and Coastal Risk Management Strategy for England 2011

The Strategy sets out a framework for implementing the Flood and Water Management Act 2010, aiming to assist local authorities and communities with their responsibilities by taking a risk based approach to flood and coastal risk management and ensure a full range of options is managed in a co-ordinated manner. Flood risk management authorities are required to consider a combination of flood storage, source control and SuDs to help manage surface water more effectively and avoiding damage to property, people, or assets.

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

MARKER 2.5

National Planning Policy Framework 2012
Planning Practice Guidance: Flood Risk and Coastal Change (2015)

The 2012 Framework provides the planning policy and guidance for England which informs local plans and decisions. There is a focus on the role of sustainable development which should underpin planning and decision making, particularly with regards to reducing the causes and impacts of flooding. It states that SuDS provide numerous opportunities in addition to reducing the causes and impacts of flooding. It advises on the need to plan for maintenance of SuDS to ensure effective drainage for properties and notes that local authorities and developers should work together to implement SuDS. The Planning Practice Guidance relating to SuDS was revised 23 March 2015 and highlights the considerations which should be made about the types of SuDS, operation and maintenance in relation to the Defra Non-Statutory Technical Standards.

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

http://planningguidance.planningportal.gov.uk/blog/guidance/flood-risk-and-coastal-change/reducing-the-causes-and-impacts-of-flooding/why-are-sustainable-drainage-systems-important/

2.4.2 The following marker provides information on catchment level (mixture of both national and local):

MARKER 2.6

National Flood and Coastal Risk Management Strategy for England 2011

The CFMP examines 10 sub areas in the Mersey catchment. It notes that St. Helens (Area 3) is an area of moderate to high flood risk where flood risk is generally being managed effectively. Approximately 1,000 properties are at risk for a 1% annual probability event. Also at risk of flooding are 4 km of transport network and some 17 community assets including schools and a hospital. The vision for the area includes: "to maintain the current level of flood risk management which is sufficient to cover the areas at greatest risk" by encouraging use of SuDS to reduce flood risk and control pollution and diverting future development away from flood risk areas.

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/293769/Mersey_Estuary_Catchment_Flood_Management_Plan.pdf.

2.5 Local Policy Context

2.5.1 The following markers provide information on local planning and policy level effecting SuDS:

MARKER 2.7

St.Helens Council Adopted Local Plan Core Strategy October 2012

The strategy sets out a series of polices for addressing the vision for 2027 and objectives to achieve this vision. The spatial policy reflects the need for sustainable development in the National Planning Policy Framework 2012. This ties with Policy CP1 (Ensuring Quality Development in St. Helens). The policy further states that "The adoption and/or aftercare of SuDS, flood defences and other appropriate measures will need to be carefully considered and agreed with the Council and other relevant parties".

http://www.sthelens.gov.uk/media/354627/ldf43e.pdf

MARKER 2.8

St. Helens Council Strategic Flood Risk Assessment Final Report September 2014

Council have both level 1 and level 2 assessments. It focuses on the main sources of risk in the Borough including fluvial flooding along Sankey Brook. Other sources include surface water flooding, sewer flooding, and residual risks associated with the St Helens Canal (Sankey Canal), dams and reservoirs within the Borough. One of the main SFRA recommendations was that the Council should prepare a Local Flood Risk Management Strategy (LFRMS), which was completed in 2014.

http://www.sthelens.gov.uk/media/703136/st_helens_council_strategic_flood_risk_assessment_september_2014.pdf

MARKER 2.9

Mid Mersey Water Cycle Study 2011

The study makes specific recommendations in relation to both planning and sustainable drainage and provides an Environment Agency checklist to encourage SuDS to be considered at the earliest opportunity. It also examines where infiltration SuDS would be applicable in St. Helens.

https://www.sthelens.gov.uk/traffic-travel-parking/highway-maintenance/flooding-and-drainage/flood-and-water-management/

MARKER 2.10

Surface Water Management Plan (SWMP) Strategic Risk Assessment & Scoping Study 2012

The report represents the first 'Preparation Stage' of the Defra SWMP Process Wheel and concluded that surface water flood risk in St Helens is characterised by the following. A small number of locations where different local flooding mechanisms appear to interact with Main River water levels over a wide area and there are potentially a large number of properties at risk. Several locations where local sources of flooding appear to be primarily responsible for a flood risk to significant number of properties. Numerous small areas of flood risk where minor flow-paths and ponding areas cause flooding to individual or small groups, of properties. It was recommended that rather than undertake a universal approach to investigating flood risk, a number of specific studies should be carried out, targeting the apparent higher risk locations through site specific detailed or Intermediate investigation.

http://www.sthelens.gov.uk/media/427675/01_st_helens_swmp_-_preparation_stage_report.pdf

MARKER 2.11

St.Helens Local Flood Risk Management Strategy (LFRMS) 2014

This document sets out the flood risk issues, the main responsibilities and measures required for flood risk management and details how these issues will be monitored and managed. It draws on Schedule 3 of the FWMA as well as CP1 of the Core Strategy. Upon enactment of Schedule 3 of the FWMA 2010, St. Helens will encourage, adopt and maintain SuDS. SuDS play a crucial role in managing surface water from developments on site and hence reducing flood risk.

http://www.sthelens.gov.uk/media/563762/sthelens_lfrms_2014.pdf

MARKER 2.12

St.Helens Supplementary Planning Documents

In St. Helens' Local Development Framework there are a number of supplementary planning guidance documents including the two listed in the adjacent way marker. These planning documents detail the aspirations and aims of a number of areas to be developed. SuDS to be utilised in these areas should ensure that they are in keeping with the designs and maximise the benefits which can be derived from SuDS such as increasing green areas for recreation and improving the aesthetic quality of an area.

http://www.sthelens.gov.uk/media/112101/ldf27.pdf
http://www.sthelens.gov.uk/media/112106/ldf48c.pdf

2.6 Key Benefits of SuDS

2.6.1 There are a number of proven benefits which can be derived from employing SuDS components, both for new and the existing built environment. These include; water management benefits, such as temporary storage during a storm event to reduce flooding, improved runoff water quality and removal of sediments (an accumulation of sediments can reduce storage capacity and contribute to flooding). SuDS can also have indirect social benefits for an area and community. SuDS components can be designed to create green areas used for recreation which also enhance the aesthetic qualities of the locality. In turn, these measures can improve the appeal of the area, and may also encourage investment in an area leading to economic benefits such as increased prices in the property market. The implementation of SuDS within may have the following benefits:

- **Table 2a: SuDS Benefits**

Management		Benefit
	Management of increased water quantity, frequent extreme rainfall events and brownfield sites.	Increased precipitation as climate change occurs is likely to lead to wetter winters. SuDS can help reduce surface water discharge rates and can provide betterment to drainage at brownfield sites.
	Assistance with the protection of all water bodies. Protection of the water environment from diffuse pollution and deliver long term benefits.	These management features can be undertook using the documents / legislation: The Water Framework Directive (WFD) (Directive 2000/60/EC), North West River Basin Management Plan 2009 and Environment Agency 2013: North West River Basin District: Challenges and Choices.
	Increase green spaces and vegetated areas and utilise components of Green Infrastructure	SuDS provide an array of amenity, recreational and biodiversity benefits and can help to reduce the urban heat island effect. This is to be linked with several policies in Council Local Plan Core Strategy.
	Development of social cohesion to enhance community life quality and increase recreational areas.	Council planning policies encourage the provision of opportunities for access, outdoor sport, and recreation. As an example wetlands can be wildlife parks with stepping stones and islands.
	Understanding functionality of SuDS and informing younger generations.	Education of the public about the environmental importance of SuDS. Stimulates learning of surface water management and application.
	Perceived improvement and connectivity of multiple areas.	Visual attractiveness of a development can increase house values and SuDS can link public open spaces with green infrastructure and provide habitat corridors.

- *Source reference; The SuDS Manual, CIRIA 2015 (22/01/2018)*

2.7 Biodiversity and Habitat Corridors

2.7.1 St. Helens' landscape types provide valuable habitats for species including those designated as UK Species of Conservation Concern. There are 119 Local Wildlife Sites, 10 Conservation Areas, 6 Local Nature Reserves, 8 areas of Ancient Woodland and a Wildlife Corridor (Sankey Valley) within St Helens. Within these areas are located 15 priority species and 13 priority habitats. There are also other landscape designations and programmes such as the Mersey Forest Initiative, which is a collection of woodlands and green spaces which provide social, economic and environmental benefits to local people. It is recognised as part of the Green Infrastructure for the area St. Helens' ancient woodlands cover only relatively small areas but are considered to provide significant wildlife value. Goyt Hey Wood, for example, supports a large number of locally rare flora and is also an important breeding bird site. These areas provide green corridors for biodiversity.

2.7.2 The design of SuDS provides a potential opportunity to both enhance developments (existing and proposed) and to provide a wider benefit to St Helens and the region. St. Helens For example, wetlands can enhance the aesthetic quality of an area and also provide habitats for a number of creatures. It is considered that the design of SuDS can help support the restoration of former industrial areas and benefit biodiversity. For example, Colliers Moss Common has been restored from the site of a former colliery and waste tip to a Local Nature Reserve, supporting a range of habitats and species.

MARKER 2.13

Liverpool City Region Action Plan
http://ecosystemsknowledge.net/sites/default/files/wp-content/uploads/2014/2/LCR_GI_action_plan.pdf

Landscape Character Assessment 2006
http://www.sthelens.gov.uk/media/157589/sth_lca_final_report_rfs.pdf

Liverpool City Region Ecological Network http://www.activenaturalist.org.uk/

St. Helens Council Local Plan Core Strategy October 2012
http://www.sthelens.gov.uk/media/354627/ldf43e.pdf

EC Green Infrastructure: http://ec.europa.eu/environment/nature/ecosystems/index_en.htm

2.8 Topography, Geology and Soil Type

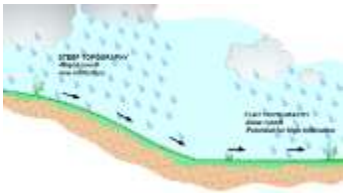
2.8.1 The bedrock geology of St Helens predominantly comprises coal measures from the Carboniferous Period and sandstone and conglomerate from the Permian and Triassic Period. Superficial geology of the area originated from the Quaternary Ice Age and includes till (formed from glaciers), peat (formed from swamps or bogs) and sand (formed from wind-blown deposits). There are two main soils which are formed from these superficial deposits - sand and gravel, and peat and glacial deposits. These soil types support a variety of land use types, noted in way marker above. The geology of a region influences the types of SuDS that are appropriate to the soil characteristics and links to groundwater aquifers. Permeable soils assist with infiltration but soils with low permeability do not preclude the use of SuDS.

2.8.2 The topography of an area can dramatically influence drainage patterns. Areas of steep topography can decrease the time rainfall takes to reach urban areas and thus increases the risk of flooding. Similarly, flat land can encourage the storage of water which can prolong flooding due to the increased time which the water will take to drain away. SuDS techniques such as swales or filter trenches can assist in reducing these affects by providing areas to slow flood water. St.Helens lies on a smoothly sloping valley orientated in a northwest to southeast direction, passing through the centre of the Borough. The bed of the valley descends from around 40 mAOD in the northwest to 20 mAOD in the southeast and the valley ridgeline extends to around 60 mAOD. Billinge Hill in the north of St.Helens is the highest area within the Borough.

MARKER 2.14

Landscape Character Assessment 2006
http://www.sthelens.gov.uk/media/157589/sth_lca_final_report_rfs.pdf

Sand and gravel: Pastoral land use
Peat and glacial deposits: Fertile agricultural soil suited for arable and root crop



2.9 Importance of Water Resources

2.9.1 The annual rainfall recorded at the nearest Met Office station at Crosby is 837mm. This is reasonably distributed throughout the year with an average of 55mm in May and 97mm in October. The main watercourses are Sankey Brook and the St. Helens/Sankey Canal into which flow a number of tributaries and smaller watercourses including Sutton Brook, Windle Brook, Rainford Brook and Black Brook. United Utilities provides water and sewerage services to the St.Helens Council area. Employing SuDS for future developments provides the opportunity to assist with addressing the water quality issues which St. Helens faces. Components such as filter drains can remove suspended sediments and other pollutants, thus facilitating the release of water of a higher quality, which is particularly important for drainage to water bodies where effort should be made to improve water body quality status.

2.10 Sankey Catchment Action Plan

2.9.2 Focusing on water management, water quality improvements and water dependant biodiversity, the Sankey Catchment Action Plan provides a framework for long-term integrated water management across the Sankey catchment. The Sankey Brook originates at the confluence of Sutton and Hardshaw Brook in St Helens and flows into the River Mersey at Sankey Bridges in Warrington. The enhancement strategy for the canal corridor embraces the integrated themes of biodiversity enhancement, economy, access, heritage, health and recreation and water management. As the Sankey Brook is the main channel draining the catchment, to address the issues of water quality and flood management in the Sankey Corridor it is necessary to address issues across the whole catchment through a broad partnership of organisations.

2.9.3 Hydraulically linked to Black Brook, Sankey Brook and Callands Brook, the Sankey (St Helens) Canal, which opened in 1757, was constructed to link the collieries around Haydock and Parr to the markets in Cheshire and Liverpool via the River Mersey at Sankey Bridges. Extensions were made, firstly to Fiddlers Ferry, and later, to Woodend (Spike Island) in Widnes by 1830 in order to overcome difficulties accessing the river lock at neap tides. Extensions in St Helens to Ravenhead and Stanley Bank in the 1770s were also cut. The latter utilised Carr Mill Dam as a headwater.

2.9.4 The canal was officially abandoned in 1963 and partially infilled. Halton, Warrington and St Helens Council restored sections of the canal as part of land reclamation works in the 1970s and 1980s but the hydrology remains largely disconnected. Historical heavy industry including deep coal mining, glass and chemical production sparked by the cutting of the canal has left a legacy of contamination, which still affects the water quality within the catchment. Diffuse pollution from agricultural run-off and urban drainage, including wrongly connected domestic appliances and highways run-off, all contribute to moderate to poor water quality within the catchment.

2.9.5 The EU Water Framework Directive (WFD) establishes a framework for the protection of all inland surface water bodies, estuaries, coastal water and groundwater. The delivery mechanism for the framework is River Basin Management Plans. The UK is divided into River Basin Districts with the Sankey Catchment in the North West River Basin District (NWRBD). The NWRBD Plan identifies the following challenges, which need to be met in order to achieve EU WFD targets:

- Diffuse pollution from agriculture and urban sources;
- Point source pollution from water industry sewage works and from industrial discharges;
- Physical modification of water bodies, water abstraction and artificial flow regulation.

2.9.6 The Natural Environment and Rural Communities Act 2006 placed a statutory duty on all public bodies to have regard to the conservation of biodiversity. This plan prioritises key species and habitats, which are clearly reliant on riverine or riparian wet habitats that can be influenced for better or worse by river management practices. There a number of other key benefits that could see enhancement in relation to European legislation, national policy and local guidance and plans.

- EU Eel Regulations / EU Habitat Regulations (Wet Woodland, Reed bed, Raised Mire);
- National Environment and Rural Communities Act 2006 / Communities at Risk;
- Priority and Protected Species (such as water Voles, Eel, Bullhead Willow Tit, and Otter);
- Invasive Species (Himalayan Balsam, Knotweed, American Mink);
- SSSI's Management / Local Nature Reserves / Local Wildlife Sites;
- Planning Application Climate Change values (utilise max allowances and identify local values).

3. Approval Process

Planning Approval	What this section will cover:
This section details the approval process for implementing SuDS. SuDS proposals that form part of an outline/full planning application should adhere to government guidance and legislation.	▪ Responsibilities - who does what?; ▪ Introduction to the planning application process; ▪ Planning application type requirements; ▪ Consultation requirements.

3.1 The Approval and Adoption Process

3.1.1 This section of the guide sets out specific technical considerations relating to this process. This guide does not cover a specific process for the consent of pumping stations. A satisfactory audit by St.Helens Council does not authorise any activities by the Developer which may be in contravention of any enactment or any order, regulation or other instrument made, granted or issued under any enactment, or in contravention of any rule, byelaw or in breach of any agreement or legal rights. The individual SuD systems, both in public and private areas, should be used in a management train that reinforces and, where possible, follows the natural pattern of drainage. The management train hierarchy techniques are:

- Prevention – use of good site design and housekeeping measures on sites to prevent runoff and pollution;
- Source control – control of runoff at, or very near, its source;
- Site control – management of water from several sub-catchments;
- Regional control – management of runoff from several sites.

3.1.2 For small developments, particular attention must be given to prevention and source controls, as site or regional controls such as detention ponds may not be practical. The reduction of runoff and the treatment of runoff at source will provide the required treatment levels. The Developer shall be wholly responsible for the design and construction of SuD systems, to serve the proposed development. The Developer and/or their designer shall certify that their design complies with St.Helens Council Guidance and accept liability for compliance through their professional indemnity insurance. These responsibilities/liabilities shall not be discharged to St.Helens Council following a satisfactory audit of their design.

3.1.3 The requirements for drainage should be taken into account when determining the overall layout of the development, as the natural features of the site will often dictate some aspects of the drainage system design and should be incorporated as green infrastructure. The developer should take cognisance of Environment Agency Main River designations paying particular attention in their master planning to the requirement for no obstructions typically within 8 meters of the edge of the watercourse. Flood Defence Consent and Land Drainage Consent information is required as part of the submission, including distance of construction from watercourses etc. Easements for work adjacent to watercourses and culverts, drains, private sewers should be indicated and assumed to be 8m. It is the Developers responsibility to obtain all required discharge permits and evidence of this should be provided.

3.1.4 The Developers design team shall liaise with the stakeholders identified and any other potential stakeholders who may be involved in the development process. When undertaking the design using the guidance provided in Sections 6 and 7, the Developer should take cognisance of that pumped surface water systems are not considered to be sustainable and pumping stations which are accessories belonging to a sewer shall be shown on the drainage plan. The Developer shall undertake the design and preparation of drawings in accordance with the principles outlined in Section 7. Upon completion, the following items should be supplied to St.Helens Council.

- As-built record drawings in electronic format and compatible with AutoCAD Release 14 in *.DWG or *.DXF format (refer to Section 6.1.4 for further information) and PDF versions;
- Where appropriate, closed circuit television (CCTV) survey of underground systems by a qualified contractor in accordance with Clause E7.6 of Sewers for Adoption 7th Edition in CD or DVD format with a hard copy of the written report. CCTV at completion is at the discretion of the Developer. The Developer is responsible for checking that the CCTV survey shows no defects or debris within the infrastructure.
- Health & Safety File prepared in accordance with the Construction (Design & Management) Regulations 2015.

3.2 Responsibility Designation

3.2.1 The following section describes the considerations and actions which should be undertaken at each stage of the SuDS submission as part of the overall Planning Application. The following points notes the responsibilities of the three key groups involved in SuDS from inception to adoption:

- Developer: Undertakes master planning, pre-application, application submission (including drainage system designs), responsible for arranging the future maintenance of SuDS and responsible for submitting the information in relation to the Council's SuDS requirements;
- LA Planning Department: Receives and validates application (and any check lists), passes application to consultees including LLFA as statutory consultee, approves application and Approves future maintenance arrangements;
- Statutory and Non-statutory Consultees: Consultation on the planning application.

3.2.2 With early consideration, SuDS are possible on any site. St.Helens Council strongly recommends pre-application discussions in relation to SuDS proposals so that the opportunities to boost the multiple benefits of SuDS are maximised, costs minimised and planning applications can be determined effectively and efficiently. The inclusion of conceptual SuDS at the very start of the process of planning the development site layout has the greatest effect on their viability and cost-effectiveness. It will also affect their integration with the development and the ability of the SuDS to deliver multiple benefits.

MARKER 3.1

Cost Balancing - Final Surface Water Drainage Report DEFRA 2013

Evidence has shown that both capital and maintenance costs for SuDS should not be greater than those for traditional piped surface water drainage systems, and in some cases can be lower. More information can be found in the 'Final Surface Water Drainage Report' published by Defra in 2013.

http://randd.defra.gov.uk/Document.aspx?Document=11852_FinalIssueSWDReport_November2013.pdf

3.2.3 Challenges to the viability of SuDS at development sites may include land take/space limitations, land contamination legacy, soil infiltration properties and groundwater conditions. Key to the viability of SuDS, however, is early consideration. St.Helens Council will not accept for example, that SuDS are unviable simply because they do not fit in with a proposed site layout which has been designed prior to the consideration of SuDS.

MARKER 3.2

Local Standard A – Phased Development and Drainage Strategies

For phased developments, the LLFA will expect planning applications to be accompanied by a Drainage Strategy which takes a strategic approach to drainage provision across the entire site and incorporates adequate provision for SuDS within each phase. Expected that the whole development discharge rate is assessed as one value, then broken down to individual phases/sections. Any alterations to individual phases/section discharge rates will change the allowable rates for the additional phases (totalling no greater than the overall site value).

3.2.4 The subsequent sections in this chapter describe in detail the considerations and actions which should be undertaken at each stage of the SuDS planning application. Where the Developer is uncertain whether the application should be submitted, consultation should be undertaken with St.Helens Planning Department. Applications will be assessed to ensure proposed minimum standards of operation are appropriate and through the use of planning conditions or planning obligations that there are clear arrangements in place for ongoing maintenance over the lifetime of the development. It should be noted that St.Helens Council have no duty to adopt SuDS and provision for the disposal of runoff remains the responsibility of the Developer.

3.2.5 The following are the stages involved in the submission of a planning application; Master Planning (only required for larger developments), pre-application, application submission, validation of application, consideration by consultees, approval of application and then the approval for the lifetime management and ongoing maintenance.

3.3 Master Planning

3.3.1 Master planning is only necessary for larger developments and those where a full planning application is required. At this stage the Developer or landowner should consult with the Council Planning Authority to understand the requirements of the development. The Developer should plan the SuDS layout with regards to the flows, topography and geology of the area in order to mitigate flood risk, taking account of established industry standards - CIRIA SuDS Manual C753 and BS8582:2013 Surface Water Management. This stage also allows an initial costing of the process.

MARKER 3.3

Checklist for master planning:
Requirements are identified in the **SuDS Submission Application and Approval Requirements**, provided in Section 1 of this guidance.

- Review of key evidence flood risk base documents;
- Review of geology, hydrology, green infrastructure, flood risk;
- Review of potential lifetime management and maintenance;
- Initial costing.

3.4 Pre-application

3.4.1 Undertaking early consultations with the Statutory Consultees can avoid delays and misunderstandings, increasing flood risk and issues with enforcement or adoption. The management of surface water flood risk is important for SuDS planning. The Council offers a Pre-Application Advice Service involving a multi-disciplinary team advising on flood risk management delivery, asset management and planning.

MARKER 3.4

Checklist for Pre-application:

Consult with statutory and non-statutory consultees. Seek advice from the Council via the Pre-Application Advice Service using the **SuDS Submission Application and Approval Requirements** provided in Section 1 of this guidance to provide the relevant information to inform discussions.

Communication with the LLFA is available using llfa-consultee@sthelens.gov.uk email address, but only with prior Planning Case Officer Approval or after Pre-Application meeting.

3.5 Application Submission

3.5.1 Full applications and outline planning (where layout is applied for) applications will require applicants to include a draft Section 106 agreement / or head of terms to deal with future maintenance and management of SuDS. Any calculations of peak flow rates and discharge volumes should also be submitted electronically. When the application is submitted, the Council Planning Department will check to ensure that all the details have been provided (as noted in Way Marker 3.3) by reviewing the provided SuDS Checklist and associated supporting information. If all details have been provided to a satisfactory level the application will be validated. The application will then be passed to the Statutory Consultees for review.

MARKER 3.5

Checklist for Application Submission:

The **SuDS Submission Application and Approval Checklist** is provided in Section 1 of this guidance and is designed to be completed by developers, validated by the LPA and reviewed by the LLFA.

For larger developments where a masterplan is required, a detailed drainage layout, post development and pre-development layouts and development phasing will be required. Any direct requests from the LLFA requiring electronic evidence / mapping will be subject to cost charge and is separate from the Pre Application Service.

3.6 Development and Flood Risk

3.6.1 When considering new development, Developers will need to consider flood risk and development in accordance with the requirements of the National Planning Policy Framework (NPPF). Section 3.5.2 summarises the process. Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk of flooding. Where development is necessary, it should be demonstrated to be safe and should not result in an increase in flood risk elsewhere.

3.6.2 The NPPF sets of the aims of the Sequential Test, to steer new development to areas with the lowest probability of flooding. Development should not be allocated or permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower probability of flooding. The Council's Strategic Flood Risk Assessment (SFRA) will provide the basis for applying this test although the most recent Environment Agency flood maps should also be reviewed. A sequential approach should be used in areas known to be at risk from any form of flooding. A site-specific Flood Risk Assessment (FRA) will be required and this will need to demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere. Where possible overall flood risk should be reduced. A site-specific flood risk assessment is required for development proposals:

❖ **Table 3a: Flood Risk Assessment (FRA) Criteria**

Criteria must contain the following…	
1	…of 1 hectare or greater in Flood Zone 1
2	…all new development (including minor development and change of use) in Flood Zones 2 and 3;
3	…or in an area within Flood Zone 1 which has critical drainage problems (notified by the EA);
4	…proposed development/change of use to a more vulnerable class may be subject to other sources of flooding.

3.6.3 Drainage strategies will need to take local flooding into account. Interactions with receiving ditches and watercourses (including culverts) will need to be fully appraised in order to ensure that surface water runoff is effectively managed without increasing flood risk elsewhere. Proposals will need to include assessment of surface water interactions with other sources of flooding including fluvial and tidal interactions. This will need to include consideration of, for example, climate change, blockage scenarios and hydraulic capacity of for example, bridges and culverts during design flood events. Developers will need to demonstrate that all land ownership; long-term maintenance, relevant permits and pollution control measures have been resolved as prior to submitting a full planning application. Recommended that developers consult with the Local Planning Authority and the Environment Agency in order to determine the requirements for a site specific FRA. The development and flood risk assessment stages are as follows:

❖ **Table 3b: Development and Flood Risk Assessment**

Development steps…	
1	NPPF sequential testing and justification testing to confirm the suitability of a development site;
2	Confirm the requirements of a site specific FRA (taking all sources of flooding into account);
3	Develop drainage strategy;
4	Confirm the impacts on the receiving watercourse and mitigation measures required;
5	Consider ecological interactions/investigations that may impact on the suitability of watercourse;
6	Confirm / agree 3rd party land issues and Permits to discharge;
7	Develop site drainage strategy and appropriate planning application.

3.7 Consultation Development and Flood Risk

3.7.1 Under the FWMA 2010, St.Helens Council are a Lead Local Flood Authority (LLFA) and according to the Defra Planning Practice Guidance, LLFA's should be consulted at the planning consultation stage to gain advice for surface water drainage. As St.Helens is well placed in terms of existing strategic policy and flood risk evidence base, being at the forefront of the SuDS approval process will positively affect local decisions on planning and drainage and will make a significant contribution to the vision of the local plan core strategy. Whilst not compulsory, it is beneficial to consult with organisations, or groups to gain further understanding of the implications and considerations which should be made when planning for SuDS. The timescale for the consultation period is **21 days (15 Working days)**.

❖ **Table 3c: Consultees**

Type	Consultee (Further Information)
Statutory	Environment Agency: Consult if the SuDS will discharge to a waterbody ('Main River')
	Highways Authority: Consult if the SuDS discharge will impact on adopted public highways or discharge surface water to Highway drainage systems
	Sewerage Undertaker: Consult if SuDS will connect to the sewerage network
	LLFA: Consult for all applications
Non-statutory	RSPB / Wildlife Trust / Fisheries Trust
	Local community
	National Coal Authority
	Local and Canals and Rivers Trust. Consult if SuDS will affect any Canals

3.8 Adoption Process Stage

3.8.1 The approval of SuDS within an application will be determined by the Planning Department, taking into consideration the extent to which the proposal has complied national standards, local requirements, local plan and the recommendations made by the LLFA and the other consultees. Larger developments and those which have met with objections will be determined by planning committees within the Planning Department. Currently, only large scale applications require SuDS but any future changes in legislation may change this requirement.

3.8.2 The adoption process technically begins once SuDS approval has been granted and includes the physical construction and subsequent maintenance of the SuDS. However, in order to ensure that the proposed SuDS will be adopted and maintained to a high standard and ensure long term benefits, this stage of the planning application process should be considered before submission. The SuDS Checklist (contained in the Appendices of this document) has been designed for use by planners, LLFA and Developers to ensure that the various requirements of adoption and maintenance have been carefully planned before submission. If sufficient provision has not been made, then absence of these details will be flagged and the planning application will be recommended for rejection by the LLFA. National guidance allows the Developer to arrange for the adoption and maintenance to be undertaken by any one of four bodies:

- Service management companies;
- LLFA or LPA (Note that the Councils are not currently adopting SuDS schemes);
- Water and sewerage companies;
- Individuals (site owners or inhabitants).

3.8.3 Evidence of an agreement in principle with the body who will adopt the SuDS, connecting sewer networks and storm drainage is required at the submission stage together with a plan of the maintenance schedule and the likely activities to be involved. Further details of SuDS Maintenance and Management requirements can be found in Section 6and 8 of this guidance document.

3.9 Other Consents

3.9.1 In addition to planning approval, developers may also need to obtain further consents to discharge. The LLFA will require evidence of compliance from the responsible authority, as outlined in the table below:

❖ **Table 3d: Consents**

Consent	Responsible	Summary
Land Drainage Consent (Ordinary Watercourse) (Land Drainage Act, 1991, Section 23)	LLFA where outside an Internal Drainage Board (IDB) area. IDBs for IDB areas.	This is for works on ordinary watercourses that could affect flows, such as new culverts, weirs, protruding outfalls and bridges with supports in the channel. See LLFA websites for further information.
Flood Risk Activity Permits (Main River) (The Environmental Permitting (England and Wales) Regulations 2010)	Environment Agency	This is for works in, over, under or adjacent to (within 8m) main rivers. More information is available via the GOV.UK website: https://www.gov.uk/permission-work-on-river-flood-sea-defence
Environmental Permits for Waste or Emissions	Environment Agency/Local Authority	An environmental permit may be required for a business which manages or produces waste or emissions that pollute the air, water or land. These cover a range of activities including waste management, pollution prevention and control (PPC) permits, discharge consents, groundwater authorisations, abstraction licensing and radioactive substances regulation (RSR). More information is available via the GOV.UK website: https://www.gov.uk/guidance/check-if-you-need-an-environmental-permit
Protected Species and Habitats	Natural England	The disturbance of certain protected species and their habitats require a licence from Natural England. Other habitats and species are protected by legislation and policy. In all cases avoidance and mitigation of harm is required. Habitat and species survey and assessment is required to support most planning applications, see GOV.UK website: https://www.gov.uk/guidance/protected-species-how-to-review-planning-applications
Listed Building Consent	Local Planning Authority	Consent from the Local Planning Authority (or in some circumstances the Secretary of State) for the demolition of a listed building or the carrying out of any works for the alteration or extension of a listed building in any manner that would affect its character as a building of special architectural or historic interest. More information is available from the historical England website: https://historicengland.org.uk/advice/hpg/hpr-definitions/l/536329/
Scheduled Monument Consent	Secretary of State for Culture, Media and Sport.	Application for Scheduled Monument Consent (SMC) must be made to the Secretary of State for Culture, Media and Sport before any work can be carried out which might affect a monument either above or below ground level. More information is available from Historic England. https://historicengland.org.uk/advice/planning/consents/smc/

❖ **Table 3d: Consents (continued)**

Consent	Responsible	Summary
Adoption of a sewer (Water Industry Act, 1991, Section 104)	Water and Sewerage Companies (United Utilities)	Links to the appropriate Water and Sewerage Company websites for the applicable forms, processes and guidance is provided within the LLFA appendices. Systems which drain either private areas such as roofs and driveways or highway drainage can be adopted through a Section 104 Agreement. A specific condition of a Section 104 agreement is that the new sewer development meets a Mandatory Build Standard (MBS), which sets out the required standards in the design and construction of new sewers and lateral drains.
Connection to a sewer (Water Industry Act, 1991, Section 106)		
Building over or close to a sewer (within 3m) (Building Regulations, 2015, Document H)		
Connection to an existing highway drain or adoption of highways drainage (Highways Act, 1980, Section 38)	Highway Authority	It is illegal to discharge drainage directly on to the highway or to connect without consent, private drainage into a highway drainage system.
Highways Technical Approval Category D	Highway Authority	This relates to the design of large drainage structures (900mm or above in diameter) under the public highway
Third party landowner permissions	Third party landowner	Disposal of development runoff via an existing culverted land drain or watercourse is not in general a favoured design solution and any decisions on using this method of disposal should be informed by an assessment of the condition of the culvert. Where a developer proposes to discharge surface water via third party land into a connecting sewer or watercourse or where surface water discharges to a third party owned pipe, sewer or drain, a legal agreement will need to be in place. This agreement must ensure that responsibilities for any maintenance duties are clarified. Where there is an existing legal right of discharge via a pipe, ditch or overland flow through that site a new legal agreement will not be necessary. Evidence of discussions with landowners will be required. At full application stage the LLFA will require evidence of compliance with the need for obtaining additional consents, particularly where an inability to obtain these would affect the feasibility of the proposed drainage system. At outline stage, they may request evidence of compliance, where not obtaining such consents would render a proposed scheme unworkable.
Stopping Up or Diverting Public Rights of Way	Local Planning Authority	If planning permission has been granted and your proposed development will require a footpath, bridleway or restricted byway to be stopped up or diverted to allow the development to take place, you should apply to the relevant local authority through the planning process to do so.

3.10 Frequently asked questions?

3.10.1 Below in Table 3e is a series of potential questions from developers in regard to the utilisation of SuDS with a development along with corresponding answers. Advise that any questions you may have as a developer or applicant to speak with the LLFA or at any Pre Application stage with the planning authority.

❖ **Table 3e: FAQ's**

Question	Response
My site is too flat for SuDS to work?	Managing surface water on the surface tends to provide the best solution for flat sites. All runoff should be close to the source as possible. Conveyance SuDS such as rills and swales, along with appropriate use of roadside kerbs should be used.
My site is too steep for SuDS to work?	Check dams and storage features should be used to slow site runoff rates and to allow for infiltration / attenuation. Ponds and wetland features can be staggered in a terraced arrangement on slopes.
My soils are very Clayey, SuDS won't work.	SuDS are not excluded by your ground conditions; they merely influence the choice of SuDS. Infiltration based SuDS are unlikely to be suitable for clay soils, however SuDS which store or convey water such as swales, ponds and wetlands can be used.
Groundwater levels on my site are very high; SuDS won't work.	SuDS are not excluded by your ground conditions; they merely influence the choice of SuDS. The SuDS components selected should store and convey water on the surface. Impermeable geotextile liners can be used to limit the ingress of groundwater into a SuDS feature.
There is contaminated groundwater on my site; SuDS won't work	SuDS are not excluded by your ground conditions; they merely influence the choice of SuDS. Impermeable geotextile liners should be used to limit the movement of contaminants.
I can't fit SuDS into my development layout.	If SuDS are considered at an early stage in the development planning process, appropriate features can be employed as shown in Appendix C and D.
My site falls within Flood Zone 2 / 3; SuDS won't be an option here.	A surface water drainage system should function effectively during the 1% AEP (with climate change allowance) event. Therefore it is not appropriate to site SuDS features which are critical to the site drainage system in these areas. SuDS which provides storage which is surplus to the design requirement, have a water quality only purpose, are used for amenity only or are appropriate within a designated Flood Zone.

4. SuDS Components and Considerations

The non-statutory technical standards for SuDS (March 2015) provide guidance for Councils to define their own standards for approval of SuDS proposals within planning applications to ensure developments suit local requirements and address common site challenges for SuDS.

What this section will cover:

- National Standards for SuDS
- SuDS management train & runoff destination
- The SuDS philosophy
- The SuDS design process and considerations

4.1 National SuDS standards

4.1.1 The national SuDS standards are written to allow Councils to define their own standards for approval of SuDS based on the tier of the Local Authority, the location geographically, the position in the catchment and what challenges and pressures are present within the Boroughs.

MARKER 4.1

National and Local Standards:

National standards for SuDS can be found following this link: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/415773/sustainable-drainage-technical-standards.pdf

The Local SuDS Submission Application and Approval Checklist (the SuDS Checklist) and is contained in Appendix A. This SuDS Checklist identifies the requirements for SuDS to be submitted as part of a planning application in line with the National Standards and Local Policy.

4.1.2 Ideally SuDS should be designed with the minimum amount of underground, or traditional piped linkage as possible. The designer should always aim to use conveyance channels, swales, or infiltration trenches to connect SuDS features wherever possible. SuDS should therefore be designed with these standards in mind: design, construction, maintenance, and operation. The following criteria should also be considered:

❖ **Table 4a: SuDS Standards**

Item	Description
Function	As well as treating and attenuating runoff, SuDS should be designed with multiple benefits in mind such as public friendly spaces, enhance and create new niche habitats, encouraging wildlife to flourish, in turn creating better places to live.
Maintenance	All SuDS features should be easily maintained with suitable access provisions included.
Aesthetics	Designs should be appealing to the eye; use of native planting can enhance even the simplest of SuDS features.

4.2 The SuDS Management Train

4.2.1 The 'management train' concept aims to highlight how a series of techniques may be employed in order to reduce the effect which the additional urban runoff from a development may have on the surrounding environment and watercourse as well as ensuring that pollutants and sediment are removed before water enters the watercourse. SuDS should be seen in the context of other surface water management approaches, including flood routing, the management of drainage exceedance and the opening of urban channelised watercourses (culverts). There are many SuDS features that can be incorporated into any drainage scheme this is considered in terms of:

- Prevention - reducing the introduction of impermeable surfaces;
- Source Control - restricting and reducing runoff to receptors within the catchment;
- Site Control - managing surface water at the location of development;
- Regional controls - maintaining and establishing blue networks and storage.

4.3 The SuDS Design Philosophy

4.3.1 SuDS are designed to control surface water runoff close to where it falls, mimic natural drainage as closely as possible and provide similar drainage conditions post development to the pre-development site. SuDS can provide betterment to drainage from brownfield sites and can also aim to reduce diffuse pollution in urban runoff and maximise environmental and social benefits. Sustainable drainage is a departure from the traditional approach to draining sites. There are some key principles that influence the planning and design process enabling SuDS to mimic natural drainage by:

- Storing runoff and releasing it slowly (attenuation);
- Allowing water to soak into the ground (infiltration);
- Slowly transporting (conveying) water on the surface and filtering out pollutants;
- Allowing sediments to settle out by controlling the flow of the water;

4.3.2 There are many SuDS features that can be incorporated into any drainage scheme. Features should be selected based on how they fit in the SuDS Management Train, how they would fit in the local context and the suitability of the site (function, maintenance, adoptability and land available).

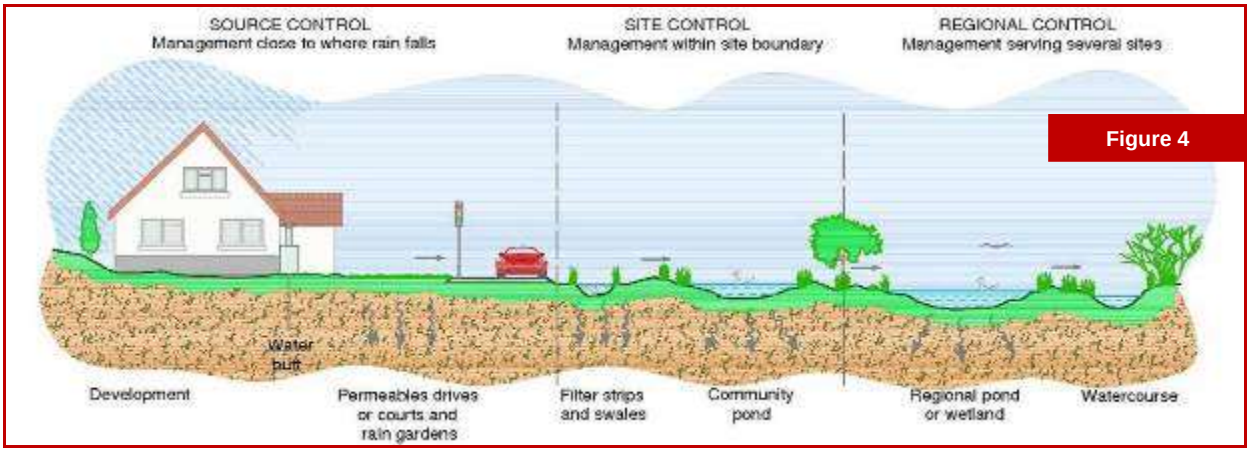


Figure 4

❖ *Image: Figures 6 Source reference; The SuDS Manual, CIRIA 2015 (28/06/2017)*

4.3.3 SuDS design should focus on easy and efficient maintenance, to achieve low operation and maintenance costs and provide a safe operating environment for the maintenance operatives. Urban runoff increases the volume of storm water runoff compared to greenfield runoff, especially for frequent rainfall events. Rainfall on developed land does not tend to infiltrate into the soil as much as greenfield, leading to higher runoff volumes. To minimise the impact of this additional runoff, the use of infiltration systems is encouraged where appropriate.

❖ **Table 4b: SuDS Focuses**

Infiltration shall be provided using the following types of SuDS:	Long term attenuation storage shall be provided in the following types of SuDS:
▪ Swales (dry and conveyance)	▪ Detention ponds
▪ Filter strip	▪ Retention basins
▪ Infiltration trenches	▪ Underground storage
▪ Bio-retention	

4.3.4 Where infiltration does not provide sufficient reduction of runoff, the use of long-term storage to address this additional runoff volume shall be provided. The options are listed above in order of preference. Subject to site constraints and the results of a risk assessment, ponds can provide the most effective water treatment. Underground storage does not provide water quality benefit and can only be used in conjunction with other SuDS.

4.4 Prioritisation of Runoff Destination

4.4.1 The preference for the discharge of surface water runoff is to the ground via infiltration SuDS. However, this may not be entirely possible for all sites due to soil permeability, topography of the area and quantity of sediments and contaminants within the surface water. As identified below, other options of discharging to a surface water body, to a surface water sewer, or a combined sewer (in that order of preference) should be explored where infiltration is not fully possible. Surface water should never be discharged to the foul sewer. Connections from developments are not permitted onto highway drainage unless they comprise solely water from highway gullies.

❖ **Table 4c: Drainage Hierarchy**

Order of preference for connection…	
(1) Surface water is collected for site use (domestic, industrial etc.)	Preferred
(2) Discharge to the ground via infiltration	↓
(3) Discharge to a watercourse or surface water body	
(4) Discharge to surface water sewer which discharges to a watercourse etc.	
(5) Discharge to surface water sewer which discharges to a treatment centre etc.	
(6) Discharge to combined sewer	Least Preferred

4.5 Calculations for surface water runoff

4.5.1 Once the preferred method of discharge has been decided, the following details are required to be included as identified on the SuDS Checklist detailed in Section 1 of this guidance and details of how to undertake these calculations are provided in Section 4.7 and Section 4.8 of this guidance.

- Peak runoff flows calculations and results to demonstrate pre- and post-development runoff rates in relation to greenfield runoff rates. For redevelopment sites, existing brownfield rates may need to be taken into consideration, along with the method used to calculate the Runoff;
- Discharge volume calculations and results;
- Simulation modelling of runoff;
- Flood risk (from surface water, coastal, river and groundwater sources).

4.6 SuDS Design Process

4.6.1 The SuDS Design Process can be broken down into the following four Stages. The flowchart diagrams that follow describe best practice for the SuDS design process based on the CIRIA SuDS Manual. The design team should incorporate a range of people and organisations in order to ensure a holistic approach to the design process. By identifying the likely considerations which need to be made for the SuDS application early on, this will avoid potential delays and exceedance of time and budget allocated. Potential design team members are: Drainage engineer, urban designer, landscape architect, town planner, ecologist, highways engineer, land developer and architect.

❖ **Table 4d: SuDS Design Process**

Requirements for surface water runoff…
(1) Set strategic surface water management objectives
(2) Conceptual design – including initial design and layout
(3) Outline design – including sizing and optimisation
(4) Detailed design – including testing and finalisation of the scheme

4.7 Design considerations

4.7.1 There is a variety of SuDS components which may be used independently or as a combination to fit into a SuDS management train. The list below summarises the actions and considerations which should be made when designing SuDS for the scheme.

- Plan SuDS at development proposal inception;
- Enhance landscape through SuDS design;
- Ensure access and maintenance is feasible;
- Promote and encourage biodiversity;
- Reduce waste produced from SuDS;
- Replicate natural drainage and avoid pipes / pumps;
- Maximise benefits and multi-use features and promote water re-use.

4.8 Hazards levels and stages of treatment

4.8.1 In regard to runoff hazard levels the treatment train process should be used to assess storm water quality requirements (see Table 4e). When discharging to groundwater surface runoff from roof drainage must be isolated from other sources where it is discharged to G1 and G2. Infiltration may only be used to discharge to G1 and G2 where a risk assessment has been undertaken and the SuDS design effectively addresses these risks (see Table 4f). Where discharge to a sensitive surface water body (defined as any catchment smaller than 50km; any catchment with less than 20% urbanisation; any catchment with an environmental designation or national or international recognition, or any catchment where good ecological status is at risk), one extra treatment stage must be added (see Table 4g).

❖ **Table 4e: Runoff Hazard Levels**

Hazard	Origin of runoff
Low	Roof drainage
Medium	Residential, amenity, commercial, industrial uses. Includes car parking and roads
High	Areas used for handling and storage of chemicals and fuels, handling and storage of waste. Includes scrap yards as well as lorry, bus or coach parking or turning areas
Hazard	Level of hazard

❖ **Table 4f: Treatment stages for discharge to groundwater**

Groundwater discharge location (No Treatment Stages)		Low	Medium	High
G1	Source Protection Zone, within 50m of a well, spring or borehole that supplies potable water	1	3	Consult the Environment Agency
G2	Into or immediately adjacent to a sensitive receptor that could be influenced by infiltrated water. Includes designated nature conservation, heritage and landscape sites - including Biodiversity Action Plan (BAP) (habitats / protected species)	1	3	
G3	Source Protection Zone II or III or Principal Aquifer	1	3	
G4	Secondary Aquifer	1	2	

❖ **Table 4g: Treatment stages for surface water bodies**

Hazard	Normal surface water	Sensitive surface water
Low	0	1
Medium	2	3
High	Consult the Environment Agency	

4.9 SuDS Design Process Flow Chart

4.9.1 The flow chart diagram describes best practice for the SuDS design based on the CIRIA SuDS Manual.

❖ **Table 4h: SuDS Design Process Flow Chart**

STAGE 1: Set Strategic surface water management objectives			
Set objectives for: flood risk, water quality, community, social and amenity benefit, habitat and biodiversity, adoption and maintenance, climate change and water supply. **(Then move to next stage)**			
STAGE 2: Conceptual design (Initial design and layout)			
(1)	Define site characteristics		
(2)	Define development characteristics		
Establish SuDS design criteria for quantity, quality, amenity and biodiversity			
(3)	Identify feasible points of discharge		
(4)	Define surface water sub-catchments and flow routes		
(5)	Select SuDS components for management train		
(6)	Optimise management train **(Then move to next stage)**		
STAGE 3: Outline design (sizing and optimisation)			
(7)	Size SuDS components at site scale		
(8)	Develop design at sub-catchment scale		
(9)	Check design feasibility		
Is the design feasible?		**No**, then	Refine and optimise scheme
(10)	Yes **(Then move to next stage)**		
STAGE 4: Detailed design (testing and finalising scheme)			
(11)	Test hydraulic performance of scheme		
(12)	Check scheme meets design criteria and agree standards for: water quantity, water quality, amenity and biodiversity		
Scheme meet design criteria & agreed standards		**No**, then	Refine component sizing and controls
(13)	Yes **(Then move to next stage)**		
FINALISE			
Design strategy statement, component sizing and design details, construction method statement, identification of assets requiring designation, detailed costed maintenance and management plan, health and safety risk assessment, cost and benefits assessment and community education and engagement strategies			

5. SuDS Area Suitability

One of the key elements of designing a site with SuDS is the decision about which components to use. As there are a variety of different SuDS components but not all will be suitable. It is vital to have a comprehensive understanding about the sites nature, ensure that a constant review is undertaken from inception to SuDS operation.

What this section will cover:

- Choosing SuDS components
- The SuDS selection matrix
- Considerations for discharge
- Local SuDS zones
- Types of permitted SuDS

5.1 Choosing SuDS Components

5.1.1 Understanding what SuDS components are available and what is suitable to the area is the key aspect in developing acceptable drainage system. To assist in the selection of appropriate SuDS, this guidance includes a SuDS suitability selection matrix table which identifies the various benefits and constraints of common SuDS techniques. The matrix compares various SuDS techniques against the following criteria:

- Land use suitability;
- Water quantity suitability;
- Water quality suitability;
- Environmental benefits;
- Cost suitability.

❖ **Table 5a: Analysis of site and drainage requirements**

Analysis of site and drainage requirements	
(1) Consider how surface runoff can be prevented	
(2) **Choose source control / pre-treatment method**	
(3) Choose site attenuation and treatment method	
(4) Choose regional attenuation and treatment method	
(5) Ensure the site conditions and SuDS design are compatible	
(6) **Ensure design compliance with water quality, hydraulic and ecological guidelines**	**No**, then
(7) Yes, confirm responsibility for adoption and maintenance	

5.2 Discharge considerations and Local SuDS Zones

5.2.1 The types of SuDS should be chosen to suit the local conditions. The guidance provides a description and high level mapping of the predominant soil types within the area covered by each Council. This identifies possible SuDS opportunities and constraints associated with soil type and provides guidance as to which SuDS components may be suitable. It should be noted that appropriate site level ground investigation should be carried out prior to the design of the drainage system. Other considerations and actions that should be undertaken include:

- Calculations of pre- and post-development runoff rates to ensure a neutral or better impact;
- Consideration of the method of attenuation;
- Identification that the site lies within fluvial or pluvial flood outlines, or affected by groundwater;
- Consideration of the effects of climate change upon surface water volumes and flow pathways;
- Consultation with relevant bodies depending on the location to which surface water is to be discharged;
- To the ground - consultation with the EA, National Coal Authority, British Geological Survey;
- To surface water bodies - consultation with the EA or Council or Canal and River Trust (near canals);
- To a surface water sewer or combined sewer - consultation typically with UU or the HA.

5.3 Local SuDS Zones

5.3.1 The types of SuDS should be chosen to suit the local conditions. St.Helens has three predominant soil types; Sand and Gravel Soil, Peat and Glacial Deposits and additional soil types, in which mapping can be found in Appendix D. Disposal of surface water via infiltration to ground should be considered first when developing SuDS design. Preliminary information on whether a site may be suitable for infiltration can be obtained from the British Geological Survey (BGS) Infiltration SuDS Map (chargeable data).

5.3.2 Where infiltration drainage techniques are indicated to be potentially viable, soil testing is necessary to quantify soakage rates. Guidance on undertaking these tests is available in Part H of the Building Regulations which is freely available from the Planning Portal. Where soakaways are proposed to serve areas above 2 hectares the testing methodology should follow BRE Digest 365 or the latest appropriate guidance should this methodology be revised.

5.3.3 For large sites it is recommended that infiltration testing be undertaken in close proximity to where soakaways or infiltration devices would be or are likely to be placed. BRE Digest 365 includes design guidance which states that soakaways should be designed for the 10% Annual Exceedance Probability event. At sites where infiltration is not viable, the discharge hierarchy should be followed and an alternative SuDS technique used. Where a soakaway is designed to accommodate only the 10% Annual Exceedance Probability event, a developer must either:

- Undertake an exceedance flow route exercise to ensure that flows in excess of those produced by the 10% Annual Exceedance Probability event do not affect people or property, or;
- Redesign the soakaway to cater for the 1% Annual Exceedance Probability event with an allowance for climate change (20% allowance on rainfall intensity for non-residential developments and 30% allowance on rainfall intensity for residential developments).

MARKER 5.1

Infiltration Information:

British Geological Survey (BGS) Infiltration SuDS Map
http://www.bgs.ac.uk/products/hydrogeology/infiltrationSuDS.html

Part H of the Building Regulation – Drainage and Waste Disposal
https://www.gov.uk/government/publications/drainage-and-waste-disposal-approved-document-h

BRE Digest 365
https://www.brebookshop.com/details.jsp?id=327592

5.4 Why use SuDS in St.Helens

5.4.1 Urbanisation can cause significant problems for surface water drainage if not managed correctly. St.Helens' Local Plan Policy CP1 states that "protection from the risk of flooding, through the use of Sustainable Drainage Systems (SuDS) and/or other appropriate measures will be required. St. Helens has the following predominant soil types; Sand and Gravel, peat and Glacial Deposits and other additional types. Appropriate site investigation should be undertaken prior to the design of the drainage system".

5.5 Sand and Gravel Soils

5.5.1 SUDS aim to mimic natural drainage patterns as they would occur with a range of ground conditions. Sand and gravel dominated soils have a larger, more open texture that are generally more permeable soils. These soils tend to produce less runoff as water infiltrates more rapidly into the ground. The ability of the soil to drain provides a more stable soil mass and reduces hydrostatic pressures that could lead to land slip. However, these soils are also more susceptible to erosion and are more likely to be affected by fluctuating groundwater levels. These characteristics also mean that there can be a direct pathway for pollutants to enter underlying aquifers and adequate pre-treatment needs to be achieved prior to disposing of surface water to ground. The higher permeability of these soils is more likely to be suitable for soakaway techniques. It should be possible in most cases to match predevelopment runoff rates and volumes to provide a neutral development impact. A full range of SuDS techniques (subject to other geotechnical conditions such as contamination and groundwater) can be applied in these types of soils.

5.5.2 Developers recommended to complete the following due diligence to fully investigate the opportunities and constraints for SuDS in these areas:

- Surface water flooding;
- Receptor sensitivity check;
- Groundwater protection status;
- Ground investigations (including the assessment of seasonal groundwater levels);
- Pre and post development runoff rate and volume checks;
- Ensure SuDS land take is accounted for in the development plans.

5.5.3 Possible constraints is that sand and gravel dominated soils tend to be more erodible. SuDS techniques that are designed to retain water, such as ponds, may need to be lined to prevent water dissipating into the ground and drying up. Buoyancy of certain SuDS, including pond liners, needs to be considered in fluctuating groundwater conditions. Direct disposal of surface water to ground may not be acceptable for all developments as highly permeable soils can provide a direct pollution pathway to aquifers within groundwater protection zones. Water balance needs to be considered in the management train, as water sensitive SuDS such as ponds at the end of a SuDS train need to receive sufficient water to thrive and function as designed. It is recommended that developers complete the following due diligence to fully investigate the opportunities and constraints for SuDS in these areas:

- Surface water flooding;
- Receptor sensitivity check;
- Groundwater protection status;
- Ground investigations (including the assessment of seasonal groundwater levels);
- Pre and post development runoff rate and volume checks;
- Ensure SuDS land take is accounted for in the development plans;
- Most Suitable SuDS include: Infiltration trench, Dry Swale, Pond (with liner).

5.6 Peat and Glacial Deposits

5.6.1 SUDS aim to mimic natural drainage patterns as they would occur with a range of ground conditions. These areas are a combination of organic deposits that form peat, which can hold water, thereby creating wetter conditions and mixed unsorted glacial deposits, which can be free draining. Individually these form very different landscape and hydrological characteristics, but when combined make particularly good soils for farming practices. Areas of significant peat deposits tend to be found around ponds, mires and bogs and the geotechnical characteristics are not normally conducive to standard development.

5.6.2 The low permeability pockets within these soils makes above ground surface water management easier to implement, operate and maintain. The higher permeability pockets within these soils may be suitable for soakaway techniques. It may be possible to match predevelopment runoff rates and volumes to provide a neutral development impact. SuDS in these areas are more likely to be in proximity to existing wetland habitats and will be naturally exploited by existing flora and fauna. When implemented through good design practice this can enhance developments making better places to live and work. It is recommended that developers complete the following due diligence to fully investigate the opportunities and constraints for SuDS in these areas:

- Surface water flooding;
- Receptor sensitivity checks including environmental designation;
- Groundwater protection status;
- Ground investigations (including the assessment of seasonal groundwater levels);
- Pre and post development runoff rate and volume checks;
- Ensure SuDS land take is accounted for in the development plans;
- Most Suitable SuDS include: Swale, Detention Basins, Ponds.

5.6.3 These soils tend to be very variable and need to consider all the constraints of other soils types. These soils can be compressible, susceptible to erosion, underground piping and landslide hazards on steeply sloping sites. Perched, shallow, and seasonally variable groundwater table could present buoyancy problems or a pathway for pollutants to reach groundwater sources. SuDS aim to work with the natural environment. It is not desirable to remove peatland landscapes as these tend to provide ecological conditions and habitat for a distinctive fauna and flora.

5.7 Other Soils

5.7.1 The other soils category generally refers to superficial deposits of glacial till comprising of boulder clay with irregular bands or lenses of sand and gravel, river alluvium, or marine/estuarine clay sand and silt. The top layers of the till are likely to be weathered, siltier and somewhat softer than the underlying soils. Extremely variable nature of the soils requires sites to be considered on a site by site basis taking cognisance of the possible opportunities and considerations noted for all the other soil types.

5.8 Site Challenges

5.8.1 The following flowchart indicates the challenges faced in designing and developing SuDS:

❖ **Table 5b: Challenges in attenuating flood flows and volumes**

Challenges in attenuating flood flows and volumes	
(1)	Addressing surface water runoff: Proximity to sites with existing surface water issues; Proximity to homes and other urban features; Runoff by adopted highway and other impermeable surfaces
(2)	Consideration of groundwater: Potential entry of pollutants to groundwater through infiltration of surface water runoff; high groundwater levels; restrictions of Groundwater Protection Zones
(3)	Topography: Conveying water on ground ‘without a’ or ‘with a steep’ gradient
(4)	Conditions of the ground: Highly cohesive soils restricting infiltration; Contamination
(5)	Constrained space: Limitations of space within the site are
(6)	Existing/buried infrastructure: Utilities (particularly water pipes); predominantly impervious sites

5.9 Brownfield sites

5.9.1 On uncontaminated brownfield sites, the water quality design criteria will depend on the existing sewerage infrastructure. If the water is discharged to a separate surface water sewer or directly to a watercourse, the site should be treated as an undeveloped site and the quality criteria will relate to the proposed land use. If the site drains to a combined sewer that is unlikely to be converted to a separate system, the surface water should be treated with a single stage of treatment to remove grit and coarse solids. Foul sewage should be drained separately within the site. An important criterion for all sites is the quantity of runoff. Storm flows can trigger combined sewer overflows, causing foul pollution and they can also overload wastewater treatment works, reducing treatment efficiencies. In exceptional circumstances the water authority might request that the runoff is detained completely and released only at night.

5.10 Contaminated Land

5.10.1 Where a piece of land affected by contamination is proposed for redevelopment, SuDS may still be used for drainage of surface water. Where a SuDS scheme is proposed on a site affected by contamination, specialist geo-environmental advice and input into the SUDS design is likely to be required and that the SUDS design will have to fit together with the remediation strategy for the site. The developer will need to consult with the planning authority and demonstrate that the proposed drainage system will not cause re-mobilisation of contaminants resulting in exposure to the wider environment. Infiltration systems may not be appropriate without remedial measures, and most techniques will require the use of liners. Remediation and redevelopment of contaminated land is a complex subject that requires specialist knowledge. The CIRIA publication SP164 (Harris et al, 1998) should be referred to for further information.

MARKER 5.2

Contaminated Land Remediation

Remedial treatment for contaminated land, Volumes I - XII (SP164)

http://www.ciria.org/ItemDetail?iProductCode=SP164&Category=BOOK&WebsiteKey=3f18c87a-d62b-4eca-8ef4-9b09309c1c91

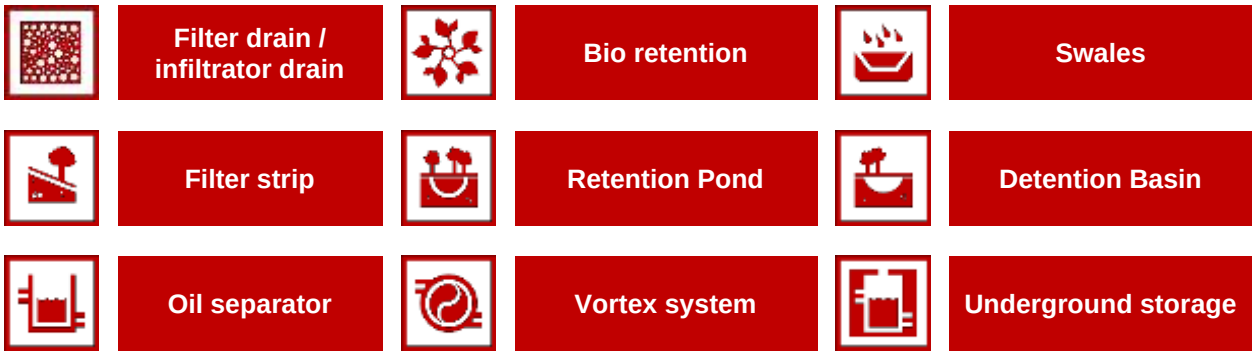
5.11 Natural and Historic Site Drainage Pattern

5.11.1 Natural and Historic Site Drainage Patterns SuDS are most cost effective when designed to work with the natural and historic drainage patterns of a site; consequently SuDS design should begin with an assessment of these. The analysis should look at site topography, geology and soils and identify the presence of any existing or historical drainage features e.g. culverts, sewer networks, mill leats, and water meadows. Flow routes can then be mapped out. This process may lead to the designation of small, discreet drainage areas that have their own drainage characteristics (sub-catchments). This assessment should also be informed by ecology survey information as existing wetlands may support important habitats or species. There are a range of tools freely available to do this:

5.12 Acceptable Suds components in St Helens

5.12.1 There are a variety of SuDS components which are considered suitable within the Council area. They may be used independently or as a combination (SuDS management train). The list below summarises these SuDS components which have been categorised according to how they fit within the SuDS Management Train (source, site and regional controls). . There are a variety of source control measures, the simplest being rainwater harvesting. Within a residential context this may include the provision of individual water butts to collect rainwater from roofs. A commercial application could be the use of storage ponds to accumulate water for reuse as an alternative water supply for a garden centre.

5.12.2 The drainage of privately-owned areas should, be served by appropriate SuDS as part of the overall management train. Privately owned SuDS can be included in the treatment management train, but shall not be included in the hydraulic modelling of the holistic system due to extensions or permeable surfaces being sealed, etc. Where SuDS are proposed in which elements of the SuDS features (such as swales ponds etc) replace conventional (pipes and tanks) adopted highway drainage systems, these will also not be adopted and a private maintenance plan should be put in place by the applicant/developer. Technical design requirements are described following each SuDS Component.



5.13 Not favoured Suds components in St Helens

5.13.1 The use of permeable systems requires further discussion with the LLFA at pre application stage, marker 5.13 containing local standard B provides further information of the use of permeable systems.

MARKER 5.13

Local Standard B – Permeable Paving Systems or Equivalent

The use of permeable paving systems should not be used in domestic situations where maintenance is the responsibility of the individual dwelling owners where the component attenuated storage is counted as a percentage of the sites overall surface water storage. In this case certain property owners would in effect have greater responsibility of maintenance, this is due to cumulative flows and any failure would affect multiple adjacent dwellings. Other options for storage requirements must be investigated.

Permeable systems will be considered only while used in a groundwater infiltration system or where the permeable paving system or equivalent is not included as part of the sites storage and climate change volumes. Full construction detail and assessment of permeable paving system must be provided as part of the full planning submission.

6. SuDS Components and Design Considerations

The non-statutory technical standards for SuDS (March 2015) provide guidance for Councils to define their own standards for approval of SuDS proposals within planning applications to ensure developments suit local requirements and address common site challenges for SuDS.

What this section will cover:

- National Standards for SuDS
- Local Standards for SuDS
- General design requirements for submission
- The SuDS design process and considerations

6.1 Design Submission Acceptance

6.1.1 SuDS located in public areas shall be limited to infiltration/filter trenches, filter strips, swales, bio-retention, detention basins, and underground storage and retention ponds. These SUDS techniques should be appropriately considered, for the best overall performance of the drainage systems and the water quality of the receiving water body. A planning application that deviates from the following design standards must include specific data and information on the proposed design to prove that it is a more appropriate solution for that site. St.Helens will assess the evidence and if in agreement they will confirm in writing the acceptance of the proposal.

6.1.2 The Developer may be asked to provide additional information supporting their proposal. SuDS shall be located in passive public open space or road side verges, so that SuDS can be accessed for maintenance purposes. Potential maintenance options available are Maintenance Companies, United Utilities, St.Helens Council; and/or Owners / occupiers. SuDS are not to be located within the highway, carriageway or footway. The complete surface water drainage system for a development (sewers and SuDS) could be partly private, partly adopted by United Utilities and partly owned and maintained by a third party but not St.Helens Council.

6.2 Design Philosophy

6.2.1 SuDS are designed to control surface water runoff close to where it falls, mimic natural drainage as closely as possible and provide similar drainage conditions post development to the pre-development site. SuDS also aim to reduce diffuse pollution in urban runoff and maximise environmental and social benefits. SuDS design should focus on easy and efficient maintenance, to achieve low operation and maintenance costs and provide a safe operating environment for the maintenance operatives. Urban runoff increases the volume of storm water runoff compared to greenfield runoff, especially for frequent rainfall events. To minimise the impact of this additional runoff, the use of infiltration systems is encouraged where appropriate. Infiltration shall be provided using the following types of SuDS: Swales (dry and conveyance), Filter strip, Infiltration trenches and/or Bio-retention.

6.2.2 Where infiltration does not provide sufficient reduction of runoff, the use of long-term storage to address this additional runoff volume shall be provided. Long term attenuation storage shall be provided in the following types of SuD systems: Detention ponds, Detention basins and/or Underground storage. The options are listed above in order of preference. Subject to site constraints and the results of a risk assessment, ponds can provide the most effective water treatment. Underground storage does not provide treatment and can only be used in conjunction with other SuD systems.

MARKER 6.1

Local Standard C – Pollution Prevention and Control

St.Helens Council will expect the SuDS to demonstrate how pollutants are prevented or controlled as part of the SuDS scheme. This should include consideration of the sensitivity of receiving waterbodies and particular attention should be given to the first 5mm of rainfall (‘first flush’ that mobilises the most pollutants).

Local Standard D - Conformity with the SuDS Management Train Principles

St.Helens Council will expect the SuDS design to demonstrate how the principles of the SuDS Management Train have been taken into account.

6.3 General Design Requirements

6.3.1 The Developer is responsible for the design of SuDS. The design shall be supported by a risk assessment to ensure risks to both the local community and operators of the drainage system are minimised. The Developer and/or his designer shall certify that their design complies with this design guide and accept liability for compliance through their professional indemnity insurance. These responsibilities/liabilities shall not be discharged to St.Helens Council or their representatives through the planning consent process. SuDS designs shall be carried out in accordance with this Guide and the best practice principles in current UK drainage guidance – The SuDS Manual C753 (CIRIA).

6.3.2 Where, as a last resort, the water authority permits both surface and foul water to discharge to a combined sewer system, the surface water sewer drainage shall be attenuated to the requirements of the water authority. The Developer shall support their planning submission with written discharge consent from the water authority. The Developer should take cognisance of the St.Helens Council Land Drainage Byelaws paying particular attention in their master planning to the requirement for no obstructions within 8 meters of the edge of the watercourse.

6.3.3 Design submission requirements to St.Helens Council (calculations, drawings and construction details) for private SuD systems and pipe drainage, are presented in Appendix A -Checklist for SuDS assessment and form part of the audit for the design of the proposed system. The complete surface water drainage system for a development (sewers and SuD systems) could be partly private, partly adopted by United Utilities and partly owned and maintained by a third party.

6.4 Drawings, calculations and manhole records

6.4.1 Drawings and calculations of the complete drainage system should be supplied with the application for SuDS assessment. Separate drawings of private systems should be supplied for record purposes only. All drawings and calculations submitted should be in metric units. The drawings should show all the necessary detailed information required by the SuDS Checklist, this Guidance and Appendix VI of Sewers for Adoption 7th Edition. Location and layout plans, sections and details should show the proposed SuDS and drainage system in full, including private SuDS.

6.4.2 Plan scales should be those in common use, i.e. 1:20, 1:50 and 1:100 as appropriate. Longitudinal sections should generally be to an exaggerated scale, with the horizontal scale the same as the plan (but no less than 1:500) and the vertical scale 1:100. Drawings shall contain the “as-built” information to 300mm accuracy in the horizontal plane, with dimensions related to fixed Ordnance Survey features or Ordnance Survey co-ordinates to 1m accuracy (12-digit accuracy, e.g. 123456, 123456).

6.5 Surface Water Drainage Design

6.5.1 For details on the layout of pipework for surface water sewers, design of manholes, depths of sewers and minimum sewer diameters, reference should be made to text below. The surface water drainage system shall be designed according to Part C5 Hydraulic Design of Sewers for Adoption 7th Edition, so that flooding does not occur in any part of the site in a 1-in-30 year return period design storm flood frequency. Appropriate software shall be used to simulate the system and provide expected performance data. For all developments, which utilise SuDS the use of appropriate analytical tools are likely to be needed to demonstrate the required level of flood protection performance. For developments having less than ten houses, the procedure presented in Part C3 Hydraulic Design of Sewers for Adoption Small Developments Version – September 2013 shall be followed.

6.5.2 Representation of SuD systems in simulation software should be explicit, where possible. A copy of the model and results should be submitted to St.Helens Council for acceptance. All hard surfaces draining to the network should be accurately allocated to the drainage network and represented in the model. All connecting manholes should be included in the model. Representation of the hard surfaces draining to the network should be accurately allocated to the drainage system and all manholes should normally be included in the model. Surface water drainage should be designed for runoff from roofs and subject to the agreement of the Undertaker, roads (including verges) and other hard-standing areas. For these areas impermeable (runoff coefficient of 100% shall be assumed.

6.5.3 An additional increase in the paved surface area of 10% shall be assumed for all areas to allow for future urban expansion (extensions and additional paved areas) unless this would produce a figure greater than 100% of the site. Refer to Section 6.3 for further information. Design event rainfall should be based on the use of the most recent version of the Flood Estimation Handbook specific to the location of the development. An allowance for climate change of an additional 40% (by factoring the rainfall intensity hyetograph values) should be applied unless otherwise specified.

WAY MARKER 6.2

Climate Change & Peak Rainfall Intensity Allowance

Increased rainfall affects river levels and land and urban drainage systems. The table below shows anticipated changes in extreme rainfall intensity in small and urban catchments. For design, assess both the central and upper end allowances to understand the range of impact.

Applies across all of England	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)
Upper end	10%	20%	**40% (Council Standard)**
Central	5%	10%	20%

Defra Climate Change Guidance
https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

6.5.4 During severe wet weather, the capacity of the surface water drainage systems may be inadequate, even though they have been designed in accordance with this Guide and Sewers for Adoption 7th edition. Examples of different weather conditions which cause flooding include:

- High-intensity rainfall events bypassing gully inlets;
- High-intensity rainfall events resulting in sewer surcharging and surface water escaping where the ground level is below the hydraulic gradient;
- High-intensity rainfall events on areas adjacent to the development site (urban or rural) from which overland flooding can take place;
- Long-duration rainfall may result in the top water level in storage systems becoming full an overflowing;
- Extended periods of wet weather which may result in high receiving watercourse water levels affecting the hydraulics of the drainage system.

6.5.5 Checks shall be made for the 1 in 100 year return period to ensure that properties on and off site are protected against flooding for all these scenarios. The design of the site layout, or the drainage system should be modified where the required flood protection is not achieved. This is particularly relevant on undulating and steeply-sloping catchments and adjacent to watercourses. Developers should also demonstrate flow paths and the potential effects of flooding resulting from these storm events. In particular, access roads into and through the site for emergency vehicles must be ensured for these events.

6.5.6 Where it is proposed to connect to an existing drainage network, the Developer shall consult with the Undertaker regarding acceptable discharge criteria. Hydraulic performance modelling of the receiving drainage system may be required. Where it is proposed to connect to an existing sewer, or drainage network (including but not limited to culverts, open drainage ditches, or constrained watercourses) the Developer shall consult with the Undertaker and/or the Lead Local Flood Authority to agree acceptable discharge criteria. Hydraulic and structural assessment of the receiving drainage system may be required.

6.6 Urban Creep

6.6.1 Urban creep is the gradual loss of permeable surfaces within urban areas which results in increased surface water runoff. Typical examples of urban creep include the creation of patios, the paving over of front gardens to generate space for parking or small scale house extensions. To ensure that SuDS schemes can cope with future demand, an allowance for urban creep must be made in the design calculations. St.Helens Council will expect the SuDS design to include an allowance for an increase in impermeable area to accommodate urban creep as set out in Table 6a.

❖ **Table 6a: Urban Creep Allowance**

Residential Development Density (dwellings / ha)	Change Allowance (% of impermeable area)
<=25	10*(Default value suggested by Ciria)
30	8
35	6
45	4
>=50	2
Flats and Apartments	0

6.7 Attenuation Storage

6.7.1 The limiting discharge rates from the site should normally be assessed using the Flood Estimation for Small Catchments (Institute of Hydrology, 1994). For areas smaller than 50 ha it should be applied for 50 ha and linearly interpolated to the development area. Values should be determined for the 1 in 1 year, 1 in 30 year and 1 in 100 years as a minimum. An example calculation and tool for assessing greenfield runoff rates in the St.Helens Council area is provided in Appendix B.

MARKER 6.3

Examples for guidance of attenuation storage

Flood Estimation for Small Catchments
http://nora.nerc.ac.uk/7367/1/IH_124.pdf

CIRIA Drainage of development sites – a guide (X108)
http://www.ciria.org/Resources/Free_publications/drainage_of_development_sites.aspx

6.7.2 The maximum 1-year water level in attenuation storage should not cause significant backing up of flows in the incoming sewer and a 1-year, 1-hour duration event should not surcharge the drainage network. Simulation modelling of the contributing development area considering the head-discharge relationship of the proposed SuDS discharge outlet is required to calculate the attenuation storage volume. The model may be based on either the fixed percentage runoff of 100% runoff from all impermeable surfaces, or the UK variable runoff model (see CIRIA document 'Drainage of Development Sites – A Guide' (2004) for the runoff from the whole site. Appropriate allowance in the reduction in runoff should be made for infiltration systems serving any impermeable areas.

WAY MARKER 6.4

Calculation for greenfield runoff peak flows ((Institute of Hydrology Report 124)

The equation and following definitions are as follows:

$\mathbf{QBAR_{rural}} = 1.08(AREA/100)^{0.89}\ SAAR^{1.17}\ SOIL^{2.17}$

$QBAR_{rural}$ = Mean annual runoff for rural (greenfield) areas (litres/second)

AREA = area of the site (hectares) If the site is smaller than 50 hectares, the calculations should be undertaken using 50 hectares and then amended (by dividing by the actual site area) at the end of the calculation.

SAAR = Standard Average Annual Rainfall (mm)

SOIL = Predominant soil type (The most suitable soil type should be selected from the table below)

Soil Description	Soil value for calculation	Soil Description	Soil value for calculation
Peat (waterlogged)	0.50	Loam	0.40
Clay	0.50	Sandy Loam	0.30
Clayey loam	0.45	Sand	0.15

6.8 Sewers

6.8.1 Sewers and connecting pipework should be designed to the requirements of the Undertaker and Sewers for Adoption 7th Edition or its successors. The Water and Sewerage Companies (i.e. United Utilities) will be able to advise of flood risk from the sewerage network, either from existing public sewers crossing the development or where the connection of new development drainage may affect flood risk (e.g. low lying connections). Where a surface water connection to a public sewer may be required they will be able to provide advice as to whether there are likely to be capacity constraints on the sewerage network which may need to be considered as part of SuDS design to ensure additional flows do not adversely impact on flood risk from the sewerage network. Where a sewer system is utilised, suitable access for the public / existing access users (deemed by the LLFA / Highway Street Works team or equivalent) must be maintained through the development process (and construction phase).

6.8.2 It is illegal to build over or close to a public sewer without first gaining approval. Where practical, any components of SuDS should be located at least 3m from a public sewer. Where it is not practical to relocate the SuDS feature, or divert the public sewer, a formal Building Over Agreement will be required. This ensures that the Water and Sewerage Company can access the pipe in the event of any problems.

6.9 Peak flow rate and volume

6.9.1 The limiting Peak flow rate and volume does not apply to any surface runoff that is discharged by infiltration, to a coastal or estuarial water body or to an alternative water body where the LLFA considers it appropriate to do so. Developers will need to demonstrate that Consent to discharge and 3rd party land ownership issues/crossing have been agreed prior to planning application and detail these in the relevant sections of the SuDS Checklist contained in Appendix A. In low rainfall, there should be no discharge to a surface water body, or sewer that results from the first 5mm of any rainfall event. In low permeability soils where this is not achievable, the developer shall demonstrate to Council that infiltration has been encouraged through the SuDS management train. In high rainfall either of the two approaches below must be used to manage the surface discharge:

MARKER 6.5

Flood risk outside the development

S1-Where the drainage system discharges to a surface water body that can accommodate uncontrolled surface water discharges without any impact on flood risk from that surface water body (e.g. the sea or a large estuary) the peak flow control standards (S2 and S3 below) and volume control technical standards (S4 and S6 below) need not apply.

Peak flow control

S2-For greenfield developments, the peak runoff rate from the development to any highway drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event should never exceed the peak greenfield runoff rate for the same event.

S3-For developments which were previously developed, the peak runoff rate from the development to any drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event must be as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event, but should never exceed the rate of discharge from the development prior to redevelopment for that event.

Volume control

S4 Where reasonably practicable, for greenfield development, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event should never exceed the greenfield runoff volume for the same event.

S5 Where reasonably practicable, for developments which have been previously developed, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event must be constrained to a value as close as is reasonably practicable to the greenfield runoff volume for the same event, but should never exceed the runoff volume from the development site prior to redevelopment for that event.

S6 Where it is not reasonably practicable to constrain the volume of runoff to any drain, sewer or surface water body in accordance with S4 or S5 above, the runoff volume must be discharged at a rate that does not adversely affect flood risk.

MARKER 6.6

Approach 1: Restricting both the peak flow rate and volume of runoff:

The peak flow rates for the: 1 in 1 year rainfall event and 1 in 100 year rainfall event; must not be greater than the equivalent greenfield runoff rates for these events. The critical duration rainfall event must be used to calculate the required storage volume for the 1 in 100 year rainfall event. The volume of runoff must not be greater than the greenfield runoff volume from the site for the 1 in 100 year, 6 hour rainfall event.

Climate change should be considered in attenuation storage calculations by increasing the rainfall depth using a climate change factor. Current Environment Agency guidance should be referenced to apply the appropriate climate change factors relevant to the location and design life of the proposed development.

Approach 2: Restricting the peak flow rate:-

The critical duration rainfall event must be used to calculate the required storage volume for the 1 in 100 year rainfall event.

- The flow rate discharged: For the 1 in 1 year event, must not be greater than either the greenfield runoff rate from the site for the 1 in 1 year event, or 2 litres per second per hectare (l/s/ha);
- And for the 1 in 100 year event must not be greater than either the greenfield mean annual flood for the site, or 2 litres per second per hectare (l/s/ha).

Previously developed land (Brownfield sites):

Where the site is situated on previously developed land and neither Approach 1 or 2 of the peak flow rate and volume is reasonably practicable then the following must be addressed:

- An approach as close to Approach 1 as is reasonably practicable must be used (the Councils are seeking runoff from brownfield sites to mimic greenfield runoff rates wherever possible);
- The flow rate discharged from the site must not exceed that prior to the proposed development for: the 1 in 1 year event; and the 1 in 100 year event. The volume of runoff may only exceed that prior to the proposed development where the peak flow rate is restricted to 2 l/s/ha.

6.10 Exceedance

6.10.1 The design of the drainage system must take into account the impact of rainfall falling on any part of the site and also any estimated surface runoff flowing onto the site from adjacent areas. Drainage systems must be designed so that, unless an area is designated for flood management in the Local Flood Risk Management Strategy, flooding from the drainage system does not occur: on any part of the site for a 1 in 30 year rainfall event; and during a 1 in 100 year rainfall event in any part of a building (including a basement) or utility plant susceptible to water (e.g. pumping station or electricity substation) or on neighbouring sites during a 1 in 100 year rainfall event.

6.10.2 Flows that exceed the design criteria must be managed in flood conveyance routes, preferably in green networks, that minimise the risks to people and property both on and off the site. When considering exceedance routes, particular attention should be paid to: The position of walls, bunds and other obstructions that may direct water but must not cause ponding; the location and form of buildings (e.g. terraces and linked detached properties) that must not impede flows or cause ponding; The finished floor levels relative to surrounding ground. Submitted drawings and calculations must identify sources of water entering a site pre development, how flows will be routed through a site, where flows leave the site pre development and where they leave the site post development. For highway adoption, private or non-adopted areas (e.g. driveways) must actively place in measures to reduce water flow to adoptable areas.

6.11 Land Take

6.11.1 When planning for SuDS in high density developments both innovative design and selection of appropriate components are fundamental. Good design should ensure that no space is wasted and by integrating vegetated/landscaped and proprietary/more engineered components, an effective SuDS scheme that minimises land take can be delivered. However good design must also ensure that sufficient space is allowed so that features such as retention and infiltration basins and swales can be sensitively designed to deliver landscape and biodiversity enhancement.

6.12 Good Urban Design

6.12.1 SuDS should be consistent with good urban design; likewise urban design should embrace the principles of SuDS. When considering the design of SuDS, the following points should be considered.

- No space on a development site is useless; all space can have a function. This can be particularly relevant for small scale SuDS features which can work together to create a local network of drainage features, managing water at source within sub-catchment units;
- Creating a diverse scheme increases the quality of the feature for humans and the environment. When planning a development, consideration is required about the types of SuDS features which will work within the site;
- Improve connections and cohesion across the site by creating networks of SuDS features which link up allowing movement not only of surface water but also of residents and wildlife;
- Where appropriate, SuDS should be informed by Local Planning Authority specific Conservation Design Guidance, Village Design Plans and Conservation Area Appraisals;
- Water storage facilities should be designed to reflect natural shapes and contours so as to create a natural appearance/landscape. Highly engineered finishes and landforms should be avoided.

6.13 Planting

6.13.1 Many SuDS features are vegetated and plant selection will depend upon locally native species, climate / microclimate and ground conditions. A survey of locally native species may contribute to plant selection and the Council Ecology Officer should be consulted for further details on this. New planting should, where appropriate, reflect historic landscape character in the location and scale of planting. The following factors need to be considered to ensure that systems function as designed:

- The vegetated side slopes of SuDS features should not exceed a gradient of 1:4 in order to avoid soil slippage, the resultant non-establishment of vegetation, for health and safety reasons and to ensure access for maintenance;
- Landform design should be appropriate for plant colonisation e.g. shelves on the margins of ponds;
- Planting areas should be designed to be lower than adjacent surfaces and dished wherever possible, to avoid excessive volumes of silt washing onto permeable surfaces. Care will be required with the design of tree pits in hard surfaces, to ensure that they do not become toxic □salt traps□ following winter de-icing operations. A variety of proprietary tree products and systems have been developed to ensure successful tree planting and establishment, as part of SuDS schemes. Research and development continues apace in this field;
- Consideration should be made as to how quickly and how large trees and plants will grow ensuring that there is sufficient space both above and below ground for the plant to develop;
- The potential impacts of ground compaction as a result of any pedestrian or vehicular activity should be considered as this may reduce the effectiveness with which rainwater can reach the roots and / or result in stunted growth;
- Plants appropriate to site conditions (soil type, slope and orientation, light availability) should be selected that are suitable for the expected flow velocities and weather conditions;
- Planting should be undertaken at the appropriate time of year and allow planting to establish before drainage that would otherwise damage immature plants, is allowed to enter the system;
- The maintenance requirements of SuDS planting need to be considered. For example unless the feature includes deep water some plant species such as common reed and reedmace that spread rapidly should be avoided. SuDS maintenance should be included in site landscape management planning.

6.13.2 There are a variety of planting techniques available for use in SuDS features. Where drainage systems are to be planted, the following are options should be considered.

- Use of aquatic plants in small groups or more densely if erosion is a concern on water body margins;
- Grass seeding (including wildflower meadow mixes), is particularly applicable for attenuation basins and swales and around ponds;
- Where a dense ground cover is required quickly, planted or seeded coir mats or rolls can be used. This avoids soil erosion and prevents soil and mulch washing into the drainage system;

- In general fertiliser use should be avoided as this affects water quality.

6.14 Designing for Maintenance and Safety

MARKER 6.7

The Construction (Design and Management) Regulations 2015

The Construction Design and Management (CDM) Regulations require all designers to identify, eliminate or control foreseeable risks that could arise at any time during the lifetime of a scheme because of its design. Therefore, the design process must include consideration of how the SuDS scheme in its entirety is to be maintained. http://www.legislation.gov.uk/uksi/2015/51/contents/made

6.14.1 Design should minimise maintenance requirements and health and safety should be appropriately managed as part of the design process. SuDS components should have shallow side slopes and ponds should have shallow shelving at their edges. Guidance on the selection of appropriate side slopes for different SuDS components is contained within the CIRIA C753 SuDS Manual. Good use of vegetation should be made to prevent access to open water features where required.

6.14.2 Pipe connectors should be shallow and short, allowing simple jetting to keep them clear. Inlets, outlets and control structures should be at or near the surface to allow day to day care by landscape contractors or site managers. Inspection points which are easy to access should be incorporated. Chapter 36 of the CIRIA C753 SuDS Manual provides guidance on managing the safety risk associated with SuDS. Risks should be identified and managed through the use of an appropriate risk assessment. A template Health and Safety Risk Assessment is provided in Appendix B3 of the CIRIA C753 SuDS Manual.

MARKER 6.8

Flood risk outside the development

S1- Where the drainage system discharges to a surface water body that can accommodate uncontrolled surface water discharges without any impact on flood risk from that surface water body (e.g. the sea or a large estuary) the peak flow control standards (S2 and S3 below) and volume control technical standards (S4 and S6 below) need not apply.

Structural integrity

S10 Components must be designed to ensure structural integrity of the drainage system and any adjacent structures or infrastructure under anticipated loading conditions over the design life of the development taking into account the requirement for reasonable levels of maintenance.

S11 The materials, including products, components, fittings or naturally occurring materials, which are specified by the designer, must be of a suitable nature and quality for their intended use.

Designing for maintenance considerations

S12 Pumping should only be used to facilitate drainage for those parts of the site where it is not reasonably practicable to drain water by gravity.

Construction

S13 The mode of construction of any communication with an existing sewer or drainage system must be such that the making of the communication would not be prejudicial to the structural integrity and functionality of the sewerage or drainage system.

S14 Damage to the drainage system resulting from associated construction activities must be minimised and must be rectified before the drainage system is considered to be completed.

MARKER 6.9

Local Standard E - Maintenance Requirements

St.Helens Council will expect SuDS to be designed so that they are easy to maintain. Proper use of the SuDS management train, including surface features, is one way to achieve this. The developer must set out who will maintain the system, how the maintenance will be funded and provide a maintenance and operation manual.

Where a sewer system is utilised, suitable access for the public / existing access users (deemed by the LLFA / Highway Street Works team or equivalent) must be maintained through the development process (and construction phase).

MARKER 6.10

Local Standard F - Minimising the Risk of Blockages

St.Helens Council will expect the SuDS design to minimise the risk of blockage as far as is reasonably possible e.g. by using suitable pipe sizes and making underground assets as visible and accessible. A minimum of 150mm pipes should be used as carrier drains, where an exception to allow or lower 100mm orifice plate to limit discharge rates (with maintenance plans).

Local Standard G - Use of Pumped Systems

If it can be demonstrated that a partial or completely pumped drainage system is the only viable option, St.Helens Council will expect the residual risk of flooding due to the failure of the pumps to be assessed. The design flood level must be determined under the following conditions: (1) If the pumps were to fail, (2) If the attenuation storage was full, and (3) If a design storm occurred.

The finished floor levels of the affected properties should be raised above this level and all flooding should be safely stored onsite. An emergency overflow must be provided for piped and storage features above the predicted water level arising from a 1 in 100 year Annual Exceedance Probability rainfall event inclusive of allowances for climate change and urban creep.

6.14.3 Upon completion, the following items should be supplied to Council. Two sets of as-built record drawings in electronic format and compatible with AutoCAD Release 14 in *.DWG or *.DXF format. Where appropriate, closed circuit television (CCTV) survey of underground systems by a qualified contractor in accordance with Clause E7.6 of Sewers for Adoption 7th Edition in CD or DVD format with a hard copy of the written report. CCTV at completion is at the discretion of the Developer. The Developer is responsible for checking that the CCTV survey shows no defects or debris within the infrastructure. A Health & Safety File prepared in accordance with the Construction (Design & Management) Regulations 2015.

6.15 Good Urban Design

6.15.1 Where a SuDS proposal relies on the use of components which attenuate and convey storm water (e.g. attenuation ponds, basins or swales), these should not be situated within Flood Zone 3 inclusive of an allowance for climate change. During a flood event, such features would be at risk of filling with fluvial floodwater thus rendering them ineffective for storm water management. SuDS design in areas at risk of river or watercourse flooding should limit use of surface features which could be washed out during a flood and should focus instead on dispersing surface water as sheet flow across the site. Discharge from the SuDS scheme must be timed to minimise the impact on the receiving watercourse relative to its response time. Consultation with the LLFA or the Environment Agency may be necessary to assess this. High level information on river (and surface water) flooding is available from the Environment Agency. This is likely to be sufficient to inform outline applications; although the presence of small watercourses that may not have been included on the Environment Agency's national scale **Flood Map for Planning** needs to be considered. These flow routes are often shown on the surface water flood mapping.

MARKER 6.11

Environment Agency – Flood Map for Planning

You will need the postcode, place, national grid reference (NGR) or easting and northing co-ordinates for the location you want to know about. For more detailed information in developing a flood risk assessment the Government have produced guidance.

https://flood-map-for-planning.service.gov.uk/ and https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications#when-you-need-an-assessment

6.15.2 For a full application, flood risk from watercourses at or near a development site must be considered in detail by undertaking local quantitative assessments (utilising hydraulic modelling where necessary), using topographic and watercourse cross section survey and hydrological data. An assessment should incorporate peak river flows for a 1 in 100 year Annual Exceedance Probability flood event, inclusive of the impacts of climate change. Such models, built using readily available hydraulic computer modelling software, can then be used to inform development site layout, finished floor levels and flood mitigation measures that may be necessary. The Environment Agency or St.Helens Council may already hold flood model information for some watercourses. In all cases, it is recommended that consideration of the joint probability of the occurrence of surface water flooding and high flood levels in receiving watercourses is considered.

6.16 Surface Water

6.16.1 The Environment Agency publishes maps showing the risk of flooding from surface water. The methodology used in generating these maps means that they tend to highlight natural drainage paths and can therefore be used to inform the layout of SuDS features on a site. Due consideration must be given to locations where surface water flows are shown to enter a development site from outside the site boundary as additional space for storage and conveyance may be required to accommodate this. Likewise, any onsite measures should not adversely impact on surface water flow routes and volumes downstream.

MARKER 6.12

Environment Agency – Flood Risk Maps

For large major developments, where surface water flooding has been shown on the national scale mapping to be a potential issue, detailed surface water flood modelling using topographic survey of the site should be undertaken for to inform full planning applications.

https://flood-warning-information.service.gov.uk/long-term-flood-risk/map
https://flood-warning-information.service.gov.uk/long-term-flood-risk/risk-types

MARKER 6.13

Flood risk within the development

S7 The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur on any part of the site for a 1 in 30 year rainfall event.

S8 The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur during a 1 in 100 year rainfall event in any part of: a building (including a basement); or in any utility plant susceptible to water (e.g. pumping station or electricity substation) within the development.

S9 The design of the site must ensure that, so far as is reasonably practicable, flows resulting from rainfall in excess of a 1 in 100 year rainfall event are managed in exceedance routes that minimise the risks to people and property.

MARKER 6.14

Local Standard H - Emergency Overflows

St.Helens Council will expect an emergency overflow to be provided for piped and storage features above the predicted water level in a 1 in 100 year Annual Exceedance Probability rainfall event, with an allowance for climate change.

Local Standard I - Freeboard Levels

St.Helens Council will expect all surface water storage ponds to provide a 600mm freeboard above the predicted water level arising from a 1 in 100 year probability rainfall event inclusive of an allowance for climate change. Also ensure that excavations do not take place below the ground water level.

Local Standard J - Watercourse Floodplains

The floodplains of ordinary watercourses should be mapped to an appropriate level of detail considering the nature of the application. The development layout should take a sequential approach, siting the least vulnerable parts of that development in the highest flood risk areas.

Local Standard K - Retention of Natural Drainage Features

Natural drainage features on a site should be maintained and enhanced. Culverting of open watercourses will not normally be permitted except where essential to allow highways and / or other infrastructure to cross. Culverts should be designed in accordance with CIRIA's Culvert design and operation guide, (C689). Where a culverted watercourse crosses a development site, it should be reverted back to open channel. In such a case the natural conditions deemed to have existed prior to the culverting taking place should be re-instated.

Local Standard L - Impact of Downstream Water Levels

If high water levels within a receiving watercourse into which a SuDS scheme discharges are anticipated, St.Helens Council will expect that they will not adversely affect the function of that SuD system. The joint probability of the occurrence of peak surface water / river flow should be considered

6.17 Historic Environment

6.17.1 The historic environment is comprised of buried archaeological remains (and the remains of upstanding earthworks), historic buildings and structures and historic landscape character. Some heritage assets have been identified as being of national importance and are statutorily designated. Details of nationally designated heritage assets can be identified on the government's National Heritage List for England. A SuDS scheme may impact on significant heritage assets and therefore consent for the works must be sought at an early stage.

MARKER 6.15

Further information on these can be found on the Historic England website

Historic England - National Heritage List for England:

https://historicengland.org.uk/listing/the-list/

Historic England - Consent and Planning Permission Requirements:

https://historicengland.org.uk/advice/hpg/consent/

6.17.2 Undesignated heritage assets are usually recorded in a county (or equivalent) Historic Environment Record (HER); this record is not exhaustive as heritage assets may come to light at any time and therefore contact should be made with St.Helens Council. These assets may be as significant as designated heritage assets but are considered as part of the planning process rather than as separate consented works.

6.17.3 Developers should identify the presence of heritage assets during the planning stage and make the presence of these clear to St.Helens Council, where they have the potential to inform or affect the drainage of the site. This will enable St.Helens Council to liaise with relevant organisations and colleagues to ensure the SuDS system is in keeping with the historic setting of the site, where appropriate. Developers should also ensure that the design of a SuDS system does not have a detrimental impact on any heritage assets. Opportunities for SuDS to enhance the historic environment shall be explored.

6.18 Delivering Multiple Benefits

6.18.1 Well planned SuDS will deliver multiple environmental, social and economic benefits. In addition to managing flows, volumes, and diffuse pollution, some components (particularly vegetated or landscaped features) can positively impact air quality, carbon reduction, recreation, education and other elements of community health and vitality, having monetary or intangible social value.

6.18.2 In designing SuDS features, the developer should consider how these could be co-located with open space and public areas to create multi-functional spaces. By integrating SuDS features with other street features such as traffic calming measures, parking bays and verges, opportunities to improve the streetscape are presented.

6.18.3 Where a new development is proposed on existing undeveloped land, it may be that existing land drainage features are present e.g. field drainage ditches, minor ponds or elements of surviving historic water management e.g. mill leats, water meadows. These present opportunities to manage surface water via existing pathways and also to enhance their attributes e.g. by improving conveyance or habitat potential. Care should be taken to accommodate any existing drainage functions.

MARKER 6.16

Local Standard M - Multiple Benefits

The SuDS design must demonstrate, where appropriate, how environmental site constraints have been considered and how the features design will provide multiple benefits e.g. landscape enhancement, biodiversity, recreation, amenity, leisure and the enhancement of historical features.

CIRIA has developed a freely available tool with associated guidance which makes it easier to assess the benefits of SuDS. The BeST (Benefits of SuDS Tool) can be accessed via the Susdrain website.

https://www.susdrain.org/resources/best.html

6.19 Landscape

6.19.1 Many developments are likely to be in an urban setting or part of proposals that create new urban environments. Good design should be informed by local character and distinctiveness as well as the historic landscape character and historic built environment, and should contribute to a sense of place. For greenfield development sites and development within and around villages and small towns, the full context of the site and its surroundings should be considered to inform design through reference to Local Landscape Character Assessments.

MARKER 6.17

National Character Area profiles: data for local decision making

Where relevant, landscape architects and historic environment specialists should work together to develop an appropriate design strategy for the SuDS. Reference should also be made to local design and development guides as well as any relevant Supplementary Planning Documents (SPD).

https://www.gov.uk/government/publications/national-character-area-profiles-data-for-local-decision-making

6.19.2 National Character Areas have been defined for 159 major landscape areas in England. They utilise a variety of environmental information to create a profile for each landscape area which sets out the landscape, wildlife, cultural and geological features in conjunction with information on the local environmental opportunities for the future. The information provided on opportunities within the National Character Area along with an understanding of the local character should be used to guide the SuDS strategy in order to deliver landscape and biodiversity enhancement. This may extend to choice of vegetation, use of buffer strips alongside watercourses and the types of features use e.g. ponds to encourage key wildlife species.

6.19.3 Where detailed design requires hard engineering then this should use materials appropriate to the locality. Soft landscape solutions should use grass seed and planting mixes that are ecologically appropriate, although in some urban situations a combination of native and ornamental species may be acceptable.

6.20 Public Open Space and Amenity

6.20.1 The requirement to provide Public Open Space on all new developments presents an opportunity for the provision of SuDS as many of the integral system features can function as green parks, wildlife corridors and gardens. Good SuDS design will ensure that systems act as truly multifunctional spaces and will avoid poorly conceived design features such as steep sided, fenced basins. It is highlighted however that not all SuDS will contribute to Public Open Space; for example the requirement to provide functioning or usable open space specifically for sport, recreation and leisure activities may not always be offset against the requirements to include SuDS within a development. St.Helens Council should be contacted to determine what and how much of a SuDS scheme can contribute to the Public Open Space.

6.21 Wildlife and Biodiversity

6.21.1 Any development site has potential to support habitats and/or species of importance for biodiversity; guidance can be found in British Standard BS42020:2013 Biodiversity Code of Practice for Planning and Development. Proposed SuDS schemes should be informed by appropriate ecological surveys and assessments in line with St.Helens Council policies and guidance. The location and design of SuDS should be informed by surrounding habitats and land-uses with to contribute to green infrastructure and provision of features of value for wildlife to help species breed, feed and move through the landscape. Opportunities to create wildlife habitats that can be enjoyed by residents should be demonstrated.

6.21.2 Biodiversity Opportunity maps are developed to highlight where priority habitats can be enhanced, restored or created in a particular area, county or region. They are used as a basis from which to develop policies and targets. A variety of initiatives focused on improving and restoring ponds across the UK are in existence and the contribution of a SuDS scheme to these should be explored. It is recommended that ecological advice be taken when designing SuDS and deciding on planting schemes. Well designed and maintained SuDS can become valuable features within site greenspace.

6.22 Trees

6.22.1 Trees, particularly long-lived, large-canopied species, are important and often defining components of the rural landscape or urban 'streetscene', conferring a wealth of social, economic and environmental benefits. Trees and woodland can play an active part in SuDS through canopy interception of rain and root uptake of water from the soil, which attenuates surface water run-off by decreasing peak flow rate and volume. Tree placement is best in more open areas away. The British Standard BS5837:2012 Trees in relation to design, demolition and construction - Recommendations provides guidance on deciding, in relation to planning applications, which trees are appropriate for retention, on the effect of trees on design and layout considerations and on the means of protecting trees during development.

6.22.2 Care should be taken during the design and construction of the SuDS scheme that this guidance is adhered to and that designs maximise the opportunity to maintain existing tree cover where appropriate and enhance future cover through new planting. Trees (requirement for suitable rooting volume and canopy space) should be an integral part of SuDS from the earliest stages of project, concept and design.

6.23 Key Water Framework Directives Objectives

6.23.1 The Water Framework Directive, established in October 2000, is a piece of European Union legislation with the aim of preserving, restoring and improving the water environment. This was transposed into national law via The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003 (Statutory Instrument 2003 No. 3242) for England and Wales. The key environmental objectives of the directive from the first cycle (2009 – 2015):

- All surface water bodies to achieve good ecological and chemical status by 2015. This covers inland waters, transitional waters (estuaries) and coastal waters;
- All groundwater bodies to achieve good groundwater quantitative and chemical status by 2015;
- Heavily-modified water bodies and artificial water bodies to achieve good ecological potential and good surface water chemical status by 2015;
- No water bodies to experience deterioration in status from one class to another;
- Protected areas to achieve the requirements made under the designation to the water environment.

MARKER 6.18

The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003

The current expectation from the Environment Agency is that 60% of waters will achieve good status by 2021. All of the objectives are to be met by the end of the third cycle (2021 – 2027). The aim is to continual development of the objectives from the first cycle. The second cycle (2015 – 2021) of the Water Framework Directive is now underway and a review of the Directive is expected in 2019.

http://www.legislation.gov.uk/uksi/2003/3242/regulation/7/made

6.24 River Basin Objectives

6.24.1 The basic unit at which the Directive is implemented is the River Basin District and management plans have been developed for each district which set statutory objectives for the water bodies within them. These river basin level objectives contribute to meeting the overall objectives of the Directive. This information should be used in conjunction with the SuDS Management Train to determine the most appropriate approach to water quality management. River Basin Management Plans are subject to a six year review cycle; the last review took place in 2015 and the next review is scheduled for 2021.

MARKER 6.19

St.Helens is located in the North West River Basin District. Information on the current / future chemical and ecological status of a watercourse can be found via the Environment Agency online maps.

River Basin Management Plans
https://www.gov.uk/government/collections/river-basin-management-plans-2015

Environment Agency – Catchment Data Explorer
http://environment.data.gov.uk/catchment-planning/

6.25 Role of SuDS in Meeting Water Framework Directive

6.25.1 Using SuDS to manage surface water plays an important role in preventing the pollution of water bodies from surface water runoff. The implementation of the SuDS approach for the drainage for new developments will ensure that these sites cannot contribute to the degradation in the quality of surface or ground water. Specific reference is made to the role of SuDS within the River Basin Management Plans. The SuDS Management Train should be used to assess storm water quality requirements.

WAY MARKER 6.20

Treatment stages for surface water bodies

Hazard	Normal surface water	Sensitive surface water
Low	0	1
Medium	2	3
High	Consult the Environment Agency	

Treatment stages for Groundwater

Groundwater Discharge Location		Minimum number of treatment stages		
Runoff Hazard Level		Low	Medium	High
G1	Source Protection Zone, within 50m of a well, spring or borehole that supplies potable water	1	3	Consult the Environment Agency
G2	Into or immediately adjacent to a sensitive receptor that could be influenced by infiltrated water. Includes designated nature conservation, heritage and landscape sites - including Biodiversity Action Plan (BAP) habitats and protected species.	1	3	
G3	Source Protection Zone II or III or Principal Aquifer	1	3	
G4	Secondary Aquifer	1	2	

NB. Where discharge to a sensitive surface water body (defined as any catchment smaller than 50km; any catchment with less than 20% urbanisation; any catchment with an environmental designation or national or international recognition, or any catchment where good ecological status is at risk), one extra treatment stage must be added.

6.26 Designation of SuDS Constructed on Third Party Land

6.26.1 The FWMA 2010 enables LLFAs to designate features or structures, constructed on third party land, which may impact on flood risk, at their discretion. All designated structures will be recorded onto an asset database. This process may be used to designate private SuDS serving new developments. Once a SuDS feature has been designated and placed on the asset register, formal consent from the LLFA will be required for any changes. No action on the part of the developer is required; all decisions relating to the designation of SuDS will be made by the LLFA.

6.27 Riparian Responsibilities

6.27.1 Anyone owning land or property next to a river, stream or ditch is classed as a riparian landowner and has associated rights and responsibilities. Wherever possible, watercourses should be made features of development sites and integrated into the overall drainage system. This includes opening up culverted watercourses where this would not increase flood risk to others up or downstream. Access to maintain a watercourse should be provided at all times and buildings should not be placed directly on the watercourse banks.

MARKER 6.21

Living on the Edge: A Guide to Your Rights and Responsibilities of Riverside Ownership

Further details and explanation of all rights and responsibilities pertaining to riparian ownership can be found in the Environment Agency's Responsibilities of Riverside Ownership along with the Councils Land Drainage Bylaws available from the LLFA's. Future owners of properties who will have riparian responsibilities should be made aware of these when purchasing properties.

https://www.gov.uk/guidance/owning-a-watercourse

6.28 Local Standards

6.28.1 As identified in the guidance way markers there are a number of local standards throughout the document. The local standards are also placed below in one full section for quick reference.

❖ **Table 6b: Local Standards**

Local Standard		Description
A	**Phased Development and Drainage Strategies**	For phased developments, the LLFA will expect planning applications to be accompanied by a Drainage Strategy which takes a strategic approach to drainage provision across the entire site and incorporates adequate provision for SuDS within each phase. Expected that the whole development discharge rate is assessed as one value, then broken down to individual phases/sections. Any alterations to individual phases/section discharge rates will change the allowable rates for the additional phases (totalling no greater than the overall site value).
B	**Permeable Paving Systems or Equivalent**	The use of permeable paving systems should not be used in domestic situations where maintenance is the responsibility of the individual dwelling owners where the component attenuated storage is counted as a percentage of the sites overall surface water storage. In this case certain property owners would in effect have greater responsibility of maintenance, this is due to cumulative flows and any failure would affect multiple adjacent dwellings. Other options for storage requirements must be investigated. Permeable systems will be considered only while used in a groundwater infiltration system or where the permeable paving system or equivalent is not included as part of the sites storage and climate change volumes. Full construction detail and assessment of permeable paving system must be provided as part of the full planning submission.
C	**Pollution Prevention and Control**	St.Helens Council will expect the SuDS to demonstrate how pollutants are prevented or controlled as part of the SuDS scheme. This should include consideration of the sensitivity of receiving waterbodies and particular attention should be given to the first 5mm of rainfall (‘first flush’ that mobilises the most pollutants).
D	**Conformity with SuDS Train**	St.Helens Council will expect the SuDS design to demonstrate how the principles of the SuDS Management Train have been taken into account.
E	**Maintenance Requirements**	St.Helens Council will expect SuDS to be designed so that they are easy to maintain. Proper use of the SuDS management train, including surface features, is one way to achieve this. The developer must set out who will maintain the system, how the maintenance will be funded and provide a maintenance and operation manual. Where a sewer system is utilised, suitable access for the public / existing access users (deemed by the LLFA / Highway Street Works team or equivalent) must be maintained through the development process (and construction phase).
F	**Minimising the Risk of Blockages**	St.Helens Council will expect the SuDS design to minimise the risk of blockage as far as is reasonably possible e.g. by using suitable pipe sizes and making underground assets as visible and accessible. A minimum of 150mm pipes should be used as carrier drains, where an exception to allow or lower 100mm orifice plate to limit discharge rates (with maintenance plans).
G	**Use of Pumped Systems**	If it can be demonstrated that a partial or completely pumped drainage system is the only viable option, St.Helens Council will expect the residual risk of flooding due to the failure of the pumps to be assessed.

❖ **Table 6b: Local Standards (Continued)**

Standard		Remedial Tasks…
G	**Use of Pumped Systems (Continued)**	the residual risk of flooding due to the failure of the pumps to be assessed. The design flood level must be determined under the following conditions: ▪ (1) If the pumps were to fail ▪ (2) If the attenuation storage was full, and ▪ (3) If a design storm occurred. The finished floor levels of the affected properties should be raised above this level and all flooding should be safely stored onsite. An emergency overflow must be provided for piped and storage features above the predicted water level arising from a 1 in 100 year Annual Exceedance Probability rainfall event inclusive of allowances for climate change and urban creep.
H	**Emergency Overflows**	St.Helens Council will expect an emergency overflow to be provided for piped and storage features above the predicted water level in a 1 in 100 year Annual Exceedance Probability rainfall event, with an allowance for climate change.
I	**Freeboard Levels**	St.Helens Council will expect all surface water storage ponds to provide a 600mm freeboard above the predicted water level arising from a 1 in 100 year probability rainfall event inclusive of an allowance for climate change. Also ensure that excavations do not take place below the ground water level.
J	**Watercourse Floodplains**	The floodplains of ordinary watercourses should be mapped to an appropriate level of detail considering the nature of the application. The development layout should take a sequential approach, siting the least vulnerable parts of that development in the highest flood risk areas.
K	**Retention of Natural Drainage Features**	Natural drainage features on a site should be maintained and enhanced. Culverting of open watercourses will not normally be permitted except where essential to allow highways and / or other infrastructure to cross. Culverts should be designed in accordance with CIRIA's Culvert design and operation guide, (C689). Where a culverted watercourse crosses a development site, it should be reverted back to open channel. In such a case the natural conditions deemed to have existed prior to the culverting taking place should be re-instated.
L	**Impact of Downstream Water Levels**	If high water levels within a receiving watercourse into which a SuDS scheme discharges are anticipated, St.Helens Council will expect that they will not adversely affect the function of that SuD system. The joint probability of the occurrence of peak surface water / river flow should be considered.
M	**Multiple Benefits**	The SuDS design must demonstrate, where appropriate, how environmental site constraints have been considered and how the features design will provide multiple benefits e.g. landscape enhancement, biodiversity, recreation, amenity, leisure and the enhancement of historical features. CIRIA has developed a freely available tool with associated guidance which makes it easier to assess the benefits of SuDS. The BeST (Benefits of SuDS Tool) can be accessed via the Susdrain website. https://www.susdrain.org/resources/best.html
N	**Private Flow Paths**	Appropriate physical measures must be installed where possible to prevent surface water flow from private areas / hardstanding from entering the prospective or existing highway network.

7. Technical Design Requirements

This section will cover and expand on the technical requirements of the SuDS features discussed and identified within this guidance document.	What this section will cover: ▪ Technical design requirements for submission ▪ Source / Site / Regional and Pollution Control

7.1 SuDS Components

7.1.1 This section along with Appendix D of this document contains diagrams for the various SuDS considered acceptable to be used within the administrative area of St.Helens Council. Each SuDS component will have information in regard to best practice, hydraulic and water quality, local opportunities, local considerations, safely and maintenance. Additional SuDS measures and controls may be considered for use depending on the individual situation, however detailed information and early discussion is required with the Planning Authority. Suds components detailed in this guidance are as follows: Filter drain / infiltrator drain / Filter strip / Bio retention / Swales / Retention Pond / Detention Basin / Underground storage / Vortex system and Oil separator.

7.2 Source Control

7.2.1 To optimise the management of surface water on the development, dealing with water when and where it is falls as source control is preferred to reduce the peak of downstream water volumes, reduce potential contamination treatment measures and options to recycle the water for additional uses. Dealing with source control measures may reduce the contamination. Often source control components are within the curtilage of properties and maintained by the property owner or manager and can include green roofs, permeable surfaces, rainwater harvesting and water butts. A commercial application could be the use of storage ponds to accumulate water for reuse as an alternative water supply for a garden centre. Rainwater harvesting generally relies on the collection of rainwater from roofs and areas of hard standings with the intention of localised reuse.

7.3 Site and Regional Control

7.3.1 A well designed SuDS scheme should have most of the storage and water treatment performed by upstream source control components of the SuDS scheme. Site Control components designed to either provide storage, through the retention of surface water runoff, or attenuation through the detention of surface water runoff. Retention is primarily provided on the surface through ponds, and underground through tanks, more commonly geo-cellular tanks. At the regional level, mainly for multiple developments using the same storage area water storage is often provided by detention basins. Retention storage within ponds as well as helping manage flood risk is also useful in providing water treatment. However, there should be upstream components or treatment stages before surface water is conveyed to ponds (and wetlands).

7.4 Seed Grass Mixes

7.4.1 Swales and other grassed areas shall be turfed or seeded at a rate of 40g/m2 over 100 – 150mm of topsoil with the following grass mix: Perennial rye grass (25%), Smooth stalked meadow grass (25%), Slender creeping red fescue (30%), Chewings fescue (10%) and Browntop bent (10%). Where appropriate alternative specifications can be used such as wild flower species, where the developer can demonstrate that the proposed mix will be resistant to pollution and periods of prolonged dry and wet conditions.

7.5 Treatment Control

7.5.1 Oil and sediment separators can be used as pre-treatment, or as a last resort, site treatment for the removal of sediment, litter and oil from surface water runoff. These systems can be installed in a standard size manhole. Captured pollutants are retained within the separator, providing a single point of maintenance.

7.6 Filter Drain / Infiltrator Drain (Source Control) Overview

Guidance Documents:
- CIRIA C753: The SuDS Manual Part D.
- Design Manual for Roads and Bridges HA 103/06

Gravel or rubble filled trench that creates subsurface storage for infiltration, or filtration of surface water runoff. Trenches can be used to filter, attenuate and dissipate storm water into the ground through the base and sides of the trench and/or provide a level of treatment prior to reaching a secondary SuDS feature. ***Benefits:*** *Permeable surface Increase, Improve Water Quality, Pollutant Removal, Silt Removal.*

7.1.1 Best practice:

- The location of the filter trenches should be carefully considered so there is no interaction with people and vehicles;
- Work best with SuDS components which provide attenuation of storm flows;
- Use in combination with effective pre-treatment;
- Separate filter media from surrounding ground with a geotextile where infiltration is desirable;
- Membrane where infiltration is not permitted;
- Include a geotextile layer within the upper gravel, observation wells and rodding points for maintenance;
- Use a distribution pipe in combination with point discharges;
- Consider the impacts of stone scatter.

7.1.2 Local context opportunities:

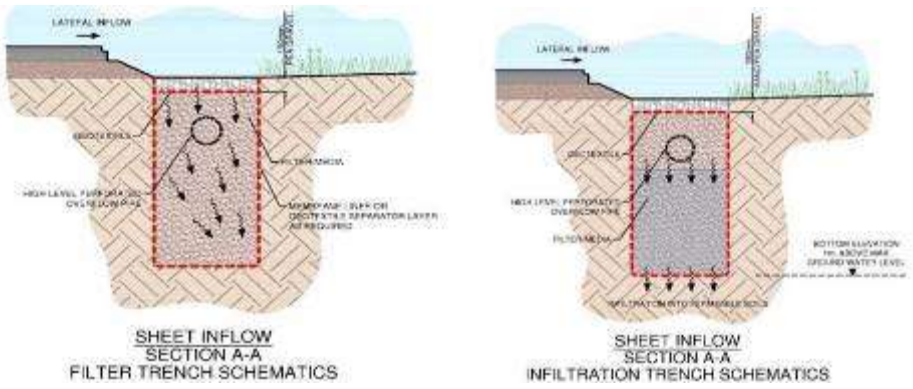
- Ideal for use with small contributing areas;
- The land-take is usually low, typically 0.5-1.5m wide;
- Can be used to reduce both runoff rate and volume;
- Good water quality treatment;
- Can be easily incorporated into site landscaping / along roads.

7.1.3 Local context considerations:

- Can be prone to blockage, works best in combination with pre-treatment such as filter strips to reduce sediment load;
- Features to help inspection and maintenance are critical;
- Can be expensive to replace the filter material if poorly designed or neglected maintenance;
- Difficult to identify pollution and maintenance issues underground.

❖ **Figure 7: Filter Drain / Infiltration Trench**
Source reference: The SuDS Manual, CIRIA 2015 (28/06/2017)

FIGURE 7



7.7 Filter Strip (Source Control) Overview

Guidance Documents:
- CIRIA C753: The SuDS Manual Part D.

Filter strips are gently sloping, vegetated strips of land that provide opportunities for slow conveyance and infiltration (where appropriate). They are designed to accept runoff as overland sheet flow from upstream development and often lie between a hard-surfaced area and a receiving stream, surface water collection, treatment or disposal system. They treat runoff by vegetative filtering, and promote settlement of particulate pollutants and infiltration. ***Benefits:*** *Improve Water Quality, Pollutant Removal.*

7.1.4 Best practice:

- Integrated into the site and surrounding landscape;
- Consider opportunities for green corridors;
- Can be used in conjunction with SuDS components offering attenuation.

7.1.5 Local context opportunities:

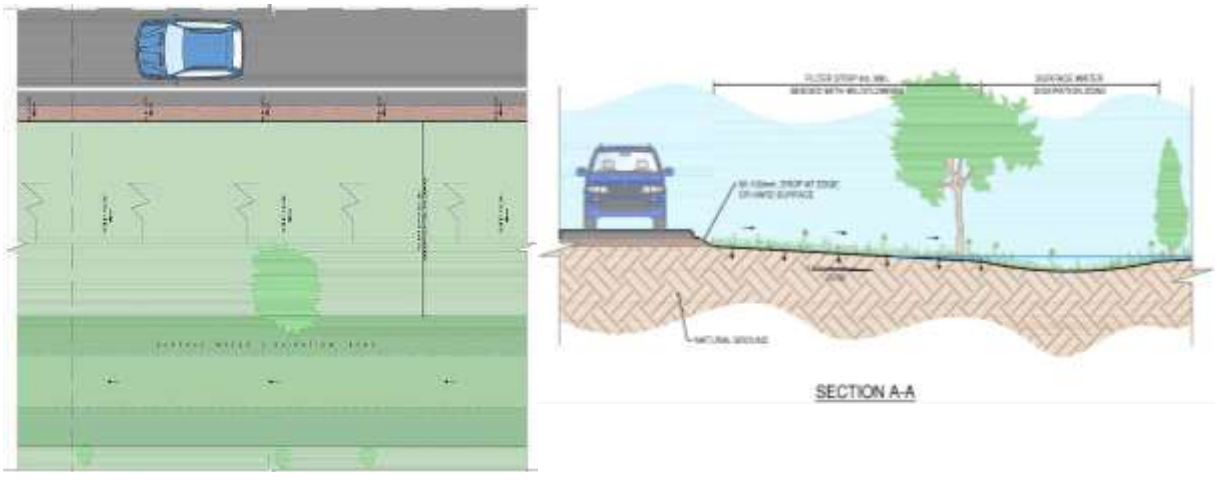
- Ideal for use with small contributing areas;
- Good for pre-treatment;
- The land-take is usually moderate, minimum of 6m wide with a slope not exceeding 1 in 20;
- Moderate water quality treatment;
- Can be easily incorporated into site landscaping and alongside roads;
- Can be enhanced using grass/wildflower seed mixes;
- Can link green areas;
- Low cost and maintenance.

7.1.6 Local context considerations:

- Relatively large land-take;
- Not suitable for step sites;
- Does not attenuate or significantly reduce peak flow or volume.

❖ **Figure 8: Filter Strip**
Source reference: The SuDS Manual, CIRIA 2015 (28/06/2017)

FIGURE 8



7.8 Filter Strips / Infiltrator Trenches (Technical Requirements)

MARKER 7.1

Design Manual for Roads and Bridges (or revision)

Volume 4, Section 2, Part 5, HA40/01

- Determination of Pipe and Bedding Combinations for Drainage Works, Drawing F2, trench Type H,
- Filter / Infiltration Trenches should not exceed 3m in depth.

Discussion / reference with building regulations in distance easements of infiltration / swales systems near or effecting buildings / structures

This document guidance

- LLFA guide requirements and Appendix D - Figure D1 and D2.

Geotextile Specification Requirements
Specification for Highway Works Series 500

7.8.1 Configuration and Dimensions of Infiltration Trenches & Filter Strips:

- Filter / Infiltration Trenches should be used as source controls only;
- Filter / Infiltration Trenches should not be designed as sediment traps;
- Filter / Infiltration Trenches should be designed to the requirements in way marker 7.1;
- Filter / Infiltration Trenches should be provided with a high-level overflow to accommodate design exceedance;
- It is preferred that storm water inflow be sheet flow from drainage areas;
- Where sheet flow is not practical point flow inputs will be acceptable;
- Where point flows are used, a pre-treatment stage be installed that will effectively remove particulate matter present in the water and prevent clogging of the trench;
- Point flow inputs should be connected to a slotted high level distributor pipe;
- The pipe should be capable of conveying the design flow;
- The stone filter material should be wrapped in geotextile to the diagram as shown on Appendix D, Figure D1, with a minimum 150mm overlap at all joins.

7.8.2 Hydraulic and Water Quality Design Criteria:

- The trench design should be checked for design exceedance and modelled explicitly and holistically to demonstrate the impact to the downstream drainage components;
- Infiltration trenches should be designed to half-empty in 24 hours to allow for incoming flows from subsequent storms;
- Base of the trench should be at least 1m above the highest seasonal or permanent groundwater table.

7.8.3 Selection and Siting:

- The trench shall be designed for easy maintenance;
- Design of infiltration trenches must comply with groundwater protection regulations and with EA policy on infiltration;
- Infiltration trenches to be sited on stable ground, soil and groundwater conditions assessed to verify ground stability;
- A risk assessment shall include all relevant safety and environmental issues associated with siting a filter / infiltration trench.

7.8.4 Safety:

- Risk assessment shall include risks associated with scatter of filter material.

7.8.5 Operation and Maintenance

- All maintenance access points shall be clearly visible and documented in the Operation and Maintenance plan.

7.9 Swales (Source Control) Overview

Guidance Documents:

- CIRIA C753: The SuDS Manual Part D.
- Design manual for Roads and bridges HA 103/06

A vegetated shallow channel or depression designed to treat, filter, store and convey runoff. Swales can be either 'dry' (where water is stored beneath the ground in a gravel layer) or 'wet' where runoff is stored above the surface in the channel so may be permanently wet. Lining can be added to enable infiltration even when there are known contaminants in the water. ***Benefits:*** *Improve Water Quality, Pollutant Removal, Aesthetic Enhancement, and Storm Event Storage.*

7.9.1 Best practice:

- Integrated into the site and surrounding landscape;
- Consider opportunities for green corridors;
- Can be used in conjunction with SuDS components offering attenuation;
- Conveyance swales are suited to directing flow;
- Dry swales provide additional filter treatment;
- Wet swales encourage filtering and attenuation through wet and marsh like conditions.

7.9.2 Local Context Opportunities:

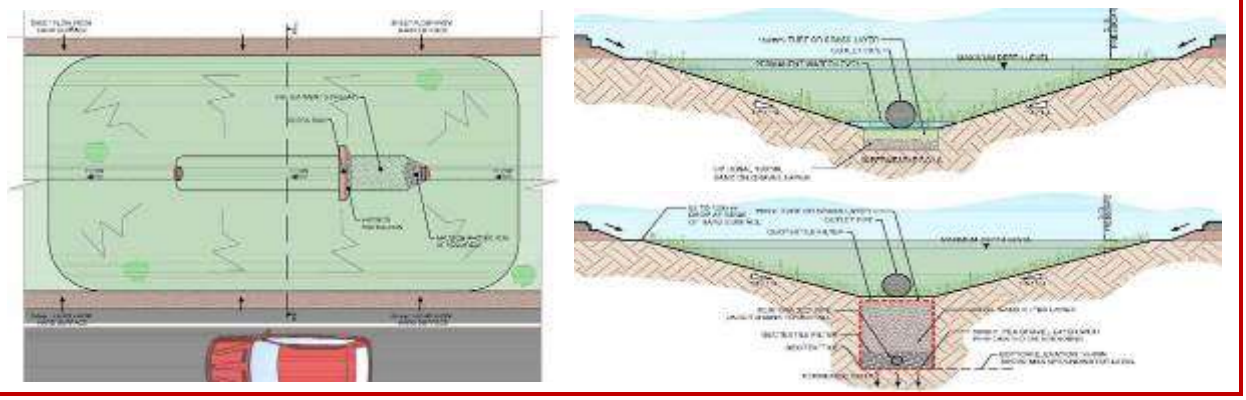
- Difficult to achieve minimum length in residential developments due to access crossings;
- Relatively moderate land-take;
- Check dams needed for steeper sites;
- Needs to be enhanced to attenuate or significantly reduce peak flow or volume;
- May require lining on contaminated sites.

7.9.3 Local Context Considerations:

- Ideal for use with linear contributing areas like roads;
- Good for pre-treatment;
- Can be enhanced to provide two stages of treatment;
- The land-take is usually moderate, minimum of 4m wide;
- Good water quality treatment;
- Can be easily incorporated into site landscaping and alongside roads;
- Can be enhanced using grass/wildflower seed mixes;
- Can be linked to create green corridors;
- Low/Medium cost and maintenance.

❖ **Figure 9: Filter Strip**
Source reference: The SuDS Manual, CIRIA 2015 (28/06/2017)

FIGURE 9



7.10 Swales (Technical Requirements)

MARKER 7.2

CIRIA C753 The SuDS Manual (or revision) Appendix D - Figure D3

Discussion where components are within open spaces should be undertaken with **Grounds Maintenance**.

Reference building regulations in distance easements of infiltration potential near or effecting buildings / structures. Swale systems should be designed for temporary storage (30 to 100 year event) or conveyance. Swales should be used as source controls only.

7.10.1 Configuration and Dimensions of Swales:

- Swales should be Trapezoidal or parabolic in cross section;
- The side slopes of a swale shall be a maximum of 1 vertically to 4 horizontally;
- Base shall be a minimum of 0.5m and a maximum of 2m wide and designed to avoid formation of rills;
- Depth shall be between (400-600mm) and achieve a freeboard of 150mm during design flow conditions;
- Swales shall be no less that 30m in length, the longitudinal slope of the swale shall not exceed 1 vertically to 40 horizontally without the use of check dams and shall not exceed 1 vertically to 10 horizontally.

7.10.2 Hydraulic and Water Quality Design Criteria:

- Designed so flow from a 1 in 1 year 30-minute storm event does not exceed 0.3m/s or 100mm in depth;
- The average velocity should be calculated using Manning's equation with a roughness coefficient of 0.025 for flows up to the grass height. Grass height in the channel should be assumed to be 100-150mm;
- Flow above grass height, friction factor can be reduced to 0.01 for analysis of exceedance storm event;
- Storage volumes for the 1 in 1 year design event should dissipate within 24 hours, so that subsequent storms can be accommodated in terms of storage and treatment;
- Where practical, swales should form part of a wide blue/green network, designed for the temporary storage and conveyance of design exceedance storm events 30 to 100 year storm event. The maximum flow velocity should be below 1.0m/s. Higher velocities up to 2.0m/s may be permissible if erosion, soil stability and safety aspects can be demonstrated to the satisfaction of Council.

7.10.3 Selection and Siting:

- Swales should be positioned as close to the source of receiving runoff as possible, in a location that is easily and safely accessible by maintenance machinery;
- On stable ground and where groundwater will not occur within 1 m of the base of the swale;
- Infiltration swales shall not be positioned adjacent to building foundations without a design certificate from a suitably qualified geotechnical engineer, Infiltration swales shall not dissipate water directly to ground without a suitable groundwater risk assessment.

7.10.4 Pre-treatment, inlets, and outlets:

- Sheet flow is desirable to minimise erosion and increase treatment potential. Other options to provide an approximate to sheet flow, such as flush kerbs, shall be considered on a site by site basis;
- Point flow outlets (e.g. Road gullies) shall flow into a flow spreader to minimise risk of erosion and silting;
- A drop of 50-100mm included at the edge of the hard surface to prevent the formation of a sediment lip;
- Discharge/underdrain pipes be provided with an erosion resistant hydraulically designed outlet structure;
- Swales shall include a suitably designed overflow to safely convey flows from design exceedance events;
- Overflows shown in the strategy for managing exceedance events and routed to temporary storage areas.

7.10.5 Landscaping and Amenity:

- See section 7.4 for grass mix.

7.10.6 Safety:

- Risk assessment shall include all relevant safety and environmental issues associated with siting a swale.

7.10.7 Operation and Maintenance:

- Access shall be provided to all areas of the swale for inspection and maintenance;
- All maintenance assess points shall be visible and documented in the Operation and Maintenance plan.

7.11 Bio-retention (Source Control) Overview

Guidance Documents:

- CIRIA C753: The SuDS Manual Part D.
- Design manual for Roads and bridges HA 103/06

Bio-retention areas are shallow landscaped depressions which are typically under drained and rely on engineered soils, enhanced vegetation (specially selected plant species) and filtration to remove pollution and reduce runoff downstream. They are aimed at managing and treating runoff from frequent rainfall events. Water flows horizontally and is gradually treated prior to discharge; flow control is required. ***Benefits:*** *Improve Water Quality, Pollutant Removal, Aesthetic Enhancement, and Recreational Space.*

7.11.1 Best practice:

- Generally applied to small catchments and are typically 5% -10% of the contributing area;
- Bio-retention should be lined where infiltration could cause slope stability or foundation problems;
- Groundwater table must be 1m below the base of the feature;
- Suggested width of 3m and a 2:1 length to width ratio to allow random planting of vegetation;
- Standard landscape mulch should be used for the top dressing not exceeding 75mm;
- Plants must be able to withstand pollution and extended dry and wet periods.

7.11.2 Local Context Opportunities:

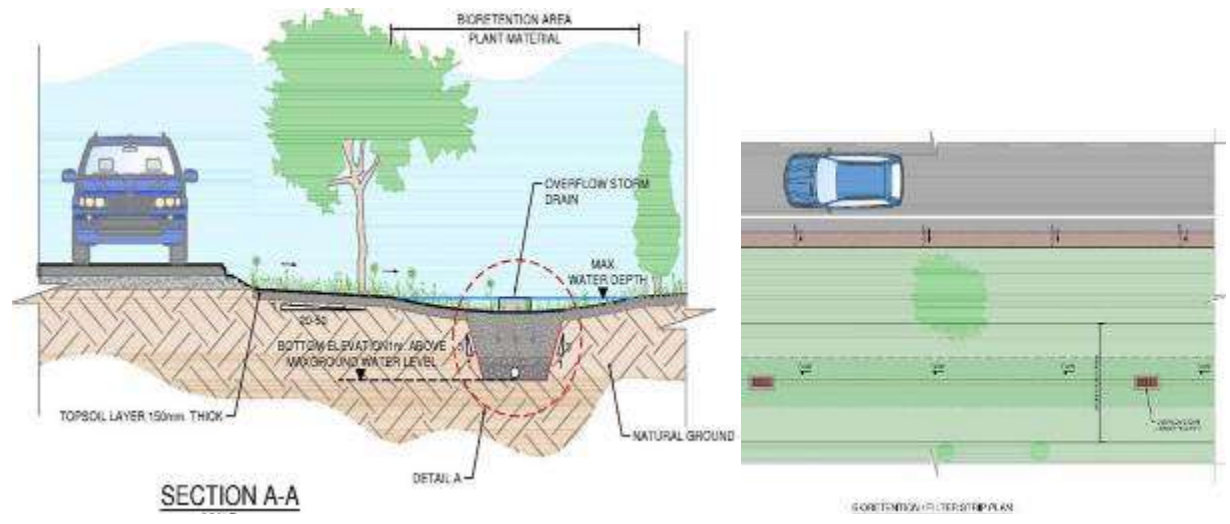
- Suitable for a variety of urban and rural environments;
- Good retrofit solution;
- Works well in low permeability soils;
- Can be very compact and used within streetscaping, or in larger landscaping areas;
- Good water quality treatment and volume reduction with infiltration;
- Can be adapted into a rain garden feature.

7.11.3 Local Context Considerations:

- Requires landscaping and management.

❖ **Figure 10: Bio-retention**
Source reference: The SuDS Manual, CIRIA 2015 (28/06/2017)

FIGURE 10



7.12 Bio-retention (Technical Requirements)

MARKER 7.3

CIRIA C753 The SuDS Manual (or revision) Appendix D - Figure D4
Design Manual for Roads and Bridges (or revision)

Geotextile Specification Requirements
Specification for Highway Works Series 500. The engineered soil, transition sand later and coarse bedding material shall be wrapped in geotextile (Appendix D, Figure D4) with a minimum 150mm overlap at all joins. Bio-retention should be used as source controls only.

7.12.1 Configuration and Dimensions of Bio-retention:

- The use of proprietary bio retention units is permitted and shall be considered on a case by case basis;
- Performance is independent of shape. A minimum plan area of 20m2 with length to width of 2 to 1 should be considered to provide opportunities for diverse planting and easy access maintenance;
- The 75mm mulch layer composed of shredded wood chips shall cover the bio-retention area to reduce erosion and help to maintain moisture levels for plants;
- The filtration / bedding material shall comprise of engineered soil designed to sustain selected plants and achieve a permeability of 250 to 1000mm per hour under design conditions. The depth of the engineered soil will vary depending on the selected planting scheme (minimum of 1m and a maximum of 2m).

7.12.2 Hydraulic and Water Quality Design Criteria:

- Ponding in the bio-retention area should not exceed 150mm;
- The bio-retention design should be checked for design exceedance and modelled explicitly and holistically to demonstrate the impact to the downstream drainage components;
- Bio-retention to be designed to half-empty in 24 hours to allow for incoming flows from subsequent storm;
- Bio-retention base shall be at least 1m above the highest seasonal or permanent groundwater table;
- The underdrain pipe design should follow standard hydraulic design methods. Bio-retention areas shall be provided with high level overflows and sub-surface collection pipe to accommodate design exceedance;
- A maintenance pipe for cleaning the underdrain should be provided and secured against vandalism;
- Transition layer below the soil filter media shall consist of 100mm coarse sand, grain size of 0.5 to 1mm;
- The gravel around the perforated underdrain shall be 5 to 20mm size.

7.12.3 Selection and Siting:

- A risk assessment shall include all relevant safety and environmental issues associated with siting bio-retention. Carried out by a qualified Engineer or Geologist where infiltration systems are proposed;
- Bio-retention shall be designed for easy maintenance, should be sited on stable ground, soil and groundwater conditions should be assessed to verify ground stability;
- Design must comply with groundwater protection regulations and EA policy on infiltration.

7.12.4 Pre-treatment, inlets, and outlets:

- Sheet flow is desirable to minimise erosion and increase treatment potential. Other options to provide an approximate to sheet flow, such as flush kerbs, shall be considered on a site by site basis;
- Point flow outlets (e.g. Road gullies) shall flow into a flow spreader to minimise risk of erosion and silting;
- A drop of 50-100mm included at the edge of the hard surface to prevent the formation of a sediment lip;
- Shall include a suitably designed overflow to safely convey flows from design exceedance events;
- Overflows shown in the strategy for managing exceedance events and routed to temporary storage areas.

7.12.5 Landscaping and Amenity:

- See section 7.4 for grass mix.

7.12.6 Safety:

- Risk assessment includes all relevant safety and environmental issues associated with bio retention.

7.12.7 Operation and Maintenance:

- Access shall be provided to all areas of the swale for inspection and maintenance. All maintenance assess points shall be clearly visible and documented in the Operation and Maintenance plan.

7.13 Underground Storage (Site Control) Overview

Guidance Documents:

- CIRIA C753: The SuDS Manual Part D.
- Design manual for Roads and bridges HA 103/06

Underground structures with capacity to store water below ground. They only provide attenuation and not treatment - cleaning of the water is therefore required prior to release. Geo-cellular systems can be used to control and manage rainwater surface water runoff either as a soakaway or as a storage tank. The modular / honey comb nature of geo-cellular systems means that they can be tailored to suit the specific requirements of any site. ***Benefits:*** *Storm Event Storage.*

7.13.1 Best practice:

- Clear evidence of where the storage structure fits into a planned SuDS Management Train to provide silt removal and pollution treatment to the satisfaction of the Council;
- Examine possibility of enabling infiltration through geotextile layer;
- Suitable internal void ratio of the structure (>90%).

7.13.2 Local Context Opportunities:

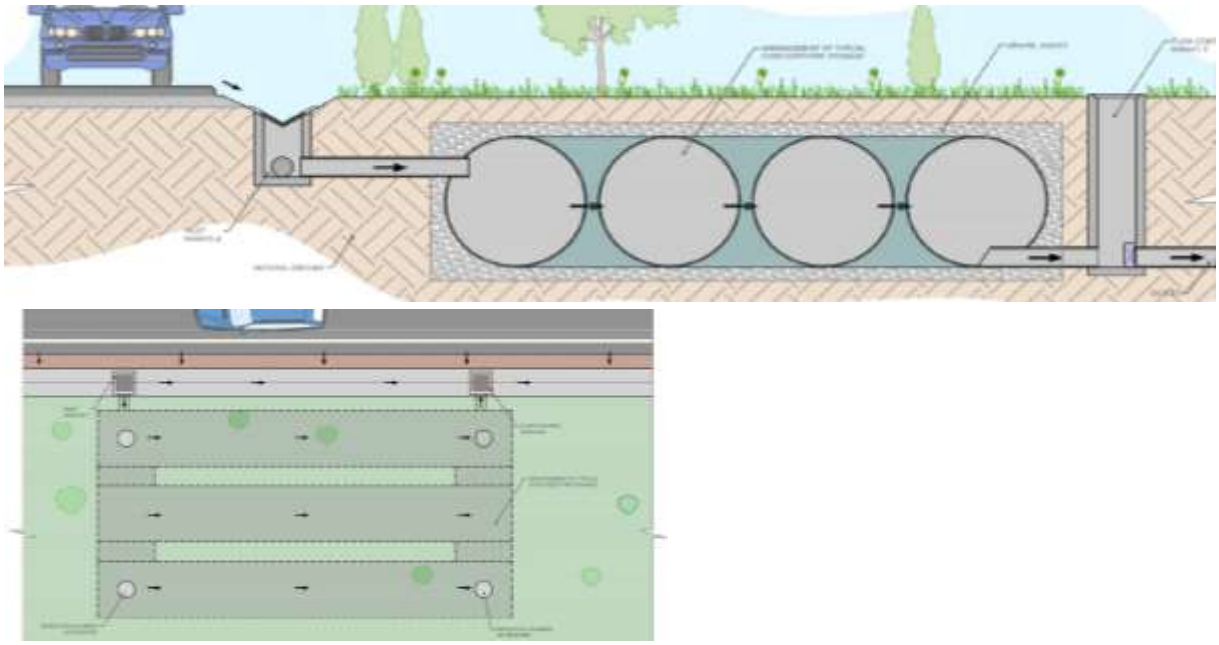
- Can be designed to attenuate stormwater from any drainage area;
- Ideal where above ground space is not available;
- Stable ground is required.

7.13.3 Local Context Considerations:

- The underground storage must be part of a wider SuDS Management Train;
- Designs should ensure avoidance of structural failure and collapse as well as expected loading.

❖ **Figure 11: Bio-retention**
Source reference: The SuDS Manual, CIRIA 2015 (28/06/2017)

FIGURE 11



7.14 Underground Storage (Technical Requirements)

MARKER 7.4

CIRIA C753 The SuDS Manual (or revision) Appendix D - Figure D7
Sewers for Adoption 7th Edition

Discussion where components are within highways should be undertaken with **Highways Design / Maintenance**.

Underground systems, must only be used in conjunction with the SuDS Hierarchy, clear evidence and justification of why infiltration and open components such as swales and basins cannot be used in the development.

7.14.1 Configuration and Dimensions of Underground Storage:

- The use of underground storage (which provides no surface water treatment) shall only be allowed where the use of other SuDS methods are inappropriate;
- The design of the underground storage shall aim to minimise sedimentation. Underground storage should be designed to the CIRIA C753 SuDS Manual Part D;
- Larger underground storage structures shall permit man-entry to enable inspection and maintenance activities to be carried out within the storage chambers;
- This shall include suitable clear opening and internal step irons for safe access/egress. Smaller underground storage structures should have suitable access points to permit remote cleaning and inspection to be readily carried out;
- Covers should be large enough to allow man-entry with breathing apparatus;
- Entry points should be on level ground to permit the erection of man-entry safety tripods;
- Design options that shall be acceptable for public areas are pre-fabricated structures, oversized pipes or cast in-situ concrete structures;
- The maximum water level in any underground storage structure shall be at least 600mm below the lowest floor level of any adjacent premises;
- Underground storage should normally be designed as off-line storage and should be sized in accordance with the hydraulic design requirements;
- Low-flow channels should be provided;
- The minimum gradient for storage systems should be 1:100 for off-line tanks and 1:200 for on-line tanks to minimise sedimentation.

7.14.2 Selection and Siting:

- Underground storage should be located beneath public areas or roads.

7.14.3 Pre-treatment, inlets, and outlets:

- The outlet structure should be designed to operate and discharge the design-limiting discharge rates;
- Appropriate hydraulic checks on the implications of high downstream water levels should be made, where appropriate, and take account of the receiving watercourse or downstream sewer capacity;
- Flow controls shall be designed to the requirements of Sewers for Adoption 7th Edition;
- The minimum size of any orifice should be 75mm diameter;
- The outlet structure should have an overflow provided.

7.14.4 Safety:

- A risk assessment should cover all aspects of safety, including access, for operatives during maintenance operations;
- A minimum of two access points (upstream and downstream) should be provided with maximum intervals between access points of 50m;
- Ventilation should be provided to minimise the risk of build-up of dangerous gases.

7.14.5 Operation and Maintenance:

- All maintenance assess points shall be clearly visible and documented in the Operation and Maintenance plan.

7.15 Detention Basin (Site Control) Overview

Guidance Documents:

- CIRIA C753: The SuDS Manual Part D.
- Design manual for Roads and bridges HA 103/06

Detention basins are surface storage basins or facilities that provide flow control through attenuation of storm water runoff. They also facilitate some settling of particulate pollutants. Detention basins are normally dry and in certain situations the land may also function as a recreational facility. However, basins can also be mixed, including both a permanently wet area for wildlife or treatment of the runoff and an area that is usually dry to cater for flood attenuation. Basins tend to be found towards the end of the SuDS management train, so are used if extended treatment of the runoff is required or if they are required for wildlife or landscape reasons. ***Benefits:*** *Storm Event Storage, Removing Sediments, Recreational Areas.*

7.15.1 Best practice:

- Maximum water depth should not exceed 3m although local safety considerations may reduce this further;
- Length/width ratio should be between 1:2 and 5:1;
- Contouring inside the basin can assist with defining areas likely to be inundated;
- Maximum side slopes of 1 in 4 to allow easy access;
- Sediment forebay or pre-treatment option will improve the water quality;
- Surface water bypass and drawdown is required to facilitate safe maintenance;
- Can be enhanced to improve ecological value;
- Large outlet pipes should be screened.

7.15.2 Local Context Opportunities:

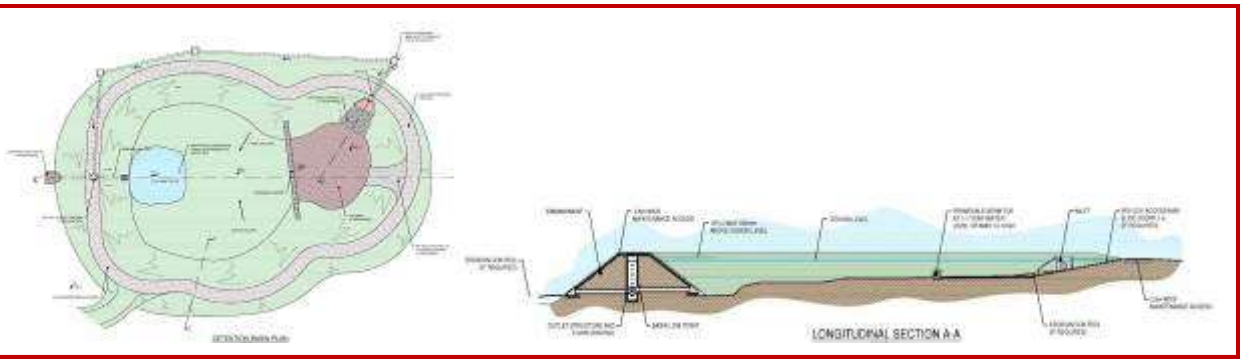
- Can be applied to large contributing catchments;
- Areas incorporated into larger landscaping and connectivity requirements with woodland and trees;
- Works well in low permeability soils;
- Good flow control;
- Easy to design, build and maintain;
- Can be used for sports, playgrounds or car parking if designed carefully.

7.15.3 Local Context Considerations:

- Requires landscaping and management;
- Low volume and pollution reduction;
- Requires landscaping and management.

❖ **Figure 12: Detention Basin**
Source reference: The SuDS Manual, CIRIA 2015 (28/06/2017)

FIGURE 12



7.16 Detention Basin (Technical Requirements)

MARKER 7.5

CIRIA C753 The SuDS Manual (or revision) Appendix D - Figure D6

An irregular shape should be used for maximising the aesthetic aspect of the detention basins. Angular shapes should be avoided as far as practical in the design of basin elements and details. As a minimum detention basins should contain the following sections: the sediment forebay (if expected sediment loading is significantly high), the main basin and a micro-pool (part of the main basin). Additional elements to be included in the design of basins should be an inflow structure, an emergency overflow structure, bypass sewer piping and outlet with flow control device. The sedimentation forebay shall be separated from the permanent pool by a permeable berm.

7.16.1 Configuration and Dimensions of Detention Basins:

- Detention basin bases shall be designed with gentle inner slopes (1 to 100 maximum) towards the centre;
- Embankment inner slopes shall be less than 1 to 4;
- The maximum design water depth of the basins shall be 3m;
- The length to width ratio for online detention basins shall be between 5:1 to 2:1;
- The maximum volume of the detention basins shall be 5000m3.

7.16.2 Hydraulic and Water Quality Design Criteria:

- The drain down time should be a minimum of 24 hours, to allow for sedimentation to take place.

7.16.3 Selection and Siting:

- A risk assessment should include all relevant safety issues associated with siting a basin;
- Siting of detention basins should follow a multi criteria analysis to provide the widest benefits to the public;
- The 100yr +Climate Change water level in any detention basin shall be at least 600mm below the finished floor level of any adjacent properties;
- Consideration should be given to the potential failure of any embankment and the subsequent flood flows through, and downstream, of the site;
- The maximum 1-year return period event basin water level shall be higher than the appropriate return period event water level of the adjacent watercourse, as specified by the Local Authority as part of its flood prevention duties;
- Appropriate hydraulic checks for implications of high watercourse levels to be made, where appropriate;
- At sites of high groundwater table, the basin bottom level shall be built 500mm above the annual maximum groundwater level;
- At sites with contaminated soil, detention basins shall be designed water tight. Unlined detention basins should not be used on brownfield sites unless it has been clearly demonstrated that there is no risk of groundwater pollution.

7.16.4 Pre-treatment, inlets, and outlets:

- Sheet flow is desirable to minimise erosion and increase treatment potential;
- Other options to provide an approximate to sheet flow, such as flush kerbs, shall be considered on a site by site basis;
- Point flow outlets (e.g. Road gullies) shall flow into a flow spreader to minimise risk of erosion and silting;
- A drop of 50 to 100mm shall be included at the edge of the hard surface to prevent the formation of a sediment lip;
- Bioretention units shall include a suitably designed overflow to safely convey flows arising from design exceedance events. Overflows shall be incorporated within the development strategy for managing exceedance events and routed to planned temporary storage areas.

7.16.5 Landscaping and Amenity:

- Consideration should be given to the suitable aesthetic design of the detention basin and its surrounds;
- The dual use of the detention basin as passive public open space for recreation activities should be considered where the area is subject to flooding from events less frequent than the 1-year return period and where it can be clearly distinguished from the area providing flood storage for frequent events.

7.16.6 Safety:

- A safety risk assessment shall examine all relevant safety issues for both operatives and the public;
- Maximum embankment cross slope shall be 1:4 to provide safe working conditions for grass cutting;
- Dense vegetation around the external perimeter of the detention basin is discouraged to allow high levels of visibility of the area. Detention basins should not normally require to be fenced.

7.16.7 Operation and Maintenance:

- Access road for maintenance of 3.5m minimum width access road shall be provided;
- Summary of maintenance activities provided below shall be considered for basin accessibility design;
- Removal of litter, debris and grass cutting;
- Removal of unwanted plant species, aquatic plants if present and dead plant growth;
- Bank vegetation cutting and removal;
- Sediment removal from forebays and micropools;
- Reseeding of areas with poor vegetation growth.

7.16.8 Ecology:

- Suitable native planting to be selected to maximise ecological value of the detention basin and surrounds.

7.17 Retention Basin (Regional Control) Overview

Guidance Documents:

- CIRIA C753: The SuDS Manual Part D.
- ROSPA Safety at Inland Water Sites - Operational Guidelines.

Retention ponds are structures that provide both retention and treatment of contaminated storm water runoff. Retention ponds include a permanent pool of water into which storm water runoff is directed and outflows are controlled to reduce flow rate. A well-designed pond provides a community asset and opportunities for new habitats. The pond's physical, biological, and chemical processes work to remove storm water pollutants. Sedimentation processes remove particulates, organic matter, and metals, while dissolved metals and nutrients are removed through biological uptake. In general, a higher-level storm water quantity control can be achieved as well providing positive amenity benefits. ***Benefits:*** *Storm Event Storage, Removing Sediments, Habitat Creation.*

7.17.1 Best practice:

- 4 Zones: sediment forebay, permanent pool, temporary storage volume and shallow, wetland-type zone;
- Located outside the floodplain and water quality treatment levels required should determine design;
- Depth should be <2m to prevent stratification;
- A liner may be required to prevent infiltration if the water is polluted or if the pond is near an aquifer;
- Maintenance should account for invasive species;
- Health and safety should be considered to restrict proximity of the public to the pond.

7.17.2 Local Context Opportunities:

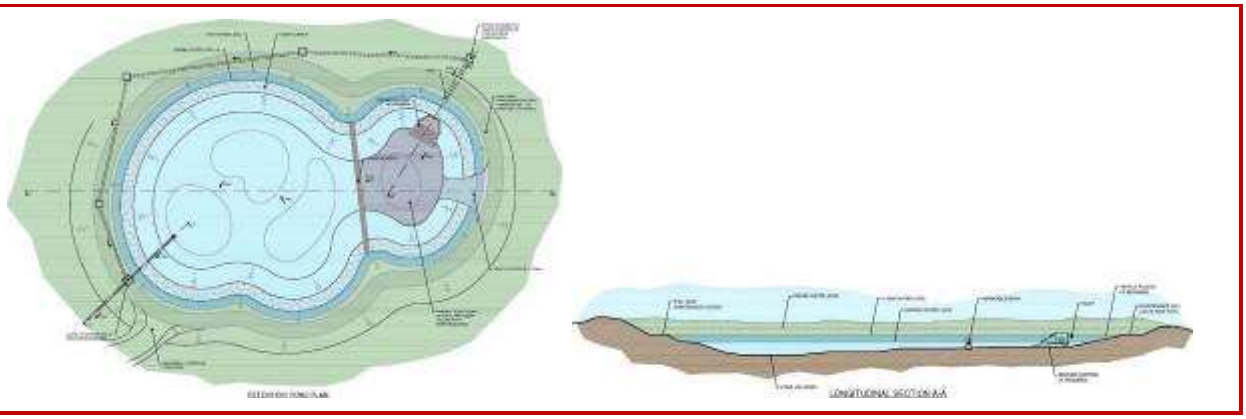
- Can be applied to large contributing catchments;
- Works well in low permeability soils and permeable soils with a liner;
- Good flow control and easy to design, build, maintain;
- Can be used for amenity use;
- Can incorporate a drawdown zone to reduce runoff volume.

7.17.3 Local Context Considerations:

- Large area of land required and not suited to sloping sites;
- Requires landscaping and management;
- Perceived safety risks need to be managed.

❖ **Figure 13: Retention Basin**
Source reference: The SuDS Manual, CIRIA 2015 (28/06/2017)

FIGURE 13



7.18 Retention Basin (Technical Requirements)

MARKER 7.6

CIRIA C753 The SuDS Manual (or revision) - Appendix D - Figure D5
ROSPA Safety at Inland Water Sites - Operational Guidelines.

The aesthetic element should prevail in the design of ponds. Angular shapes and symmetry should be avoided in the design of pond layout and details. All ponds should contain several zones: the sediment forebay, the permanent pool, the temporary storage volume, an aquatic bench. Additional elements included in the design of ponds, includes: a 3.5m wide maintenance route, suitable for vehicles, an inflow structure, a bypass sewer, an outlet with flow control and drain down chamber and an emergency overflow structure.

7.18.1 Configuration and Dimensions of Retention Basins:

- Sedimentation forebay to be separated from the permanent pool by a permeable berm and an average width of 5 to 10 times the inlet pipe diameter and a length of 10m or 4 x width, whichever is greater:
- Inlets and outlets shall be placed at the maximum distance to maximise flow paths:
- The flow path length to width ratio shall be 3:1 minimum to avoid short circuiting:
- Maximum 2m depth to be used for the permanent pool to prevent anoxic conditions / water stratification.
- The minimum water depth of the permanent water zone shall be 1.2m to prevent plant growth:
- The maximum depth of attenuation storage should not exceed 2m:
- The aquatic bench should be a minimum of 2m continuous around the pond, except at inlets and should range in depth up to 450mm below the design permanent pool level:
- The top level of the permeable berm shall be 150mm below the permanent pool water level;
- Energy dissipation should be provided at the inlet and outlet to the pond;
- Ponds designed to hold a permanent volume of water equivalent to the treatment volume, referred as Vt
- The treatment volume (Vt) should be calculated using the fixed depth method of 15mm of rainfall from impermeable (including paved and roofed) surfaces draining to the pond;
- The volume of the sediment forebay should be approximately 10% of the pond's permanent volume (Vt);
- The maximum volume of any retention pond should be 5000m3;
- The Sedimentation forebay should be designed to provide efficient deposition of sediment and should be accessible for cleaning and maintenance operations in its entire area;
- The floor of the sedimentation forebay should be a minimum of 300mm above the main pond bottom;
- The design should include a safe and efficient means of draining the lowest point in the detention pond.

7.18.2 Hydraulic and Water Quality Design Criteria (Ponds hydraulic design):

- The top of the embankment should be 600mm above the maximum design water level;
- The outlet structure should be designed to operate and discharge the design discharge flow rates up to the 100yr + climate change 6-hour storm event;
- Provide a minimum permanent pool volume equal to 1 times the treatment volume for paved surfaces;
- Pond liners should be finished at a height 150mm below the outlet control unit to encourage infiltration and to minimise discharges to the receiving water for small events. However, they should not be lower than the invert level if used on a site with a sensitive underlying groundwater zone or if used to treat runoff from a potential pollution hotspot;
- The by-pass sewer network should be designed for flows equal to the incoming flows;
- The hydraulic capacity of the draw down facility for emptying the pond should consider the geotechnical stability of the pond and associated embankments.

7.18.3 Selection and Siting:

- The risk assessment should include all relevant safety issues associated with siting a pond;
- Detailed analysis and impact assessment of a flood exceedance event indicating flow paths shall be undertaken and submitted to Council. Where ponds are impounded behind engineered embankments, the unlikely scenario of embankment failure should be examined, potential impacts downstream assessed;
- Siting of retention ponds should follow a multi criteria analysis to provide the widest benefits to the public;
- Highest design water level in retention ponds at least 600mm below the adjacent premises floor level;
- The maximum 1-year return period event pond water level should be higher than the appropriate return period event water level of the adjacent watercourse, as specified by the Lead Local Flood Authority;

- In sites containing contaminated soils or contaminated groundwater, ponds should be fully contained within an impermeable liner to prevent cross contamination of surface water;
- Appropriate hydraulic checks on the implications of high watercourse levels should be made, where appropriate.

7.18.4 Pre-treatment, inlets, and outlets:

- Bypass structures shall be provided at both the inlet and outlet chambers. The risk to the embankment stability shall be kept to a minimum;
- A man entry chamber shall be provided at the inlet of the pond;
- Invert level of the incoming sewers to inlet structure shall be at or above the 1-year pond water level;
- A man entry chamber shall be provided for the pond outlet equipped with a flow control device. Minimum diameter of the control device shall be 75mm;
- Bypass structures shall be provided at both the inlet and outlet chambers. The risk to the embankment stability shall be kept to a minimum.

7.18.5 Landscaping and Amenity:

- Ponds to be designed to protect and enhance the landscape;
- Ponds to be planted/seeded with native species to promote variation in the physical pond habitat value;
- Trees shall not be planted within the pond or embankments needed to retain water.

7.18.6 Safety:

- A safety risk assessment shall examine all relevant safety issues for both operatives and the public;
- The maximum side slope between the maintenance access path and the aquatic bench shall be 1:4 to allow easy egress from the pond;
- The aquatic bench should be planted with appropriate species to achieve a high-density barrier when they mature which effectively dissuades people from trying to get access to the open water. Dense or tall vegetation (bushes and trees) around the external perimeter of the ponds is discouraged to provide high levels of visibility of the whole pond;
- Barrier fencing must be provided at all retention ponds. All access gates must be lockable. The locks must be childproof. The minimum height of the fence shall be 1.1m and shall be constructed in such a manner that there are no step-ups to reduce the 1.1m minimum height. The form of the fence should not detract from the aesthetic value of the local environment;
- All exposed pipe inlets or outlets, which are larger than 350mm, should normally have safety grilles. However, where grilles can be avoided by the use of appropriate design to restrict human access into the structures, this is preferred. Grille designs should be suitable to minimise the risk of blockage, have safe access for clearing during extreme events and prevent unauthorised access particularly by children and dogs. A typical outfall safety grille is illustrated in Appendix D, Figure D5;
- Bar spacing should not exceed 150mm and should not be less than 75mm to avoid trapping small debris;
- Consideration should be given to the potential failure of any embankment and the subsequent flood flows through, and downstream, of the site;
- Warning signs erected providing information on pond function, basic data, and prohibition of swimming;
- The perimeter of the pond 1m inside and outside the water's edge (water level during dry periods) should have a gradient of less than 1:10. This shall provide a margin which is attractive to flora and fauna and is a disincentive for people to enter the pond. Other areas (above and below the pond) shall have gradients of less than 1:4.

7.18.7 Operation and Maintenance:

- The pond shall be accessible to cleaning equipment by an access road 3.5m minimum width;
- Summary of maintenance activities provided below shall be considered for pond accessibility design;
- Removal of litter, debris and grass cutting;
- Removal of nuisance plant species and dead plant growth;
- Removal of submerged and emergent aquatic plants if present;
- Bank vegetation cutting and removal;
- Sediment removal from forebays and main pond body;
- Reseeding and replanting as required;
- Pond outlet design shall provide for removal of blockages.

7.19 Vortex System (Pre Treatment Options) Overview

Guidance Documents:

- CIRIA C753: The SuDS Manual Part D.
- Comply with BS EN standards for separating systems

A self-activating device that provides improved hydraulic performance over conventional flow controls such as orifice plates and throttle pipes and reduced maintenance requirements. It consists of an intake, a volute and an outlet. Flow is directed tangentially into the volute to form a vortex. High peripheral velocities induce an air-filled core with resulting back pressure that reduces the rate of discharge of the flow. Require designing so that regular maintenance can be undertaken. As the vortex separator requires a velocity to function, a filtration chamber or detention basin should be used for small flow events. ***Benefits:*** *Removing Sediments.*

7.19.1 Design Standards:

- Require designing so that regular maintenance can be undertaken;
- Vortex separators requires a medium or high velocity to function;
- Filtration chamber or detention basins should be used for small flow events;
- Require maintenance to prevent re-suspension of pollution.

7.19.2 Best Practice:

- Most effective for removal of heavy particulate matter rather than solids or dissolved pollutants.

7.20 Vortex System (Technical Requirements)

MARKER 7.7

BS EN 858-1:2002 Separator systems for light liquids (e.g. oil and petrol).
Principles of product design, performance, and testing, marking and quality control

The design of a vortex solids separator shall be based on the anticipated type and quantity and the settlement potential of pollutants to be removed. May require confined space entry potential if removal or replacement is required.

5.1.1 Selection and Siting:

- Vortex pre-treatment units shall be considered primarily for use in small to medium size catchments;
- Vortex units should be installed underground. The installation site shall be within passive open space accessible by a vacuum tanker for cleaning and maintenance.

5.1.2 Safety:

- A risk assessment shall include all relevant safety and environmental issues associated with siting the vortex separator units.

5.1.3 Operation and Maintenance:

- Removal of litter and debris is a regular maintenance requirement of vortex separators. Collected sediment can be removed as required based on the volume collected in the unit. As a minimum sediment should be removed on a six month basis;
- Regular inspection of the vortex units is required usually on a bi-annual basis. The frequency of inspections shall be established following an initial 30 day inspection period. During this period the unit shall be checked for performance and sediment collection after every rainfall event;
- Collection and disposal of the collected sediment shall be performed by a licenced waste management company.

7.21 Oil and Sediment Separator (Pre Treatment Options) Overview

Guidance Documents:

- CIRIA C753: The SuDS Manual Part D.
- Comply with BS EN standards for separating systems

Oil and sediment separators can be used as pre-treatment, or as a last resort, site treatment for the removal of sediment, litter, and oil from surface water runoff. These systems can be installed in a standard size manhole. Captured pollutants are retained within the separator, providing a single point of maintenance. Usually placed in systems with high risk potential for oil leaks (situated as close the pollution source as possible) in industrial settings or near fuel station car parks and require maintenance to prevent re-suspension of pollution. ***Benefits:*** *Improve Water Quality.*

7.21.1 Design Standards:

- Require designing so that regular maintenance can be undertaken;
- Filtration chamber or detention basins should be used for small flow events;
- Should be situated close to the pollution source and require maintenance to prevent re-suspension.

7.21.2 Best Practice:

- Depending on the location to which the water is to be drained and the type / severity of pollutants, different classes of separators should be used.

7.22 Oil and Sediment (Technical Requirements)

MARKER 7.8

BS EN 858-1:2002 Separator systems for light liquids (e.g. oil and petrol).
Principles of product design, performance, and testing, marking and quality control

Pollution Prevention Guideline, Use and design of oil separators in surface water drainage systems: PPG 3, published by the Environment Agency and SEPA.

Sewers for Adoption 7th Edition

7.22.1 Configuration and Dimensions of Oil and Sediment Separators:

- Oil separators used for the removal of oil and grease present in storm waters operate flotation principle;
- Separated oils are floating on the water surface inside the unit;
- The use of proprietary units is permitted and shall be considered on a case by case basis;
- An integral flow bypass without disturbing the collected solids shall be provided.

5.1.4 Selection and Siting:

- Oil separator units should be installed underground. The installation site shall be within passive open space accessible by a vacuum tanker for cleaning and maintenance;
- Guidance on selection and use of oil separators is provided by www.gov.uk website, replacing Pollution Prevention Guideline 3 (PPG 3) - Use and design of oil separators in surface water drainage systems, published by the Environment Agency and SEPA, on 14th December 2015.

5.1.5 Safety:

- Risk assessment to include all relevant safety and environmental issues associated with oil separators.

5.1.6 Operation and Maintenance:

- Regular inspection of the unit in accordance with the manufacturer's maintenance requirements but no longer than every six months. The volumes of bottom sludge and the floating layer shall be estimated and cleaning of the unit should be scheduled;
- Cleaning of the oil separator shall be performed by a licenced waste management company to ensure appropriate disposal of the collected oils, floatables and sediment;
- Following cleaning the separator shall be filled with clean water, ready to fully operate with the first rainfall.

8. SuDS Maintenance

Unlike more **conventional** drainage systems, SuDS should be designed to be visible and function under anticipated loading conditions over the design life of the development. This will enable those who are responsible for maintenance to easily identify and remediate problems as they occur. When systems are properly designed, operated, and maintained, SuDS performance can be easily monitored against the expected performance.

What this section will cover:

- SuDS maintenance and management plan
- Responsibility of SuDS maintenance
- Maintenance of SuDS Components
- Waste Management for SuDS
- Maintenance activities
- Maintenance frequencies

8.1 SuDS Management Plan

8.1.1 The maintenance and management of SuDS should be recorded within a SuDS Management Plan which should form part of the information submitted by the Developer at the planning application stage. The approved Maintenance and Management plan must include information on the safe operation, design assumptions, maintenance of SuDS components and how SuDS components interact. The Maintenance and Management Plan must include an estimate of the ongoing maintenance costs along with the responsible owner of the plan or specific elements. Where appropriate the management plan must make provision for a warning system and contingency arrangements. If undertaken correctly, the design of SuDS will ensure that day to day and long term maintenance is feasible, cost-efficient, and easy to undertake. Most the SuDS components are features of the landscape and so should be managed according to existing landscape practices (CIRIA SuDS Manual C753, Chapter 29). Maintenance fits into the management plan below as shown in table 8a and frequency type in table 8b:

❖ **Table 8a: SuDS Management Plan**

SuDS Management Plan…	
1	Overview of SuDS to be utilised
2	Management statement including performance and maintenance tasks
3	Specification details noting timescales and materials required
4	Maintenance Plan
5	Site plan detailing the locations for the SuDS and maintenance areas
6	Costings
7	Provide details of the adopting body

❖ **Table 8b: What does SuDS maintenance involve?**

Frequent Maintenance…	Occasional Maintenance…	Remedial Tasks…
Daily or monthly activities	Frequency is determined by each site in the development	Addressing defects or damage to the SuDS
Cutting / mowing of the grassed areas to recommended lengths	Siltation management of the SuDS system (including pipes and ponds)	Potential damage caused by interaction with people / vandalism
Removal of litter / debris and review of inlets and outlets for blockages and damage	Vegetation control in pools and detention basins to address / prevent blockages	These should be minimal if correct design procedures and standards have been followed

8.2 Responsibility for Maintenance

8.2.1 It is the responsibility of the developer to establish a maintenance agreement that ensures the drainage system is maintained and continues to function as designed in perpetuity for the lifetime of the development. National guidance indicates that this maintenance should be undertaken by any of the following bodies: Service management companies, Local government (LLFA or LPA), Water and sewage companies and Individuals (site owners or inhabitants). It should be noted that the Councils are currently not adopting or maintaining SuDS schemes.

8.3 Maintenance of SuDS Components

8.3.1 Maintenance of SuDS components is important to ensure their ongoing effectiveness. The tables 6a identifies the principal "Frequent", "Occasional" and "Remedial" maintenance works for a range of SuDS components table 6b below identifies in more detail specific SuDS components.

❖ **Table 8c: Detailed SuDS Maintenance and Management Plan**

	Activity	Filter Drain	Filter Strips	Swales	Bio Retention	Detention Basin	Underground Storage	Pond	Vortex Separator	Oil Separator
Frequency	Removal of litter/debris	✓	✓	✓	✓	✓		✓	✓	✓
	Pruning grass and SuDS vegetation	✓	✓	✓	✓	✓		✓	✓	✓
	Maintenance of surrounding plants				✓	✓		✓		
	Clearance of inlets/outlets	✓	✓	✓		✓	✓	✓		
	Silt removal				✓			✓	✓	✓
	Removal of compost			✓						
	Replenish mulch				✓					
	Surface scarification				✓					
	High powered wash / suction sweep									
Occasion	Silt removal / review of silt levels	✓	✓			✓		✓	✓	
	Replenish mulch									
	Excess vegetation removal			✓		✓		✓	✓	✓
	High powered wash / sweep of paving									
Remedial	Review of erosion			✓						
	Review / repair of inlets and outlets	✓		✓	✓	✓		✓	✓	✓
	Replace filter stones	✓	✓							
	Readjust retention levels				✓					
	Replace geotextile layer		✓							
	Silt removal	✓		✓			✓			

8.3.2 As indicated in the Sus drain website and Ciria SuDS Guidance; source control SuDS components within private property is the responsibility of the landowner or property manager. There should be information provided to the residents on how these components function and to reduce the risk of unintentional damage (through alterations to the property or DIY). Where private SuDS components are within a curtilage of a property it is expected this is indicated in some way on the deeds and is linked to new requirements in Land Register and Land Charges.

8.3.3 The use of poorly designed SuDS systems should not be used in domestic situations where specialised high cost maintenance (such as permeable paving) is the responsibility of the individual dwelling owners, where the component attenuated storage is counted as a percentage of the sites overall surface water storage. In this case certain property owners would in effect have greater responsibility of maintenance, this is due to cumulative flows and any failure would affect multiple adjacent dwellings. If the developer is going to use private management company potential approaches in funding can be undertaken through commuted sums, service charge or pay an assurance bond.

8.3.4 A management and maintenance plan for the lifetime of the development should be submitted to ensure that the sustainable drainage system (SuDS) will not pose a future flood risk as a result of poor maintenance. As a minimum this should include details of the arrangements for adoption by the appropriate party, arrangements concerning appropriate funding mechanisms for its on-going maintenance of all elements of the sustainable drainage system (including mechanical components, ongoing inspections, operation costs, regular maintenance, remedial works and irregular maintenance) to secure the operation of the surface water drainage scheme throughout its lifetime.

8.4 Construction and Waste Management for SuDS

8.4.1 The design process must properly take into account the construction programme of the development from starting on site to the finished product. Construction plan should be submitted as part of the management and maintenance plan indicating how surface water and waterbodies are dealt with during construction. This should include how potential flooding issues may arise and be mitigated to stop areas outside of the development to be effected, access requirements, as well as pollution, sedimentation and erosion control. Flooding incidents while construction is being undertaken, which effect areas outside of the development may be subject to formal investigation by the Council.

8.4.2 Traditional drainage is one of the first elements of infrastructure constructed on site. For SuDS, although the form of the drainage will be constructed during the earthworks phase, final construction should not take place until the end of the development programme, unless adequate provision is made to remove any silt that is deposited during construction operations, and refurbish any areas that have been subject to over-compaction, siltation etc. Surface water runoff from the construction site should not drain into SuDS components or receiving waters unless it has been mitigated / allowed for in the design and specification.

8.4.3 The contractor and all relevant operatives should have an understanding of the purpose, operation and function of the SuDS components to ensure appropriate construction practice and protection is used. This relates to the conveyance (gradients), infiltration (quality of soil) and storage of surface water runoff. A maintenance programme should also include plans for addressing waste produced by SuDS:

❖ **Table 8d: What does SuDS maintenance involve?**

Area	Action
Litter	Regular removal from the site;
Silt entering waterbody	Intercept and control at source;
Silt entering SuDS	Regular removal from silt traps, inlets and outlets of SuDS;
Organic pollution (i.e. small amounts of animal waste)	Bio-remediation through the SuDS;
Vegetation waste from cutting grass	Removal from the SuDS area;
Heavy metals and other pollutants	Captured at the source or through lining of the SuDS.

9. Appendices

- Appendix A: SuDS Submission Application & Approval Checklist (the Checklist)
- Appendix B: Runoff Calculator Guide
- Appendix C: SuDS Suitability Selection Matrix
- Appendix D: SuDS Indicative Schematics and Mapping
- Appendix E: Useful Resources
- Appendix F: Document Links
- Appendix G: Document Abbreviations and Definitions

A. Application Checklist for SuDS Assessment (Appendix A)

A.1 Process Summary

A.1.1 This checklist outlines the requirements of a SuDS application for submission to St.Helens Council.

MARKER A.1

Key points to remember:

- SuDS aim to mimic natural drainage, encourage infiltration and attenuate both flows and pollution to minimise adverse impacts on people and the environment.
- Surface water drainage measures proposed as part of a planning application should have a neutral or better effect on the risk of flooding both on and off the site.
- SuDS design should consider prevention, source and site controls.
- Well-constructed SuDS will ensure maintenance for both the short and long term.

A.2 Pre-Application

A.2.1 St.Helens Council should be involved in any pre-application discussions relating to a development as it will preliminary identify the most efficient method of SuDS to be utilised in the formulation of the development design and layout. It is beneficial for a range of people to be involved at the pre-application stage, including the Local Planning Authority (LPA), Lead Local Flood Authority (LLFA), Highway Authority, Environment Agency (where relevant), sewerage undertakers, the developer, consultants, drainage engineers, landscape architects or urban designers and ecologists.

A.2.2 Where pre-application discussions are to be held with the LPA specific advice should be sought with the LPA regarding any charges that are applicable. This will enable different areas or features to be integrated as part of the overall development at the different scales and for potential adoption by different bodies to be defined. Pre-application will allow development of conceptual drainage designs with subsequent working up to outline designs. This will allow applicants to design to detail with confidence that applications will be approved.

A.2.3 Land Drainage Consent may also be required (is a watercourse going to be effected in the development, will it be altered or culverted) if this is the case Land Drainage Consent is required from the LLFA, then this will be undertaken as part of the application and is usually a condition. No formal submission of information is required at this stage, however some important information is strongly recommended for discussion with St.Helens Council prior to any submission and should include the following:

❖ **Table A.1: Pre-design discussion list**

Number	Action
1	Site assessments including the existing drainage characteristics, geology and topography
2	Existing flood risks
3	Identification of any watercourses running through the site
4	Natural flow paths (land or existing highways), discharge locations, sub-catchments
5	Identification of any potential off-site flood risk impact / work access impact
6	Likely design criteria applicable to the site
7	Potential SuDS integration
8	Evidence of discussions with Water Companies, EA, and / or other interested parties
9	Adoption options / ownerships / easements
10	Maintenance and access arrangements including (emergency) access and egress.

A.3 Master Planning

A.3.1 Master planning should be undertaken at the beginning of the design process to develop an area wide strategy especially where a number of developments could resolve SuDS issues together. This would enable the creation of larger schemes with lakes, ponds, basins etc. including access paths within the green infrastructure area. Undertaking master planning the following should be taken into consideration;

- Large scale natural flow paths informing SuDS catchments;
- Integration of SuDS within the overall green infrastructure of the site;
- Distribution of water storage between regional and source / site controls;
- Adoption arrangements of all infrastructures;
- Solutions to investment requirements to cater for phased nature of developments;
- Maintenance and access arrangements in perpetuity for all SuDS and at construction stages.

A.4 Outline Planning Application

A.4.1 Following the initial meeting designers will be able to develop concepts for drainage design, working with other disciplines involved in the development. This can then be developed in to a design outline which provides information for approval, in-principle, by the LPA. The LLFA will be consulted on outline planning applications. An outline planning application should therefore include a conceptual Drainage Design for the LLFA to provide comments on, otherwise more information may be required at the reserved matters stage and the developer may discover problems later on that will be harder to resolve.

❖ **Table A.2: Outline planning application list**

Number	Action
1	Detailed flood risk assessment (where one is required, completed in line with the Environment Agency's guidelines and National Planning Policy Framework: https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications)
2	Existing utilities plan (if applicable) along with any evidence of discussions with service utilities if consultation has occurred.
3	Topography of the development site (contours at 1m intervals)
4	Existing surface water flow routes / drains / sewers and watercourses
5	Flood risk from rivers / surface water / groundwater
6	Geological data and soil types
7	Preliminary drainage proposals (SuDS Hierarchy) with confirmed discharge locations
8	Impermeable areas estimate and drainage sub-catchments
9	Existing (pre development) and proposed (post development) surface water discharge rate for the site in question along with methodology and calculation evidence (as close to Greenfield as possible)
10	Storage volume estimate (100 year storm event plus climate change) Current standard is 40% if no other value is discussed with the LLFA and Planning department.
11	Flow control(s) details / Storage location(s) source to regional
12	Provisional/Concept Drainage Layout
13	Ecology and water quality implications, e.g. treatment train
14	Areas where SuDS will form recreational features
15	Public health and safety consideration
16	Maintenance and access arrangements and Identification of adoption responsibilities

A.5 Full Planning Application

A.5.1 Any application should clearly identify who will be responsible for maintaining the sustainable drainage systems and funding for maintenance. The Table A.3 below is an extension to Table A.2 so for full planning application both set of tables are required for assessment. It is advised that the location of information is clearly stated in any statements for flood risk assessments to provide a quick response to the planning consultee process or any subsequent reviews.

❖ **Table A.2: Full planning application list**

Number	Action
1	Detailed Flood Risk Assessment or Drainage Strategy (including steps 1-10 of table A.2)
2	Detailed design drawings (includes all elements of drainage on site) not just the information required for section 278 or 38 drawings), must include all invert and covers levels
3	Specification of materials
4	Storm Simulation Results and Reports and Flow calculations (.mdx files where possible). Include drainage system flow rates for the storm events 1 in 1 year; 1 in 2 year; 1 in 30 year, 1 in 100 year and 1 in 100 year plus climate change
5	Details of inlets, outlets and flow controls
6	Construction details
7	Ground Investigation Work (variable based on drainage proposal)
8	Plan identifying allocation of storm storage volumes for the development
9	Phasing of development including Construction Management Plan
10	Long and Cross sections including design levels
11	SuDS Design Statement
12	Operation and Maintenance Plan (following 15 and 16 of table A.2)
13	Health and Safety Risk Assessment (following 15 and 16 of table A.2)

A.6 Check List

A.6.1 The checklist is contained with excel file **'STH SuDS Assessment Checklist v1.0.xlsx'**.

A.6.2 The checklist should be used as a guide by the applicant and completed by St.Helens Council as part of the relevant planning application in order to demonstrate that the necessary information has been supplied to assess the suitability of the proposed sustainable drainage system, in line with the National Planning Policy Framework (NPPF). Failure to provide any of the information requested below may result in the LLFA making recommendation for refusal of the planning application on grounds of insufficient information.

A.7 File Submission

A.7.1 To aid in the response to the Planning Case Officer and Applicant the following points of the information submitted for both Outline and Full application must be given consideration:

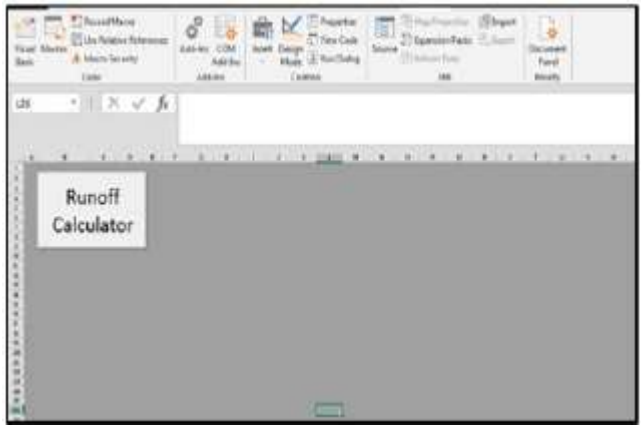
- Files submitted must be legible, and must be submitted in colour (maps, photographs etc);
- Drainage Software output files must be submitted electronically to the LLFA;
- LLFA to be given notice of updates or new files submitted as part of the review.

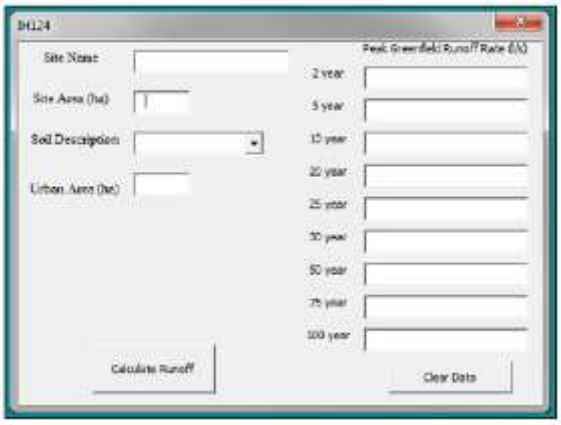
B. Runoff Calculator Guide (Appendix B)

B.1 Process Summary

B.1.1 The Runoff Calculator is a programme constructed in Microsoft Excel and is available on the St Helens Council Website (if the file is not working please contact the Council using details provided in this document). To use the programme open the file **'Runoff Calculator.xlsm'** and ensure macros are enabled. When opening the file it should look similar to Image shown in marker B.1. To use the Calculator, press the Runoff Calculator Button and an additional window should be displayed similar to Marker B.1.

MARKER B.1





B.1.2 Once the calculator tool has been completed press the 'Calculate Runoff' button to calculate the peak Greenfield Runoff Rate in litres per second for the displayed return periods. Table B.1 below indicates further information to be submitted in the system inputs.

❖ **Table B.1: Runoff calculator guide examples**

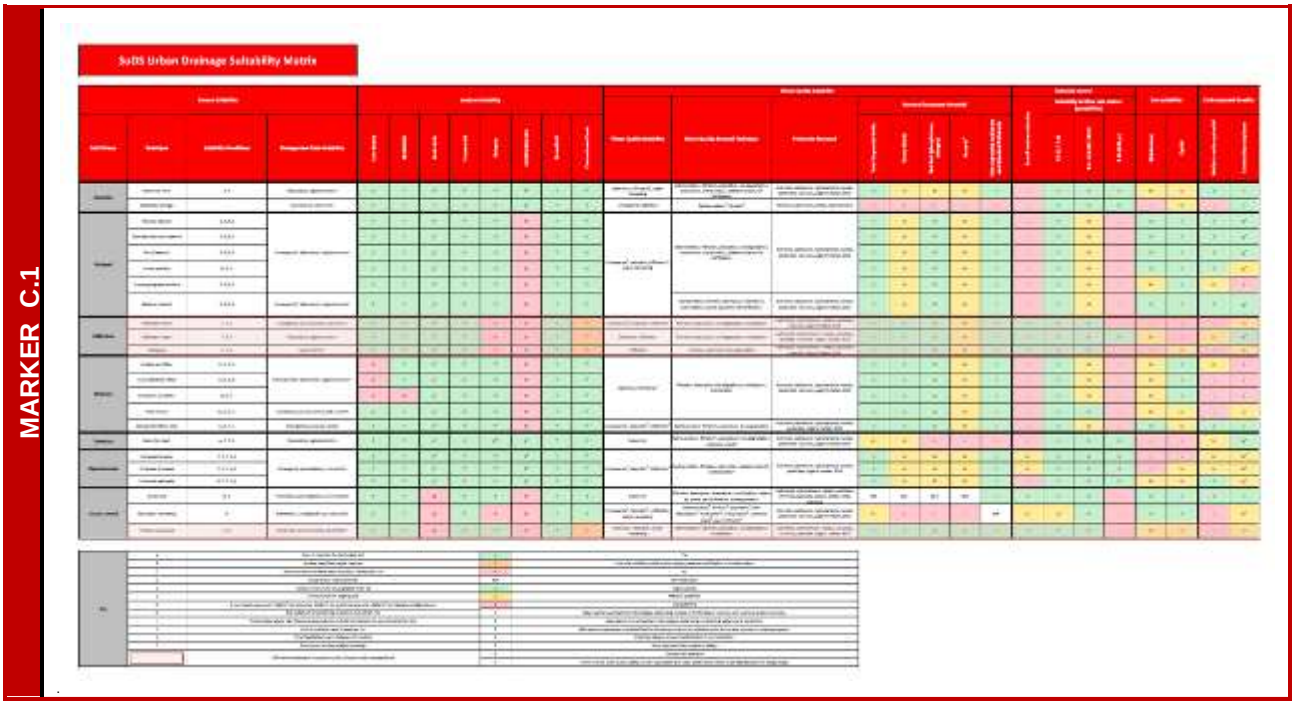
Section	Example
Site Name:	A name for the Site
Site Area:	The area of the site in hectares
Soil Description:	Select the best description of the prevailing ground conditions for the Site
Urban Area	The area of impermeable surface within the site in hectares

C. SuDS Suitability Selection Matrix (Appendix C)

C.1 Matrix Selection

C.1.1 The SuDS suitability selection matrix is a separate document to this guidance and is available on the Council website in the file **'STH SuDS Assessment Checklist v1.0.xlsx'.** Matrix allows comparison of suitable features that can be used on the development area in question.

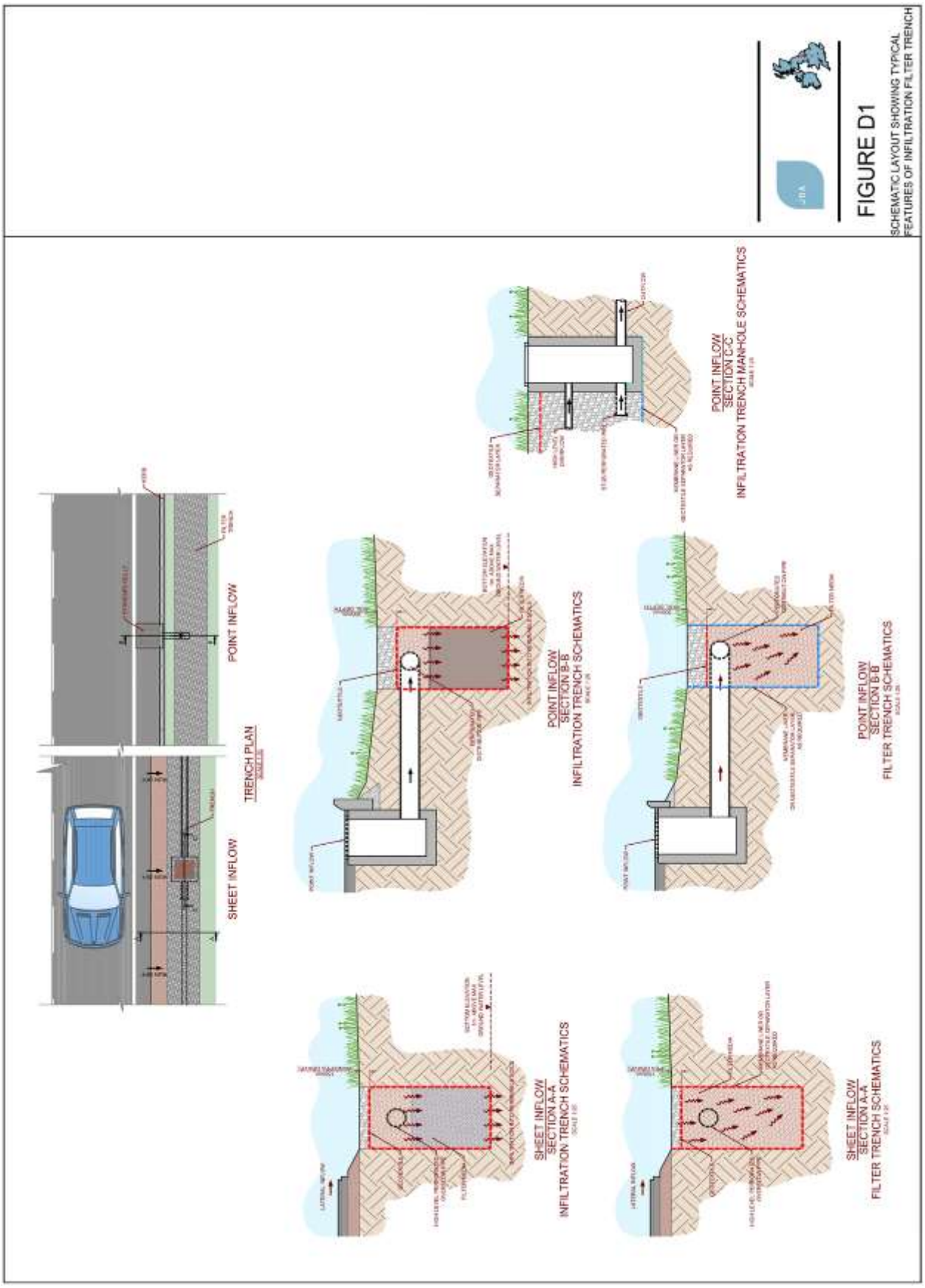
MARKER C.1



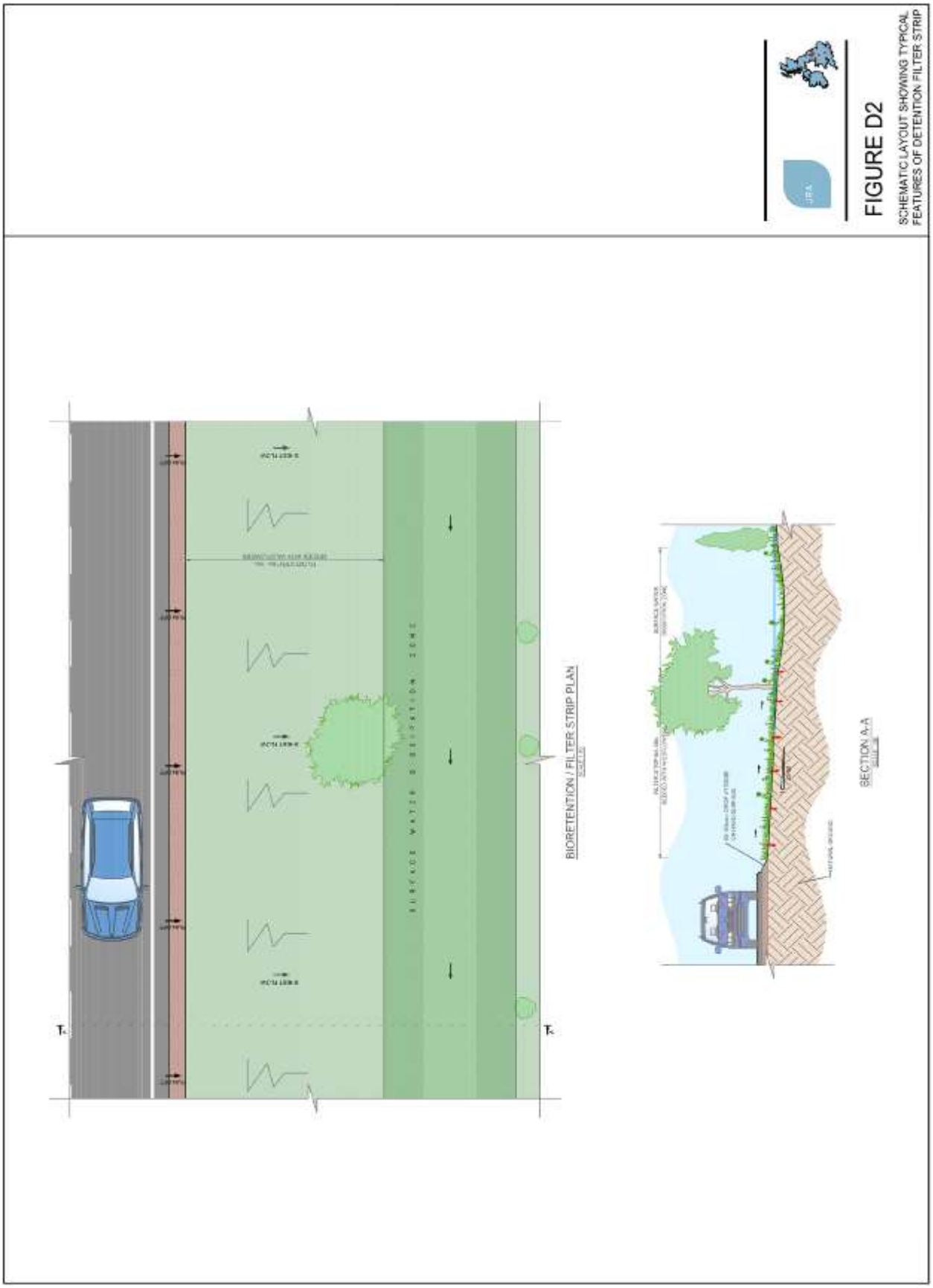
D. SuDS Indicative Schematics and Mapping (Appendix D)

- Appendices D: Figure D1 - Filter Drain / Infiltration Trench
- Appendices D: Figure D2 - Detention Filter Strip
- Appendices D: Figure D3 - Swales
- Appendices D: Figure D4 – Bio-retention
- Appendices D: Figure D5 - Retention Basin
- Appendices D: Figure D6 - Detention Basin
- Appendices D: Figure D7 - Underground Storage
- Appendices D: Figure D8 - Sand and Gravel Soil
- Appendices D: Figure D9 - Peat and Glacial Deposits
- Appendices D: Figure D10 - Other Soils
- Appendices D: Figure D11 - Topography

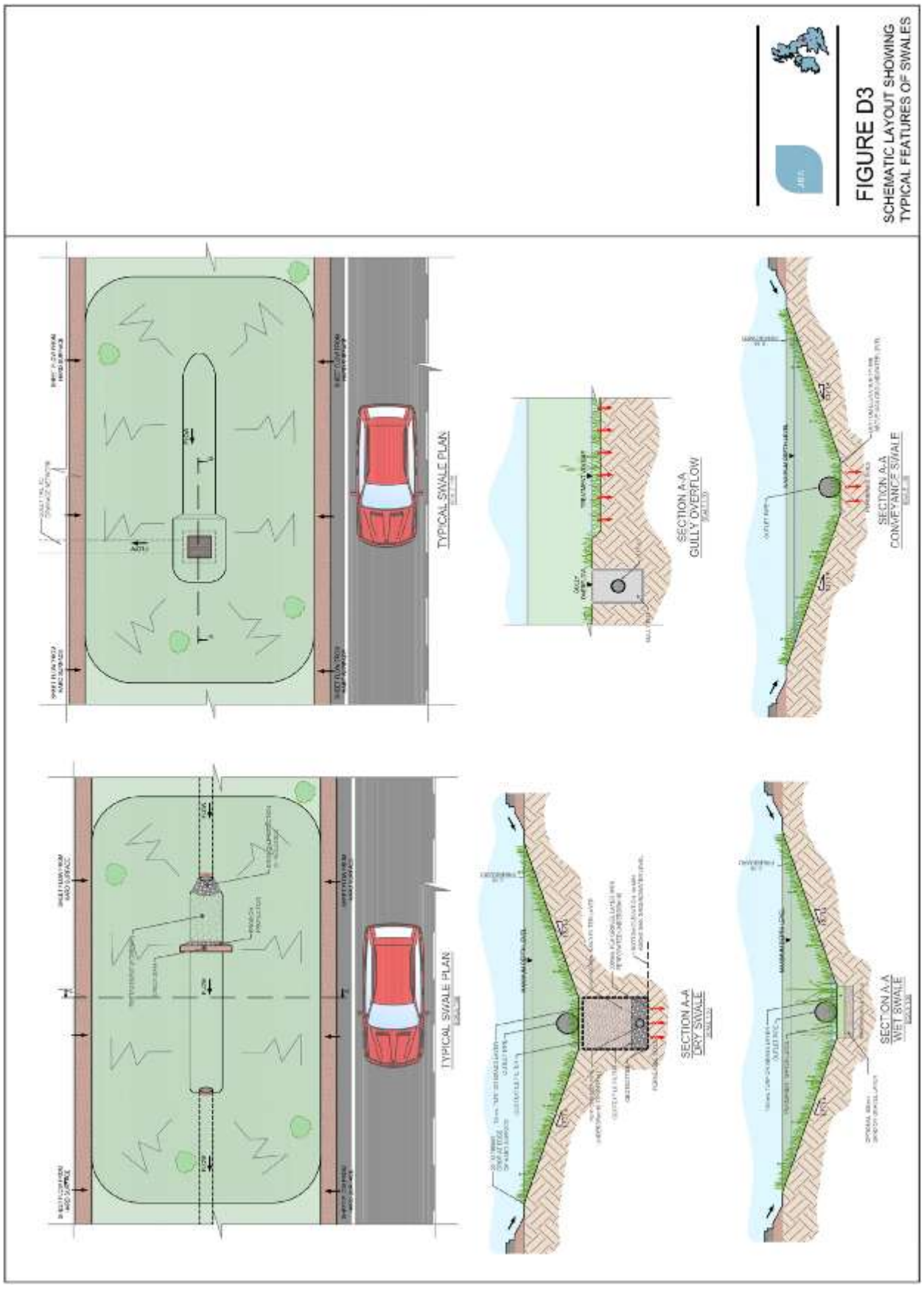
D.1 Appendices D: Figure D1 - Filter Drain / Infiltration Trench



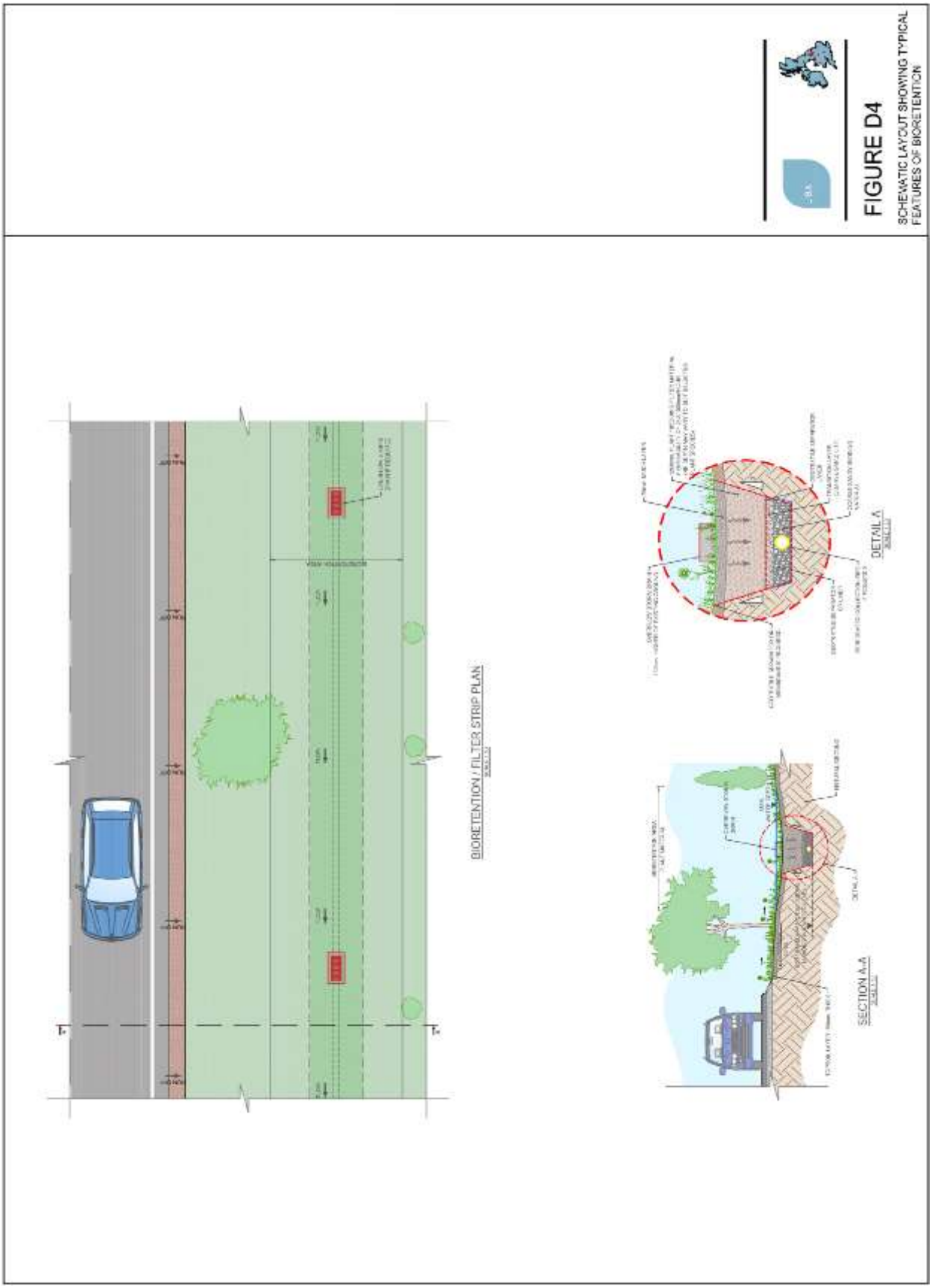
D.2 Appendices D: Figure D2 - Detention Filter Strip



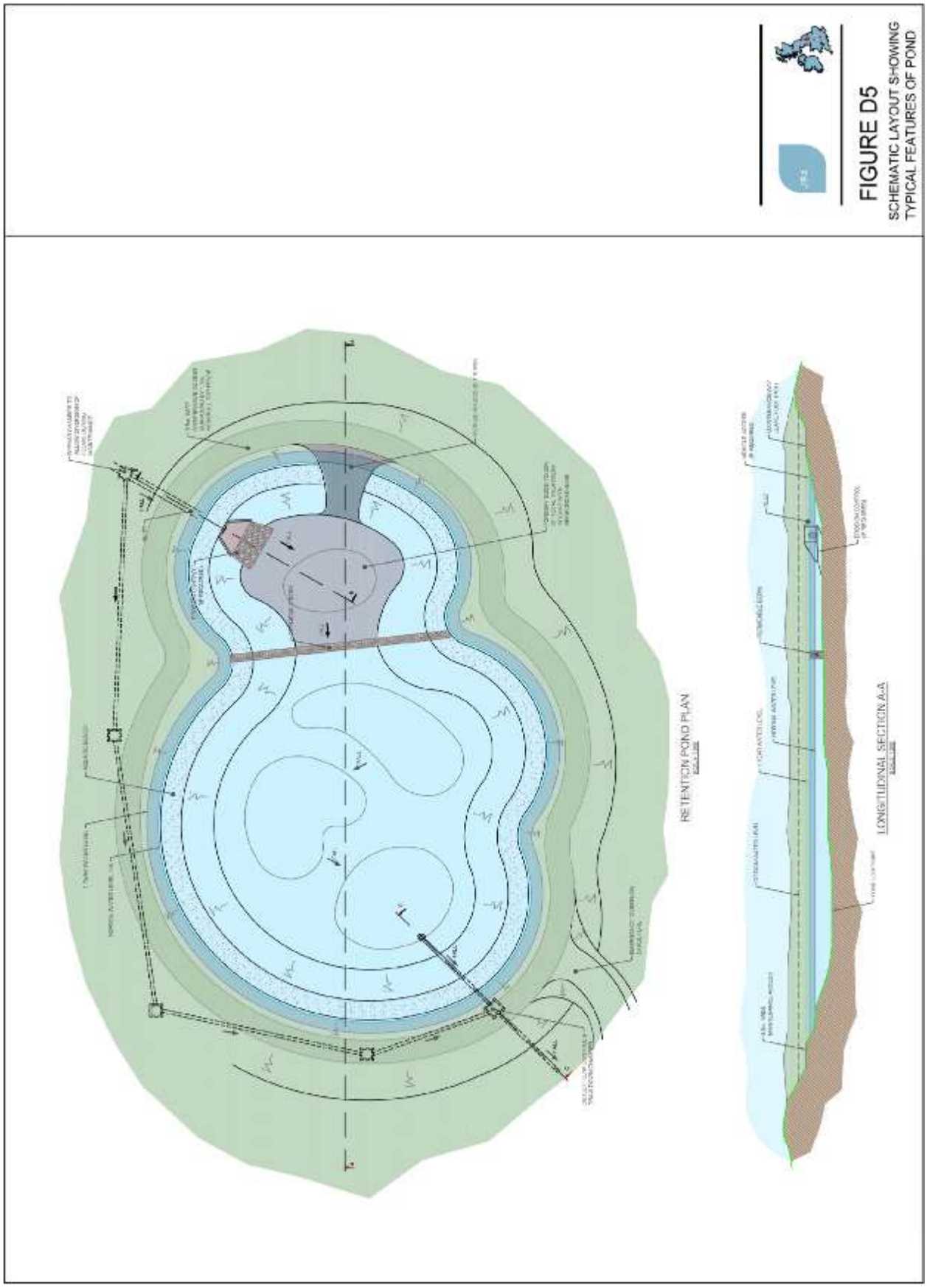
D.3 Appendices D: Figure D3 - Swales



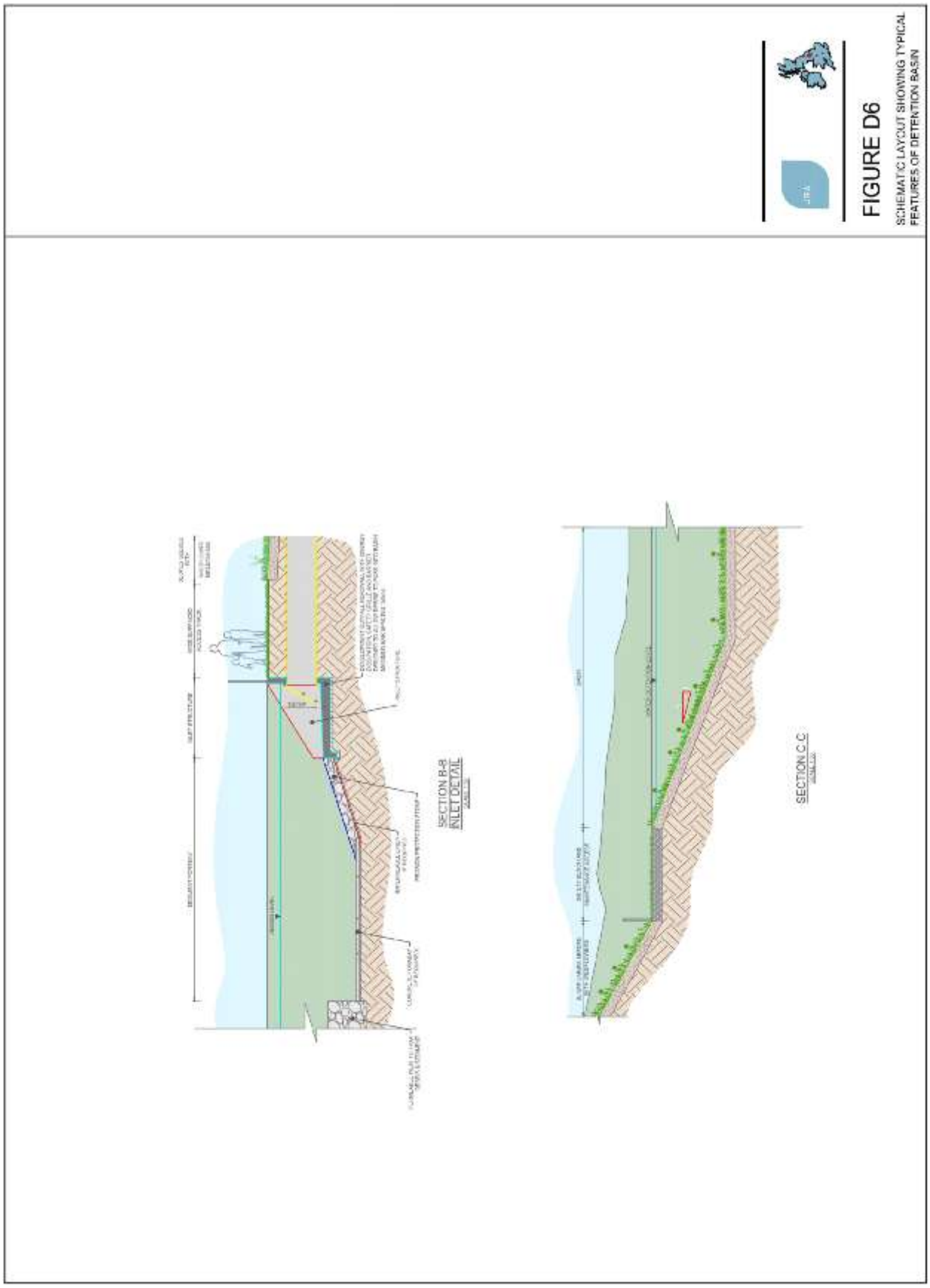
D.4 Appendices D: Figure D4 – Bio-retention



D.5 Appendices D: Figure D5 - Retention Basin

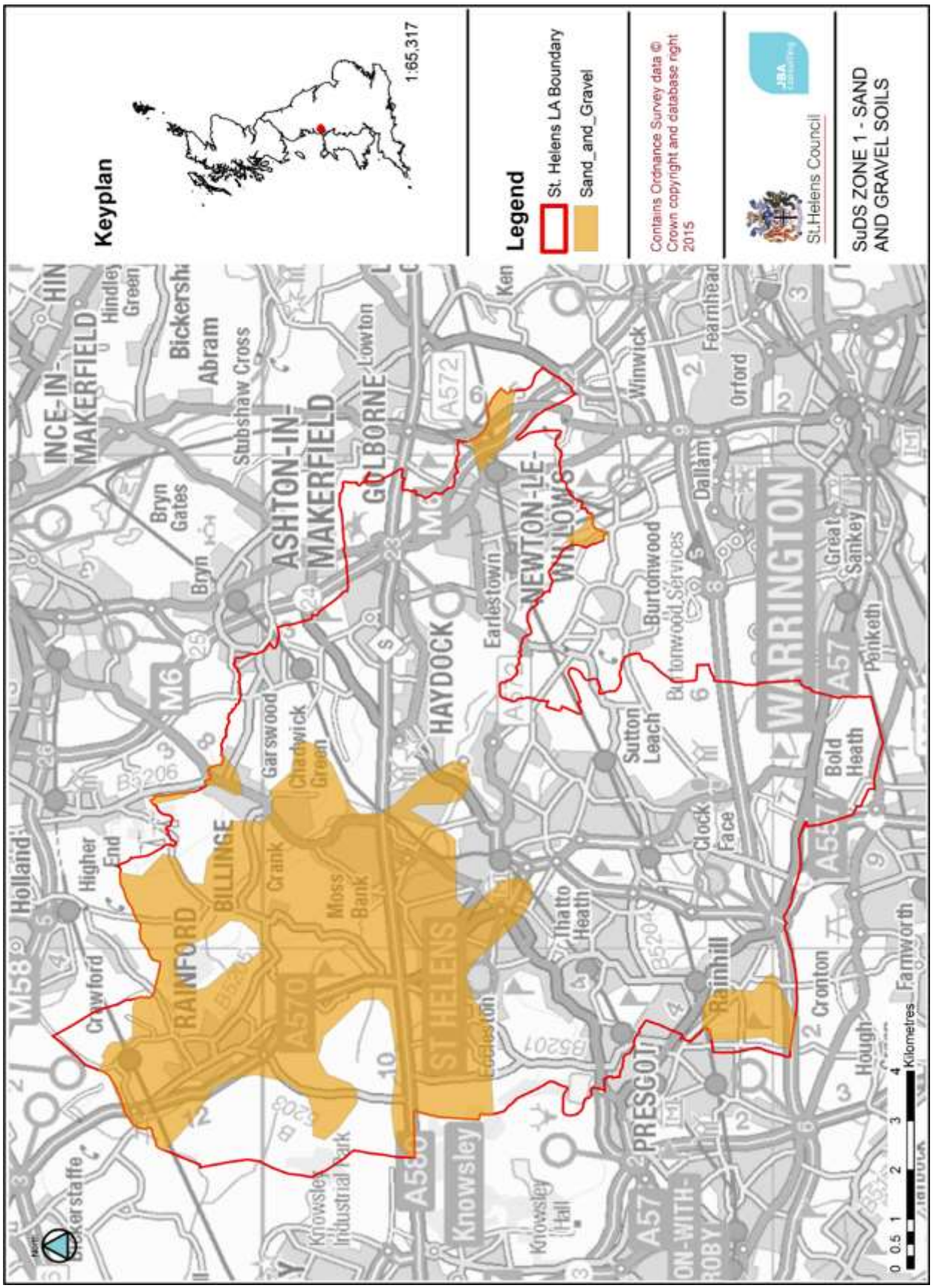


D.6 Appendices D: Figure D6 - Detention Basin

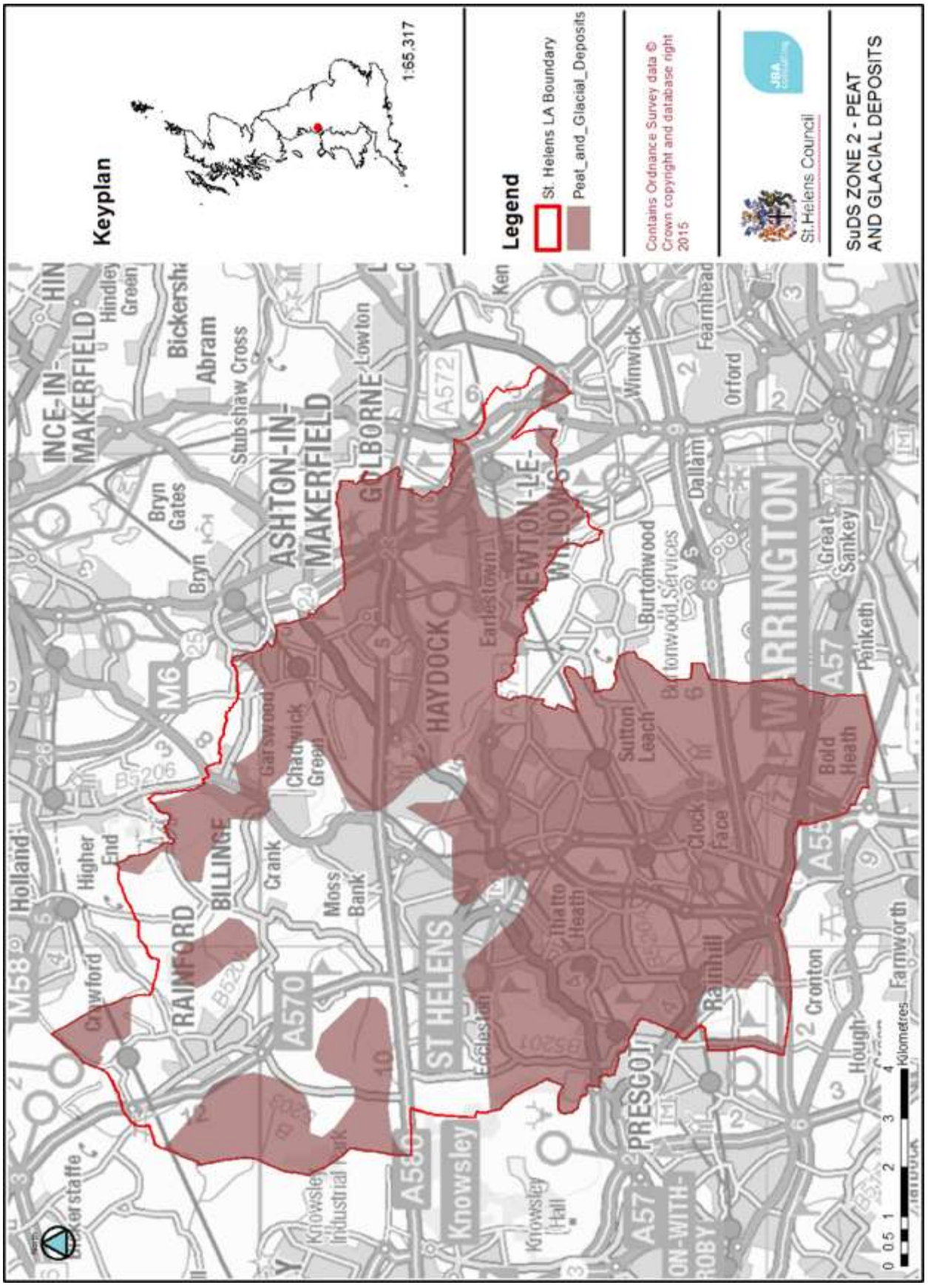


D.7 Appendices D: Figure D7 - Underground Storage

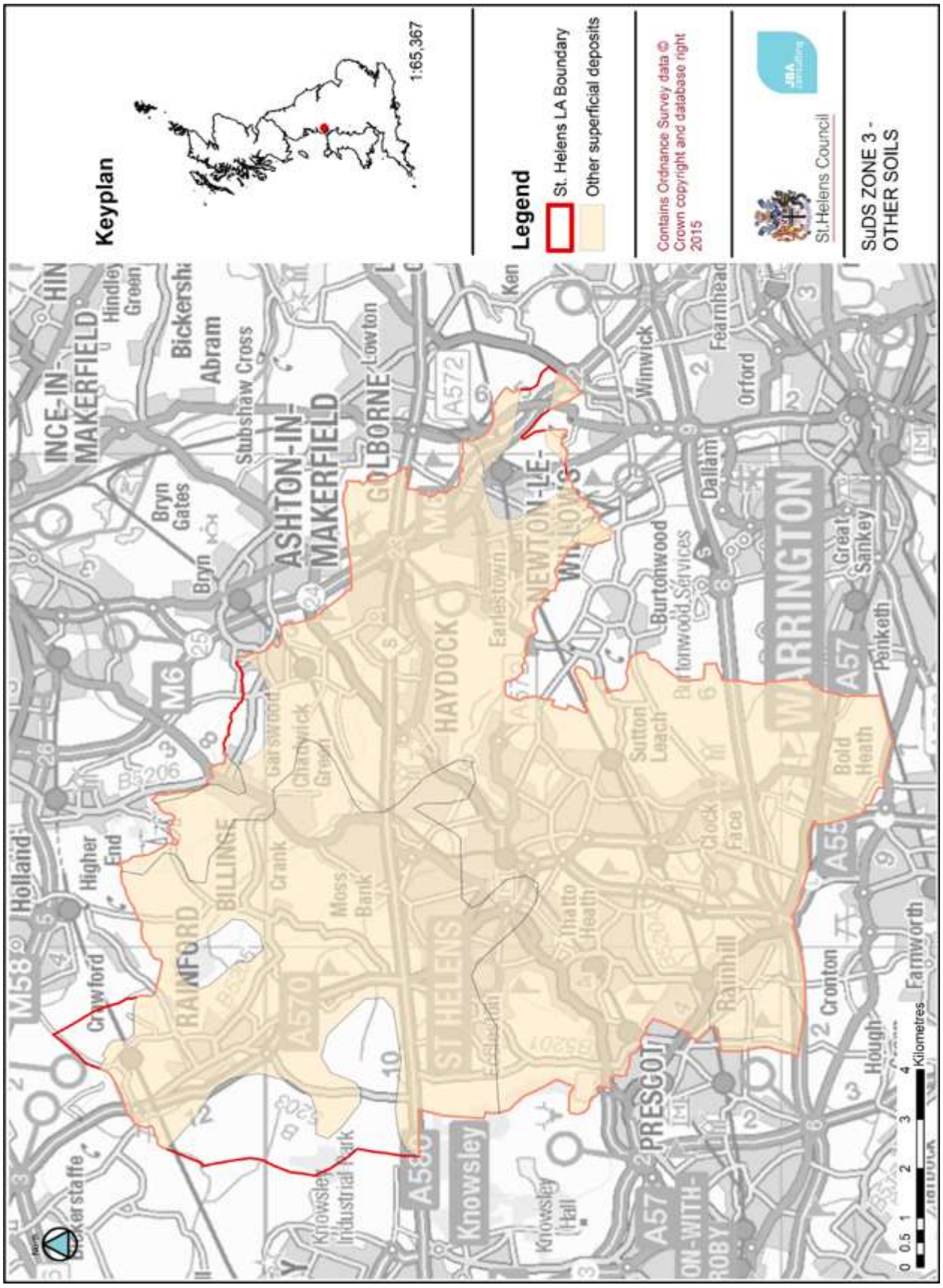
D.8 Appendices D: Figure D8 - Sand and Gravel Soil



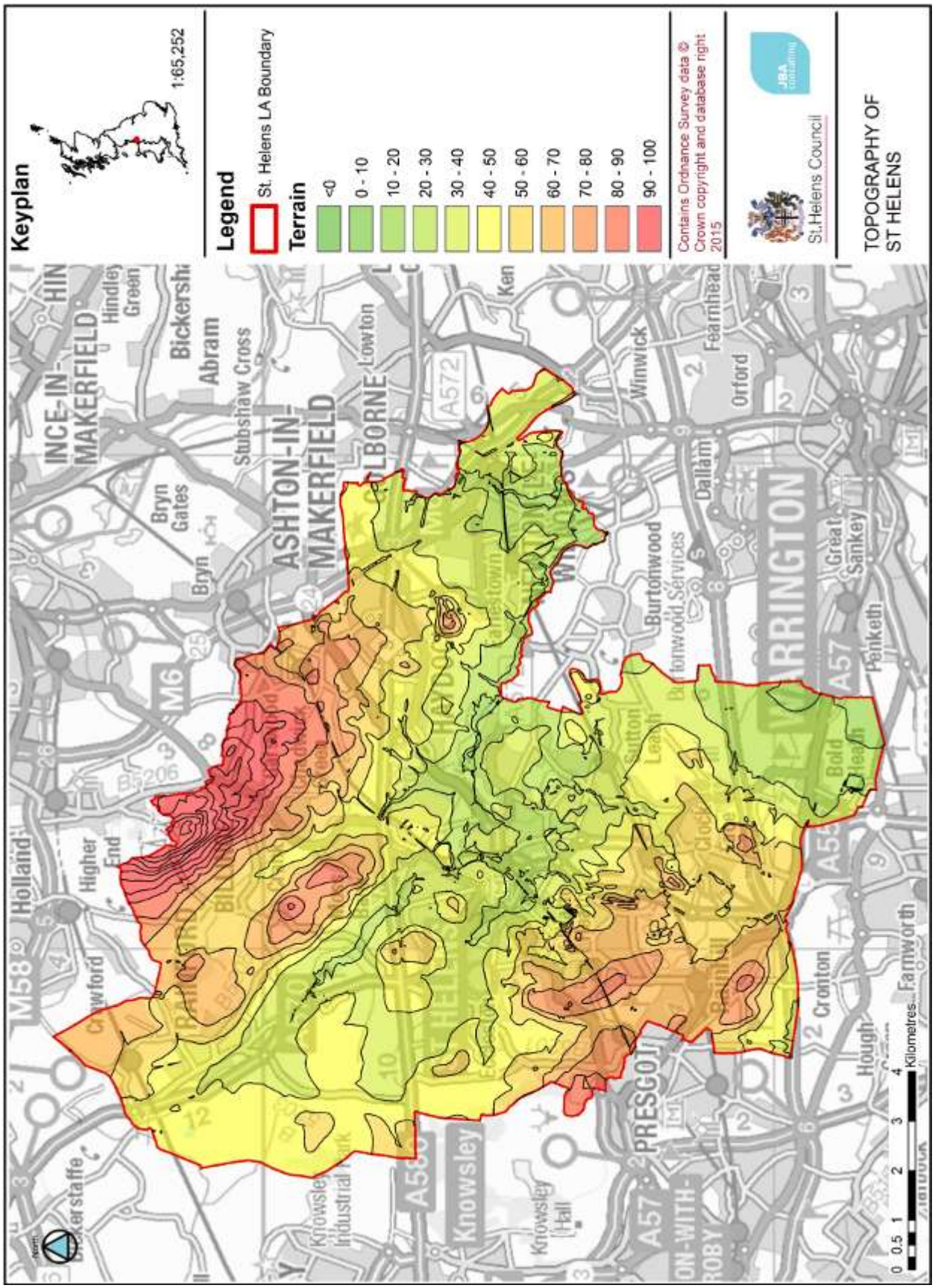
D.9 Appendices D: Figure D9 - Peat and Glacial Deposits



D.10 Appendices D: Figure D10 - Other Soils



D.11 Appendices D: Figure D11 - Topography



E. Useful Resources (Appendix E)

❖ **Table E.1: Master Planning and Concept Design**

Master Planning and Concept Design	
CIRIA (2010) Guidance on water cycle management for new developments (WaND) (C690)	https://www.ciria.org/ItemDetail?iProductCode=C690&Category=BOOK&WebsiteKey=3f18c87a-d62b-4eca-8ef4-9b09309c1c91
CIRIA (2010) Planning for SuDS: Making it Happen (C687)	http://www.ciria.org/Resources/Free_publications/Planning_for_SuDS_ma.aspx
CIRIA (2013) Creating water sensitive places: scoping the potential for Water Sensitive Design in the UK (C724)	http://www.ciria.org/Resources/Free_publications/Creating_water_sens1.aspx
CIRIA (2013) Water sensitive urban design in the UK: Ideas for built environment practitioners.	http://www.ciria.org/Resources/Free_publications/Water_Sensitive_Urba.aspx

❖ **Table E.2: Outline Design**

Outline Design	
BSI Standards Publication (2013) Code of Practice for Surface Water Management for Development Sites (Section 5)	http://shop.bsigroup.com/en/ProductDetail/?pid=00000000030253266
CIRIA (1996) Infiltration drainage - manual of good practice (R156)	https://www.ciria.org/ItemDetail?iProductCode=R156&Category=BOOK&WebsiteKey=3f18c87a-d62b-4eca-8ef4-9b09309c1c91
CIRIA (2004) Sustainable Drainage Systems. Hydraulic, structural and water quality advice (C609B)	https://www.ciria.org/ItemDetail?iProductCode=C609B&Category=BOOK&WebsiteKey=3f18c87a-d62b-4eca-8ef4-9b09309c1c91
Defra (2015) Non-statutory Technical Standards for Sustainable Drainage Systems	https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/415773/sustainable-drainage-technical-standards.pdf
HR Wallingford (2004) The Operation and Maintenance of Sustainable Drainage Systems (and Associated Costs) (SR626	http://eprints.hrwallingford.co.uk/982/1/SR626-Operation-maintenance-sustainable-drainage-systems.pdf
HR Wallingford (2004) Whole Life Costing for Sustainable Drainage (SR 627)	http://eprints.hrwallingford.co.uk/983/1/SR627-Whole-life-costing-sustainable-drainage.pdf
Hydro International (2011) A guide to SuDS in the urban landscape	http://www.engineeringnaturesway.co.uk/wp-content/uploads/Hydro_e-guide.pdf
Local Authority SuDS Officer Organisation (living document) Non-Statutory Technical Standards for Sustainable Drainage: Best Practice Guidance	http://www.susdrain.org/files/resources/other-guidance/lasoo_non_statutory_suds_technical_standards_guidance_2016_.pdf
National SuDS Working Group (2004) Interim Code of Practice for Sustainable Drainage Systems.	http://www.susdrain.org/files/resources/other-guidance/nswg_icop_for_suds_0704.pdf
Susdrain website	http://www.susdrain.org/
Addendum to Sewers for Adoption 7th Edition Nov 2012	http://sfa.wrcplc.co.uk/sfa7-supporting-documents.aspx

❖ **Table E.3: Detailed Design**

Detailed Design	
British Water Code of Practice. Assessment of Manufactured Treatment Devices Designed to Treat Surface Water Runoff performance issues (C582)	http://www.britishwater.co.uk/Publications/manufactured-treatment-devices.aspx
CIRIA (2002) Source control using constructed pervious surfaces. Hydraulic, structural and water quality	https://www.ciria.org/ItemDetail?iProductCode=C582&Category=BOOK&WebsiteKey=3f18c87a-d62b-4eca-8ef4-9b09309c1c91
CIRIA (2007) Building Greener: Guidance on the use of green roofs, green walls and complementary features on buildings (C644D)	https://www.ciria.org/ItemDetail?iProductCode=C644D&Category=DOWNLOAD&WebsiteKey=3f18c87a-d62b-4eca-8ef4-9b09309c1c91
CIRIA (2008) Structural designs of modular geocellular drainage tanks (C680)	https://www.ciria.org/ItemDetail?iProductCode=C680&Category=BOOK&WebsiteKey=3f18c87a-d62b-4eca-8ef4-9b09309c1c91
Department for Communities and Local Government (2009) Permeable surfacing of front gardens: guidance.	https://www.gov.uk/government/publications/permeable-surfacing-of-front-gardens-guidance
Interpave (2010) Permeable paving for adoption	http://www.paving.org.uk/commercial/permeable_paving_for_adoption.php
Interpave (2012) Planning with paving	http://www.paving.org.uk/commercial/planning_with_paving.php
Interpave (2012) Understanding permeable paving: Guidance for designers, developers, planners and local authorities. Edition 4	http://www.paving.org.uk/commercial/understanding_permeable_paving.php
Green Roof Organisation (2014) The GRO Green Roof Code: Green Roof Code of Best Practice for the UK 2014.	https://livingroofs.org/code-practice-green-roof-organisation/

❖ **Table E.4: Adoption / Retro-fitting / Operation and Maintenance**

Adoption / Retro-fitting / Operation and Maintenance	
CIRIA (2015) The SuDS Manual C753 Update: Appendix B: SuDS adoption handover checklist.	http://www.susdrain.org/resources/SuDS_Manual.html
CIRIA (2012) Retro-fitting to manage surface water (C713)	https://www.ciria.org/ItemDetail?iProductCode=C713&Category=BOOK&WebsiteKey=3f18c87a-d62b-4eca-8ef4-9b09309c1c91
CIRIA (2004) Model agreements for sustainable water management systems, model agreements for SuDS (C625)	https://www.ciria.org/ItemDetail?iProductCode=C625&Category=PHOTOCOPY&WebsiteKey=3f18c87a-d62b-4eca-8ef4-9b09309c1c91
CIRIA RP992 The SuDS Manual Update: Paper RP992/23 - Example of a SuDS Maintenance Plan	http://www.susdrain.org/files/resources/SuDS_manual_output/paper_rp992_23_example_suds_maintenance_plan.pdf
CIRIA RP992 The SuDS Manual Update: Paper RP992/23 - Guidance on the Maintenance Plan.	http://www.susdrain.org/files/resources/SuDS_manual_output/paper_rp992_21_maintenance_plan_checklist.pdf

❖ **Table E.5: Construction**

Construction	
CIRIA (2001) Control of water pollution from construction sites. Guidance for consultants and contractors (C532)	https://www.ciria.org/ItemDetail?iProductCode=C532&Category=BOOK&WebsiteKey=3f18c87a-d62b-4eca-8ef4-9b09309c1c91
CIRIA (2006) Control of water pollution from linear construction projects. Technical Guidance (C648)	https://www.ciria.org/ItemDetail?iProductCode=C648&Category=BOOK&WebsiteKey=3f18c87a-d62b-4eca-8ef4-9b09309c1c91
CIRIA (2006) Control of water pollution from linear construction projects. Site Guide (C649)	https://www.ciria.org/ItemDetail?iProductCode=C649&Category=BOOK&WebsiteKey=3f18c87a-d62b-4eca-8ef4-9b09309c1c91
CIRIA (2007) Site handbook for the construction of SuDS (C698)	http://www.ciria.org/Resources/Free_publications/site_handbook_SuDS.aspx
CIRIA RP992 The SuDS Manual Update: Paper RP992/22 Guidance of Construction Method Statements.	http://www.susdrain.org/files/resources/SuDS_manual_output/paper_rp992_22_construction_method_statements_assessment_checklists.pdf

❖ **Table E.6: Water Quality and Contaminated Land**

Water Quality and Contaminated Land	
Environment Agency (2013) Water Stressed Areas - Final Classification	https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/244333/water-stressed-classification-2013.pdf
Environment Agency (2017) The Environment Agency's approach to groundwater protection.	https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/598778/LIT_7660.pdf
CIRIA (2005) Remedial treatment for contaminated land (SP164)	https://www.ciria.org/CIRIA/Topics/Regeneration_and_contaminated_land/Topic_overviews/Regeneration_and_contaminated_land.aspx?hkey=42ca2967-93bc-468c-8d24-616472007e1f

❖ **Table E.7: Biodiversity / Landscape / Amenity and Public Engagement**

Biodiversity / Landscape / Amenity and Public Engagement	
CIRIA (2011) Delivering biodiversity benefits through green infrastructure (C711)	https://www.thenbs.com/PublicationIndex/documents/details?Pub=CIRIA&DocID=299980
Forestry Commission (2013) Air temperature regulation by trees and green infrastructure.	http://www.forestry.gov.uk/PDF/FCRN012.pdf/$FILE/FCRN012.pdf
Freshwater Habitats Trust (live) Pond Creation Toolkit website	http://freshwaterhabitats.org.uk/projects/million-ponds/pond-creation-toolkit/
CIRIA (2015) Communication and engagement in local flood risk management (C751) / (C752)	http://www.susdrain.org/resources/ciria-guidance.html
Forestry Commission (undated) The Urban Forest: How trees and woodlands can improve our lives in towns and cities.	http://www.forestry.gov.uk/pdf/FCURBANFORESTA44PP.PDF/$FILE/FCURBANFORESTA44PP.PDF
RSPB/WWT (2012) Sustainable Drainage Systems: Maximising the potential for people and wildlife. Guide for local authorities and developers.	http://www.rspb.org.uk/Images/SuDS_report_final_tcm9-338064.pdf

F. Document References (Appendix F)

❖ **Table F.1: Document References**

Document Links	
BRE Digest 365	https://www.brebookshop.com/details.jsp?id=327592
British Geological Survey (BGS) Infiltration SuDS Map	http://www.bgs.ac.uk/products/hydrogeology/infiltrationSuDS.html
CIRIA Drainage of development sites – a guide (X108)	http://www.ciria.org/Resources/Free_publications/drainage_of_development_sites.aspx
Cost Balancing - Final Surface Water Drainage Report DEFRA 2013	http://randd.defra.gov.uk/Document.aspx?Document=11852_FinalIssueSWDReport_November2013.pdf
Defra Climate Change Guidance	https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances
Defra SuDS Non Statutory Technical Standards	https://www.gov.uk/government/publications/sustainable-drainage-systems-non-statutory-technical-standards
EC Green Infrastructure	http://ec.europa.eu/environment/nature/ecosystems/index_en.htm
Environment Agency – Catchment Data Explorer	http://environment.data.gov.uk/catchment-planning/
Environment Agency – Flood Map for Planning	https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications#when-you-need-an-assessment
Environment Agency – Flood Risk Maps	https://flood-warning-information.service.gov.uk/long-term-flood-risk/map
Environmental Permits for Waste or Emissions	https://www.gov.uk/guidance/check-if-you-need-an-environmental-permit
Flood Estimation for Small Catchments	http://nora.nerc.ac.uk/7367/1/IH_124.pdf
Flood Risk Activity Permits (Main River)	https://www.gov.uk/permission-work-on-river-flood-sea-defence
Historic England - Consent and Planning Permission Requirements	https://historicengland.org.uk/advice/hpg/consent/
Historic England - National Heritage List for England	https://historicengland.org.uk/listing/the-list/
Landscape Character Assessment 2006	http://www.sthelens.gov.uk/media/157589/sth_lca_final_report_rfs.pdf
Listed Building Consent	https://historicengland.org.uk/advice/hpg/hpr-definitions/l/536329/
Liverpool City Region Action Plan	http://ecosystemsknowledge.net/sites/default/files/wp-content/uploads/2014/2/LCR_GI_action_plan.pdf
Liverpool City Region Ecological Network	http://www.activenaturalist.org.uk/
Living on the Edge: A Guide to Your Rights and Responsibilities of Riverside Ownership	https://www.gov.uk/guidance/owning-a-watercourse

❖ **Table F.1: Document References (continued)**

Document Links	
Mid Mersey Water Cycle Study 2011 (currently awaiting the full version to be provided)	https://www.sthelens.gov.uk/traffic-travel-parking/highway-maintenance/flooding-and-drainage/flood-and-water-management/
National Character Area profiles: data for local decision making	https://www.gov.uk/government/publications/national-character-area-profiles-data-for-local-decision-making
National Flood and Coastal Risk Management Strategy for England 2011	https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/293769/Mersey_Estuary_Catchment_Flood_Management_Plan.pdf.
National Planning Policy Framework 2012	https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/6077/2116950.pdf
National standards for SuDS:	https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/415773/sustainable-drainage-technical-standards.pdf
Part H of the Building Regulation – Drainage and Waste Disposal	https://www.gov.uk/government/publications/drainage-and-waste-disposal-approved-document-h
Planning Practice Guidance: Flood Risk and Coastal Change (2015)	http://planningguidance.planningportal.gov.uk/blog/guidance/flood-risk-and-coastal-change/reducing-the-causes-and-impacts-of-flooding/why-are-sustainable-drainage-systems-important/
Protected Species and Habitats	https://www.gov.uk/guidance/protected-species-how-to-review-planning-applications
Remedial treatment for contaminated land, Volumes I - XII (SP164)	http://www.ciria.org/ItemDetail?iProductCode=SP164&Category=BOOK&WebsiteKey=3f18c87a-d62b-4eca-8ef4-9b09309c1c91
River Basin Management Plans	https://www.gov.uk/government/collections/river-basin-management-plans-2015
Scheduled Monument Consent	https://historicengland.org.uk/advice/planning/consents/smc/
St. Helens Council Local Plan Core Strategy October 2012	http://www.sthelens.gov.uk/media/354627/ldf43e.pdf
St. Helens Council Strategic Flood Risk Assessment Final Report September 2014	http://www.sthelens.gov.uk/media/703136/st_helens_council_strategic_flood_risk_assessment_september_2014.pdf
St.Helens Local Flood Risk Management Strategy (LFRMS) 2014	http://www.sthelens.gov.uk/media/563762/sthelens_lfrms_2014.pdf
St.Helens Supplementary Planning Documents	http://www.sthelens.gov.uk/media/112101/ldf27.pdf
The Construction (Design and Management) Regulations 2015	http://www.legislation.gov.uk/uksi/2015/51/contents/made
The Town and Country Planning (Development Management Procedure) Order (2015)	http://www.legislation.gov.uk/uksi/2015/595/article/23/made
The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003	http://www.legislation.gov.uk/uksi/2003/3242/regulation/7/made
United Utilities	https://www.unitedutilities.com/

G. Document Abbreviations and Definitions (Appendix G)

❖ **Table G.1: Abbreviations**

Item	Description
ABI	Association of British Insurers
ADA	Association of Drainage Authorities
AGMA	Association of Greater Manchester Authorities
AStSWF	Areas Susceptible to Surface Water Flooding
BAP	Biodiversity Action Plan
CIRIA	Construction Industry Research and Information Association
CLA	Country Land and Business Association
CLG	Department of Communities and Local Government
CFMP	Catchment Flood Management Plan
COMAH	Control of Major Accident Hazards
DCLG	Department for Communities and Local Government
DEFRA	Department for Environment, Food and Rural Affairs
DPD	Development Plan Document
EA	Environment Agency
EC	European Commission
FCRM	Flood and Coastal Risk Management
FCERM	Flood and Coastal Erosion Risk Management
FWMA	Flood and Water Management Act 2010
FRA	Flood Risk Assessment
GEM	Groundwater Emergence Map
GHG	Greenhouse Gases
GIA	Grant in Aid
HFM	Historic Flood Map
IUD	Integrated Urban Drainage
IDB	Internal Drainage Board
LGA	Local Government Association
LDF	Local Development Framework
LLFA	Lead Local Flood Authority
LoSA	Level of Service Agreements
LPA	Local Planning Authority
LRF	Local Resilience Forum
MoU	Memorandums of Understanding
NRD	National Receptor Database

❖ **Table G.1: Abbreviations (continued)**

Item	Description
NFU	National Farmers Union
NPPF	National Planning Policy Framework
RFCC	Regional Flood and Coastal Committee
PFRA	Preliminary Flood Risk Assessment
PPC	Pollution Prevention Control
PPS	Planning Policy Statement
RBD	River Basin District
RFCC	Regional Flood and Coastal Committee
RoFSW	Risk of Flooding from Surface Water
RSPB	Royal Society of the Protection of Birds
S19	Section 19 - Flood Investigation Report
SA	Sustainability Appraisal
SAB	SuDS Approving Body
SAC	Special Areas of Conservation
SCI	Statement of Community Involvement
SEA	Strategic Environmental Assessment
SMP	Shoreline Management Plan
SFRA	Strategic Flood Risk Assessment
SSSI	Site of Specific Scientific Interest
SPA	Special Protocol Area
SPD	Supplementary Planning Document
SuDS	Sustainable Drainage Systems
SWMP	Surface Water Management Plan
WMS	Water Management Statement
UU	United Utilities

❖ **Table G.2: Definitions**

Item	Description
Assets	Structures or a system of structures used to manage flood risk.
Attenuation	Reduction of peak flows and increased duration of a flow event.
Balancing Pond	A pond designed to attenuate flows by storing runoff during the peak flow and releasing it at a controlled rate during and after the peak flow has passed. The pond always contains water. Also known as wet detention pond.
Basin	Flow control or water treatment structure that is normally dry.
Bio retention area	A depressed landscaping area that is allowed to collect runoff so it percolates through the soil below the area into an under drain, promoting pollutant removal.

❖ **Table G.2: Definitions (continued)**

Item	Description
Building Regulations	The UK Building Regulations are rules of a statutory nature to set standards for the design and construction of buildings, primarily to ensure the safety and health for people in or around those buildings, but also for purposes of energy conservation and access to and about other buildings.
Catchment	The area contributing surface water flow to a point on a drainage or river system. Can be divided into sub-catchments.
Catchment Flood Management Plans	CFMPs help the lead flood risk authority (EA) and their partners to plan and agree the most effective way to manage flood risk in the future, in which they are grouped by river basin district. Catchment flood management plans (CFMPs) consider all types of inland flooding, from rivers, groundwater, surface water and tidal flooding. Shoreline management plans consider flooding from the sea. The focus of CFMP include the likely impacts of climate change, the effects of how land is used and managed, how areas could be developed to meet present day needs without compromising the ability of future generations to meet their own needs.
Climate Change	Any long-term significant change in the “average weather” in a given region. Average weather may include average temperature, precipitation and wind patterns.
Combined Sewer	A sewer designed to carry foul sewage and surface runoff in the same pipe.
Consequence	A condition or occurrence traceable to a cause e.g. the flood was an inevitable consequence of the prolonged, heavy rains.
Cultural Heritage	Buildings, structures and landscape features that have an historic value.
Culvert	A covered structure under a road, embankment etc., to direct the flow of water.
Defences	A structure that is used to reduce the probability of floodwater or coastal erosion affecting a particular area (for example a raised embankment or sea wall).
Defra	Department for Environment, Food and Rural Affairs.
Deposition	Process whereby sediment is placed on the seabed, shoreline, riverbed or floodplain.
Detention Basin	A vegetated depression, normally dry except after storm events constructed to store water temporarily to attenuate flows. May allow infiltration of water to the ground.
Discharge	The discharge of a river is the volume of water, which flows through it in a given time. It is usually measured in cubic meters per second (m^3/s).
Drainage Authorities	Organisations involved in water level management, including IDBs, the Environment Agency, and RFDCs.
Environment Agency	Is a UK non-departmental public body of Defra with the principle aim of protecting and enhancing the environment to make a contribution towards the objective of achieving sustainable development, principle responsibility for river (fluvial) flooding.
Eva-potranspiration	The process by which the Earth's surface or soil loses moisture by evaporation of water and by uptake and then transpiration from plants.
Filter drain	A linear drain consisting of a trench filled with a permeable material, often with a perforated pipe in the base of the trench to assist drainage, to store and conduct water, but may also be designed to permit infiltration.
Filter strip	A vegetated area of gently sloping ground designed to drain water evenly off impermeable areas and filter out silt and other particulates.
Flood	A flood is defined as when water covers land that is normally dry.
Flood frequency	The probability of a flow rate being equalled or exceeded in any year.

❖ **Table G.2: Definitions (continued)**

Item	Description
Flood Mitigation	Methods of reducing the effects of floods. These methods may be structural solutions (e.g. reservoirs) or non-structural (e.g. land- use planning, early warning systems).
Flood Risk Assessment	FRA is a report that outlines all flood risks to a development site and presents recommendations for mitigating measures to reduce the impact of flooding to the site and surrounding area.
Floodplain	Land adjacent to a watercourse that would be subject to repeated flooding under natural conditions.
Fluvial flooding	Flooding from a main watercourse (brooks, streams, rivers and lakes etc.) that occurs when the water features cannot cope with the amount of water draining into them, from the land. When rainfall is heavy and/or prolonged, a large amount of run-off reaches the rivers and eventually causes them to overtop their banks.
Green Infrastructure	The network of land and water that is made up of green spaces and natural elements.
Green roof	A roof with plants growing on its surface, which contributes to local biodiversity. The vegetated surface provides a degree of retention, attenuation and treatment of rainwater, and promotes evapotranspiration.
Greywater	Wastewater from sinks, baths, showers and domestic appliances. A Greywater system captures this water before it reaches the sewer (or septic tank system).
Groundwater	Water that is below the surface of ground in the saturation zone.
Groundwater flooding	Occurs when water levels in the ground rise above the natural surface. Low-lying areas underlain by permeable strata are particularly susceptible.
Highway authority	A local authority with responsibility for the maintenance and drainage of highways maintainable at public expense.
Highways Agency	The government agency responsible for strategic highways, i.e. motorways and trunk roads.
Hydrological	The occurrence, circulation, distribution, and properties of the waters of the earth and its atmosphere.
Impermeable surface	An artificial non-porous surface that generates a surface water runoff after rainfall.
Infiltration	The passage of surface waters though the surface of the ground/the entry of groundwater to a sewer.
Infiltration device / trench	A device designed to aid infiltration of surface water into the ground. A trench, usually filled with stone, designed to promote infiltration of surface water to the ground.
Material Consideration	A legal term describing a matter or subject which is relevant (material) for a local authority to consider when using its powers under planning law in dealing with a planning application.
Model agreement	A legal document that can be completed to form the basis of an agreement between two or more parties regarding the maintenance and operation of sustainable water management systems.
Operating Authorities	Anybody, including the EA, IDB, County Council and Local Authority, who have powers to make or maintain works for the drainage of land.
Ordinary Watercourses	Any watercourse that does not form part of a main river.

❖ **Table G.2: Definitions (continued)**

Item	Description
Permeability	Ease of which a fluid can flow through a porous medium. It depends on the physical properties of the medium, for example grain size, porosity and pore shape.
Permeable pavement	A paved surface that allows the passage of water through voids between the paving blocks/slabs.
Permeable surface	A surface formed of material that is itself impervious to water but, by virtue of voids formed through the surface, allows infiltration of water to the sub-base through the pattern of voids, e.g. concrete block paving.
Pervious surface	A surface that allows inflow of rainwater into the underlying construction or soil.
Piped system	Conduits generally located below ground to conduct water to a suitable location for treatment and/or disposal.
Pluvial Flooding	Flooding that result from rainfall generated overland flow before the runoff enters any watercourse or sewer. It is usually associated with high intensity rainfall events. Also referred to as surface water flooding.
Pollution	A change in the physical, chemical, radiological or biological quality of a resource (air, water or land) caused by man or man's activities that is injurious to existing, intended or potential uses of the resource.
Pond	Permanently wet basin designed to retain storm water and permit settlement of suspended solids and biological removal of pollutants.
Porous paving	A permeable surface allowing the passage of water through voids within, rather than between, the paving blocks/slabs.
Porous surface	A surface that infiltrates water to the sub-base across the entire surface of the material forming the surface, for example grass, gravel surfaces, porous concrete / asphalt.
Prevention	Site design and management to stop or reduce the occurrence of pollution and to reduce the volume of runoff by reducing impermeable areas.
Probability Event	The statistical probability of a flooding episode (event) occurring.
Protection	The flood event return period above which significant damage and possible failure of the flood defences could occur.
Public sewer	A sewer that is vested in and maintained by a sewerage undertaker.
Recovery	The process of rebuilding and rehabilitating the community following an emergency.
Reservoir	A natural or artificial lake where water is collected and stored until needed. Reservoirs can be used for irrigation, recreation, providing water supply for municipal needs, hydroelectric power or controlling water flow.
Residual Risk	Risk that remains after management / mitigation measures have been implemented.
Resilience	The ability of the community, services, area or infrastructure to withstand the consequences of an incident.
Return Period	A return period also known as a recurrence interval is an estimate of the likelihood of an event, it is a statistical measurement typically based on historic data denoting the average recurrence interval over an extended period of time.
Risk	"Risk" as defined by the Flood and Water Management Act 2010 means a risk in respect of an occurrence assessed and expressed as a combination of the probability of the occurrence with its potential consequences.

❖ **Table G.2: Definitions (continued)**

Item	Description
Risk assessment	A structured and auditable process of identifying potentially significant events, assessing their likelihood and impacts, and then combining these to provide an overall assessment of risk, as a basis for further decisions and action.
Risk Management Authorities	Organisations that have a key role in flood and coastal erosion risk management as defined by the Flood and Water Management Act (2010). These are the Environment Agency, lead local flood authorities, district councils where there is no unitary authority, internal drainage boards, water companies, and highways authorities.
River flooding	Occurs when water levels in a channel overwhelms the capacity of the channel.
Run-off	Water flow over the ground surface to the drainage system. This occurs if the ground is impermeable, is saturated or if rainfall is particularly intense.
Separate sewer	A sewer for surface water or foul sewage, but not a combination of both.
Sequential Test	Sequential test (NPPF) advocates that planners use a sequential test when considering land allocations for development to avoid flood risk where possible.
Sewer	A pipe/channel taking domestic foul and/or surface water from buildings associated paths and hardstanding's from two or more curtilages and having a proper outfall.
Sewerage undertaker	A collective term relating to the statutory undertaking of water companies that are responsible for sewerage and sewage disposal including surface water from roofs and yards of premises.
Sewers for Adoption	A guide agreed between sewerage undertakers and developers (through the House Builders Federation) specifying the standards to which new sewers need to be constructed to facilitate adoption.
Significant	Defined threshold of flooding consequence.
Soakaway	Subsurface structure which surface water is conveyed to allow ground infiltration.
Source control	The control of runoff or pollution at or near its source.
Storm water	Rainwater that runs off impervious surfaces and into storm drains rather than being absorbed into the soil.
Sub-catchment	A division of a catchment, allowing runoff management as near to the source as is reasonable.
Surface water flooding	Occurs when the level of rainfall overwhelms the capacity of the drainage system to cope.
Sustainable Drainage Systems (SuDS)	A sequence of management practices and control structures designed to drain surface water in a more sustainable fashion than some conventional techniques.
Swale	A shallow vegetated channel designed to conduct and retain water, but may also permit infiltration; the vegetation filters particulate matter.
Treatment	Improving the quality of water by physical, chemical and/or biological means.
Wastewater	This is 'used' water arising from homes and businesses and includes water from sinks, toilets, bathtubs, washing machines and dishwashers – any water that has to be drained, including storm water.
Watercourse	A term including all rivers, streams ditches drains cuts culverts dykes sluices and passages through which water flows.
Wetland	A pond that has a high proportion of emergent vegetation in relation to open water.

St.Helens Council

Engineering
4th Floor
Wesley House
Corporation Street
St.Helens
Merseyside WA10 1HF

Tel: (01744) 456789/676789
Fax: (01744) 453363
Minicom: (01744) 671671
contactcentre@sthelens.gov.uk
www.sthelens.gov.uk