mpa Precast

February 2025

Retrofit SuDS & Permeable Paving Tottenham Lanes London

Case studies exploring new concrete block permeable paving techniques for retrofit SuDS plus urban regeneration and green infrastructure sustenance.

Mineral Products Association

Introduction

A series of public realm regeneration projects for the London Borough of Haringey, by muf architecture/art, include innovative retrofit sustainable drainage (SuDS) techniques introduced by design collaborators Robert Bray Associates. Extensive concrete block permeable paving (CBPP) not only acts as a SuDS element – attenuating and treating rainwater runoff – but also enables essential gas exchange and optimised water supply for tree roots, and sustenance for green infrastructure.

Our first case study looks in detail at White Hart Lane in north Tottenham, designed using 'Healthy Streets' principles and meeting a wide range of challenges. Various techniques were used to manage polluted highway runoff throughout the scheme and a new pocket park introduced as a focal point. The nearby Love Lane, serving a new Underground station, is now a CBPP adopted highway, incorporating structural tree pits based on the 'Stockholm Solution' for urban tree planting.

At the renovation of Broad Lane Square in south Tottenham the same designers take forward these principles with further innovations. In particular, 'inverted raingardens' protect existing trees and new green infrastructure, supplied with a gradual supply of clean water from extensive CBPP catchments. These three projects exemplify the growing, multifunctional potential of CBPP in the hands of innovative designers.

Understanding Permeable Paving

With more than 25 years' use on a wide range of project typologies, including adopted roads and even container terminals, concrete block permeable paving (CBPP) has proven to be a robust, resilient and adaptable technology. It provides an attractive, safe and puddle-free surface for pedestrians and traffic, combining a structural pavement with integral drainage and no gullies.

Utilising a range of innovative techniques – demonstrated in these and other MPA Precast case studies – CBPP can be used to deliver low-cost, retrofit SuDS. This approach can be applied across regeneration projects, paving asset renewal and street upgrades, providing improved urban realm, sustainable street trees and other benefits – in addition to addressing surface water flooding and pollution at source.

The key to CBPP is its permeable surface zone of high-strength concrete blocks with angular aggregate used to fill enlarged joints and as a laying course. It allows water to pass between the blocks while filtering out silt with many pollutants – particularly the 'first flush' following rainfall – and preventing ingress of debris, retained on the surface where it can easily be removed. It can then deliver a gradual flow of clean water for safe SuDS, irrigation, biodiversity reuse or discharge. This unique permeable surface works in conjunction with various construction profiles and differentiates the technology from other types of 'pervious' paving.

In most CBPP constructed to date, water passes from the surface zone into voids within an underlying coarse grade aggregate permeable sub-base, combining structural support and water storage. Increasingly, however, alternative structural layers are being used to create exciting opportunities for urban trees and green infrastructure, provide additional water storage, accommodate statutory services or meet other requirements.

More information is available in the *'Understanding Permeable Paving'* guide available at www.mpaprecast.org

White Hart Lane

Completed in 2018, the regeneration of White Hart Lane was a pilot designed using 'Healthy Streets' principles. Nominated for various awards, the project is now considered to be the standard for future regeneration schemes.

These principles aim to create: *'streets that feel pleasant, safe and attractive. Streets where noise, air pollution, accessibility and lack of seating and shelter are not barriers ... streets with seating, shade and greenery, and reduced dominance of vehicles by designing for slower vehicle speeds.'* The project delivers these aspirations and was one of the first to use the Healthy Streets indicator as a metric. But in addition, the SuDS design approach applied by Robert Bray Associates (RBA) reduces flooding and pollution of the hidden Moselle River through the integration of bioretention raingardens to collect and treat polluted road runoff.

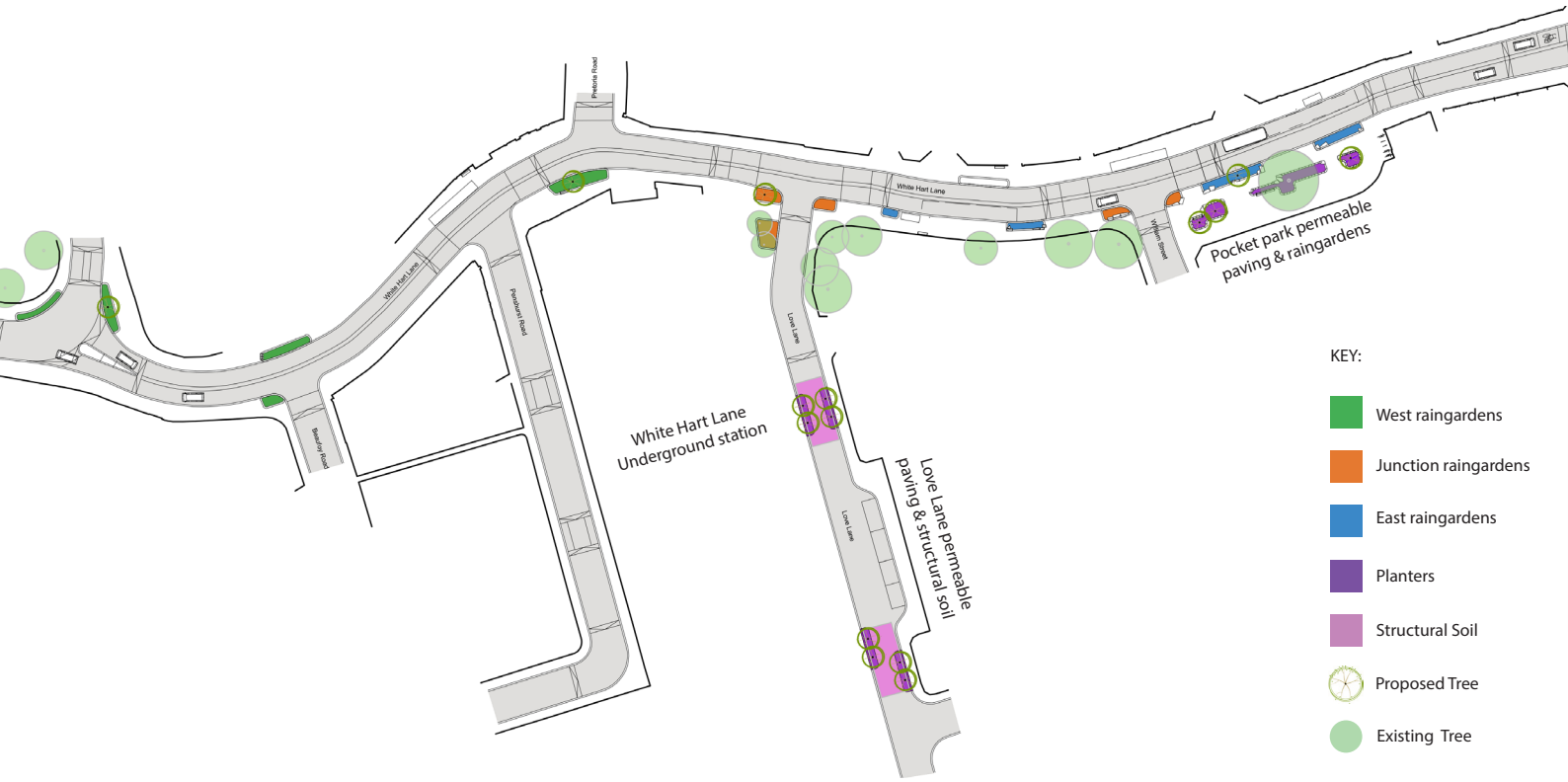
Meeting Complex Challenges

This pilot infrastructure improvement scheme for London Borough of Haringey – funded by TfL as part of a wider masterplan and subject to value for money scrutiny – resulted in a dramatic improvement in the public realm, creating significant new planted features and introducing improved accessibility and comfort for pedestrians.

The scheme also had to address a number of challenges including retention of bus routes and management of football match crowds moving between the Underground station and Tottenham Hotspur Stadium, while still focusing on the day-to-day lives of the local community.

The road was remodelled to deliver modal change with a narrower carriageway and prominent central lane-divider zone. New visual patterning and changes in road level reduce the tendency to speed and keep traffic within the 20mph limit. Road space is reallocated to people and planting, creating a place where walking and the social life of the street is more pleasant: a destination, not just a place to speed through by car on the way somewhere else.

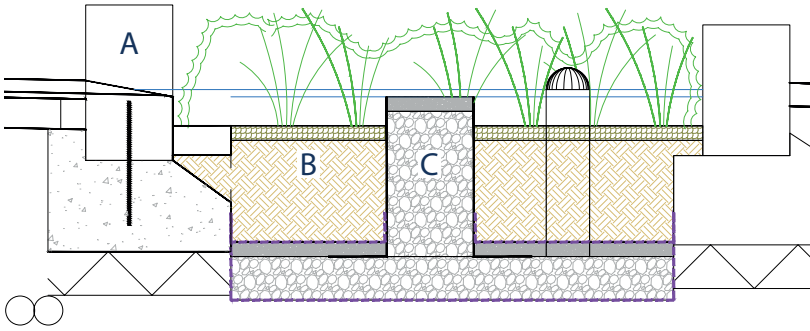
The design also responds to the Moselle River, below the street. In its highly-polluted state, it was not possible to open it to daylight yet. But raingardens mark the line of the river and protect it from highway runoff, looking to the future return of the river to the surface for the enjoyment of local people and biodiversity, in line with Haringey policy.



Bioretention Raingardens

Strategically-placed, small bioretention raingardens accept polluted highway runoff through gaps[A] in granite kerbs. An innovative, two-tier approach was applied to bioretention design, incorporating a particular soil blend (known as 'RBA SuDS Soil'). This approach responds to the pollution hierarchy of smaller rainfall events and the first flush of larger events, whilst ensuring healthy and resilient plant growth suitable for demanding urban environments.

The first flush of runoff containing most pollutants is dealt with in the raingarden soil[B], then prolonged rainfall with less pollutants is treated in gravel-filled infiltration tubes[C]. The raingardens were designed to work in both infiltrating soils as well as non-infiltrating soils, with the latter using a simple orifice flow control discharge from the gravel base of the raingarden.



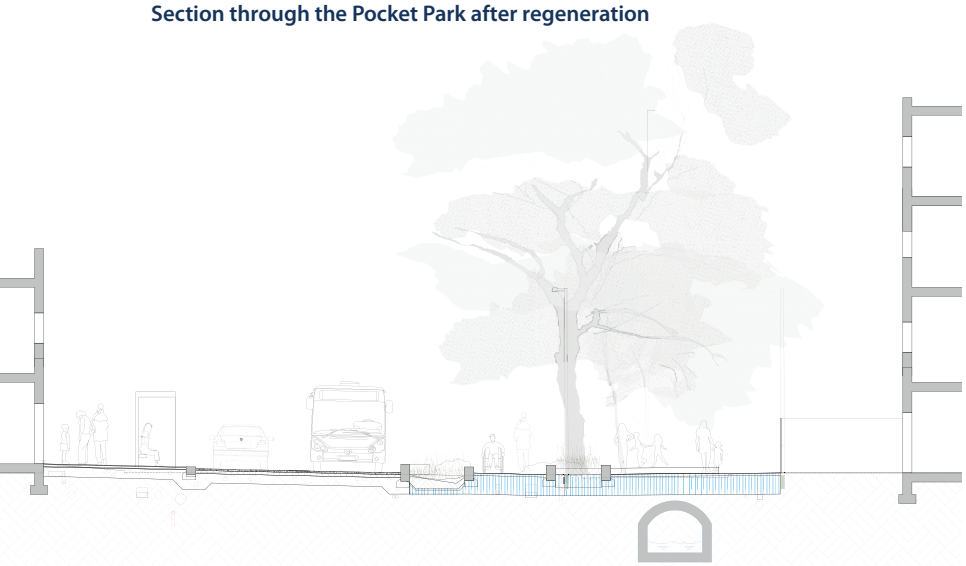
Pocket Park and Permeable Paving

A focal point of the scheme is a new Pocket Park, enabled by relocation of a bus stop and removal of extensive asphalt paving. The park is separated from the highway by bioretention raingardens, intercepting runoff from the whole width of the 'side-hung' road which acts as a catchment. It also includes long planters to accommodate mature and new trees, and other green infrastructure, incorporating seating. This also enabled de-paving around a mature but suffocated and asphalt-locked Plane tree.

Section before regeneration

A mature Plane tree was liberated from asphalt by a new planter.

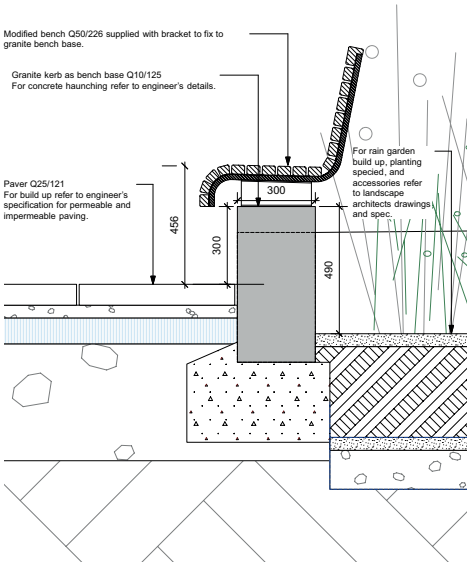
Section through the Pocket Park after regeneration



Permeable paving – using 600x300mm small-element concrete flags designed specifically for CBPP – was employed throughout pedestrian areas to the south side of the street facing shops, including the pocket park. It provides an attractive, safe and puddle-free accessible surface for all. In addition to providing a key SuDS feature, the CBPP between planters also provides a source of treated water and invaluable gas exchange (air in/CO_2 out) to the tree's root zone.

The infiltration ability of the underlying soils allowed structural CGA sub-base to vary in depth to accommodate existing utility constraints, creating a blanket infiltration zone capable of receiving runoff from areas where significant CGA sub-base depths were not achievable, such as above very shallow services. Surface water flooding – even during heavy rainfall events – has ceased completely along the length of White Hart Lane.

The project designers worked in conjunction with an MPA Precast manufacturer member to develop the 600x300mm small-element CBPP flag module – now available as standard. Muf partner Katherine Clarke commented: *'The small-element flags provide an enhanced backdrop to the street, particularly with the light sparkle of the Mica aggregate surface that we selected, which lifts the tonal quality. The flags will form the basis for a family of modular paving for use throughout the Borough.'*



Raingarden with Seat

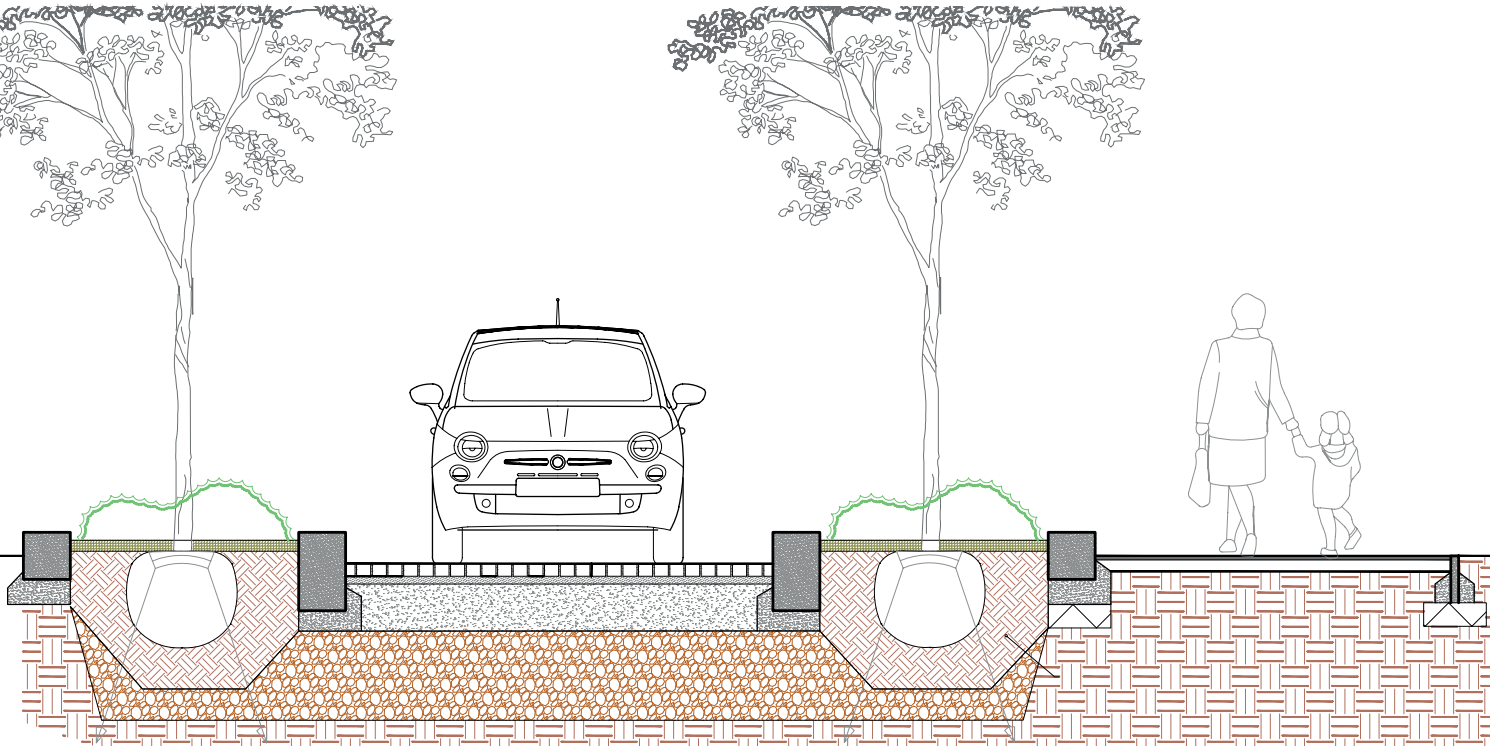
Love Lane

Love Lane, which runs perpendicular to White Hart Lane in front of the new landmark Underground station, is now a concrete block permeable paved adopted highway. The CBPP can also accept runoff from the road and other impermeable surfaces (additionally up to double its own area). At two points, structural tree pits span the full width below the road surface connecting road-narrowing tree planters on each side, in readiness for future planting. Based on the 'Stockholm Solution' for urban tree planting, the deep structural soil zones – comprising compacted stone and 'RBA SuDS Soil' – form sumps which are hydraulically connected to the CGA sub-base of the permeable paving.

This means that in heavy or prolonged rain, once percolated runoff begins to move laterally along the interface between the sub-base and subgrade, it moves toward the structural tree pits where it begins to be attenuated. Once the pits fill to the level of the base of the road sub-base, the attenuation and infiltration spread out over the whole road zone. This pattern of flow and attenuation means that the trees benefit from rainwater collected from an extended catchment making them healthier and more resilient to drought. Although initially unfamiliar with the structural tree pits, with support and advice the installation contractors soon became comfortable and are now installing them elsewhere.

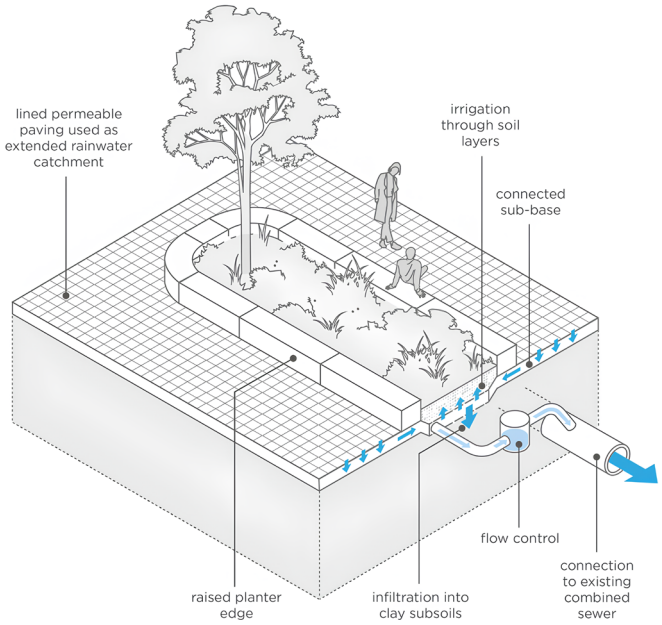
The CBPP paved highway withstood heavy construction traffic during the new station construction.

'Stockholm Solution' tree planting trenches with CBPP



Broad Lane

In south Tottenham, some 1.7 miles south of White Hart Lane, muf and RBA have developed further multifunctional SuDS principles to regenerate a public square surrounded by shops and cafes, creating a community hub. The same paving material palette as White Hart Lane is being used but with added light/ dark grey checkerboard paving. The scheme makes extensive use of CBPP to capture, clean and convey as much water as possible to nurture green infrastructure, including existing mature trees. Comparison of photos from Spring 2022 (under construction) with those from a revisit in Summer 2024 highlight the impact of CBPP on sustaining green infrastructure.

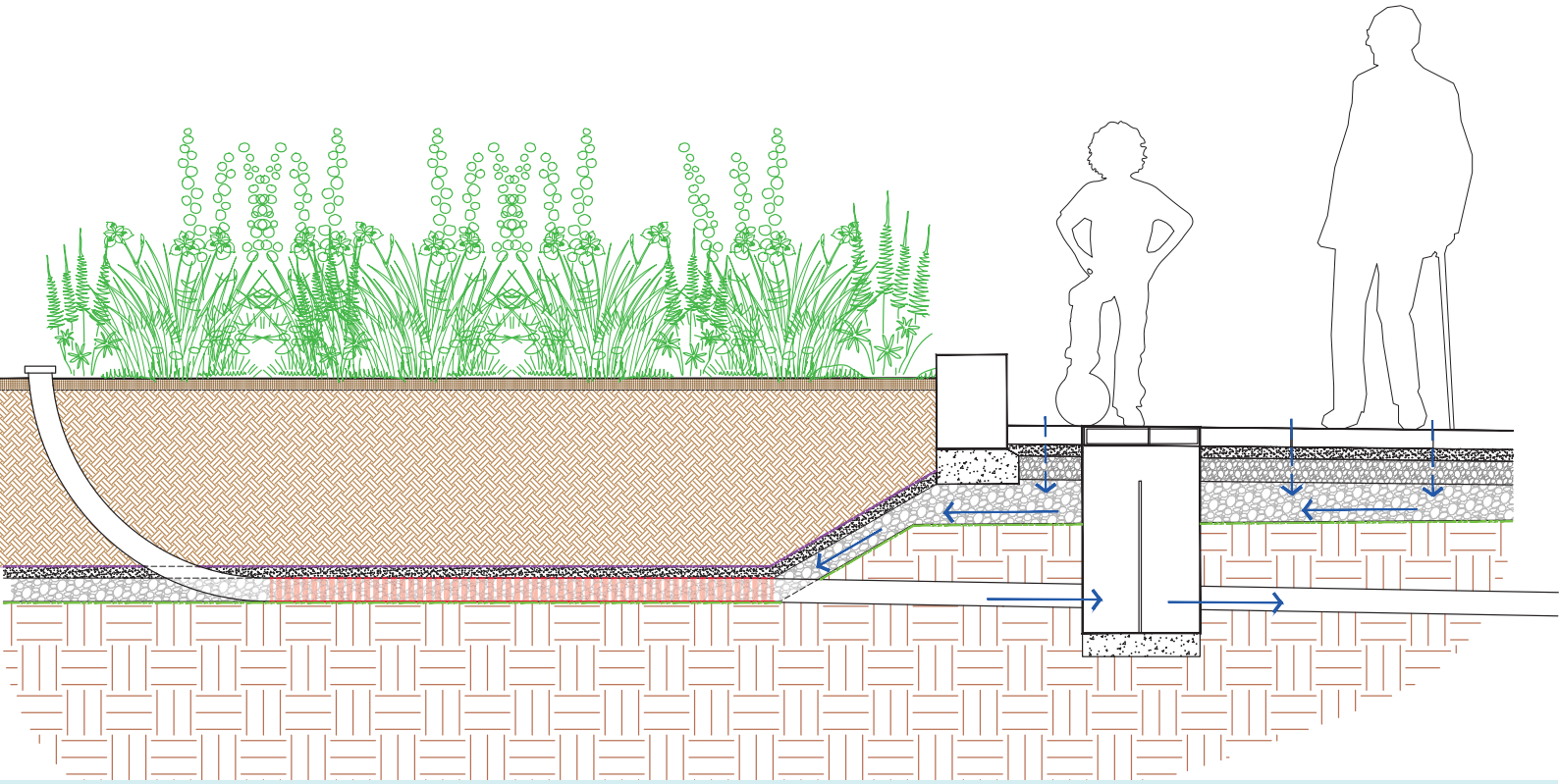


Permeable Paving and Inverted Raingardens

RBA Director Kevin Barton explains:

'Instead of directing water over the surface, we're using the adjacent concrete block permeable paving as our extended rainwater catchment and its sub-base to feed valuable irrigating rainwater under the edging wall and into the drainage layers and soil of the raingarden. Here, it can be stored in storms then taken up by trees and planting. Permeable paving is the ideal inlet in this scenario as it ensures that the water is cleaned and filtered in a diffuse, low maintenance way. So the void space in the raingarden gravels and soils does not get silted over time as can happen with piped inlets.

In smaller rainfall events, the green infrastructure gets watered and in extreme events water storage can spread out within the permeable paving. A series of flow controls ensures



that the whole system drains down slowly over time but we anticipate large volume losses through soils, plants, evaporation and infiltration/ rehydration of clay subsoils.

We wanted to demonstrate how raised landscape features could also be designed to be climate resilient, blue-green infrastructure. So, not all raingardens managing runoff from adjacent surfaces need to be sunken. Raised planting and features can have more presence in the landscape and become informal seating or play'.

This project demonstrates a different approach to another RBA scheme – Bridget Joyce Square, Australia Road, London – where extensive CBPP, applied as an overlay on an existing road-base, collects, treats and conveys water before discharging laterally into sunken raingardens. This project is explored in detail in a separate MPA Precast case study.

Project Credits
Muf architecture/art - design
Robert Bray Associates - landscape and SuDS design
Civic Engineers - highway and civil engineering
Dekka - lighting
LB Haringey - project delivery managers - Peter Watson; Dana Rasheed; Dave Butcher
Marlborough – contractors

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