March 2015 – Issue Version 1

West of England Sustainable Drainage Developer Guide

Section 2 North Somerset Sustainable Drainage Design Guidance

Weston Water Park (photograph from NSC)

North Somerset Council

Nailsea and Backwell Station Car Park – porous asphalt (photograph from NSC)

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This guide has been prepared by North Somerset Council and is supported by the Environment Agency, the North Somerset Levels Internal Drainage Board and Wessex Water who have all been involved in its preparation.

The document will be endorsed by North Somerset Council in February 2015. This is a living document and will be kept under review at 12 monthly intervals. User feedback is welcomed through:
Drainage.Comments@n-somerset.gov.uk

Other documents:

West of England Guide – **Section 1**

West of England Guide – **Section 2** Bristol Local Sustainable Drainage Design Guidance

North Somerset Council

Many of the new and re-development sites in our area will need careful consideration of sustainable drainage (SuDS) due to the nature of the topography and ground conditions, which means that the key to good design is to understand the context of any site within the catchment.

We recommend that developers contact us to discuss their sites at a pre planning stage to help develop a proof of concept and Master plan. This can maximise the use of the site, but still provide a SuDS system which mitigates the risk of flooding and provides enhancements in terms of quality of the site for future residents.

This chapter outlines information that supports the selection and specification of sustainable drainage systems in North Somerset. Key characteristics of the area are outlined and specific requirements for sustainable drainage are set out.

Figure 1: Portishead attenuation pond (photograph from NSC)

Area character

The landscape of North Somerset is highly varied, containing within it four of Natural England's National Character Areas:

- Bristol, Avon Valleys and Ridges – Portishead, Clevedon, Nailsea, Winford, Long Ashton and Wrington
- Severn and Avon Vales – Portbury, Clapton and Gordano
- Mendip Hills – Winscombe, Burrington and Bleadon
- Somerset Levels and Moors. – Weston-super-Mare, Yatton, Kingston Seymour and Hutton

The Severn Estuary forms the western edge of the district with extensive areas of inter-tidal mudflats, sometimes with low cliffs, at the coastal edge. The Severn catchment dominates the hydrology of the area with four main rivers flowing east to west across the area to join it. Forming the boundaries of the area to the far north and south respectively are the River Avon, carried to the Severn through its dramatic limestone gorge, and the River Axe, which meanders through the moors and levels to the south. In between these two watercourses are the Rivers Kenn and Banwell, and the Congresbury Yeo, Land Yeo and Blind Yeo all of which join the Severn Estuary.

The Rivers Land Yeo, Kenn and Congresbury Yeo all flow through the valleys between the limestone ridges then over the levels and moors areas to the Severn. As they flow through the valleys they generally have a natural river form sometimes with adjacent wetlands. As they reach the moors the channels are often more engineered and sometimes embanked, forming part of the system of numerous rhynes (watercourses) used to control the water levels on the wetlands to provide effective land drainage.

At the east of the District are the River Chew and Colliter's Brook which flow north to join the River Avon. Blagdon Lake, at the far south east of the area, is a reservoir controlling the flow of water taken from the Mendip Hills to the south and east.

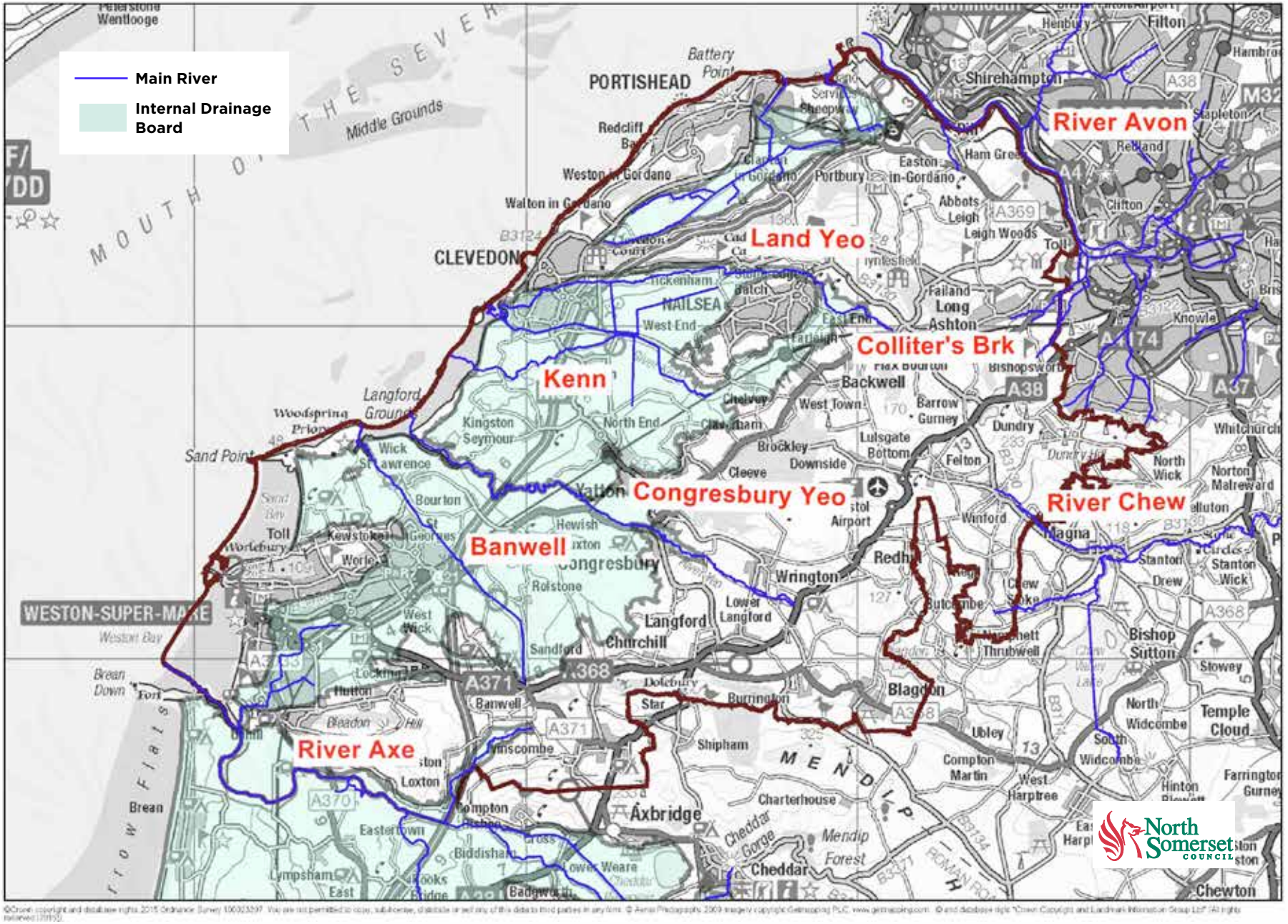


Figure 2: Internal Drainage Board Area and Main Rivers in North Somerset

Topography and geology

North Somerset has a dramatically diverse landscape from the flat lowlands of the levels and moors (0 to 10m AOD) to the steep slopes of the Mendip Hills (which rise to 200 to 240m AOD).

Characterised by alternating ridges and broad valleys the Bristol, Avon Valleys and Ridges are underlain by Carboniferous and Jurassic Limestone with natural cliffs. Within this area in both Portishead and Clevedon, infiltration is possible and where a direct connection to the Severn is viable then restriction on flows will not apply however tide locking will occur and storage may be needed.

In the areas which include Nailsea, Winford, Long Ashton and Wrington, infiltration should be incorporated into SuDS design. On all sites, establishing site conditions through appropriate investigations will inform the viability of the final design.

A small part of North Somerset district falls into the Severn and Avon Vale, namely Portbury, Clapton and Gordano, and is characterised by beach and tidal flat deposits. Here there are constraints on infiltration so where possible discharge to surface waters with sufficient volume for storage should be identified, including considerations of tide locking along the Severn and Avon.

The south of the district is characterised by the Mendip Hills; Winscombe, Burrington and Bleadon areas. Carboniferous Limestone outcrops protrude from the species rich unimproved calcareous grassland and heath, with lower flanks of Mercia Mudstone; these areas will allow infiltration and the constraints are based on the quality of the water being infiltrated. In areas with combes (dry steep valley slopes) there is often an associated risk of flash flooding from short duration high intensity rainfall events. Therefore management of surface runoff needs to be built into the design of SuDS systems. Where the Hills meet the flat moorland, storage and flow control will need to be combined within drainage designs.

The south and western part of the district falls within the Somerset Levels and Moors and include Weston-super-Mare, Yatton, Kingston Seymour and Hutton. This very distinctive area is characterised by beach and tidal flat deposits, underlain with small areas of gravel, peat, Mercia Mudstone and Lias. Infiltration constraints in this area are due to high seasonal groundwater levels. Here attenuation ponds or channels may be required which control volume due to the long term nature of flood events. Groundwater levels are seasonally high, due to the flat and low-lying nature of the area. Here the engineered nature of the rhyne network which is penned at summer and winter levels needs to be evalulated in relationship to the site.

Consideration of tide locking will need to form part of the design constraints on coastal sites. In Weston-super-Mare there are both steeply sloping and flat areas. In the hilly areas, runoff from steep slopes will need to be restricted with adequate storage provided to prevent impacts at the interface with the low-lying areas.

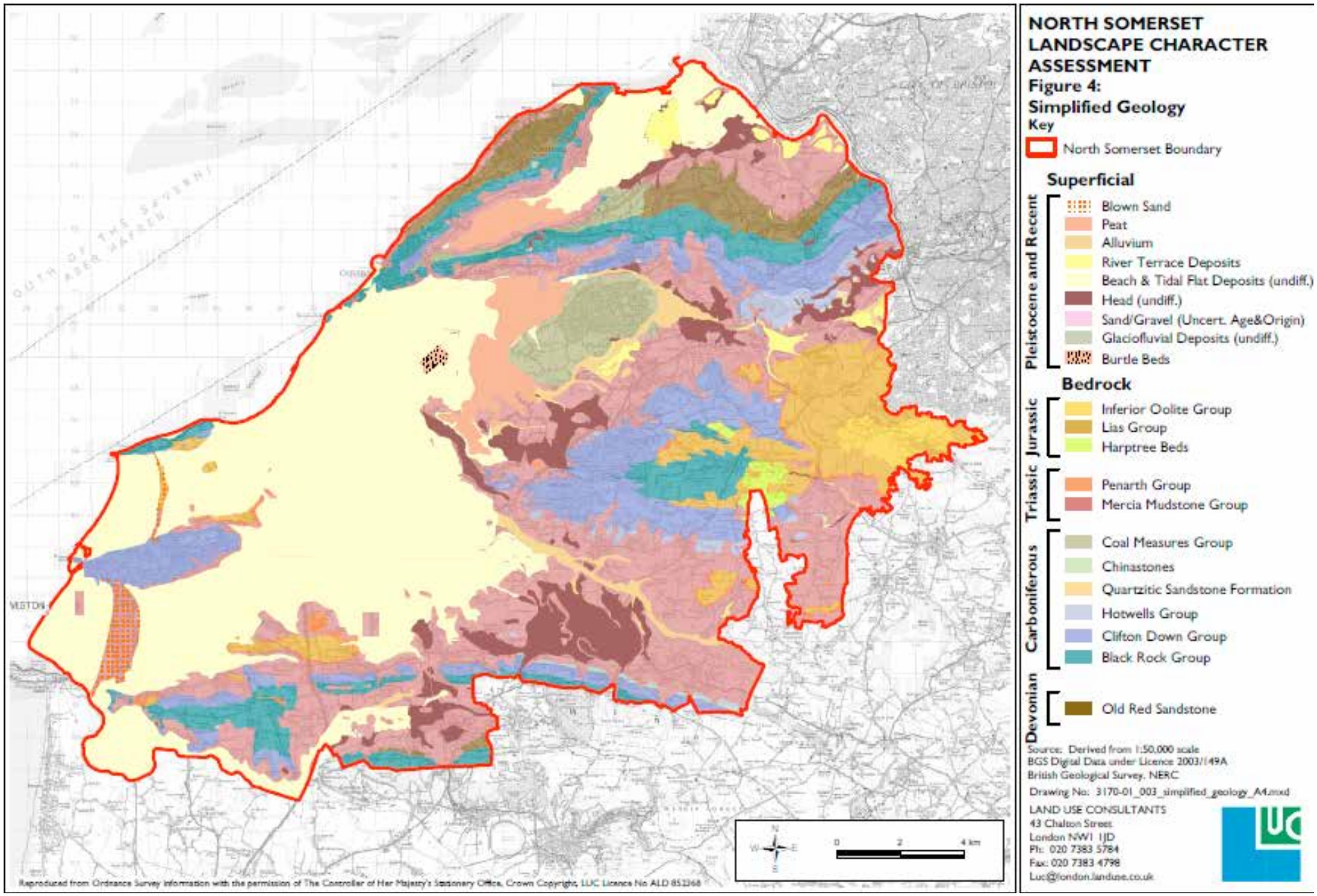


Figure 3: North Somerset Landscape Character Assesment Supplementry Planning Document

Selecting SuDS techniques

British Geological Society Maps have been used to assess at a broad scale the percentage of North Somerset where infiltration SuDS can potentially be used. This detail is shown in the table and maps on the next two pages.

Figure 5 provides a first look at the potential of infiltration on any site. Infiltration SuDS are suitable in a wide variety of ground conditions, but the design must be compatible with the properties of the subsurface. In particular, soakaways, infiltration basins or trenches are encouraged in the green areas of ***Figure 5***.

Where soils may be poorly draining, have a shallow water table, are located on floodplain deposits, or have some combination of these characters, there is little infiltration and storage in the form of ponds or wetlands may be appropriate, pink areas of ***Figure 5***. The blue areas will need a mix of both infiltration techniques, complemented by storage, which take account of the local ground conditions.

To inform the drainage strategy a site specific assessment should be made to determine the full potential for infiltration using CIRIA R156 or BRE Digest 365 soakaway design or equivalent.

Maintaining the quality of groundwater resources is important. In certain areas of North Somerset, greater consideration of managing water quality through treatment will be required. These constraints are shown in ***Figure 6***, which shows the ground water source protection zones (SPZ). Here a risk assessment for potentially polluting activities and accidental releases of pollutants should be undertaken. The purple areas of ***Figure 6*** are most vulnerable and where the Environment Agency will need to be consulted.

In the orange areas treatment via vegetated areas may be viable, outside of these areas simple water quality measures should be used.

Each planning application will need to be assessed against our planning policies and maps plus the appropriate sequential tests.

Infiltration and suitable areas	% of North Somerset area where infiltration is viable
Figure 5 Green areas on the map are compatible with infiltration SuDS. Free draining soils may allow soakaways, infiltration trenches and detention ponds to be used.	28%
Blue areas on the map have opportunities for bespoke infiltration SuDs. The subsurface is potentially suitable for infiltration SuDS but the design will be influenced or highly influenced by the ground conditions	60%
Very significant constraints for Infiltration SuDS in purple (***Figure 6***) areas. There is a very significant potential for one or more hazards associated with infiltration	12%

Figure 4: Infiltration opportunities

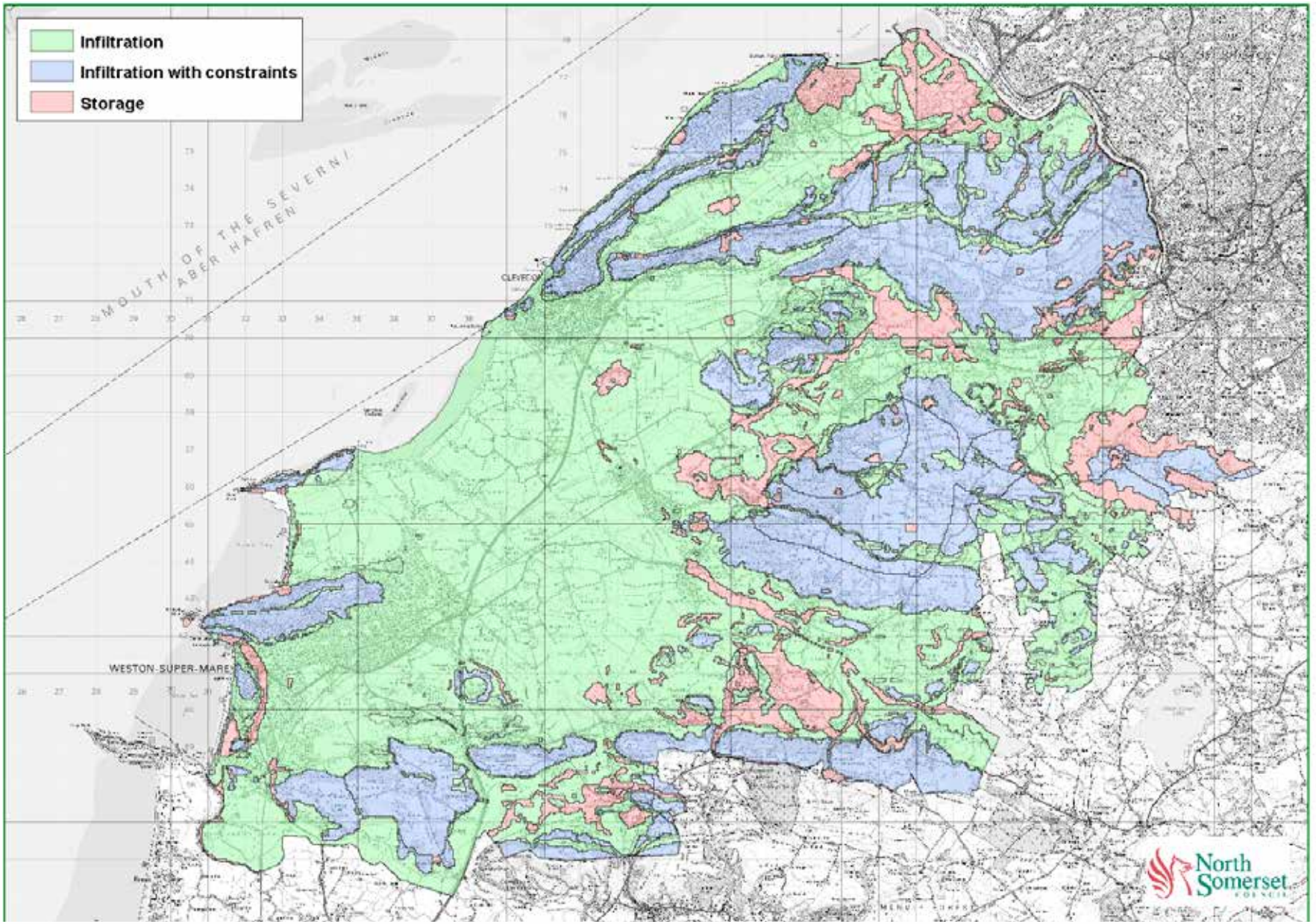


Figure 5: Infiltration potential from British Geological Survey (OR/11/061)

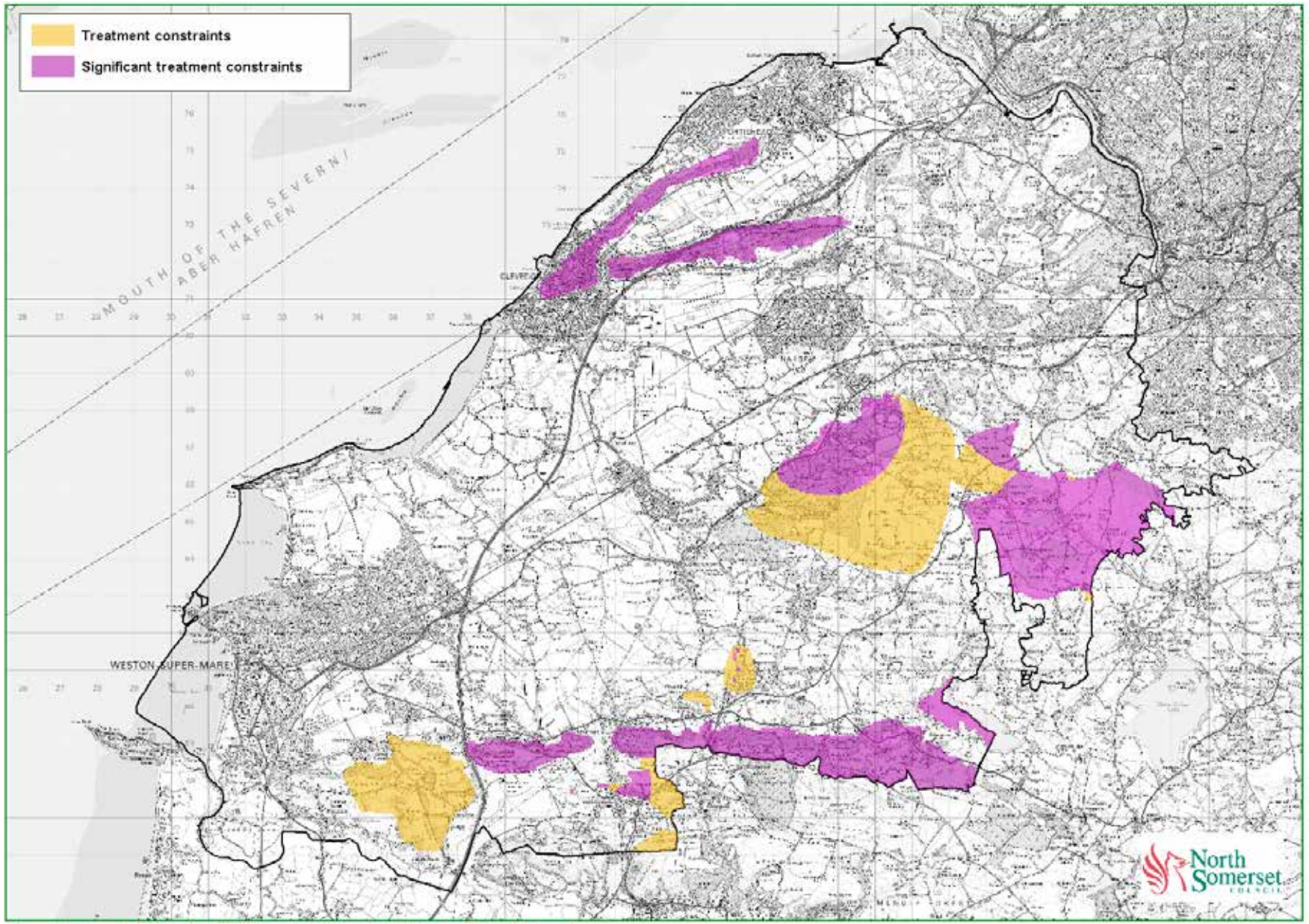


Figure 6: Water quality treatment from British Geological Survey (OR/11/061)

Rainfall and flooding

The flood mechanisms vary across the area from steep valleys where the risks are from fast flowing short duration events to the flat areas where long duration events are more typical with a combination of tide locking and high ground water levels.

Approximatly one-third of the area is at risk of flooding and is reliant on engineered defences for protection to varying standards. Surface water risks arise when the capacity in the pipe network is exceeded due to water running off hard surfaces quickly in urban settings, and runoff from steep agricultural land into villages.

The average annual rainfall in North Somerset is between 800 and 950mm. The last significant flooding incidents occured in 2012, and were scattered across the entire area. Background and supporting information on some of the known flood risk issues at sites can be found in our investigation of these flood events[1].

Due to the nature of the catchments we experienced surface water flooding which occurred when the ground was saturated which was both fast flowing from the Mendips hills and water lying on the moors and levels for several weeks.

Figure 7: Winscombe in December 2012 (photograph from NSC)

1 Flood Investigation Report 2012, North Somerset Council
www.n-somerset.gov.uk/Environment/flooding/Documents/flood%20investigation%20report%20(pdf).pdf

Amenity

Our aim is to safeguard the rich and varied built, historic and natural heritage of the area in accordance with the principles of sustainable development.

We have a wide range of natural spaces from open hillsides, low lying moors and formal parks which improve the quality of life within the area. With traditional seaside towns and a hinterland which attracts weekend tourists, amenity is an important factor for tourism.

There is a need for high standards of design throughout the area including sustainable eco-friendly development. With innovation and design that responds appropriately to its context and integrating sustainable surface water management features in spaces which can be used by the local community.

We will encourage sustainable development through our planning policy and our **Creating Sustainable Buildings and Places in North Somerset: Supplementary Planning Document**, which encourages dual uses for spaces (***Figure 8***) such as informal recreation areas which can act as storage basins during extreme events.

There are a number of SuDS that could be associated with sport and leisure built facilities, these are included in the Appendix on Green space categories ***Table 1***.

Figure8: Recreation area within sustainable drainage scheme (photopgraph from NSC)

Biodiversity

The design of sustainable drainage can be effective in delivering biodiversity improvements as part of developments. Improving the quality of surface runoff can also help meet the objectives of the Water Framework Directive.

Based on the assessment in 2013 three waterbodies achieved Good Ecological Status (GES). ***Figure 8*** shows the 3 watercourses with good status in green. The other waterbodies achieve only moderate status with two deteriorating to poor status in 2013. The waterbodies that do not reach Good Ecological Status are failing in respect of the fish, phosphate and dissolved oxygen elements for the WFD requirements. There are a number of SuDS which help to improve water quality and therefore help achieve or promote WFD objectives and these should be considered as a priority along failing watercourses. These techniques are highlighted in the Appendix ***Table 3*** – SuDS techniques.

Native planting and the creation of green corridors which link existing rhynes or new rhynes should be considered in the design, these can also act as pathways and cycleways, or the exceedance routes for flood water. We have populations of newts, water vole and otter, which are protected under Schedule 5 of the Wildlife and Countryside Act within the North Somerset Area. Therefore careful consideration of the design of structures and maintenance regimes in these areas will be needed.

Substantial areas of the levels and moors within the district have been designated as SSSI's specifically for these (rhynes) waterways. In these areas developments which respect and work with the rhyne network and use SuDS alongside the area can both improve the water quality in the SSSI and create additional benefits through the enhancement of biodiversity. There are a number of SuDS that could be associated with providing improvements in biodiversity, these are included in the Appendix ***Table 2*** – Biodiversity Categories.

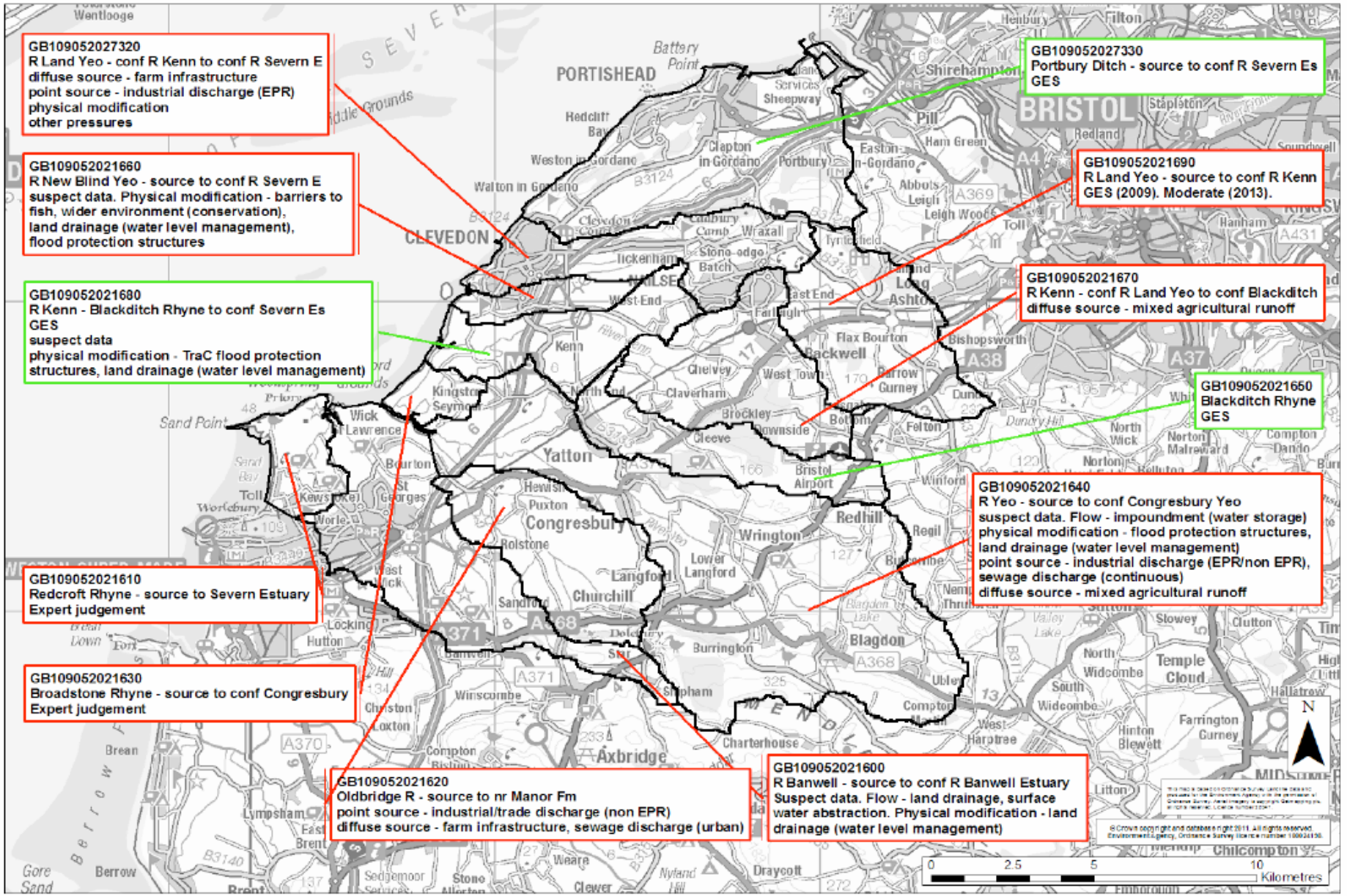


Figure 9: Ecological status 2013 Environment Agency (North Somerset Streams)

Planning Policy and Strategy

Planning Policy

SuDS have been a key element of North Somerset's policy objectives as part of the Core Strategy for several years, with a number of schemes now built and in operation.

There are a number of key documents that set out the approach to development and give guidance on SuDS and how they should be promoted in North Somerset.

- Development Documents – Core Strategy

CS1: Addressing Climate Change and Carbon Reduction

Part 10) areas will be enhanced to be resilient to the impacts of climate change including flood defence and public realm enhancements including the integration of effective shading through, for example, tree planting; and,

Part 11) developments should demonstrate water efficiency measures to reduce demand on water resources, including through the use of efficient appliances and exploration of the potential for rainwater recycling.

CS2: Delivering sustainable design and construction

Part 5) Requires the application of best practice in Sustainable Drainage Systems to reduce the impact of additional surface water run-off from new development. Such environmental infrastructure should be integrated into the design of the scheme and into landscaping features, and be easily maintained.

CS9: Green infrastructure

The continued development of a network of green spaces, water bodies, paths and cycleways and bridleways in and around the urban areas, recognising the value of sustainable drainage systems for green infrastructure; the protection of Wildlife Sites and enhancement of biodiversity.

Strategic Flood Risk Assessment (SFRA)

Where appropriate and relevant, developments should use Sustainable

Drainage Systems (SuDS) to control surface water before it enters watercourses. Within a large urban area such as Weston-super-Mare or Portishead the aim is to manage runoff from a site and to prevent downstream flooding.

Local Flood Risk Management Strategy (LFRMS)

One aim of our LFRMS is to develop local SuDS guidance in collaboration with our partners, which will complement any nationally developed SuDS standards, and are more bespoke to North Somerset and will consider how green infrastructure is considered as part of SuDS infrastructure. The Strategy identified the 15 most vulnerable communities to local sources of flooding, and careful consideration of existing issues will be needed in sites within or adjacent to these communities to ensure current issues are not exacerbated and preferably mitigated, to a degree, within the design process.

Supplementary Planning Guidance

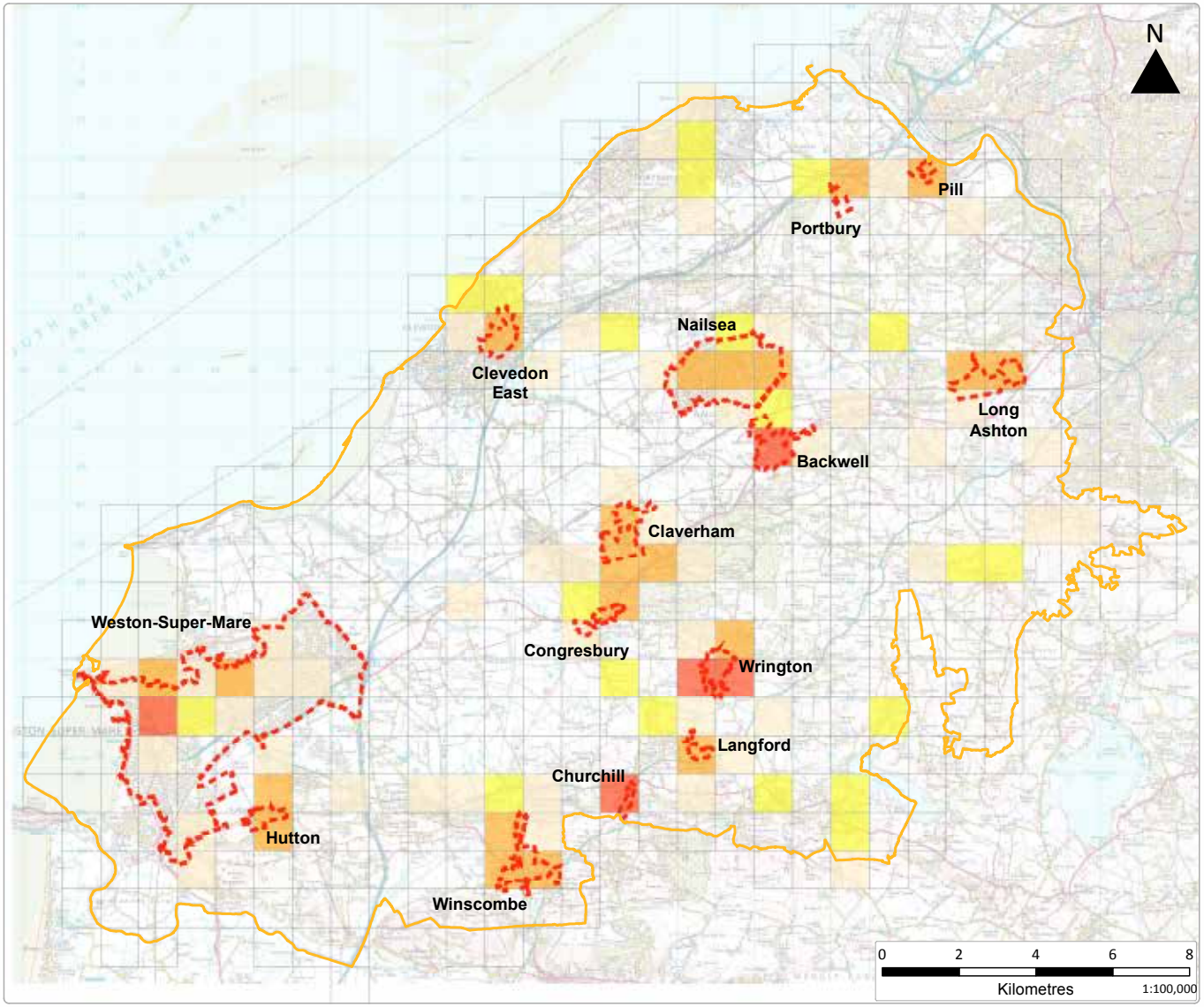
The requirements for inclusion of SuDS in developments are specifically included within a number of other supplementary planning documents:

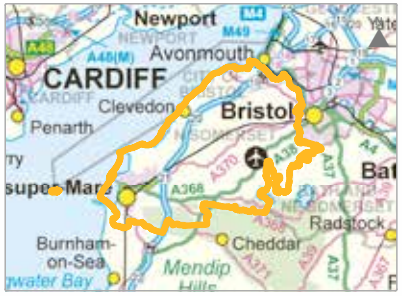
- Dolphin Square
- Weston Villages
- Creating Sustainable Buildings and Places in North Somerset:

The later document sets out our approach for energy efficiency, renewable energy and the transition to zero carbon development. It outlines our policies on sustainable drainage and sets out our requirements for implementing policies relating to sustainable drainage.

Figure 10: Surface water flooding Station Road Blagdon (photograph from NSC)

North Somerset LFRMS





Legend

- North Somerset Council Boundary
- Communities most vulnerable to local flood risk

Risk Category (per 1km)

- Lowest Risk
- Highest Risk

Communities most vulnerable to local flood risk

North Somerset Council

CH2MHILL.

Created by: Luke Webb (01/10/2013)
Checked by: Ali Cotton (01/10/2013)

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Figure 11: Communities most vulnerable to local flood risk - North Somerset LFRMS

Specific SuDS requirements

Local design principles

In our urban areas green space is often at a premium, designers and developers are therefore encouraged to use green roofs and permeable surfaces, channelling water into rain water gardens, planters and ponds, linked by carefully designed hard and soft conveyance systems such as filter strips and swales.

Combining public open space with the SuDS system to give an amenity and promote wellbeing is encouraged. Fundamental to this approach is that the area must preserve both drainage and open space functions for the majority of the time. Specific approaches and requirements should be discussed on a development by development basis.

Roads and paths make a contribution to runoff and pollutants. Treating this runoff at source is important and we prefer a system, which treats and conveys on the surface. Routes through the development for the conveyance of exceedance flows known as blue corridors which link with retention ponds, wetlands or swales, can be used as cycle ways or paths.

In rural areas we would encourage development of SuDS that can contribute to National Nature Reserves and biodiversity targets and reduce the risk of diffuse pollution to relevant receptors.

Figure 12: Swale at Long Ashton (photograph from NSC)

Pre Application

We will welcome pre application discussions and we will look for a proof of concept plan and drainage strategy or Master plan, which is based on known drainage and flooding information on the site.

Early pre application discussion will allow time for infiltration tests to be carried out to determine the suitability of proposed SuDS features. Early investigations will speed up discussions and ensure discussions are evidence based.

We would like to see the following as the focus of discussions:

- The planning and environmental objectives for the site
- The indicative layout should show the integration of drainage with the street layout and landscape aspects
- A set of design criteria which will be applied to the SuDS scheme
- The opportunities and constraints to inform theSuDS design, considering the site location, topography and ground conditions
- Points of discharge
- Requirements of other Risk Management Authorities
- An assessment of cost implications for maintenance
- An assessment of the access and maintenance requirements over the lifetime of the development
- Conduit allowance considerations for Utilities based on the proposed plan if under a SuDS element

The Master plan discussions should take into account:

- The full range of SuDS techniques being considered for all sites with the most appropriate technique(s) taken forward.
- Use of water at source will be a key part of our requirements and this applies to new or re-development sites
- Mimicking natural drainage paths and including appropriate mitigation measures, is particularly important in our IDB areas
- A complete sustainable drainage system should demonstrate how the SuDS treatment train has been applied. The number of treatment stages within a drainage system must be appropriate to the land uses onsite (Information on the application of treatment trains is in the West of England Guide)
- All drainage strategies or Design Codes must demonstrate flow paths and exceedance routes, including potential depths and velocities
- Allowances for climate change and blockage of structures must be factored into designs to manage residual risk.
- Where applicable, previously culverted watercourses should be opened up to restore natural drainage features and reduce the likelihood of bottlenecks / blockages that can occur and cause flooding in localised areas
- The ease of maintenance is an essential part of the design of sustainable drainage systems. Provisions for maintenance and easements should be considered
- Biodiversity improvements and delivering public amenity, are important elements in the design

To arrange pre application advice, please contact us via our website (details of any fees and charges for pre application advice are provided on the North Somerset website[2)].

2 www.n-somerset.gov.uk/Your_Council/Finance/Documents/fees%20and%20charges%20(pdf).pdf

Guidance

Our local requirements are designed to complement the West of England Guide and apply across all of North Somerset to support the design and implementation of sustainable drainage systems.

We will also look to take into account the comments of the other Flood Risk Management organisations with regard to Land Drainage Consents and flood risk from all sources.

North Somerset Internal Drainage Board
The IDB area covers the low lying areas of our area, see the map earlier in this section (see ***Figure 2***). Discussions with the IDB about development sites should take place at an early stage in conjunction with NSC. Within the IDB area important factors to consider are:

- Drainage paths to discharge points
- Maintenance requirements
- Volume of runoff
- Storage durations

Due to the nature of the network which is open rhynes (watercourses) and grass banks, with sluices and managed water levels to reduce flood risk, maintenance access is vital. The IDB need space to maintain this network and their Byelaws apply in particular to the requirement for maintenance access of 9 metres from top of bank which remains free of all roads, street furniture and vegetation which would increase costs in traffic management and limit access for maintenance. Both NSC and the IDB have a policy of not allowing culverting apart from crossing points.

Wessex Water
Connections to the network will need to be discussed with Wessex Water to ensure that the functionality of the system is maintained. Relevant consents to agree connection to the public sewer will be required at the approval stage.

Environment Agency
Across North Somerset the Environment Agency's standing advice is applied on planning applications and their role in assessing Flood Risk Assessments for planning continues. They also have an overview on how catchment management should be carried out; on main river they will apply their policies and byelaws.

Highways Authority
On roads the intergration of the drainage system will need to take account of pollution control and the treatment train set out in the West of England Guidance. The type of SuDS associated with road design will need to be agreed with North Somerset's Highways Engineers at a proof of concept or master plan stage. The NSC Highways Development Design Guide[3] sets out the requirements.

3 Link is not available yet

Local standard details

The standards set out in the West of England Guidance National Standards for sustainable drainage systems (Defra, June 2014, final draft) table should be followed in the North Somerset Area with a couple of exceptions.

Due to the nature of our area both the control of peak flows and volumes will be dependent on the location of the development. The IDB have critical drainage areas, near the coast where tide locking occurs or where we have high groundwater levels.

Design of drainage systems must consider blockages and ensure that pipe sizes are set appropriately and that access for maintenance is clearly allowed for.

There are many types of SuDS techniques and this guide gives some key design points which will form part of our requirements, together with the Sewers for Adoption 7th Edition and the SuDS manual.

SuDS Key Design Points - from CIRIA 697 which is being updated

SuDS techniques	Key Design Criteria
Soak away	Design to a 1 in 30 year rainfall event minimum
	Infiltration test to BRE Digest 365; on larger sites a geotechnical report will be required
	Formal soak away structures with fill material - providing >30% void space
	Base of soak away at least 1m from ground water levels – (take into account seasonal variations)
	Our Highways Authority prefers not to adopt any public highway carriageway or footway where a soak away feature is underneath
	Minimum distance from foundations of buildings and structures – 5m, unless they have been lined
Filter Strip	Minimum width will depend on the slope and area drained
	Even runoff across grass area to filter strip
	Gently sloping grass verges to be incorporated in the design as means of pre-treatment
	Appropriately landscaped to allow for maintenance
	These features are generally not suitable for steep sloping sites
Filter trenches and drains	Excavated trench 1.0 - 2.5m filled with stone aggregate
	Upstream treatment to remove silt and sediment
	This method is not suitable where ground water is vulnerable
	Access points to the perforated pipes are required

SuDS techniques	Key Design Criteria
Swale	Limit water velocities during events to the SuDS manual recommendations
	Side slopes should allow maintenance
	Base width should be designed to allow maintenance
Bioretention	Sufficient area to temporarily store for water quality treatment
	The water quality treatment event should half drain within 24hrs to provide adequate capacity for multi-event scenarios
	Minimum depth above groundwater table is 1m if unlined
	Overflow or Bypass for exceedence events to follow blue routes
Permeable Pavement – is acceptable on drives (on roads each application is to be referred to Highways Authority for assessment)	Porous sub-base to be structurally designed for site ground conditions and loading
	Temporary sub surface storage must provide infiltration and or controlled discharge
	Geotextile to provide filtration treatment on car parking
Geo Cellular structures – (on roads each application is to be referred to Highways Authority for assessment.)	Porous sub-base to structurally designed for site ground conditions and loading
	Temporary sub-surface storage must provide infiltration and or controlled discharge
	Access to remove silt from the structure should be part of the design

SuDS Approval

Evidence of drainage calculations should be provided in support of SuDS proposals, preferably in a format compatible with the Micro Drainage software package.
All documents must be provided electronically with a preference for drawings in Auto CAD, and maps in Mapinfo compatible formats to prevent delays with responding.
The following information will be required as part of an application:

1. Layout Plan

- All levels to be in metres Above Ordnance Datum (AOD)
- All co-ordinates to be to National Grid Referencing system (12 figure)
- A format which the council can read electronically suitable to be added to a GIS layer (the council uses Mapinfo)
- Layout plans with flood risk areas shown both before and after development

2. Site Investigation

- Location and type of ground investigations completed and interpretive report
- Depth to groundwater
- Identify environmentally sensitive receptors (groundwater abstractions, groundwater protection zone, aquifers etc)
- Identify areas of contamination (former landfill sites, mine workings & shafts, spoil heaps)

3. Hydraulic Report

- Greenfield runoff rates up to and including 1% (1 in 100 yr)
- Storage Volumes should be determined using the critical duration for the system, including tidal influence and high river levels in receiving watercourses / systems where appropriate
- Blockage scenarios will be required for channels and structures
- Climate change assessment should be undertaken to understand the performance of the system in the future,and all relevant calculations should be provided
- Water Butts should be included as full in all design calculations

4. Flow Routes and Control

- Exceedance flow routes through the site shown on a GIS layer
- Water levels for flow control devices and outfalls for the critical storm (30yr return period), & the exceedance event (100yr + 30% climate change) include tidal influence and high river levels in receiving watercourses / systems where appropriate
- Pollution control methods (both temporary and permanent)

5. Additional information

- Maintenance schedule and plan
- Identification of drainage route from the site to discharge point
- Construction handover reports
- Workmanship and material certification
- Location Information included in property deeds if SuDS are attached to a private property
- Adoption plan should include ownership details of all elements
- Costing compared with other methods of drainage where appropriate
- Provision for access to maintain via Easements
- Confirmation that all other consents and licences have been approved for example:
  - Approval in Principal (AIP)
  - Land Drainage Consent
  - Discharge Consents (water quality where appropriate)

SuDS Maintenance

North Somerset Council are currently considering their approach to adoption and requirements for adoptable sustainable drainage systems.

We expect access to be made available to inspect the construction of sustainable drainage systems and a fee might be payable for this. On priority or high risk sites bonds may be required before development starts. This will apply to both new development sites and redevelopment of existing sites. We will use the provisions under the Highways Act Section 38 and Section 106 of the Town and Country Planning Act 1990 (as amended) or CIL as a mechanism for securing funding contributions.

SuDS will be required to undergo an establishment period to ensure that the systems perform in accordance with the designs and to allow any 'green' elements within the system to establish themselves. This establishment period will be agreed as part of the planning process and could be as long as 12 months depending on the variety of the planting within the site. If during this period, any of the plants fail to flourish, the developer will be expected to replace these failed plants with new ones.

Requirements for adoption or information required where the system is maintained by others:

- Identify on a plan each SUDs element and where appropriate give dimensions and grid reference
- Built to National Standards (Draft standards published). (CIRIA 697 or revised document , BS8582)
- List SuDS elements that will be adopted and where elements are not adopted but maintained by others (private management company, private landowner), their details (name and contact details)
- Details of functional SuDS components on private land should be included in the properties deeds
- Provide copies of all other discharge consents and land drainage consents
- Provide details of points of access for maintenance and access agreements / easements as required
- Legal agreement for the handover of access rights where necessary
- Agreement that remedial work will be completed during the first year after completion by the developer
- Maintenance schedule (see local maintenance regime)

Whole Life Considerations

- The SuDS system must work effectively over the design life of the development
- Implementation is energy efficient for the life of the system
- Maintenance access easement agreements which allow easily maintained routes over the life of the system
- Contingency plans for failure of any part of the drainage system
- Ownership and contact details for structures and maintenance strips not adopted by NSC.

Maintenance cont'd

Long term maintenance of SuDS is as important as good design and a maintenance schedule which highlights the requirements of the system in terms of frequency of maintenance and replacement of components.

- Identification of points of access with a minimum width of 4 metres for maintenance purposes (within the IDB area the byelaw states 9 metres)
- A minimum of 5 metres grassed maintenance strip at the top of any watercourse bank must be free of trees or vegetation with no hard infrastructure such as fencing or bollards (within the IDB area the byelaw states 9 metres)
- How the SuDS will be maintained in a safe and efficient manner (must meet Health and Safety requirements)
- Detail of the maintenance regime and frequency of that maintenance for each element (both natural and engineered elements)
- Access to flow controls should be visible and accessible 24/7
- Easements on to private land to all SuDS which require maintenance will be included in plans and maintenance schedules

For example:

  - Grass Cutting
  - Jetting / Vacuum Sweep
  - Blockage Clearance
  - Landscape or Conservation maintenance
  - Structures
  - De-Silting
  - Soil Compaction
  - Litter Removal
  - Weed Control
  - Embankment maintenance
- Manufacturers guidelines for maintenance where appropriate (example pumps)

Local contact details

Drainage.Comments@n-somerset.gov.uk

Appendix

These tables give a guide to the types of SuDS and the benefits they can achieve on sites in terms of amenity, biodiversity and water quality.

Key to the following tables 1, 2 and 3

Green highlights the greatest benefits for amenity, biodiversity and water quality in each table, with Yellow for moderate and Red for no benefit.

^	Rainwater harvesting can be used in conjunction with positively drained sports pitches to capture water for re-use / irrigation of grassed pitches etc.
▲	Not Applicable
	Generally applicable
	Applicable only on / with buildings
*	Infiltration technique only viable if ground permeability is good.
~	Technique can use infiltration or if permeability is poor can be used for attenuation.
#	Broad leafed woodland provides control of surface water runoff in its own right during spring/summers/autumn if in leaf.
P	Prevention technique
S	Source control technique
CV	Conveyance technique
C	Control (site / regional) technique
A	Acceptable

Amenity Table 1

SuDS elements			Green space categories											
			Formal parks & public gardens	Community parks	Neiahbourhood open space	Woodland#	Conservation site	Green corridor	Allotments	Grassed-outdoor sports pitches	Synthetic-outdoor sports pitches	Golf course	Children's play area	Skate park
	P	Green roof	✓	✓	✓	Trees can be a form of SuDS effectively reducing runoff on developments	✓	✓	✓	✓	✓	✓	✓	✓
	P	Green wall	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
	P	Soakaway*	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
	P	Rainwater harvesting	✓	✓	✓		✓	✓	✓	✓^	✓^	✓	✓	✓
	P	Rain garden	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
	S	Permeable pavement~	▲	▲	▲		▲	▲	▲	✓	✓	▲	✓	✓
	S/C	Geocellular / modular systems~	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
	CV	Channels & rills	✓	✓	✓		✓	✓	✓	▲	▲	✓	▲	▲
	S/C	Bio-retention	✓	✓	✓		✓	✓	✓	▲	▲	✓	▲	▲
	S/C V	Infiltration trench~	✓	✓	✓		✓	✓	✓	▲	▲	✓	▲	▲
	S/C V	Filter strip~	✓	✓	✓		✓	✓	✓	▲	▲	✓	▲	▲
	S/C V	Filter drain~	✓	✓	✓		✓	✓	✓	▲	▲	✓	▲	▲
	S/C V	Swale	✓	✓	✓		✓	✓	✓	▲	▲	✓	▲	▲
	S/C V	Trench trough	✓	✓	✓		✓	✓	✓	▲	▲	✓	▲	▲
	C	Detention basin	✓	✓	✓		✓	▲	▲	▲	▲	✓	▲	▲
	C	Wetland	✓	✓	✓		✓	▲	▲	▲	▲	✓	▲	▲
	C	Retention pond	✓	✓	✓		✓	▲	▲	▲	▲	✓	▲	▲

Biodiversity Table 2

SuDS elements	Biodiversity categories: native plants wildflower meadows	grassland	habitat for invertebrates, reptiles and amphibians	Woodland#	foraging area for birds and wildlife	Green corridor	plants and animals require ephemeral water bodies as part of their lifecycle	wet woodland, reed bed, open water and wet grassland
Green roof	✓	▲	✓	▲	✓	✓	✓	✓
Green wall	✓	✓	✓	▲	✓	✓	✓	✓
Soakaway*	✓	✓	✓	▲	▲	▲	▲	▲
Rainwater harvesting	▲	▲	▲	▲	▲	▲	▲	▲
Rain garden	✓	✓	✓	▲	✓	✓	▲	▲
Permeable pavement~	▲	▲	▲	▲	▲	▲	▲	▲
Geocellular / modular systems~	▲	▲	▲	▲	▲	▲	▲	▲
Channels & rills	✓	✓	✓	▲	✓	✓	✓	✓
Bio-retention	✓	✓	✓	▲	✓	✓	▲	▲
Infiltration trench~	✓	✓	✓	▲	✓	▲	▲	▲
Filter strip~	✓	✓	✓	▲	▲	▲	▲	▲
Filter drain~	✓	✓	✓	▲	▲	▲	▲	▲
Swale	✓	✓	✓	▲	✓	✓	✓	▲
Trench trough	✓	✓	✓	▲	✓	✓	▲	▲
Detention basin	✓	✓	✓	✓	✓	✓	▲	▲
Wetland	✓	✓	✓	✓	✓	✓	✓	✓
Retention pond	✓	✓	✓	✓	✓	✓	✓	✓

Water Quality Table 3

		SuDS technique														
		Source (includes prevention)						Conveyance						Control (site & regional)		
		Green roofs	Green walls	Soakaway	Rain gardens	Permeable pavement	Geocellularsystem (Infiltration)	Bio-retention	Infiltration trench	Filter strip	Filter drain	Swale	Trench trough	Detention basin	Retention pond	Wetland
Site size	2 dwellings - 0.2ha	✓	✓	✓	✓	✓	A	A	A	A	A	A	A	✗	✗	✗
	0.2 - 1 ha	✓	✓	✓	✓	✓	✓	✓	A	A	A	A	A	A	A	✗
	1.1 - 5 ha	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	A	A	A
	5.1 - 10 ha	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	A
	>10 ha	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Portishead Wetland and Attenuation Pond (photograph from NSC)