

# Monkton Flood Alleviation Scheme



## SuDS used

- *Detention Basins and Swales used minimising future maintenance costs (removing below ground drainage)*
- *Surface water removed from combined sewer through daylighting of existing culvert*

## Benefits

- *85m of Water Framework Directive improvements*
- *0.26 hectare water development habitat and 0.84 hectares of water dependant habitat*
- *New habitats for wildlife, significant tree planting and wildflower meadow seeding will produce greater biodiversity in the area*
- *Public amenity enhanced and improved health and well-being for residents*
- *Educational Resource with local schools and community involved in the delivery of the scheme post construction*

*\*Image – view at completed detention basin, Lukes Lane*

## 1. Location

Monkton Village and surrounding area, NE32 5NN

1

NZ320636

## 2. Description

Monkton Village is a residential area surrounded by watercourses and agricultural land. Reported flooding dates back to 2005, with events being reported each year since records began. The flooding in 2012 damaged a large numbers of properties and caused significant disruption to the infrastructure in the area, with local road networks severely affected with all routes through the area impassable for several hours.

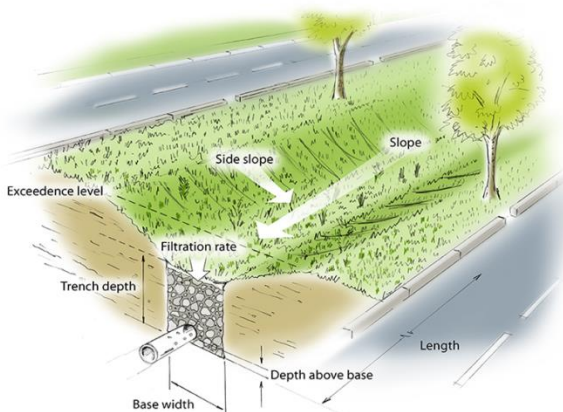
The study for Monkton flood alleviation scheme (FAS) showed a continued high risk of flooding to 150 properties in a 1 in 75 year standard against surface water flooding.

The scheme provides protection to properties by utilising SuDS techniques through the use of underdrain swales and attenuation basins to drain into Bede Burn reducing pressure on the existing system. This application of SuDS in suitable areas in combination with local highways drainage improvements will provide effective surface water management in the area.

## 3. Main SuDS components used

Monkton FAS is a strong example of how a relatively small project with a number of differing elements (traditional engineering and SuDS techniques) can have a significant impact within the community it serves, providing flood alleviation and local environmental improvements with a cost-effective sustainable approach.

The main scheme provides protection to properties by installing SuDS in the form of underdrain swales and attenuation basins draining into Bede Burn for improved surface water drainage.



*Image showing typical underdrained swale (left) and complete as part of scheme at St Josephs School (right)*

Traditional new highways drainage systems were also included to take pressure off the existing systems. This includes the installation of new traditional engineering works including kerbside drainage, road gully upsizing, earth bunds and masonry flood walls.

Improvements to highway drainage around the affected areas including new carrier pipework, installation of swales to catch surface run off, creating retention basins and installing pre-cast headwalls and manholes.

**Images showing typical attenuation basin (upper) and under construction at Lukes Lane (lower)**



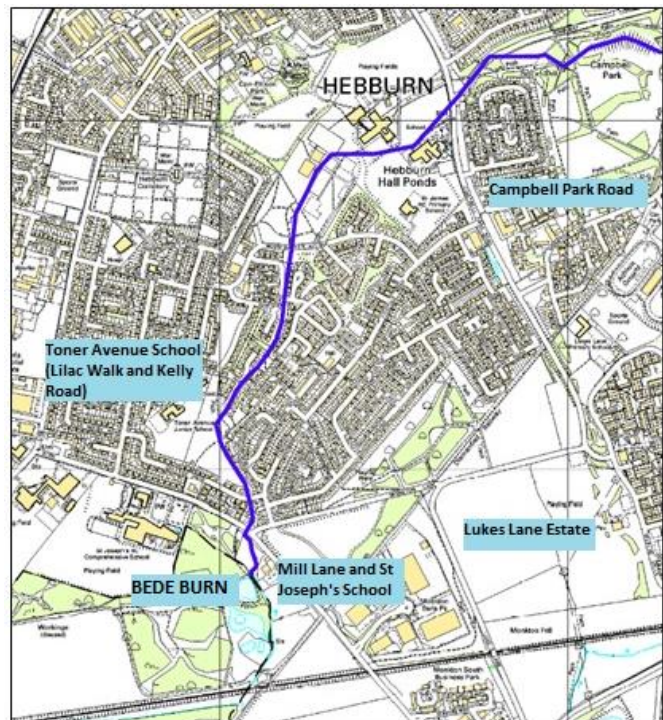
#### 4. How it works

The overall drainage strategy of the scheme is to combine natural SuDS features and local highways drainage improvements in such a way as to provide a 75 year standard of protection, cost-effective future maintenance and a visually pleasing aesthetic appearance. Soft engineering options such as detention basins and swales were prioritised over below ground drainage.

This SuDS approach in combination with de-culverting or daylighting works to Bede Burn provides the main elements of the scheme. The overall study area can be seen in the plan to the right. The main areas which underwent improvements are marked on the plan.

These elements were identified following initial design of the scheme, where multiple source flood risks had to be addressed.

Modelling was undertaken using varying storm durations over multiple event scenarios to allow options to be identified which provided the most suitable protection for a range of storm scenarios and considering wide range of flood risk sources. The final identified scheme allowed a robust



solution to be delivered, providing the required protection to the properties identified and staying within the budget allocated for the project.

The main SuDS elements of the scheme can be seen at Toner Avenue, St Joseph’s School and Marine Drive with traditional highways works forming the main drivers against surface water flooding at the remaining locations.

The main SuDS elements are discussed in more detail below:

### **Bede Burn ‘daylighting’**

Bede Burn runs alongside the majority of the scheme elements and was critical to the success of the project. A 100 metre section of Bede Burn culvert near Toner Avenue School was removed and opened up (or daylighted) to tie in with an on-line attenuation basin and wider amenity area.

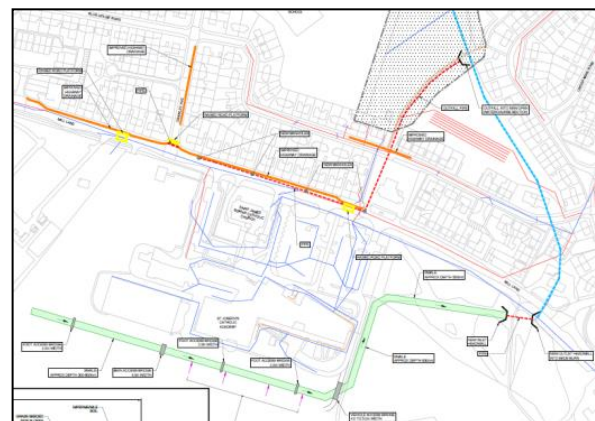


*Aerial Images showing Bede Burn daylighting section pre construction (left) and during construction (right)*

### **Mill Lane and St Joseph’s School**

A under- drained swale leading to Bede Burn to the south of St Joseph’s school will prevent surface water from reaching Mill Lane, Crawley Avenue and College Road.

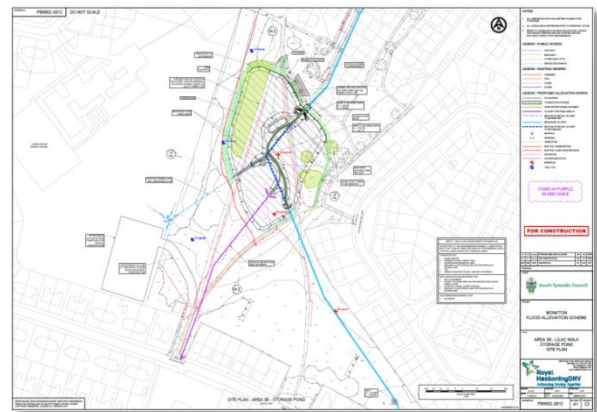
Any residual flows will be picked up by raised platforms on Mill Lane and Crawley Avenue and are diverted into to the storage pond/daylighted section at Bede Burn.



### Toner Avenue School (Lilac Walk and Kelly Road)

A detention basin constructed to the back of Toner Avenue School will store surface water run-off during peak storm events while filter drains and highways drainage works on Lilac Walk will collect surface water flows and drain directly into Bede Burn Culvert.

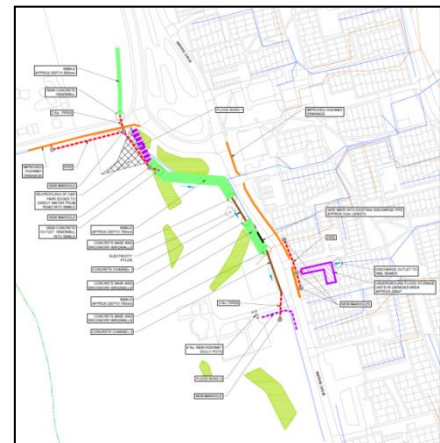
Improvements to highways drainage on Mountbatten Avenue and Kelly Road with help to better protect residents from surface water flooding.



### Lukes Lane Estate (Marine Drive)

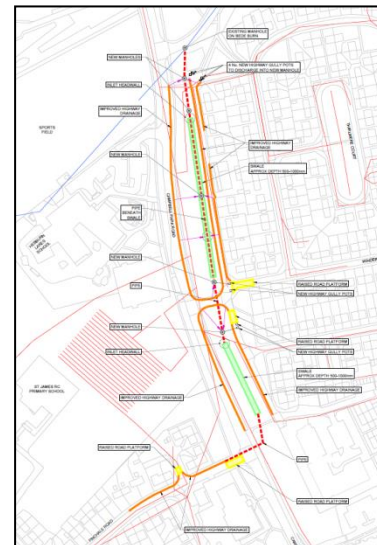
Overland flows from the fields to the west of Marine Drive are attenuated via three storage areas and discharged into the existing NWL network at a controlled rate using a hydro-brake.

Additionally, upgraded highways drainage and a storage area beneath a nearby car park will convey overland flow into the NWL system and ensure residents are better protected against surface water flooding.



### Campbell Park Road

A combination of an improved highways drainage including a new road gully system on both sides of Campbell Park Road and raised road platforms on Penrith Road direct flows from the estate and discharge into a swale flowing northwards, draining directly into the Bede Burn culvert will better protect residents in the local area.



## 5. Specific project details

The budget for the scheme was fixed so any design solutions needed to provide robust cost certainty while delivering the required standard of protection. Procurement of the contractor through the SCAPE framework allowed for Early Contractor Involvement, resulting in a strong collaborative approach between South Tyneside Council, Royal Haskoning and Balfour Beatty and ultimately a robust feasibility study and defined scope of works. This collaboration identified and delivered £550k of value engineered savings over the scheme including reusing site materials, sharing construction costs with a neighbouring scheme and redesigning construction details.

The programme was developed to ensure work at St Joseph’s Catholic Academy grounds was undertaken during the summer holidays and was delivered prior to the pupils return.



SuDS included in the design solution offer wider benefits than flood risk reduction. The daylighting work, which involved removing the once buried culverted Bede Burn at Toner Avenue School and opening it up to a low flow channel and wider flood basin, created a new habitat for wildlife. The watercourse was over pumped during the daylighting works, segregating the works from the watercourse and allowing work to proceed without risk of pollution.

Wildflower meadow seeding to the sides of the channel and three new backwater areas with wetland planting created an additional 8.4 hectares of water-dependant habitat and will produce greater biodiversity in the area over time. Headwalls within the area were also constructed from seeded bags, creating a more sustainable addition to the landscape. Over 200 trees were planted in the construction of the scheme, adding to the overall aesthetics of the scheme.



Dealing with excavated material from construction and moving it was a primary consideration, flood bunds were created using re-used material from excavations. The remaining excavated material was used as fill in a local disused quarry enabling 98% of excavated material produced by the site to be diverted from landfill.

*Images showing Bede Burn daylighting section pre construction (above) and post construction (below)*

## 6. Maintenance & operation

South Tyneside Council are responsible for the inspection, operation and maintenance of all elements of the scheme, which are all carried out using well established, best practice techniques at regular prescribed intervals.

Operation and maintenance activities are preceded by rapid walkovers by qualified ecologists, two weeks prior to any planned maintenance, to identify any invasive or protected plants or species. All operational or maintenance activities are planned to avoid disturbing protected species during nesting season.

Similarly, the timing of proposed inspection and maintenance works are timed to ensure that land use practices and the public are not unduly disrupted such as school term times and sports events.

Strong community ties with the project have been maintained long term following construction with the Tyne Rivers Trust engaging with local schools and residents to get involved with the soft landscaping of the site once major culverts were completed such

as the planting of wildflowers (local newspaper clipping shown). The collaborative approach with the community has made the scheme more resilient, preventing flooding and also encouraging residents to take ownership of the areas that have been created with their help.

### Pupils from a Hebburn primary school help spruce up area's river banks



## 7. Monitoring and evaluation

The bespoke inspection and maintenance regime put in place by South Tyneside Council and discussed in section 6 will ensure the continued successful operation of the scheme and all its elements.

## 8. Benefits and achievements

The close working relationship the project team had with the community was key to the successful delivery of the scheme. Involvement of children from Hebburn Lakes Primary School and Toner Avenue Primary helped their schools prepare for flooding during 'Flood week' organised by the Environment Agency. Pupils at St Joseph's Academy took part in flood risk management sessions and a flood risk management day which consisted of a design challenge. This also included a careers event attended by 12 partner organisations. In total, local engagement included 4 schools (3 primary 1 secondary), 39 businesses, 1138 children and young people, 106 adults, 3 consultations and 6 workshops held.

Additionally, a multi-agency communication plan was developed so that key messages for the scheme could be effectively delivered. Primary school children prepared for flooding during 'Flood week' organised by the EA, while secondary school pupils took part in a flood risk management day

including design challenge. We also delivered a flood focused careers event with 12 partner organisations. An Employment and Skills plan was produced which identified opportunities that were to be created during the project including on-site training for those employed for the contract, with 100% local employment utilised within 40 miles and a £1.2 million local spend.

Agreement was made with Northumbrian Water to discharge into their surface water drain if flows were throttled from the attenuating basin at the Lukes Lane development. This was achieved by the construction of a hydro-brake in the downstream connection into their manhole providing a highly sustainable, precision engineered flow control. The surrounding area also made use of improved ‘super-gullies’. These effective, low maintenance high capacity road gullies for kerbside storm water management are installed in highways to prevent run-off bypassing the swales and flowing into the estate. A recent development (at the time) the gully rapidly removes water from highways prone to flooding and has been effective in its use in the scheme, intercepting water on carriageways prior to it reaching flood areas.

## 9. Lessons learnt

The main challenge faced by the team was the amount of services that traversed the site. In just over 3km of drainage run, the team had to coordinate an approach for dealing with over 300 live services. Following the use of Ground Penetrating Radar (GPR) to determine the location and extent of the complicated network of services, the decision was made to use hand digging extensively. Despite, the time consuming nature of this work the approach was considered to avoid service strikes and keep the workforce safe. 60 additional services were found during hand digging which were not located using GPR, while this caused delay and added approximately 2 months to the programme, the majority of this delay was absorbed and mitigated by additional resource to work around the services.







## 10. Project details

**Construction completed:** 19<sup>th</sup> February 2019

**Cost:** *Approximately £2.5 million*

**Extent:** 1.1 Ha of entire scheme

## 11. Project team

Funders	<ul style="list-style-type: none"> <li>Environment Agency (FDGiA)</li> <li>Tyne Rivers Trust</li> <li>South Tyneside Council</li> </ul>	  
Clients	<ul style="list-style-type: none"> <li>South Tyneside Council</li> </ul>	
Designers	<ul style="list-style-type: none"> <li>Royal Haskoning DHV</li> </ul>	
Contractors	<ul style="list-style-type: none"> <li>Balfour Beatty</li> </ul>	





**Image Description – Attenuation Basin (daylighting) under construction at Toner Avenue School**



**Image Description – Attenuation Basin (daylighting) under construction at Toner Avenue School**



**Image Description – Attenuation Basin (daylighting) under construction at Toner Avenue School**



**Image Description – Attenuation Basin (daylighting) under construction at Toner School**



**Image Description – Bund/Swale under construction at Lukes Lane**



**Image Description- Completed Bund/Swale at Lukes Lane**

# Monkton Flood Alleviation Scheme, Sustainability Category

This is the perfect example of how a flood alleviation scheme can deliver many environmental benefits utilising soft engineering approaches.

It was identified that the flood alleviation scheme could be combined with a Living Waterways scheme which would daylight a section of the Bede Burn water course. This delivered a larger more attractive wildlife area than could have been delivered separately.

## DESIGN

- Catchment based modelling utilised to consider all sources of flood risk
- Surface water removed from combined sewer
- Soft engineering approaches such as sustainable urban drainage
- Low future maintenance costs
- Naturalisation of the de-culverted watercourse



## MULTI BENEFITS

- 85m of WFD improvements
- 0.26hectare water dependent habitat
- 220 trees planted
- Public amenity enhanced and improved health and well-being for residents

## CONSTRUCTION

- Material reutilised on site and diverted from landfill
- 100% local employment (within 40 miles) reducing carbon footprint
- £1.2 million local spend
- Employment and skills plan produced



## COMMUNITY ENGAGEMENT AND INSPIRING OTHERS TO ACT

- Engagement with local schools
- Careers event and flood weeks
- Multi agency and partner approach to public consultation
- Litter picking events
- 7 community plantings days



*Previous award submission - Plan showing the detention basin near Toner Avenue School (Flood and Coast Awards Submission)*