Rain gardens for the Day Brook, UK

Year of issue

2025

Summary

A rain garden was installed along the verges of a residential road in Nottingham, England. The purpose of the rain garden was to control the rate of runoff and water quality reaching the downstream watercourse (Day Brook).

A total of 21 linear rain gardens were constructed within the grass verge of Ribblesdale Road, to manage surface water run off within the catchment of Day Brook. Water contained within the gardens soaks away rather than entering the local surface water sewer which flows to the Day Brook. Construction was completed in May 2013.

The Nottingham rain gardens reduced surface water runoff by up to 30%. They help lower local flood risk, reduce combined sewer overflow, and improve water quality through filtration. Over 150 rain gardens were installed, enhancing biodiversity, creating attractive green space, and supporting pollinators. Maintenance costs are low and community feedback has been positive. The project also contributes to climate resilience and urban cooling.

Photo Gallery





Location

52.992004, -1.142012

Project

NWRM

National ID

United Kingdom_04

Sector

Urban

Installation Date

2013

Implementation status

Completed

Contact

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Overview

Location of the project

The case study is located in a central part of the United Kingdom, in Nottingham city. It is in a heavily urbanised area, at an altitude of approximately 50m AOD.

Country

United Kingdom

NUTS2 Code

Derbyshire and Nottinghamshire

Sponge measures implemented in the case study

Rain Gardens

Objectives

Document/assess rain-garden retrofit in a live highway.
Maximise interception, attenuation, infiltration of ~5,500 m² highway runoff.
Manage 1:30-year events; treat first flush.
Reduce sewer peaks (~33% in 1-year storm, modelled).
Engage residents; enable ongoing evaluation (data logger).

Involved partners

Authority type	Authority name	Authority role	Comments	Authority responsibility
National water authority	Environment Agency	Financing	Financial; guidance and ongoing evaluation	Responsible
Local water authority	Nottingham City Council	Determination of design details of the measure	Construction; Design and ongoing maintenance	Responsible
Other	Groundwork Greater Nottingham	Implementation	Design; Implementation and community liaison	Responsible

Authority type	Authority name	Authority role	Comments	Authority responsibility
Architects / Engineers	Severn Trent Water	Other	Post construction modelling	Supporting

Site Information

Climate Zone

Cool temperate moist

Temperature (°C)

10.10 °C

Elevation range

57 m

Slope range

1-2%

Soil type

Gleysols

Vegetation class

Local streetscape: amenity grass verges with mature street trees; rain gardens planted with Stipa (Anemanthele), Carex ‘Evergold’, Miscanthus ‘Yakushima Dwarf’, Festuca ‘Blue Fox’. Along the Day Brook corridor nearby, meadows/ponds/wetland habitats were created in Valley Road Park.

WFD Ecological status

Moderate

WFD Chemical status

Good

Water quality status

There was poor water quality within Day Brook, due in part to numerous sources of diffuse pollution from an extensive urban catchment.

Design and Implementation

Project scale

Micro

Project scale specifications

Site-specific retrofit on a single residential street (Ribblesdale Road) treating ~5,500 m² of highway runoff via 21 rain gardens (148 m²).

Project area

0.55

Project area specifications

The catchment area of the rain gardens is 0.55 ha

Size

148.00

Size unit

m2

Basis of design

The scheme was designed to manage surface water runoff from a 1:30 year event

Principles

The primary principle was to ensure effectiveness in managing downstream water quality and flooding. As part of this, aesthetic benefits were an important consideration, to ensure no loss of the green areas already limited within the urban environment. Part of the purpose of this pilot study was to understand the public perception and acceptability of rain gardens.

Constraints

The available space on the grass verges and budget available were key considerations in the selection of Rain Gardens over other schemes considered such as tree pits or permeable paving. Groundwork undertook a scoping/ feasibility study to consider the options but there is no available documented information.
The original plan for this scheme was to collect runoff from a surface area of 7100 m2, however only 5500m2 was incorporated into the scheme due to restrictions from underground services and a number of mature trees clustered in one section of Ribblesdale Road.
Proprietary water attenuation cells were key to the initial design as they provide significantly higher void space capacity than clean stone. However, budget contraints meant that use of proprietary cells was reduced and replaced by stone fill in a number of gardens.

Favourable preconditions

The availability of the existing grass verge with occasional mature trees along the entire length of the road, allowed the effective implementation and operation of the rain gardens.

Financing

Total cost

78921.00 €

Costs land acquisition information

No land aquisition.

Costs operation maintenance information

There are maintenance costs accociated with the scheme, but anticipated to be less than the original maintenance costs of the grass verges.

Costs maintenance information

Maintenance is now undertaken by Nottingham City Council.
NWRM measures were designed to be minimal maintenance. To ensure fully operational inlets will occasionally need to be cleared and vegetaion maintained.

Administrative annual cost information

Some monitoring is undertaken but no indication of costs has been obtained.

Financing authorities

Authority name	Type of funding
Environment Agency	National funds
Nottingham City Council	Local funds

Compensations

No

Policy and Governance

Policy description

Within the highly urbanised area of Nottingham City, a total of 972 properties fall within the Day Brook floodplain, with previous fluvial events leading to property flooding downstream. Ribblesdale Road is parallel to some of the upper reaches of Day Brook, a heavily modified watercourse that has poor water quality due in part to numerous sources of diffuse pollution from the extensive urban catchment. A pilot study was implemented that reduced the volume of surface water flowing to urban drainage systems from the existing highway setting, reducing the volume of surface water flowing to urban watercourses.

Land ownership

Highway verge of an adopted public road; owned/managed by Nottingham City Council as the Local Highway Authority. Ongoing maintenance by NCC Street Cleansing.

Policy targets

Runoff control

Peak-flow reduction

Increase Water Storage

Target remarks

The primary aim was to prove that a retro fitting project can work within an urban environment and that rain gardens can be effective in managing surface water from public highways.

Policy pressure

Directive	Relevant pressure
WFD identified pressure	Diffuse - Urban runoff - Storm overflows and discharges in urbanized areas not identified as point sources
Floods Directive identified pressure	Natural Exceedence - Flooding of land by waters exceeding the capacity of their carrying channel or the level of adjacent lands.

Policy impact

Directive	Relevant impact
Other non-EU	Property - Adverse consequences to property and businesses.
WFD identified pressure	Waterbody Status - Adverse consequences to ecological or chemical status of surface water bodies as of concern under the WFD.

Requirement directive

Requirement directive	Specification

Floods Directive-mitigating Flood Risk	Address risk of flooding to local and downstream properties.
WFD-mitigation of significant pressure	Address effects of diffuse pollution from urban catchment.

Policy challenges requirements

Urban diffuse pollution programme across the region

Part of a wider plan

No

Public consultation

Yes

Consultation activities

Activity stage	Activity type	Comments
Design phase	Local residents involvment in design	Participation from local residents in the design and future management of the rain gardens.
Other	Follow up survey	Post implimentation survey

Has contractual arrangements

No

Impacts and Monitoring

Monitoring System

Monitoring parameters

A data logger was installed beneath two of the rain gardens, which allows continuous water depth recording. This monitoring has taken place between May 2013 and September 2014.

Maintenance

Maintenance requirements

Maintenance is undertaken by Nottingham City Council. Annual trim of vegetation, occasional mulching and clearing of the inlet.

Impact Assessment Methodology

Performance impact assessment method

Laboratory

Performance impact estimation information

Continuous water level monitoring is allowing a short period of data to be collected post-implementation, and will allow future monitoring of any variation in rain garden performance.

InfoWorks CS 2D modelling has been undertaken since implementation, to model the anticipated reduction in the flow reaching the sewer based on the data logger information.

Cost assessment method

A Survey was undertaken of local residents following implementation to understand opinions and acceptance of rain gardens since construction.

Socio-economic Impacts

Direct benefits information

The use of rain gardens in a predominantly urban landscape provides a cost effective and adaptable means to reduce flood risk, while providing aesthetic value to highly populated area.

Biophysical impacts: Hydrology

Hydrological effects

The rain gardens reduce surface runoff, enhance infiltration, support groundwater recharge, and increase evapotranspiration. They slow flow, store water temporarily, and lessen sewer overflow and flood risks.

Information on retained water

Verified capture/infiltration and reduced downstream load; ~33% reduction in flow to sewer for a 1-year storm (modelled); design to manage up to 1:30-year events; overflow to gullies for exceedance.

Information on increased water storage

No storage previously

Runoff reduction

33.00

Runoff reduction unit

% Percent

Information on runoff reduction

Increased water storage will provide additional capacity to retain and efficiently remove run off from highways, and infiltrate to ground. This will reduce the volume of water reaching the local sewer and Day Brook. Modelled 33% reduction in flow reaching the sewer for 1 in 1 year event

Information on peak flow reduction

The storage capacity of the rain gardens will result in reduced peak flows reaching the local sewer, as water will be slowed and contained in the gardens.

Ecosystem water supply

0

Information on ecosystem flood control volume

Reducing the volume of water reaching the Day Brook in rainfall events will reduce flood risk to downstream homes and businesses. The reduction in flows reaching the sewer will reduce risk of localised sewer flooding.

Ecosystem flood control return periods

n/a

Information on reducing flood risks quantity

Qualitative benefits: the rain gardens provided visible reductions in standing water during storms and improved drainage response time.

Biophysical impacts: Biodiversity

Improved biodiversity

Yes

Information on improved biodiversity

The Landscape Institute case study notes that the planting attracted bees and insects, enhancing biodiversity in a heavily urbanised environment.

Biophysical impacts: Water & Soil Quality

Water quality overall improvements

N/A info

Information on water quality overall

Rain gardens are designed to always intercept and treat the, often more polluted, first flush of highway runoff, ensuring this polluted water does not reach the Day Brook or the local sewer. However there is no available data for the quality of water flowing into or within the rain gardens.

Soil quality overall improvements

N/A info

Ecosystem erosion control

No

Biophysical impacts: Others

Ecosystem impact climate regulation

Not relevant for the specific application

Lessons Learned

Key lessons

The purpose of this pilot study was to prove that a retrofit design would work within an existing constrained urban area and will be accepted by both residents and experts. The specific design of these rain gardens and the site layout is shown to work, and could be replicated.

Key lessons identified are that :
- The measure provides proven surface water capture and infiltration, leading to reduced pressure on the local sewer and watercourse.
- Active residents/ stakeholder engagement and involvement during design and construction helps ensure that concerns are being considered and that the scheme will be accepted and valued.
- When delivered as a collaborative project, multiple benefits can be achieved such as knowledge transfer and local involvement and understanding.
- It is important that all involved (from designers to the construction crew on the ground) are clear on what is to be achieved and how, before implementation/ construction begins.

Barriers

Barrier type	Barrier role	Comments

Limited staff and consultant knowledge	Main barrier	There was initial difficulty in getting the Council to accept a different and new approach. However once the approach was clearly explained, the council were fully supportive.
Lacking financing sources	Secondary barrier	There was limited time and budget for design and construction of the scheme
Limited staff and consultant knowledge	Secondary barrier	The implementation/construction of the gardens was more of a challenge than anticipated, due to lack of experience of contractors.

Drivers

Driver type	Driver role	Comments
Past flooding events	Secondary driver	Previous rainfall events had led to property flooding downstream.
Availability of subsidies	Main driver	Money available as part of wider Urban Diffuse Programme in the region

Success factors

Success factor type	Success factor role	Comments
Successful coordination between authorities	Main factor	The partnership approach between all stakeholders was critical to the delivery of the retrofit scheme and was very effective.
Communication activities	Secondary factor	The positive attitude of the local residents and their involvement in meetings as the project progressed ensured support.
Other	Secondary factor	The land was already owned by the local authority so there were no land ownership issues.

Flexibility / Adaptability

The scheme was implemented to increase the capacity to manage highway runoff, but was not specifically designed to consider climate change. However the new storage supports the existing highway drainage system to make it more resilient and effective in accommodating change.

Transferability

The approach seen with the Day Brook Catchment is suited to similar urban catchments and sites with limited space. However it should not be replicated without consideration of local factors.

Basin characteristics influence

There are no specific basin characteristics necessary for this type of measure. It could be widely applicable to urban catchments, but the detailed design would need to consider local factors.

Sources

Sources

Nottingham Green Streets Retrofit Rain Garden Project

Case Study : retrofit rain gardens, Nottingham

Retrofit Rain Garden Project - UNA

Ribblesdale Road, Nottingham Retrofit Rain Gardens