The Benefit of Geological Data for Developers: Sustainable Drainage

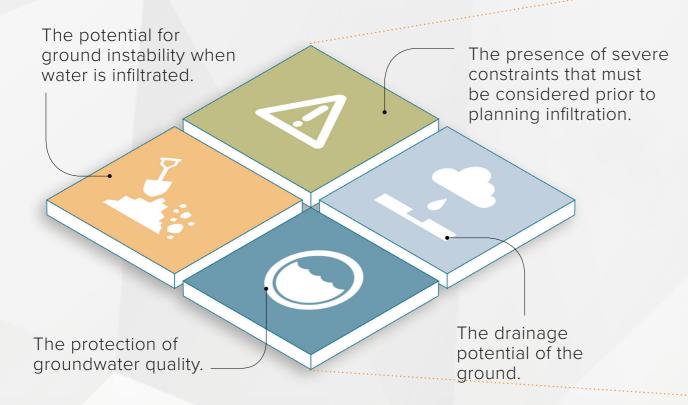
BRITISH GEOLOGICAL SURVEY INFILTRATION SUDS MAP DATA SETS:

- Infiltration constraints
- Drainage Potential
- Ground stability
- Groundwater protection

See reverse of this poster for more information.

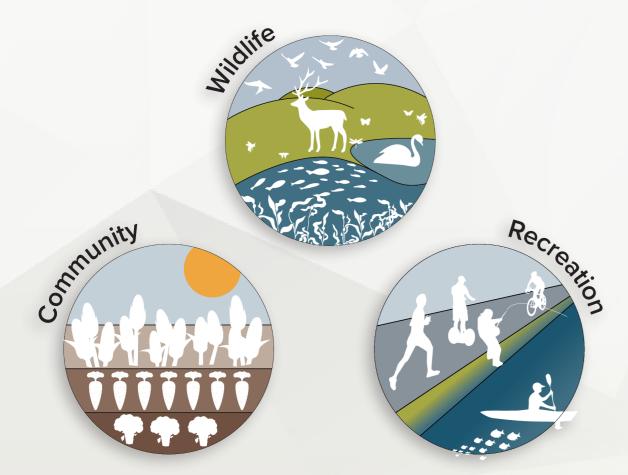
A TOOL FOR THE PLANNING & DESIGN OF SUSTAINABLE URBAN DRAINAGE SYSTEMS (SuDS):

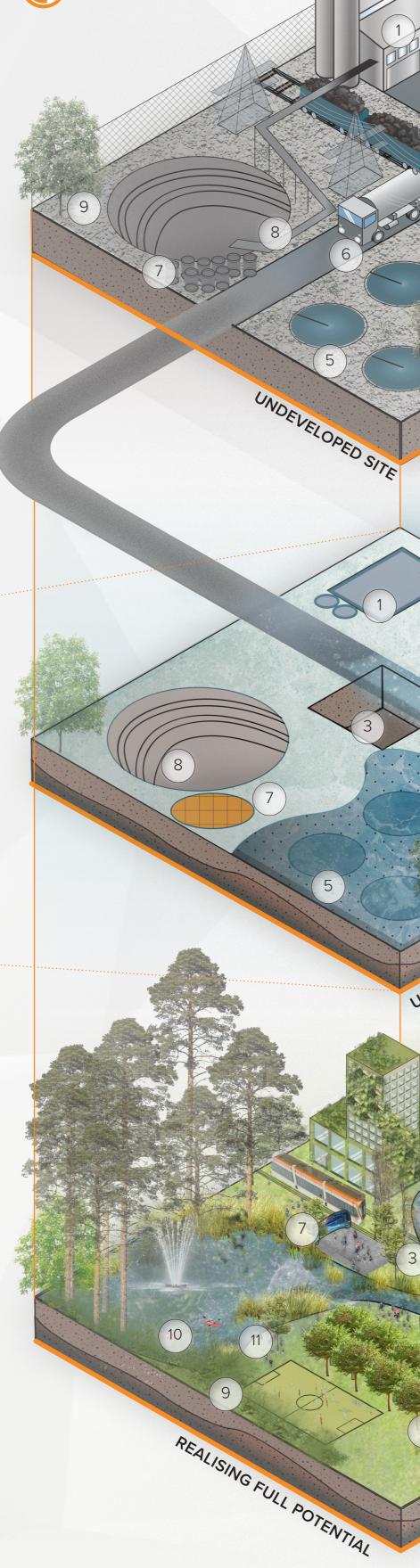
The BGS Infiltration SuDS Map provides a preliminary indication of the suitability of the ground for infiltration SuDS, including soakaways, infiltration basins, infiltration trenches and permeable pavements. The selection and design of an appropriate system depends on the properties of the ground and in particular the following four factors:



OPPORTUNITIES FOR DEVELOPERS & ADDED VALUE:

Early thought and due diligence relating to a site's ground conditions can unlock a wealth of opportunities, increasing the appeal of a development and benefiting both people and the environment.





UNCOVER OPPORTUNITIES & CONSTRAINTS

EXAMPLE SCENARIO:





- 1. Industrial facility / building.
- Industrial transport infrastructure.
- 3. Storage heap.
- 4. Overhead power lines.
- 5. Water treatment area.
- 6. Road network.
- 7. Chemical storage area.
- 8. Mineral / aggregate extraction.
- 9. Existing natural features e.g. Trees, Ponds

UNDERSTANDING THE GROUND CONDITIONS:

- 1. The existence of previous buildings & structures.
- 2. Retention of desirable existing features.
- 3. Details of the grounds permeability.
- 4. Details of ground stability and possible contamination.
- 5. Definition of groundwater protection zones.
- Determine the groundwater level, and identify flood risk/ flood zones
- 7. Reveal site specific data relating to local ground conditions & drainage capabilities.
- 8. Reveal any areas of made ground.

USING THE DATA TO INFORM DECISIONS:

- Opportunities for green developments. Incorporating SuDS, green roofs, green walls & renewable energy production.
- Utilisation of natural systems & habitats, such as rivers and wetlands for integrated water management.
- Adopt sustainable modes of transport.
- Optimal placement of renewable energy sources, such as solar, wind and ground source heat pumps.
- 5. Development of sustainable new communities, with integrated SuDS and amenity spaces away from high risk areas.
- 6. Ideal location of community spaces, services and assets.

- Utilising natural environments to create high quality green spaces suitable for recreation and habitat creation, and reduced flood risk.
- Facilitation of food production, such as community orchards or urban farms where land quality is favourable.
- Unlock new opportunities for sport and recreation, & establish the most suitable locations.
- 10. Creating site specific opportunities for leisure, recreation and environmental enhancement.
- General reduction in flood risk/enhanced water management.

BRITISH GEOLOGICAL SURVEY INFILTRATION SUDS MAP:

The BGS Infiltration SuDS map assists those involved in the design of the sustainable drainage system by identifying various properties of the ground that influence the design of an appropriate system. It is also intended to support those at local authorities who approve planning applications. The map provides advice for developers about whether, based on the ground conditions, infiltration SuDS are likely to be suitable on site, whether infiltration tests are advisable, and whether other forms of SuDS should be considered such as swales or retention ponds.

The BGS Infiltration SuDS map is a decision support tool that addresses the following factors:

- 1. The presence of severe constraints that must be considered prior to planning infiltration
- 2. The drainage potential of the ground
- 3. The potential for ground instability when water is infiltrated
- 4. The protection of groundwater quality

The dataset is structured using the above four factors, and allows consideration of the ground permeability, the depth to groundwater, the presence of geological floodplain deposits, the presence of artificial ground, ground stability (soluble rocks, collapsible ground, compressible ground, running sand, shallow mining, landslide and shrinkswell clays), potential for pollutant attenuation and the Environment Agency's source protection zones.

The infiltration SuDS map helps developers to identify any serious constraints that may prevent infiltration SuDS being installed, and addresses questions such as: Will infiltration SuDS increase flood risk, mobilise potential contaminants or increase ground instability as a result of infiltrating surface water to the ground? For more information about Infiltration SuDS refer to BGS's User Guide for the Infiltration SuDS Map: Summary

The BGS Infiltration SuDS map is available as a suite of licensed data layers in GIS format, and is also available via subscription through web services and online map viewers. A SuDS report for specific sites is also available through the BGS GeoReport service. More information about BGS SuDS data and services can found on the BGS website : www.bgs.ac.uk/products

SUSTAINABLE URBAN DRAINAGE SYSTEMS (SuDS):

There are various types of SuDS which could be employed in a scheme - some are designed to increase water infiltration, while others store water. The suitability of a site to support these systems needs to be determined at the earliest opportunity to avoid costly implications later in the development process.

Possible interventions / examples include:

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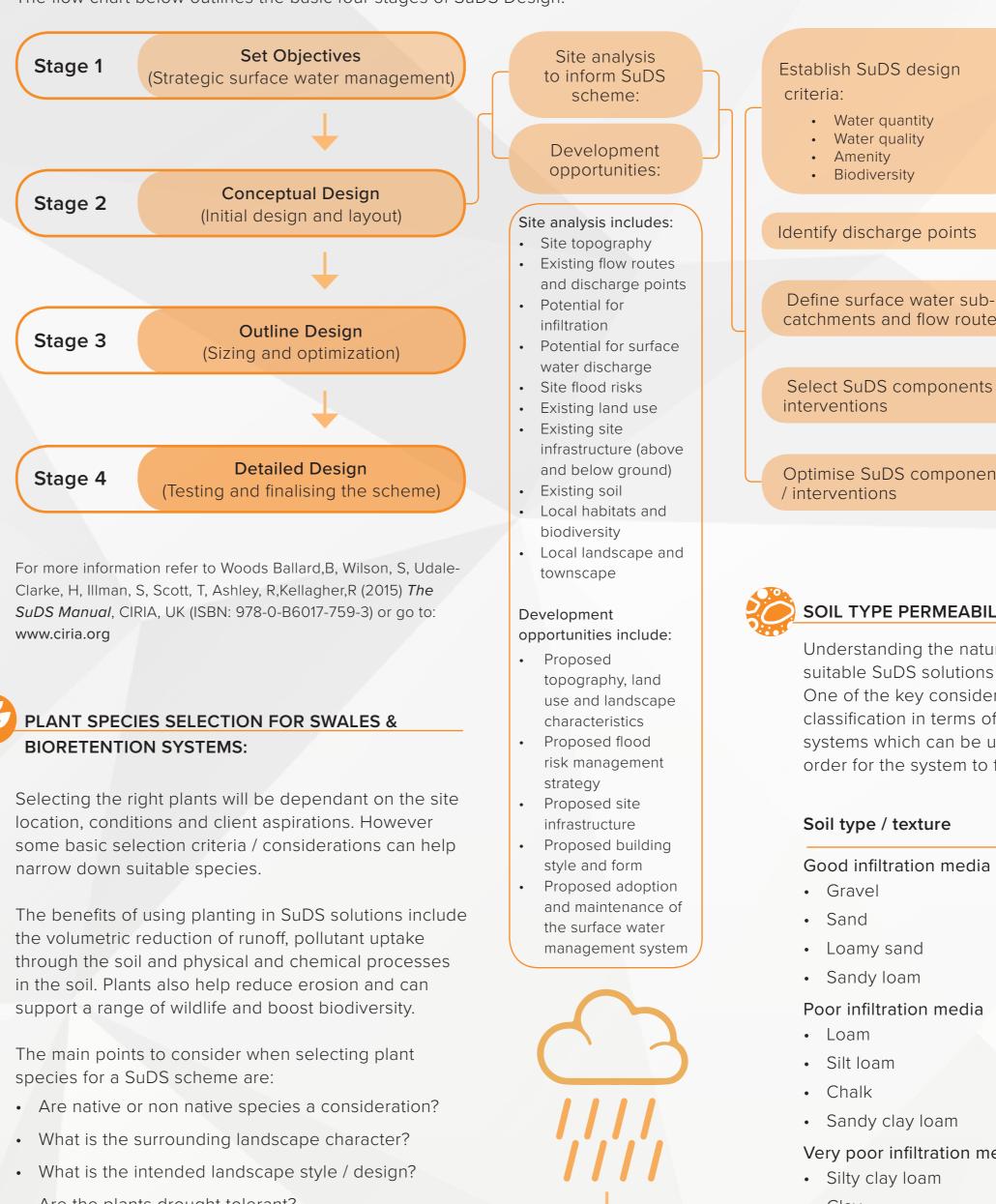
- Rainwater harvesting systems
- Green roofs
- Infiltration systems
- Proprietary treatment systems
- Filter strips
- Filter drains
- Swales
- Bioretention systems
- Trees
- Pervious pavements
- Attenuation storage tanks
- Detention basins
- Ponds and wetlands

| Infiltration SuDS | Storage Capacity | Infiltration Surface Area | Land-take Need | Pollution Attenuation | Amenity Value |
|----------------------|------------------|---------------------------|----------------|-----------------------|---------------|
| Infiltration Basin | н | M-H | н | М-Н | н |
| Infiltration Drain | м | м | L-H | L | L |
| Permeable Pavement | L-H | L-H | н | н | М |
| Soakaway | L-M | L-M | L | L-M | L |
| Ponds & Wetlands | М | M-H | н | M-H | н |

THE FOUR STAGES OF SuDS DESIGN:

The process of designing SuDS should begin at the earliest opportunity in a project life cycle, ideally before the land is purchased and well before site feasibility studies commence. Where SuDS form part of the overall development vision, character and layout of a scheme a more holistic multi-layered scheme can begin to emerge. These schemes provide added value for the developer and the intended end user, not to mention numerous environmental benefits.

The flow chart below outlines the basic four stages of SuDS Design:



- Are the plants drought tolerant?
- Are the plants tolerant of occasional inundation of water / ground saturation?
- Are the plants tolerant of free drainage soils?
- What is the availability of a particular plant in local nurseries?
- Is the plant tolerant of a particular pollutant?
- What is the porosity of the ground?

Consideration should also be given to the maintenance requirements for any plant type. Specialist guidance should be sought by a suitably qualified Landscape Architect when developing a site specific planting palette for a SuDS project.



catchments and flow routes Select SuDS components / interventions Optimise SuDS components / interventions

CONTACT DETAILS:

For more details about any of the information included on this poster please contact Urben:

Email: suds@urbenstudio.com Web: www.urbenstudio.com

Urben provide services in Landscape Architecture, Urban Design & Planning, all of which are crucial for the successful integration of SuDS into a development.

For more information about the work British Geological Survey do and how they can support developers with their research and specialist

knowledge go to:



www.bgs.ac.uk

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"Geoscience & Landscape Architecture coming together to inform the design of Sustainable Urban Drainage Systems for the benefit of people, businesses & the environment."

SOIL TYPE PERMEABILITY CLASSIFICATION:

Understanding the nature of the ground conditions on a site is imperative if suitable SuDS solutions are to be developed and successfully implemented One of the key considerations relates to the soil type, and specifically it's classification in terms of permeability. As this can effect the type of SuDS systems which can be used, or identify specific adjustments to the design in order for the system to function correctly.

| Soil type / texture | ISO 14688-1 description (System used by Geotechnical Engineers) | | | |
|-------------------------------------|---|--|--|--|
| Good infiltration media | | | | |
| • Gravel | Sandy GRAVEL | | | |
| • Sand | Slightly silty slightly clayey SAND | | | |
| Loamy sand | Silty slightly clayey SAND | | | |
| Sandy loam | Silty clayey SAND | | | |
| Poor infiltration media | | | | |
| • Loam | Very silty clayey SAND | | | |
| • Silt loam | Very sandy clayey SILT | | | |
| • Chalk | N/A | | | |
| Sandy clay loam | Very clayey silty SAND | | | |
| Very poor infiltration media | | | | |
| Silty clay loam | - | | | |
| • Clay | - | | | |
| • Till | Can be any texture of soil described above | | | |

Soil samples and field tests should always be undertaken to determine the infiltration coefficients, as this will inform the design process.

Soil texture classification: BETTES,R (1996) Infiltration drainage - manual of good practice, R156, CIRIA, UK (ISBN:978-0-86017-457-8). Go to: www.ciria.org

There are a number of online calculators which can help you calculate run off rates for a particular site, go to http://www.ukSuDS.com/drainage-calculationtools/greenfield-runoff-rate-estimation for more information.

Attenuation

SUDS

Infiltration