

**2B's Office and House SuDS Retrofit
Submitted by 2B Landscape Consultancy Ltd**

**Awards category
Regeneration and retrofit – private properties**



Lead or collaborating organisation(s)	2B Landscape Consultancy Ltd
Location of SuDS	HU15 2LF

1. SuDS overview

SuDS components used	<ul style="list-style-type: none"> • Four Green roofs: garage, wood store, shed and office • Water harvesting: four water butts including 1000L IBC tank • Permeable drive (KBI Flexistone) • Hydration channel / Rain garden to front garden • Rill and Pond act as conveyance from rear of house • Attenuation basin / rain garden to rear
Size of the scheme and its local context	Fairly standard 70's detached house/garden office and domestic landscape, in a rural East Yorkshire village. Total plot size approx. 0.1 hectares
Approximate age of scheme (years)	The scheme has developed over time – the oldest green roof is about 13 years old, the newest interventions are about 6 years old.
Benefits of the scheme	<ul style="list-style-type: none"> • Manages the water falling on the property • Adds biodiversity and interest • On-hand CPD for the 2B team - as Landscape Architects, living and working alongside SuDS features is a learning opportunity.
Briefly describe the scheme	<p>2B's office is in the garden of our Directors' house.</p> <p>Over a decade, the property has been retrofitted in every way to catch and manage rainfall, to learn first-hand about constructing and living with SuDS.</p> <p>Two larger green roofs (garage/office), and two on sheds, experiment with different constructions and planting styles.</p> <p>Every downspout is diverted via water butt; from a typical domestic one, to two large rectangular butts. The 'pièce de résistance' is a 1m³ IBC tank, mounted on brick pillars and fed by the house roof. This has been incorporated into a fencing/pergola system at the side of the house.</p> <p>All water not harvested feeds either the hydration channel at the front, or rain garden at the rear of the house.</p> <p>The crated hydration channel, and planted rain garden above, receives water from a major part of the house roof. It intercepts, and supplies water to, the roots of a mature tree, which removes the risk of subsidence around the house</p> <p>The rear rain garden takes rainfall from impermeable roof and patio areas, via a pond (recycled bathtub), to a depression in the lawn. The contingency overflow is via a dry stream bed feature, to a neighbouring agricultural ditch.</p>

2. SuDS details

No	Question	Answer
1	What difference has this scheme made to the local community or area?	<p>Benefits all 4 pillars of SuDS, and provides an exemplar case study and inspiration as part of the North Cave Open Gardens event.</p> <p>Quantity: Rear basin contains a 1:100 year 6-hour storm + 30% climate change allowance. Hydration channel provides 1m³+ storage. Driveway stores around 6m³.</p> <p>Quality: Guttermate filters, driveway wearing course/sub-base, Enviroflow product, and planting all filter water.</p> <p>Biodiversity: Pond provides native marginals, aquatic plants, water insects, tadpoles/frogs. Garden birds visit. Green roofs provide additional areas of biodiverse planting.</p> <p>Amenity: It's a garden, enjoyed from both house and office. SuDS functions inform the design and enhance the amenity interest.</p>
2	What is exceptional about this scheme beyond a standard approach?	<p>The scheme maximises every opportunity to slow the flow of water, in a creative and attractive way. It experiments with different approaches and materials, including re-use of an old bath, relocating the existing seed bed to the green roof and allowing it to naturalise, and a bespoke pergola to convey water at height to a hidden IBC tank for additional storage.</p>
3	How much work went into getting this scheme realised?	<p>The scheme has been a decade-long labour of love! Lots of rewarding work went into every different phase; countless hours of research and deliberation, design refinement, not to mention physical graft (complementing the work of skilled contractors). With two landscape architects living and working on site, it has at times been all-consuming, but very worthwhile.</p>
4	Is this scheme part of a masterplan or integrated into other initiatives?	<p>The whole house and office landscape has been an evolving masterplan. Each of the components has complemented and needed to fit in with the others, each has had to wait its turn until we were ready to do the work for that area. The whole site acts as a test bed, a perennial research project, that is fascinating to observe and take notes from over time.</p>

5	What value does this scheme provide to the local area and beyond?	<p>Benefits all 4 pillars of SuDS, see Q1. It performs faultlessly to attenuate. No water was seen in the rain garden basin until the extreme rainfall of November 2019, at which time the overflow performed as expected, with a great deal less water entering the local ditch system and contributing to the flood event, than it otherwise would.</p> <p>Additionally, the scheme provides an exemplar case study and inspiration to others. It has been part of the North Cave Open Gardens event, features regularly on 2B's blog, and is a Slow The Flow case study.</p>
6	What challenges/problems needed to be addressed to realise this scheme?	<p>In drought, the green roofs were not green at all, but brown.</p> <p>Water butts are relatively expensive for the volume of storage they provide. Second-hand IBC tanks are relatively cheap for the high volume of storage they provide, but needed careful design to mitigate the 'industrial' aesthetic, and to get the water across (over) the path to the location where it could be screened.</p>
7	How does the scheme address related issues such as water scarcity, nutrient neutrality, or biodiversity net gain?	<p>In recent drought events, the water harvested in water butts and the IBC tank has been essential for irrigation of the garden, including the green roofs, and also for some cleaning tasks.</p> <p>The pond has become a microcosm of biodiversity, with interesting water insects, tadpoles and frogs. The garden birds enjoy a drink and a bath. A range of native marginals and aquatics have been introduced, bringing new textures, colours and smells to the garden. The green roofs provide additional areas of biodiverse planting, where would otherwise be hard surfaces.</p>

8	Is learning from the scheme continually captured and communicated? Please give examples.	The rear garden rill/pond/rain garden is adjacent the garden office, and has been monitored every time there has been a daytime storm. It performs faultlessly, and no water was seen in the rain garden basin until the serious rainfall and flooding event of November 2019, at which time there were a few inches of water and the overflow performed as expected. The front garden interventions have only been overwhelmed when forced to accept additional water from the adjacent lane, in a flood event. Learnings are communicated on 2B's blog .
9	What approaches/measures are taken to ensure the scheme is properly managed and maintained?	Maintenance is limited to normal garden maintenance, underlining the benefit of landscape-based SuDS – the level of maintenance specific to the SuDS features is negligible. It is limited to: <ul style="list-style-type: none"> • occasional weeding of the roofs; • checking and emptying of the Guttermate filters/diverters after heavy rain. These trap what would otherwise be a significant amount of organic material (moss, lichen and leaves) from the roofs, being deposited into the water butts and tank. These are all accessed at ground level, apart from the filter on top of the IBC tank, which needs a small ladder, but is easy to access.
10	Have you collected any feedback on your scheme? What do people say about it? Can you provide any quotes?	During open Gardens in 2023, we provided information about the SuDS approaches and people were interested to learn more. Most people simply said what a lovely garden it was.

More detail can be found in our documentation of the project on our website blog over the years:



[2B's house and office - a SuDS retrofit exemplar](https://www.2bconsultancy.co.uk/2b-blog.php?pid=112): <https://www.2bconsultancy.co.uk/2b-blog.php?pid=112>



[2B's Rain Garden \(or is it a bathtub?\)](https://www.2bconsultancy.co.uk/2b-blog.php?pid=94): <https://www.2bconsultancy.co.uk/2b-blog.php?pid=94>

[3 Generations of Green Roof](https://www.2bconsultancy.co.uk/2b-blog.php?pid=45): <https://www.2bconsultancy.co.uk/2b-blog.php?pid=45>

[Construction video for the 2010 roof](https://player.vimeo.com/video/34448084?title=0&byline=0&portrait=0): <https://player.vimeo.com/video/34448084?title=0&byline=0&portrait=0>

3. Supporting materials

Image (low resolution)	Caption	Image credit
	<p>Graphic locating all of the SuDS interventions; produced for 'North Cave Open Gardens', where Bill and Elizabeth opened the garden to showcase the possibilities to the neighbourhood.</p>	<p>2B Landscape Consultancy Ltd</p>
	<p>The office green roof (36m²) over time, 2014-2018.</p> <p>No planting was undertaken on this green roof. A mix of garden soil and subsoil was retained and re-used from the office foundation excavation. This has led to some intriguing plant colonisation, from plants we knew we had, to many species that we had no idea were present in the soil seed bank. With only occasional weeding, the roof has provided a biodiverse and varied display every year.</p> <p>The office green roof results in a notable slowing of flow during and after a storm. The residual flow is directed to permeable 'Enviroflow', which links to the rear ditch, although the water is probably mostly absorbed by the surrounding soil.</p>	<p>2B Landscape Consultancy Ltd</p>

	<p>The 200L water butt at the rear of the house (front right of photograph) flows, via a grated rill in the rear patio, into a pond which is made from a recycled bathtub. This is also fed by the IBC tank overflow, which is piped to the rear garden due to distance and gradient. The pond overflows into the rear rain garden, which is a shallow basin created in the rear lawn. When this basin overtops, it flows through a dry stream bed feature to the rear of the garden, where there is a ditch forming part of the local surface water drainage system.</p>	<p>2B Landscape Consultancy Ltd</p>
	<p>When the shallow basin in the rear lawn overtops, it flows through a dry stream bed feature to the rear of the garden, where there is a ditch forming part of the local surface water drainage system.</p>	<p>2B Landscape Consultancy Ltd</p>



The house green roof: the flat garage roof was replaced with a green roof in 2010 (8.5m²), and provided a much improved view out of the window of the old office space in the house, until we were able to construct the garden office building. It also helps to regulate the temperature in the garage below.

The garage and office green roofs build-up comprise butyl liner and Terram protective membrane overlaid with recycled plastic permeable 'planks' (previously known as 'Aquadyne', now 'EnviroFlow') which provide support, protection and a drainage layer below the planting medium. In the case of the garage roof, and the shed and wood store green roofs, the planting medium was GreenTech GT-4 expanded aggregate, placed above a waterproofing liner. The garage green roof 'slows the flow' of part of the roof water destined for the IBC tank.

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The permeable driveway under construction, with rain garden/hydration channel seen in the curved bed in the centre of the photograph.

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The driveway was installed as the last major construction element, following the subsidence repairs and the office and rear extension construction. The former concrete drive (45 years old and well past its sell-by date) was removed for recycling. Type 3 stone sub-base was selected for its void content and permeability, and blinded with coarse sand.

The KBI Flexistone was laid to the sides of the house and the front, with simple timber edging, over the course of two days. The drive overlays part of the hydration channel, allowing a direct path for water into the channel. The channel is also fed from the front and side house downspouts, less the small amount diverted to the water butts.



Micro green roofs on the wood store (1.1m²) and shed (3.8m²) were added in 2012, adding interest and biodiversity.

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