

## Crescent Gardens SuDS Project



### SuDS used

- *Rain gardens*
- *Swales*
- *Detention Basins*
- *Trees Planting*

### Benefits

- **Water Quantity:** *Storage of run-off water from nearby highways and footways, controlled Discharge via a series of various treatment trains.*
- **Water Quality:** *Infiltration and evapotranspiration of surface water through various surface features like Rain gardens, Swales, Detention Basins and Tree planting.*
- **Water Management:** *Managing the water in an effective way by series of above ground features and treating the hydrocarbon and pollutants via many treatment trains.*

- **Amenity:** *Increase the amenity value, social cohesion and well-being of residents.*
- **Biodiversity:** *Improve the biodiversity by usage of native species in rain gardens, new tree planting and retention of existing trees.*
- **Ecology:** *Increase ecology values through native planting and habitat creation*
- **Educational:** *Educational opportunities for nearby schools, residents and those passing by and improves the connectivity.*

## 1. Location

Crescent Gardens, High Road, Wood Green, Haringey. N22 5NL

## 2. Description

London Borough of Haringey is investing in water management improvements and have assessed and identified Crescent Gardens as suitable to retrofit SuDS features. This is to enhance the character and usability of the park whilst integrating features that clean and manage rainwater runoff from adjacent roads. These will also offset the risk of flooding and pollution into nearby rivers.

We carried out detailed feasibility study to develop the environmental improvements along with enhancing its attraction as public park. The feasibility study confirmed that practical SuDS features combined with modifications to the surface water drainage network within the site and nearby roads would reduce the flood risk both locally and downstream of the site. Few options were considered regarding how they will benefit the site and improvements to the whole area in relation to the following primary and secondary objectives:

**The primary objectives of the study satisfied by proposed option are:**

- Reduce flows from the area into the highway drainage network and Thames Water (TW) sewer network, and hence incrementally reduce the risk of flooding in the wider catchment.
- Utilise SuDS features to achieve a reduction in flood risk and flows into the drainage and sewerage networks.
- Regenerate the Public Open Space.

**The secondary (desirable) objectives that satisfied the primary objectives are:**

- Identify relatively low-cost options.
- Minimise disruption to public and residents.
- Ensure maintenance requirements for Haringey Council are not overly onerous.
- Improve the quality of the environment.

## 3. Main SuDS components used

- **Rain gardens:**

These are combination of planted native shrubs, flowers and perennials in a small depression surrounded by brick wall, Corten Steel or natural. These bioretention facilities, were designed to reduce the flow rate, water quantity and to treat the polluted stormwater runoff from nearby public highways, footways and the park itself.

In total 13 rain gardens were constructed as part of this project for surface water storage and treatment management train to take the run-off from surrounding roads and channelled into the rain garden following few treatments. Any residual clean water then goes back to highway drains.

- **Swales:**

The swales were constructed to store and convey water between various rain gardens and detention basins. Swales are shallow channels covered by grass and vegetation in places. These were designed to maximise the water quality treatment benefits.

For this project, all the rain gardens relate to shallow swales and they are mainly grassed to achieve the maximum water quality benefits and reduced maintenance costs.

- **Detention Basins:**

These features hold excess amount of water and allow controlled discharge to reduce the risk of flooding. They are surface storage basins that provide flow control through attenuation of stormwater runoff.

For Crescent Gardens project, there are mainly two detention basins, these have been designed to be dry and only hold water for a short period of time during an extreme rainfall event (1 in 100 yr and above).

- **Trees Planting:**

Trees have vital role to play in managing the storm water. They aid in water interception, storage and infiltration while increasing an evapotranspiration potential.

For this project, in total 12 new trees were planted. Unarguably the largest living things on the earth, beautiful both in and out of the season. Trees can bring birds and other wildlife into the city. Increasingly valued natural UV protection and significant cooling through both shade and evapotranspiration.

## 4. How it works

The Crescent Gardens SuDS project works on multiple SuDS components to attenuate surface water from public highways via various treatment trains during which there will be some infiltration, evapotranspiration and eventually any overflow will be discharged into gullies at less than greenfield runoff rate (< 5l/s).

### **Discharge Hierarchy :**

A combination of source control throughout the site and retrofit SuDS components were implemented to satisfy the delivery of overall strategy along with taking the excess water off nearby impermeable areas and cleaning the same before discharging back into the road gullies. In order to satisfy the drainage discharge hierarchy of Source Control, few swales connecting to all the rain gardens and Detention basins have been constructed. These will also encourage bio-diversity and provide a level of final treatment along with infiltration and evapotranspiration before it goes back to surface water sewer.

The SuDS management train has been integrated into the design and implementation of the same during the construction of project.

### **Scheme Design :**

The overall scheme maximises the use of SuDS features blended into an excellent landscape design. The rain gardens, swales, detention basin and tree planting slows the runoff, treats the water and at the same time promote interception losses. The whole design caters for the 1 in 100 year rainfall event plus 40% Climate Change at a peak discharge rate of less than current greenfield rates. Flow controls have also been provided by means of orifice plate with perforated steel baskets.

Each rain garden consists of approximately 650mm deep excavation with a surrounding of Corteen Steel or Brick Wall of 330mm width. This is filled with a 100mm type 3 drainage layer of gravel on stone topped with 300mm top soil layer. All the swales consist of approximately 600mm deep excavation with flat base, 600mm wide with a long fall between 1 in 200 and 1 in 50. The gradient on each side slopes are 1 in 3 with 100mm depth of water flow and 50mm freeboard. Each swale has a topsoil depth of 150mm.

All the surface water from surrounding impermeable areas gently channeled through the sloping grassy routes within the swales and sunken planted raingardes. All the rain gardens have steps of few layers of granite sets to prevent the washing off of the top-soil. They have also been surrounded by the brickwall as a part of play apparatus, bridge, seating arrangements to encourage interaction between park users and natural environment. The access water then goes back into the swales constructed between the rain gardens. The detention basin receives water from few rain gardens and swales and if there is any excess water that will go back into the last rain garden of the scheme before it goes back to the highway gullies.

### **Amenity, Ecology and Bio-diversity :**

The location of Crescent Gardens on Wood Green High Road gives an excellent opportunity for local residents and those passing by to take a view of overall scheme, the way the SuDS elements are operating and also allows them to enjoy the park.

SuDS principles are used to manage surface water as it being captured, treated at source, controlled and conveyed on to the surface whilst providing an opportunity for water to be part of the park landscape scheme. The overall scheme manages the flows from the park's pedestrian surfaces as well as main carriageway and footways.

It is expected that water treatment processes will occur on the surface as well as within the actual growing plants . With the high proportion of SuDS for the impermeable contributing area the losses through evapotranspiration and infiltration mean the 5mm criteria for interception losses should easily be surpassed for this scheme.

The Swales connecting to all the rain gardens remove pollutants from surface water, improve water quality as well as creating an additional habitate for an aquatic species. The swales, detention basins and rain gardens as a part of this project can fill with storm water during heavy rainfall to reduce the flood risk. All the Swales, Detention basins and Rain gardens are unlined intentionally to allow maximum infiltration.

#### **Educational:**

One of the council's objectives, with the support of the cabinet member and the Head of Haringey's Education department, is to promote the educational aspects of the scheme for the benefit of local schools and residents who expressed considerable interest during both consultation and construction stages. We are therefore, working with the scheme architect (RBA) and interested residents' groups to install two additional information boards which will set out the number of SuDS used, their definition, and how they work together in an integrated way to reduce the surface water flows from nearby impermeable areas along with cleaning the water with various treatment trains.

## **5. Specific project details**

London Borough of Haringey commissioned a detailed feasibility study to develop the environmental improvements for Crescent Gardens, at the same time enhancing its attraction as a Public park. The feasibility study confirmed that practicable SuDS features combined with modifications to surface water drainage network within the site and nearby roads would reduce the risk of flooding both locally and downstream of the site.

Considering the above, we employed SuDS designers Robert Bray Associates (RBA) to undertake the surface water drainage design with the modelling inputs from McCloy Consulting (MC). Throughout the project both these consultants provided full technical support and assisted in monitoring the compliance with overall drainage strategy. The landscape was designed to be resilient to climate change by optimising sustainable drainage to cool the urban environment with number of plants and newly erected trees. These planting and trees can also slow down and attenuate surface water runoff by connecting to the below ground "rooting zone" of soil cell crates.

There was also an early involvement of Council's Highway's and Drainage term contractors Ringway Jacobs / Hugh Pearl Land Drainage Ltd. We commissioned our Highways term contractors to carry out the works which were part of our wider flood water management programme. A very strong experience of Council's Flood and Water Management team in leading the whole processes meant a scheme was able to assemble quickly. Both RBA and MC worked quite closely with us and our term contractors for the successful delivery of the project.

In total 13 rain gardens and basins, 2 detention basins / meadows were installed as a part of this wider SuDS scheme. Out of which 4 rain gardens were installed parallel to the White Hart Lane in order to take the surface water from highways, footways and other impermeable areas within the vicinity. The other 6 Rain gardens were installed parallel to Wood Green High Road to take the surface water from that specific area. The last 3 rain gardens were installed behind the War memorial, the land between the High Road and Stuart Crescent to tackle the water from both High Road and Stuart Crescent. The two dried detention basin / meadows were also created one on each side. i.e. near White Hart Lane side and Stuart Crescent to hold the water for a short period of time during an extreme rainfall event. The rain gardens maximise infiltration of highway runoff into the ground. Layer of granite setts were also installed by each inlet to reduce erosion of topsoil and capture larger silt particles carried by road runoff.

As a part of the above works, most of the existing trees have been retained due to their wider canopy creating a nice feature and again we all know that trees have a vital role to play in managing the surface water for both infiltration and slowing down the flow. Only four trees were taken down following a consultation with our tree's officer and parks team, as couple of them had some disease and they were deteriorating too. One of them was in the middle of biggest rain garden which was taking and storing maximum storm water. Considering the benefits that will be gained from that rain garden compared to the harm that will be created by taking the tree down, a decision was taken to take down the tree. However, not only that but as a compensation measures for the trees that were taken down, the scheme also planted 12 brand new trees as a part of new SuDS features as they aid in water interception, storage and infiltration while increasing evapotranspiration potential.

The whole project was developed through regular contacts with all the stakeholders such as local Councillors, Residents, Utility Companies, EA, Thames Water, TfL etc. They were consulted by means of information letters circulated in August 2018 and October 2018, respectively. All the stakeholders had an opportunity to provide their comments on draft and final design proposal. Individuals businesses were also written separately to inform them of about the key construction dates. During the works it was necessary to close certain sections of the park and to relocate a bus stop on the High Road. In order to involve the residents to gain their confidence, a mural (**Figure 1**) was also erected at few places explaining the SuDS and how they will work. This was very much appreciated by many locals and those passers-by.

## 6. Maintenance & operation

The Crescent Gardens will in time, lead to reduce the cost of maintenance particularly those associated with regular gully cleaning and periodic emergency call outs for 'blocked drains'.

The maintenance of completed rain gardens, swales, detention basins and new trees are responsibility of Haringey's Parks and open space team. Haringey's Facilities and Works Management team will also be taking some of the responsibility for operational management and maintenance. The Highways team are responsible for the channel that is carrying water from public highway into the rain gardens. Not only that but Haringey's F&WM team will also play key role in providing and taking some responsibility towards the management and maintenance of these features.

For the rain gardens, the low maintenance and high impacts planting were used. So that it requires minimal maintenance and topped up with mulching only once a year. Litter and cigarette butts within the rain gardens and park requires regular picking up, which is currently agreed twice a month. The vegetation, cutting and pruning plants and weeds are carried out once or twice a year as a part of park's routine maintenance schedule. They have also took and agreed with additional responsibility for the plants in first couple of years, which includes replacement plants, mulching and watering during the summer months.

Haringey's Park team also have their own management and maintenance plan and guidance document for each and every park within the borough. This existing document for Crescent Gardens has been amended to include the maintenance and management plan as supplied by RBA, the landscape architect for this project. The parks maintenance regime is also in line with the maintenance and management plan as supplied by landscape architects.

## 7. Monitoring and evaluation

The overall scheme has been designed and constructed whilst utilising SuDS features to reduce the flows from the highway drainage network and Thames Water Sewer to regenerate the public open space. It also improves the amenity value and quality of park environment.

The scheme is currently operational and well cared by Haringey's Parks and open space team with all the SuDS features functioning successfully even after the recent storms Ciara and Dennis. The nearby residents and community are also taking a walk and enjoying their time in nature.

As a Borough, Haringey have also taken the following few steps to monitor the scheme:

- Haringey's Flood and Water Management team and Parks team are doing regular site visits as and when possible during and after any rainfall event to monitor the management train and functioning of all the SuDS features.
- Haringey have developed a website, where members or community can report an issue or problem for highways, drainage or parks etc.

- Our Highway's Inspectors are keeping closed eyes on nearby carriageway and footways including gullies as a part of their weekly routine.
- Street wardens are taking regular walks for making sure people are not throwing litter and cigarette butts into the rain gardens and channel which is carrying the water from highways to rain gardens.

## 8. Benefits and achievements

### **Some of the key benefits of the project included :**

- Reducing the surface water flooding both locally and within the drainage network.
- Enhancing a public park and improving the quality of environment .
- Provision of public place promoting people's health and wellbeing.
- Creating and improving valuable amenity, biodiverse and attractive landscaping.
- Managing the quality of runoff discharge into the drainage system.
- Creating a high-quality multiple use streetscape.
- The success of this project will inspire future projects by London Borough of Haringey and others.

### **Some of the achievements of the project included :**

- The project was appreciated by local Councillors, many local residents and other departments within the Borough of Haringey.
- It was also included in one of the Local magazine for the Wood Green area and Haringey's own staff magazine.
- The project was also mentioned in Greater London Authority's Sector Guidance for "Reimagining rainwater in Parks and Greenspaces."

## 9. Lessons learnt

- The usage of corten Steel as all the rain gardens were designed to be surrounded by corten steel. These made project quite expensive and unaffordable. However, following meetings with architect and consultant, some of them were replaced by brick work and all the steel edges were covered with rubber tube for Health & Safety reasons.
- The integration of rain gardens within publicly accessible areas was quite challenging especially people throwing litter and cigarette butts in the rain gardens and blocking the inlets.

However a strict daily inspection and installation of couple of litter bins within the vicinity eventually resolved the issue. There are also discussions ongoing within the relevant teams to issuing spot fines for the offenders.

- All the planting for rain gardens to be selected in such a way that more usage of native species and wild flower mix to encourage greater biodiversity. At the moment only 75% to 80% plants are native species.
- Each feature within the SuDS project and in the chain is as important as the next feature. However it is always important to start the work from the bottom or where the final discharge point is to ensure that sufficient falls have been allowed on all SuDS elements and the way they interact with each other.

## 10. Interaction with local authority

The London Borough of Haringey funded this project from their capital drainage budget as we are committed to deliver a Sustainable Drainage Solution for the areas prone to flood risk. This was supported all the way by our stake holders. i.e. Friends of Chestnut Parks, Consultant, Parks Team, Thames Water, Environment Agency, Thames 21 etc.

The consultants and Haringey's F&WM team met several times during the project to ensure that all the stakeholders are satisfied with the scheme as a whole and the way it will function. There was also an early involvement and engagement of Haringey's Term contractor to make sure that the scheme is being delivered within the specified budget and timescale. A monthly meeting was organised initially with the consultant and then contractor for the duration of the work. A few combined site visits were also carried out by consultants, parks team and Haringey's F&WM team. The whole construction work was supervised by our clerk of works on daily basis.

Overall, the London Borough of Haringey was very pro-active in making the whole project designed, managed and delivered successfully. The credit also goes to all our stakeholders for showing their invaluable support, interest and brilliant piece of teamwork.

## 11. Project details

**Construction completed:** *The whole project was completed on 15<sup>th</sup> March 2019.*

**Cost:** *The total cost of project was £200,000*

**Extent:** *The total site area was approximately 1.5 Ha*

## 12. Project team

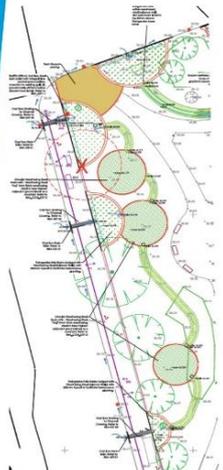
<b>Funders</b>	<ul style="list-style-type: none"> <li>London Borough of Haringey</li> </ul>	
<b>Clients</b>	<ul style="list-style-type: none"> <li>London Borough of Haringey</li> </ul>	
<b>Designers</b>	<ul style="list-style-type: none"> <li>McCloy Consultants</li> <li>Robert Bray Associates (RBA)</li> </ul>	 
<b>Contractors</b>	<ul style="list-style-type: none"> <li>Ringway Jacobs</li> <li>Hugh Pearl Land Drainage Limited</li> </ul>	 
<b>Other</b>	<ul style="list-style-type: none"> <li>Friends of Crescent Gardens</li> <li>Haringey Rivers Forum</li> </ul>	

## Welcome to Crescent Gardens SuDS Project

In the natural environment rain falls onto soil and soaks into the ground. This helps the plants to grow and filters the water naturally.

In urban areas, where many surfaces are sealed by buildings and paving, the rain can't soak into the soil, instead the water drains into networks of pipes and culverts. This has resulted in flooding downstream and deterioration in our river water quality.

SuDS aim to help to deal with these issues by storing rain water from our roads, buildings and pavements in 'Rain beds' where most of the water is used by the plants and trees and naturally filtered. It creates habitats for wildlife and reduces the flow of water into our rivers, which helps prevent flooding.



What are SuDS?  
Sustainable  
Drainage  
System



**Fig. 1: Scheme "Mural" defining SuDS for Local residents and passers-by**



**Fig. 2: Established Rain garden - Collecting surface water during storm event**



**Fig. 3:** Example of SuDS and Management Train used to link the areas and give character to the scheme. Also attracting people to interact with SuDS features.



**Fig. 4:** A Bridge as playing feature, connecting two rain gardens via swale



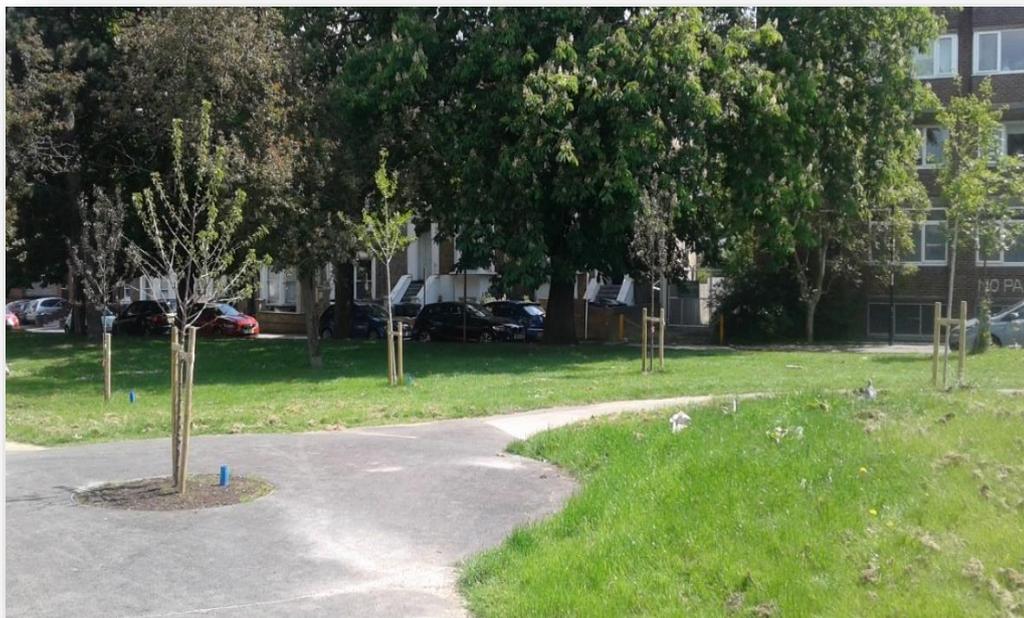
**Fig. 5: During the construction of Rain garden at the end**



**Fig. 6: After the Construction and linked with swale and other SuDS.**



**Fig. 7: Longest Swale within Park connecting rain gardens at both ends**



**Fig. 8: Newly Planted Trees playing vital role in managing surface water**