



Rialtas na hÉireann
Government of Ireland

NTA
Údarás Náisiúnta Iompair
National Transport Authority



Greening and Nature-based SuDS for Active Travel Schemes

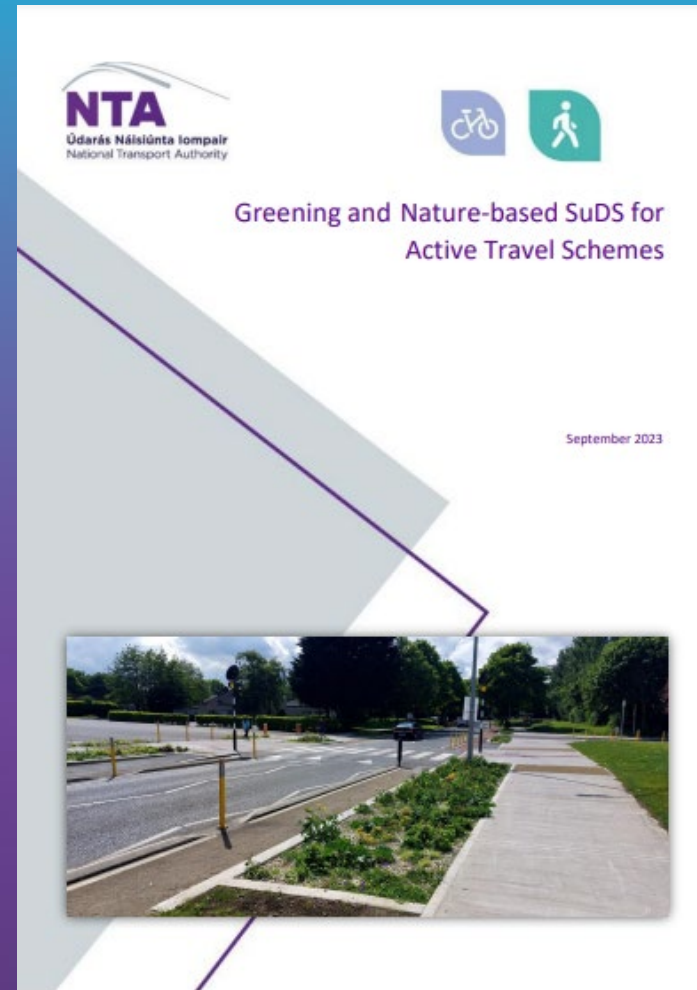
26th October 2023



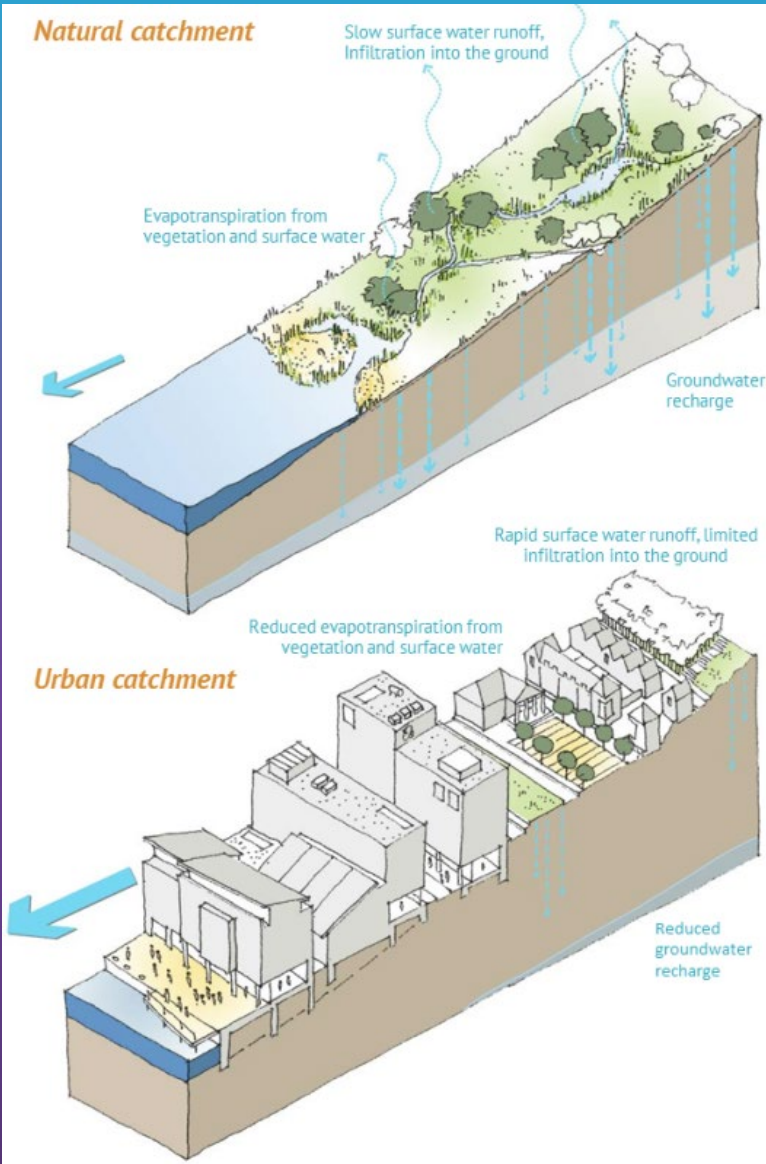
Key Objectives of the Advice Note

Developed a note that provides:

- Guidance on ways Greening and Nature Based Sustainable Urban Drainage Systems (SuDS) can be implemented and retro fitted;
- A well-structured advice note that promotes the use of SuDS interventions; and
- Simplifies the decision-making process; while,
- Trying to demystify the language in other engineering guides.



What is a Sustainable urban Drainage System (SuDS)



Traditional urban drainage systems “Hard Engineering Solutions”

Rainwater collection - conveyance - outfall
(Gullies to pipes to river)

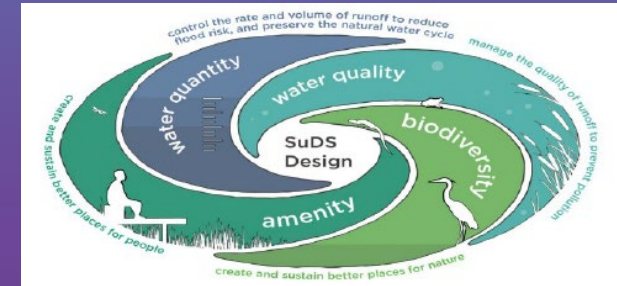
These urban drainage systems are now being challenged with urban expansion and climate change, i.e., Flooding, poor water quality and removal of amenity and biodiversity.

Sustainable Drainage Systems

Basically, means mimicking how nature manages drainage.

Nature does it best by

- Managing rainfall, close to where it falls;
- it slows conveyance of run-off to watercourses/ rivers;
- it allows for attenuation (flood plains), which allows for;
- infiltration, evaporation from surface water and through vegetation.



Delivering Greening and SuDS Interventions

- It must be acknowledged that delivering SuDS can be challenging.
- Our Industry, our Local Authorities, and our communities are still learning and adapting to the changing pressures of urbanisation, the introduction of active travel scheme and general culture change.
- Utilising very simple and hopefully cost-effective techniques in Active Travel schemes will support climate resilience while also adding amenity value and character to our streets, towns and cities.
- Nature-based SuDS in the public environment is just becoming mainstream. As such as each new feature is introduced it will be slightly different from the last, as we constantly learn, innovate, and improve with each new project.



Remember, any feature will provide a betterment over the existing condition, and this should provide confidence to anyone proposing or designing SuDS for the first time.



SuDS features considered in the Advice Note

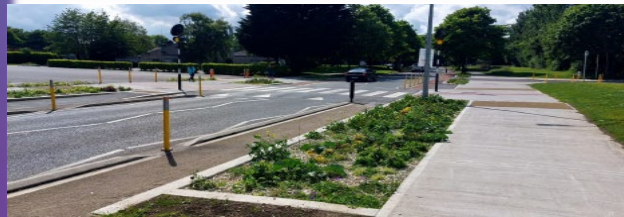
- Above Ground Planters;



- Protecting Existing Green Space and Providing New



- Rain Gardens (Bioretention System)



- Bioswales (Raingarden on a Slope)



- SuDS Tree Pits



Above Ground Planters



Key Considerations

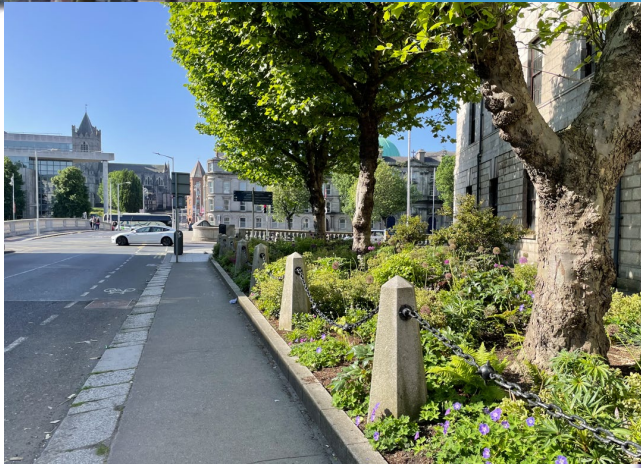
- Familiar, tried and tested technique.
- Typically sit or are fixed on top of reallocated carriageway space, footpaths or any available permissible space.
- They are mobile and can be relocated to respond to the changing demands of a space over time.
- Can be used to delineate parklets to protect cycle facilities and can be used as modal filters.
- Easier to replant and maintain as they sit taller in the streetscape.
- They bring seasonal life and vitality to the spaces they occupy, offering a home for insects and small creatures.

Challenges	Solutions
Availability of Space	Are relatively flexible and can be designed to fit in a range of spaces.
Anti-Social Behaviour	Planters should be designed so they cannot be manually pushed over. Utilise heavy planting medium to deter interference.
Impact on Visibility Splays	Planters should be placed away from the road edge where possible.
Maintenance	Regular maintenance to include plant replacement, irrigation requirements, weeding, debris and litter control.

Protect and enhance existing green space and delivering new



Chancery Place, Dublin 2017



Chancery Place, Dublin 2023



Dunkettle to Carrigtwohill (Killahora) 2019



Dunkettle to Carrigtwohill Cycleway 2021

Considerations

- Existing green space should be protected where possible, a simple strategy which helps to reduce surface water run-off.
- Consideration should be made to provide more space when initially appraising options for the project.
- Contributes positively to biodiversity and amenity and have a beneficial impact in terms of surface water quality and quantity.

Challenges	Solutions
Availability of Space	It will not always be possible to protect existing green space or provide new, but it should be prioritised wherever possible. Engagement with landscape architects at an early stage may identify opportunities that had not otherwise been considered.
Protecting Existing Trees	No dig solutions can be utilised to protect tree roots enabling delivery of hard surfaces within tree root zones without harming the tree.

Rain Gardens

Rain gardens are areas of engineered planting that sit slightly lower than the level of the adjacent ground.

The principles of a rain garden are very simple;

1. Rainwater runs off hard surfaces into the rain garden;
2. The water filters through the soil and drainage layer;
3. Water infiltrates into the ground (where ground conditions permit); and
4. Water evaporates into the air from the soil or plants.



Raingardens can be provided within the existing carriageway



Existing verges can be repurposed as rain gardens



Rain gardens can be introduced at buildouts
(Low Level Select planting)



New cycle track on carriageway, existing verge repurposed
(Could be incorporated as part of new CDM buffer requirements)

Key Design Considerations

- Location and Size;
- Infiltration to ground or connection to surface water drain; (*Guidance for basic infiltration testing provided in advice note*)
- Utilities – diversion or design rain garden as required;
- Planting, plant types and engineered soil depth;
- Drainage layers and separation layers (geotextiles);
- Edgings and retention of existing carriageway; and,
- Inlets and Overflows.

Rain Gardens cont'd



Pollerton Road/Green Lane,
Co. Carlow



Rock Road, Co. Dublin



Challenges	Solutions
Availability of Space	Rain Gardens of any size will have a positive impact, although the bigger the better.
Topography	Rain gardens should be located where rainwater will drain into them. This can be straightforwardly achieved in most instances by placing them at or around existing gullies. Rain Gardens are ideal for flatter sites, for steeper then bioswales (rain gardens with small weirs) can be used to manage and slow flows.
Existing Utilities	Early record gathering and consultation with utility providers is key to understanding the location of existing utilities and designing a rain gardens. Remember rain gardens can be adapted to avoid these below ground constraints.
Ground Conditions	Where ground conditions are not suitable for infiltration a rain garden can still be designed but with the provision of an underdrain and connection to a surface water drain.

Bioswales (Rain Garden on a Slope)



A Bioswale is a vegetated shallow landscape depressions, designed to capture, treat, and infiltrate surface water runoff as it moves downstream.

- A bioswale can employed where there is a significant fall along the length of the street and there is sufficient space to create a longer feature.
- A valley can be created within the soil and planting which can channel water across the planted surface to a desired location.
- To protect against erosion due to faster flowing water (due to gradient) a gravel base to the bottom of the channel and small check dams (or weirs) provided.
- These dams reduce the rate of flow along the channel but also retain water within the feature allowing sediment to settle and water to filter through the soils.

Challenges	Solutions
Topography	Bioswales, similar to rain gardens should be located where run-off will drain into them. Where there is a slope (no greater than 1:20), incorporating check dams will aid in slowing the flow of water.
Ground Conditions	Where ground conditions are not suitable for infiltration a rain garden can still be designed but with the provision of an underdrain and connection to a surface water drain.



Grey to Green, West Bar Sheffield
(image credit Nigel Dunnett)

SuDS Tree Pits



SuDS tree pits are constructed to increase attenuation of Surface Water by exploiting the natural void within the tree soil rooting zone contained within an underground tree pit.

- The Introduction of a tree requires an increased depth of excavation.
- Consideration as to the structural performance of the soils where they fall within the structural zone of influence of the road pavements.
- Tree pits can either be constructed using structural soils which would support the adjacent road pavement or deep concrete retaining features can be installed between the tree pit and the carriageway. Either solution can be expensive.

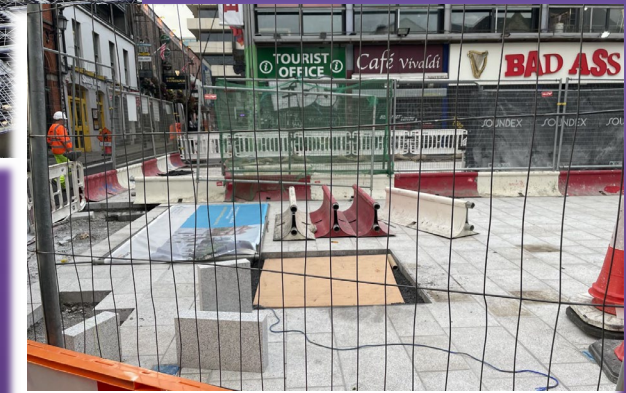
Challenges	Solutions
Availability of Space	The ideal soil volume for a tree pit will be dependent on the species of tree as such it will often be possible to select trees to suit the specific conditions and below ground constraints. The link to the GreenBlueUrban - Soil Volume will aid designers in initial estimates.
Structural Performance	As the tree pit and soils will need to be deeper than the adjacent pavement the structure consideration should be given to ensuring that the road is properly supported. Structural soils can be utilised which have low organic content or interlocking stone
Root Protection	Root barrier systems should be utilised to control the direction of root growth and mitigate the risk of damage to adjacent structures and utilities.

Other SuDS Features

The advice note mainly focuses on lower cost “opportunistic” SuDS interventions; however, it does cover other potential features that could be adopted which can provide enhanced benefits in terms of surface water management.

These include:

- Tree pit with Stockholm System for use in incorporating trees in urban/hard landscaping.
- Tree pit with proprietary crate system
- Engineered bio-retention systems - Rain gardens in conjunction with flow controls, Could be implemented on long liner active travel schemes.
- Permeable Paving
- Reinforced grass
- Permeable asphalt



Enabling SuDS to Thrive

Section 4 of the Advice Note provides guidance and information on what helps and enables SuDS devices to thrive and flourish from a planting and landscape point of view.



This guidance will aid designers to better understand the importance of soil type selection and depths, the planting objectives for the device, plant specifications and plant typologies, potential tree selection and tree pit size.

For general scheme designers this section of the report provides an insight into the importance of material selection, but advice from a qualified landscape architect will be required based on specific objectives of each SuDS device, location and environment of the scheme.

Maintenance Requirements

Operation and maintenance requirements for bioretention systems		
Maintenance Schedule	Required Action	Typical Frequency
Regular Inspections	Inspect infiltration surfaces for silting and ponding, record de-watering time of the facility and assess standing water levels in underdrain (if appropriate) to determine if maintenance is necessary.	Quarterly
	Check operation of underdrains by inspection of flows after rain.	Annually
	Assess plants for disease infection, poor growth, invasive species etc. and replace as necessary.	Quarterly
	Inspect inlets and outlets for blockage.	Quarterly
Regular maintenance	Remove litter and surface debris and weeds.	Quarterly (or more frequently for tidiness or aesthetic reasons)
	Replace any plants, to maintain planting density.	As required
	Remove sediment, litter, and debris build-up from around inlets or from forebays.	Quarterly or biannually
Occasional maintenance	Infill any holes or scour in the filter medium, improve erosion protection if required	As required - (review biannually or after significant storm events)
	Repair minor accumulations of silt by raking away surface mulch, scarifying surface medium and replacing mulch	As required - (review biannually or after significant storm events)
Remedial actions	Remove and replace soils and vegetation above.	As required but likely to be > 20 years

Community Engagement

The additional of greening and SuDS features to schemes will provide benefits for a Local Community, and to the public this will a more attractive environment. In some instances, retrofitting proposals may need to remove parking spaces, grass verges or could be introducing traffic calming using SuDS devices. Nearly always the initial reaction to proposals is hesitation or negativity, therefore it is important to explain the benefits of Greening and Nature Based SuDS devices in advance of introducing planters, rain gardens or other features into local streets.



With community support from the outset, it is more likely that;

- the local community will feel a sense of ownership;
- Experience shows this ownership has led to formal (TidyTowns) or informal community groups being established;
- These groups contribute to maintenance of the planting and undertaking more straightforward tasks like removing litter and weeds.

Discussion groups/workshops should be considered, if possible, to involve the community and share proposals.

This also provides communities an opportunity to share their feedback and offers participants a sense of comfort and that their thoughts and suggestions are being heard.

Thank You

