

# Raingardens Retrofit for Cardiothoracic Centre Courtyards at Basildon University Hospital

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## SuDS used

- *Infiltration planters*
- *Low level planters with integrated seating*
- *Permeable paved areas*

## Benefits

- *Courtyards that were previously 'grey' have been transformed to 'green' amenity spaces, for the enjoyment of patients, visitors and staff at the Cardiothoracic Centre.*
- *The infiltration planters help to control the volume and speed of rainwater from the hospital roof entering the underground drainage system, as well as improving the water quality.*
- *The permeable paved areas support the management of water quantity within the courtyards, by allowing water to naturally infiltrate into the ground.*
- *Sails and a pergola provide much needed shade within the courtyards in summer.*

## 1. Location

Cardiothoracic Centre  
Basildon University Hospital  
Nether Mayne  
Basildon  
SS16 5NL

## 2. Description

The raingardens retrofit at the Cardiothoracic Centre of Basildon University Hospital forms part of a series of European projects under the SPONGE 2020 initiative (funded by Interreg 2 Seas) which is part financed by the European Regional Development Fund. The project set out to increase “*resilience against surface water flooding*”<sup>1</sup> through innovative design solutions, whilst simultaneously improving the amenity value of the two courtyards at the hospital.

The two courtyards were originally comprised of paving slabs and gravel, with no vegetation. Numerous downpipes along the walls of the courtyards directed water from the large hospital roof directly into the underground drainage system. Consultation with patients, visitors and staff at the hospital also identified that there was too little seating in the courtyards, that shading was lacking during the summer months and that people would like the courtyards to incorporate planting and become greener environments.

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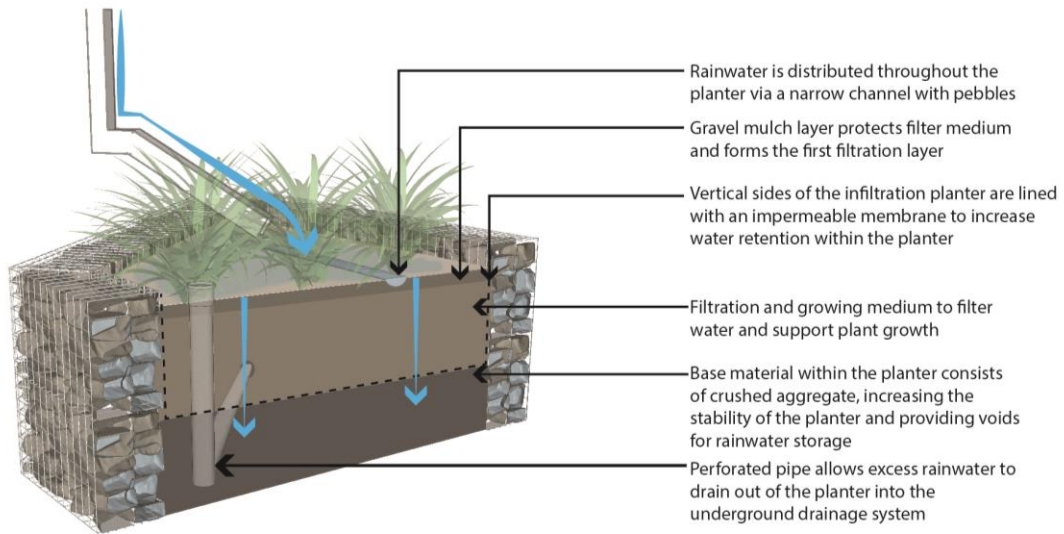
<sup>1</sup> Essex County Council (2020). *SPONGE*. Available at: <https://flood.essex.gov.uk/our-work-1/sponge/>

The SuDS design development focused on decreasing the paved area, introducing raised planters to allow rainwater from the hospital roofs to be diverted away from the underground drainage system and transforming the courtyards into green amenity spaces. As one of the courtyards is located adjacent to the existing café at the Cardiothoracic Centre, the design focused on the need to provide space for both exterior café seating, as well as fixed seating to allow people not using the café to enjoy their lunch and coffee breaks in the courtyard. The second courtyard is located next to the cardiac rehabilitation gym and a visitor reception, and was designed to provide three interlinked spaces; these included a ‘cool down’ area for the adjacent gym, a space to allow the internal waiting area for the adjacent reception to be extended outdoors and a quieter, more private space for patients and relatives.

As access to the courtyards is restricted (due to their location within a busy working hospital and the physical dimensions of the courtyard entrances), the reuse of the existing courtyard materials formed a key principle of the sustainability aspect of the SuDS design. All existing materials within the courtyards were successfully reused in the design, including gravel, concrete paving, statues and benches, as well as other existing materials which were incorporated within the walls of the new gabion planters. The existing paving was restored by thoroughly cleaning it and relaying it to a new pattern, incorporating a new edge detail, thus making it unrecognisable as the original paving. The paving was also laid to a specification that promotes natural drainage, by allowing water to pass through the joints between the paving slabs and into the granular sub-base below. The gabion planters and new seating were designed to be brought in as smaller ‘flat-packed’ units and assembled within the courtyards, which successfully minimised disruption to the hospital as a result of the construction works.

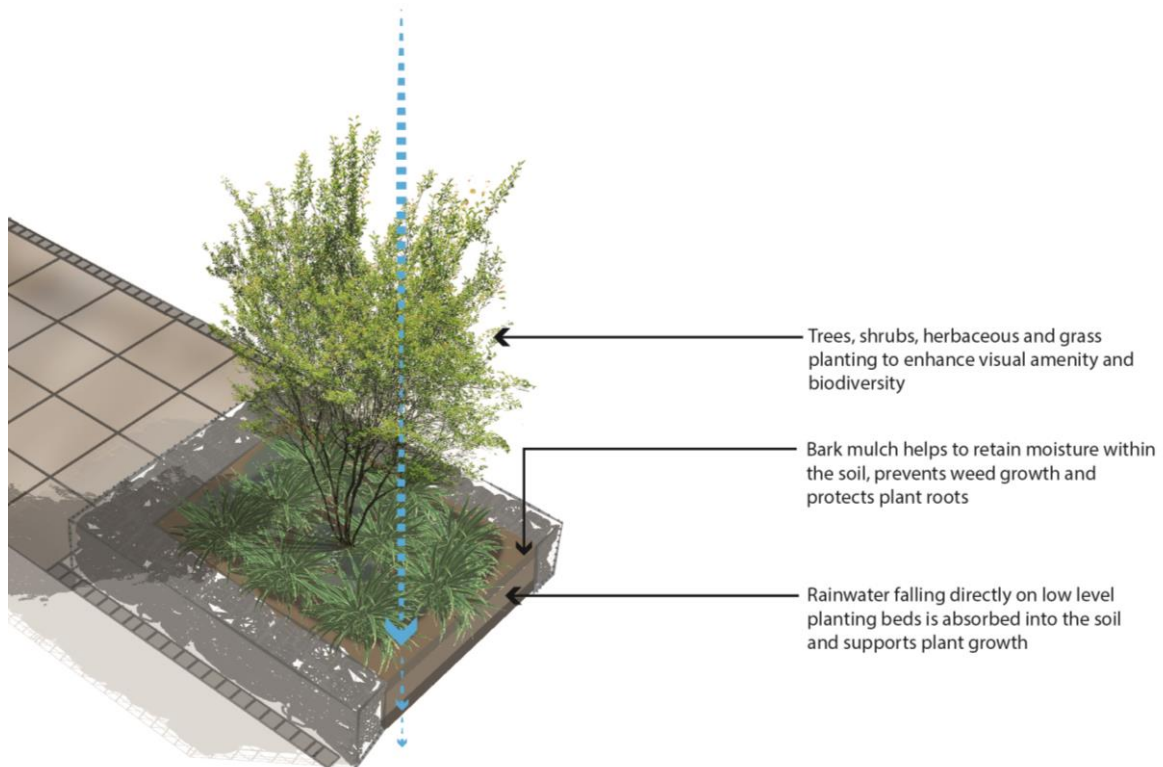
### 3. Main SuDS components used

Infiltration planters are the key SuDS features of the courtyards, where diverted rainwater from the hospital roof is captured and attenuated. In addition, low level planters with integrated seating provide added amenity benefits and permeable paved areas promote natural drainage into the ground below. These elements are illustrated in further detail by the diagrams below.



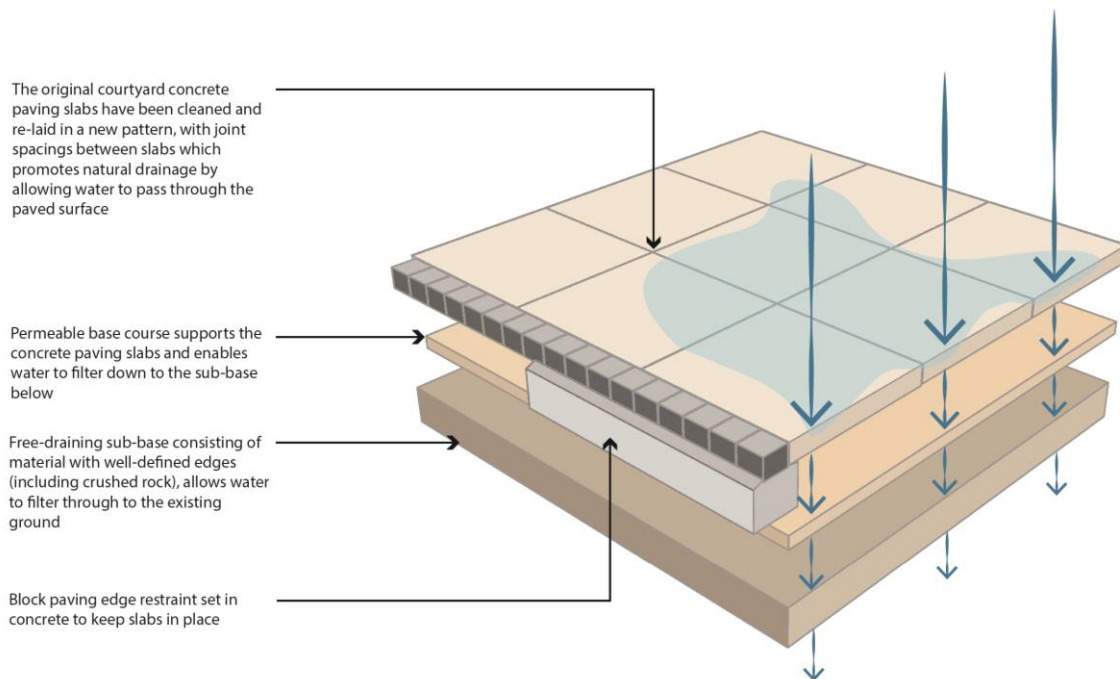
***Infiltration planter.***

© Image – Essex County Council



***Low level planter.***

© Image – Essex County Council



**Permeable paved areas.**

© Image – Essex County Council

## 4. How it works

It was clear from the outset that the SuDS features within the courtyards needed to be focussed above ground, both due to existing services below ground and to limit the volume of spoil being generated from excavation (as this would be difficult to remove due to the access restrictions). As such, a raised raingarden concept with planters providing temporary rainwater storage provided the ideal solution. This approach also allayed concerns from the hospital in relation to the risk of stagnant water, which could provide a breeding ground for bacteria such as Legionella.

Several downpipes from the hospital roof have been diverted into the new infiltration planters. The water is distributed throughout the planters via channels with pebbles to maximise flow spreading across the surface of the unit. It is then filtered through a gravel mulch layer and the filtration and plant growing medium. Water is either absorbed by the plants and soil or slowly filters through to reach the base of the planter, where a layer of crushed aggregate provides added rainwater storage. In the event of excess rainwater accumulating in the planters, overflow pipes are fitted to prevent the planters overflowing in extreme storm events. In addition, perforated pipes at the base of the planters allow excess rainwater back into the underground drainage system at a slower rate.



***Downpipe diverted into new infiltration planters.***

*© Photo – Jacobs UK*

Low level planters with a mixture of grasses, flowering plants and small trees, include areas of integrated seating. The planters increase interception and evapotranspiration of direct rainfall within the courtyards, and the absorbed rainwater is either used by the plants or slowly filters into the ground. Flowering plants that are attractive to both people and pollinators, such as Amelanchier ‘La Paloma’, Sarcococca hookeriana var. humilis, Geranium macrorrhizum 'Ingwersen's Variety' and Hebe ‘Red Edge’ were included in the planting design. As such, the planters and seating, along with shade sails and a pergola, help not only to enhance the visual amenity of the courtyards, but also the biodiversity.

The walls of all of the planters are constructed from gabions with pebbles, with slatted timber seating in selected locations along the low level planters. This means that even these elements are permeable and illustrate the ‘SPONGE’ concept when it rains, by allowing rainwater to flow through the walls.



***Infiltration and low-level planters in Café Courtyard.***

*© Photo – Jacobs UK*

The original courtyard paving slabs have been lifted, cleaned and relaid on a granular sub-base with a new edge restraint, to ensure compliance with building regulations regarding accessibility. Rainwater passes between the gaps in the paving to the permeable base, in order to promote natural drainage into the ground. During heavy rainfall, excess rainwater from the paving can also drain into the adjacent planters through the permeable gabion walls.

## 5. Specific project details

Essex County Council (ECC) commissioned Ringway Jacobs to help deliver the retrofitting of SuDS for the two courtyard spaces within Basildon University Hospital, in support of the SPONGE 2020 initiative. SPONGE 2020 is a European project partnership established to fund schemes which integrate sustainable water management in urban environments, whilst improving the appearance and usability of public open spaces.

Jacobs, in collaboration with ECC, were responsible for developing the initial concept design, taking this through to a public engagement event run at Basildon University Hospital (attended by visitors, patients and staff). Following this, the close working design team, consisting of water engineers and landscape architects, took on the challenge of producing the detailed design and tender pack. The interdisciplinary collaboration throughout the project was critical to the success, utilising Ringway Jacobs contractor experience to streamline the constructability, as the construction had to be completed within a tight timeframe of three months. Furthermore, the design had to factor in the logistical challenges that would be presented during construction, such as a busy working hospital environment, the rooms surrounding the courtyards and the potential noise and dust that could affect the health of patients.

Steps taken to achieve this were:

1. Maximising the reuse of all existing materials within the courtyards.
2. SuDS components had to be quick to install/construct and minimise manual handling.
3. Construction programming was developed to identify the least disruptive time frames throughout the working day when materials could be taken in and out of the hospital.

The successful delivery of this project would not have been achieved without the collaborative approach between client, designer and hospital, not forgetting the quality and professionalism demonstrated by the contractor (C R Swift Landscaping Ltd).

## 6. Maintenance & operation

**Permeable Surfaces:** Annual inspections are required to ensure weeds and other debris are not clogging the joints between the pavers. All tasks associated with this activity are carried out by hand to avoid disruption to paving joint material.

**Planted Areas in General:** The planting design focused on species that were robust for drought, but also species that are tolerant of occasional inundation. As the Basildon University Hospital management team were keen to keep maintenance to a minimum due to ongoing cost, the planting design where possible needed to be self-sustaining and avoid a complex maintenance regime.

A one-year maintenance period was specified in the works contract (which was undertaken by the contractor C R Swift Landscaping Ltd). The longer-term ambition is that maintenance of the courtyards will be handed across to 'Groundwork', which is a volunteering charity. Groundwork do work nationally and locally to help *"transform lives in the UK's most disadvantaged communities"*<sup>2</sup>, by giving individuals *"confidence and skills"* to help *"get into training and work"*, and, at the same time help *"protect and improve green spaces"*.

## 7. Monitoring and evaluation

The different SuDS features have reduced both the peak rates and volume of water entering the underground surface water drainage network serving the courtyards, as follows:

- By diverting rainwater from the hospital roofs and feeding it into the infiltration planters, peak discharge rates have been reduced by around 62%.
- Approximately 50% of the courtyard areas are occupied by paving slabs. By lifting, reconditioning and relaying the paving with gaps between slabs and a granular sub-base, these areas have been converted from impermeable into permeable.
- It is estimated that the available rainwater storage capacity provided by the infiltration planters, low-level planters and the granular sub-base below the permeable paved area in the two courtyards is around 80m<sup>3</sup>.

## 8. Benefits and achievements

The benefits and achievements of the project include:

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<sup>2</sup> Groundwork (2020). *About Us*. Available at: <https://www.groundwork.org.uk/about-groundwork/>

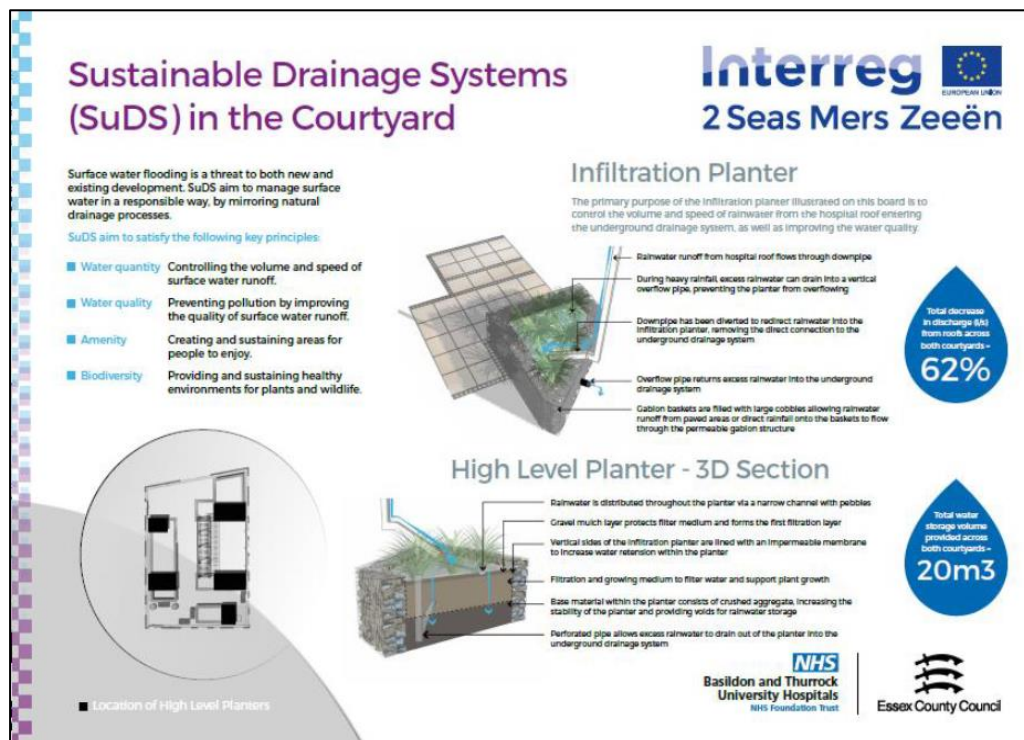


- Transformation of the courtyards into usable, attractive spaces to support communities associated with the Cardiothoracic Centre, such as recovering patients, families of patients, visitors and staff. The revitalised courtyards are also directly connected with the building café, rehabilitation gym and patient waiting areas, demonstrating their multi-use functionality.
- The restorative benefits of green infrastructure and outdoor spaces in hospitals are vital for staff and patients. During the recent COVID-19 pandemic, Basildon University Hospital have used the courtyards as a health and wellbeing facility, which has provided staff and patients with a quiet, therapeutic space for activities such as counselling, or even just a break from the hospital environment, demonstrating the added mental health benefits the courtyard spaces provide.
- Reuse of all existing materials, without disposing of any waste from the courtyards. For example, paving slabs within the courtyards were given a ‘face-lift’ through cleaning and relaying to a new pattern with new edging setts. In addition to being a sustainable choice, the reuse of the materials resulted in a total estimated client saving of approximately £40,000.
- A proven example of how all SuDS principles (water quantity and quality, amenity and biodiversity) can be successfully achieved in a very constrained environment.
- Project legacy has been ensured through the creation of public information boards displayed within the courtyards. These boards explain the functions and benefits which the different elements of the raingardens provide, and highlight the overarching principles of SuDS. An example is provided below.



***The grand opening of the SPONGE Courtyards at Basildon Hospital.***

*© Photos – Legacy Events, Sustainable Event Management*



**One of the public information boards for the courtyards.**

© Image – Essex County Council

## 9. Lessons learnt

The key lessons learnt from this project are listed below:

- It is possible to successfully install retrofit SuDS, even within a busy hospital environment, given careful design and planning. Understanding constraints early on is important, informed by surveys of existing utilities and early contractor discussions regarding construction constraints.
- Partnership working approach proved to be a key element in the success of the project. Keeping all parties engaged through the design development reduced the risk of delays to the project and ensured efficient delivery from concept to construction. The scheme construction was completed less than one year following scheme inception, highlighting that rapid delivery is possible with efficient planning.
- Importance of early engagement with Basildon University Hospital to understand the hospital’s aspirations for patient/staff/visitor use of the courtyards, particularly from a health and safety perspective, and ensuring ongoing maintenance activities are not hindered.
- Sustainable reuse of existing materials, to limit the need for disposal and import of new materials can be successfully achieved, without compromising the amenity benefits.

## 10. Interaction with local authority

Jacobs in collaboration with the client Essex County Council were responsible for developing the initial concept design before conducting an engagement event held by Essex County Council at the Cardiothoracic Centre within Basildon University Hospital. Through interaction with the hospital staff, visitors and patients during the engagement event, the Jacobs design team along with the local authority were able to analyse feedback from the event. This helped tailor the design to suit the needs of those who would be using the space most.

Subsequently, further engagement material was produced to update hospital staff, visitors and patients on how the feedback had been used to develop the design. Engagement boards were produced by Jacobs that featured plans, images and sketches of the proposals for the two courtyards. Essex County Council are looking to follow up with a post completion survey to see how stakeholders' perceptions of the courtyard areas have changed since the work has been carried out.

## 11. Project details

**Construction completed:** September 2018

**Cost:** Approx. total design and construction cost - £350,000

**Extent:** Total area of the two courtyards is approx. 470m<sup>2</sup>. The new low-level and infiltration planters now occupy a total area of 180m<sup>2</sup>, whilst the permeable paved surfaces make up the remainder.

## 12. Project team

Funders	<ul style="list-style-type: none"> <li>• Interreg 2 Seas (SPONGE 2020)</li> <li>• Essex County Council</li> <li>• Basildon University Hospital (Partner Organisation)</li> <li>• Anglian Water</li> <li>• Environment Agency</li> </ul>	
Clients	<ul style="list-style-type: none"> <li>• Essex County Council</li> </ul>	
Designers	<ul style="list-style-type: none"> <li>• Ringway Jacobs</li> <li>• Jacobs</li> </ul>	
Contractors	<ul style="list-style-type: none"> <li>• Ringway Jacobs</li> <li>• C R Swift Landscaping Ltd</li> </ul>	