B£ST Case Study

Reducing Combined Sewer Overflow Spills in Roundhay

Background

Yorkshire Water investigated the potential of different options to reduce combined sewer overflow (CSO) spills in Roundhay Park in Leeds, as part of its plans for the 2014 Periodic Review. The aim was to compare the costs, immediate and wider benefits of a SuDS and conventional drainage approach. An initial assessment of the benefits of the options using an ecosystem services approach was completed in 2013. This case study sets out an update to this work using the 2019 version of B£ST. Values therefore differ from earlier versions of the case study due to inflation.

The export report from the assessment is included below. This report includes the following outputs from B£ST.

- Project details
- B£ST Results Dashboard
- Written evidence

Approach

The study considered four options.

- Option 1: A conventional solution to store water in concrete tanks at CSOs to limit the volume spilling to the watercourse and return it to the combined sewer after the storm.
- Option 2: A conventional (+) option that limited the volume spilling from the CSOs but also reduced predicted flooding in the catchment (giving similar hydraulic performance in the combined sewer network to options 3 and 4). This option included a combination of storage tanks and pipe upsizing to manage the flow in the combined sewer.
- Option 3: A SuDS approach in public areas to disconnect surface water from the combined system and pass it through the conveyance and storage SuDS. This used a combination of swales, detention basins, geocellular storage and connecting pipes.
- Option 4: A SuDS approach as in option 3 with measures added in residential private locations. These included water butts and residential rain gardens on properties of sufficient size.

The assessment is based on Option 4.

Results summary

The main results table from B£ST is shown below. Option 4 provides a total present value (PV) benefit of £30.1mn (before confidence) and £10.1mn (post confidence). The benefit cost ratio (post confidence) is 0.9 (range of 0.2 to 4.3).

Present Value Assessment Stage	Total PV Benefits	Total PV Costs	Net Present Value	Benefit Cost Ratio	Benefit distribution score
Present Value before confidence applied	£30,102,977	£10,825,125	£19,277,852	2.8	D
Present Value after confidence applied	£10,062,056	£10,825,125	-£763,069	0.9	D
Present Value sensitivity - low	£1,877,324	£10,825,125	-£8,947,801	0.2	D
Present Value sensitivity - high	£46,933,102	£10,825,125	£36,107,977	4.3	D

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B£ST Export Report

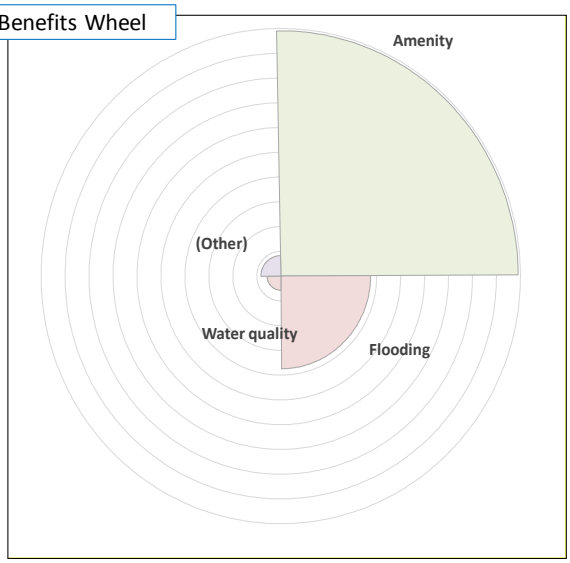
B£ST: Version: 4.1., February-2019, 12 Feb 2019, 14:46:28

Author	J McMullan
Date	01/02/2019
Project Name	Roundhay Park SuDS Scheme
Project Reference Number	
Assessment version	1
Location name	Roundhay Park, Leeds
Summarise baseline option	Existing
Summarise proposed option	Highway runoff diverted into SuDS across the catchment through swales and pipes. Storage in detention basin/online pond

Author	J McMullan
	and geocellular. Raingardens and water butts used on private properties.
Baseline option Present Value Cost (if applicable)	£0
Proposed option Present Value Cost	£10,825,125
Scheme supporters	Local Authority, Water and Sewerage Company
Scheme funders	Water and Sewerage Company
Discount rate to apply	3.5%

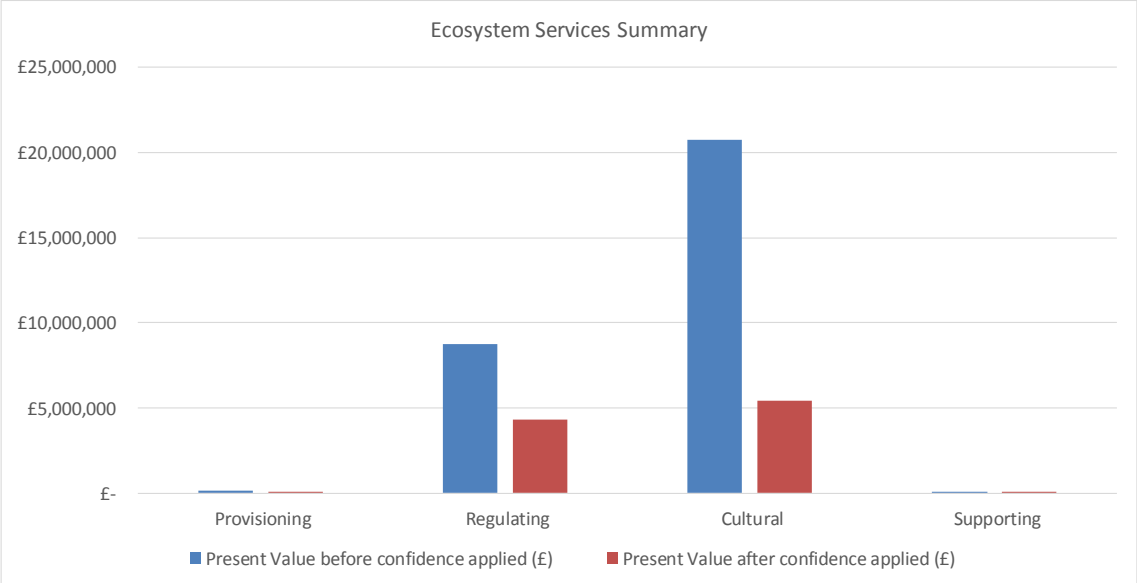
Results Dashboard

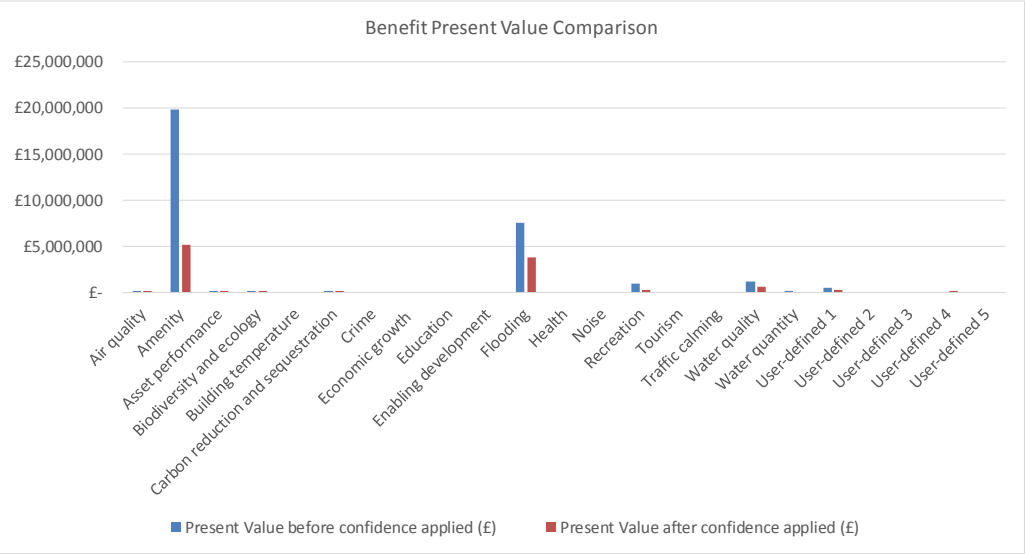
Benefits Wheel

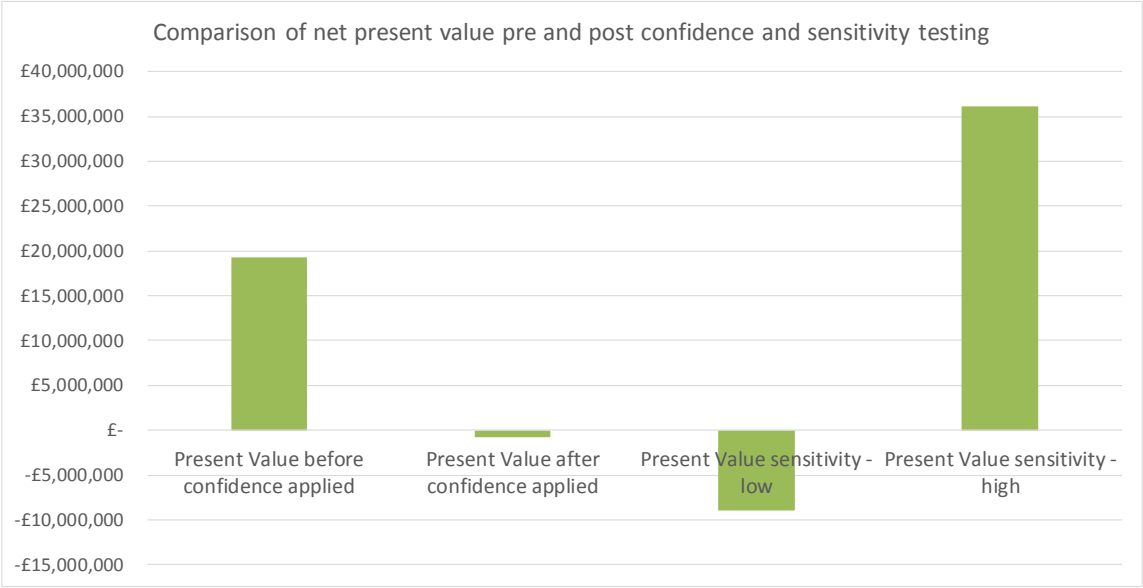


Select the number of benefits (1-10)
3

Select the present values results
Present Value before confidence applied




Benefit Present Value Comparison
£25,000,000
£20,000,000
£15,000,000
£10,000,000
£5,000,000
£-
Air quality
Amenity
Asset performance
Biodiversity and ecology
Building temperature
Carbon reduction and sequestration
Crime
Economic growth
Education
Enabling development
Flooding
Health
Noise
Recreation
Tourism
Traffic calming
Water quality
Water quantity
User-defined 1
User-defined 2
User-defined 3
User-defined 4
User-defined 5
Present Value before confidence applied (£)
Present Value after confidence applied (£)


Comparison of net present value pre and post confidence and sensitivity testing
£40,000,000
£35,000,000
£30,000,000
£25,000,000
£20,000,000
£15,000,000
£10,000,000
£5,000,000
£-
-£5,000,000
-£10,000,000
-£15,000,000
Present Value before confidence applied
Present Value after confidence applied
Present Value sensitivity - low
Present Value sensitivity - high

PV Assessment

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Benefit Category

Benefit category	Present Value before confidence applied (£)	Present Value after confidence applied (£)	Present Value sensitivity - low (£)	Present Value sensitivity - high (£)
Air quality	£89,588	£22,397	£5,599	£139,982
Amenity	£19,813,907	£5,164,098	£1,238,369	£30,959,230
Asset performance	£71,236	£53,427	£4,452	£111,306
Biodiversity and ecology	£1,219	£305	£76	£1,904
Building temperature	£0	£0	£0	£0
Carbon reduction and sequestration	£9,081	£4,567	£40	£992
Crime	£0	£0	£0	£0
Economic growth	£0	£0	£0	£0
Education	£0	£0	£0	£0
Enabling development	£0	£0	£0	£0

Benefit category	Present Value before confidence applied (£)	Present Value after confidence applied (£)	Present Value sensitivity - low (£)	Present Value sensitivity - high (£)
Flooding	£7,491,969	£3,745,984	£468,248	£11,706,201
Health	£0	£0	£0	£0
Noise	£0	£0	£0	£0
Recreation	£931,644	£252,261	£58,228	£1,455,694
Tourism	£0	£0	£0	£0
Traffic calming	£0	£0	£0	£0
Water quality	£1,142,049	£571,025	£71,378	£1,784,452
Water quantity	£57,346	£0	£0	£0
User-defined 1	£494,939	£247,469	£30,934	£773,342
User-defined 2	£0	£0	£0	£0
User-defined 3	£0	£0	£0	£0
User-defined 4	£0	£523	£0	£0
User-defined 5	£0	£0	£0	£0

EcoSystem Service

Ecosystem service	Present Value before confidence applied (£)	Present Value after confidence applied (£)	Present Value sensitivity - low (£)	Present Value sensitivity - high (£)
Provisioning	£128,582	£53,427	£4,452	£111,306
Regulating	£8,732,687	£4,343,973	£545,265	£13,631,626
Cultural	£20,745,551	£5,416,359	£1,296,597	£32,414,924
Supporting	£1,219	£305	£76	£1,904
TOTAL	£29,608,038	£9,814,064	£1,846,390	£46,159,760

Evidence Summary

Evidence from AQ - Air quality page
1: A number of trees are being planted as part of this scheme. Some potential improvement in local air quality as a result of additional planting

Evidence from Am - Amenity page
1: There will be new greening as part of this scheme

Evidence from BE - Biodiversity & Ecology page
1: Enhanced water quality and increase in flows to watercourse and lake. Provision of GI to enhance connectivity of green spaces.
2: A number of new swales, green roofs and basins

Evidence from F - Flooding page
1: Schemes across the catchment to manage the risk predicted flooding
2: The flood risk assessment indicates that around 65 properties will benefit from reduced flood risk as a result of implementing the proposed solution

Evidence from QW3 - Rainwater harvesting page
1: A number of interventions will allow rainwater harvesting.

Evidence from R - Recreation page
1: Impacts on fish assumed to be a function of improvements in both water supply and water quality, which are only considered to be more likely for the SuDS options

Evidence from AP2 - Treating wastewater page
1: Conventional solution will increase flow to works.

Evidence from WQ - Water quality page
1: Improve the water quality by reducing the pollutant loads.

Evidence from User-defined benefits page
1: Considering climate change, resilience to flooding is enhanced and an allowance can be made for this.