



# Green Bridges & Tunnels

An introduction to  
drainage geocomposites  
and water attenuation  
in green bridge and  
tunnel applications.

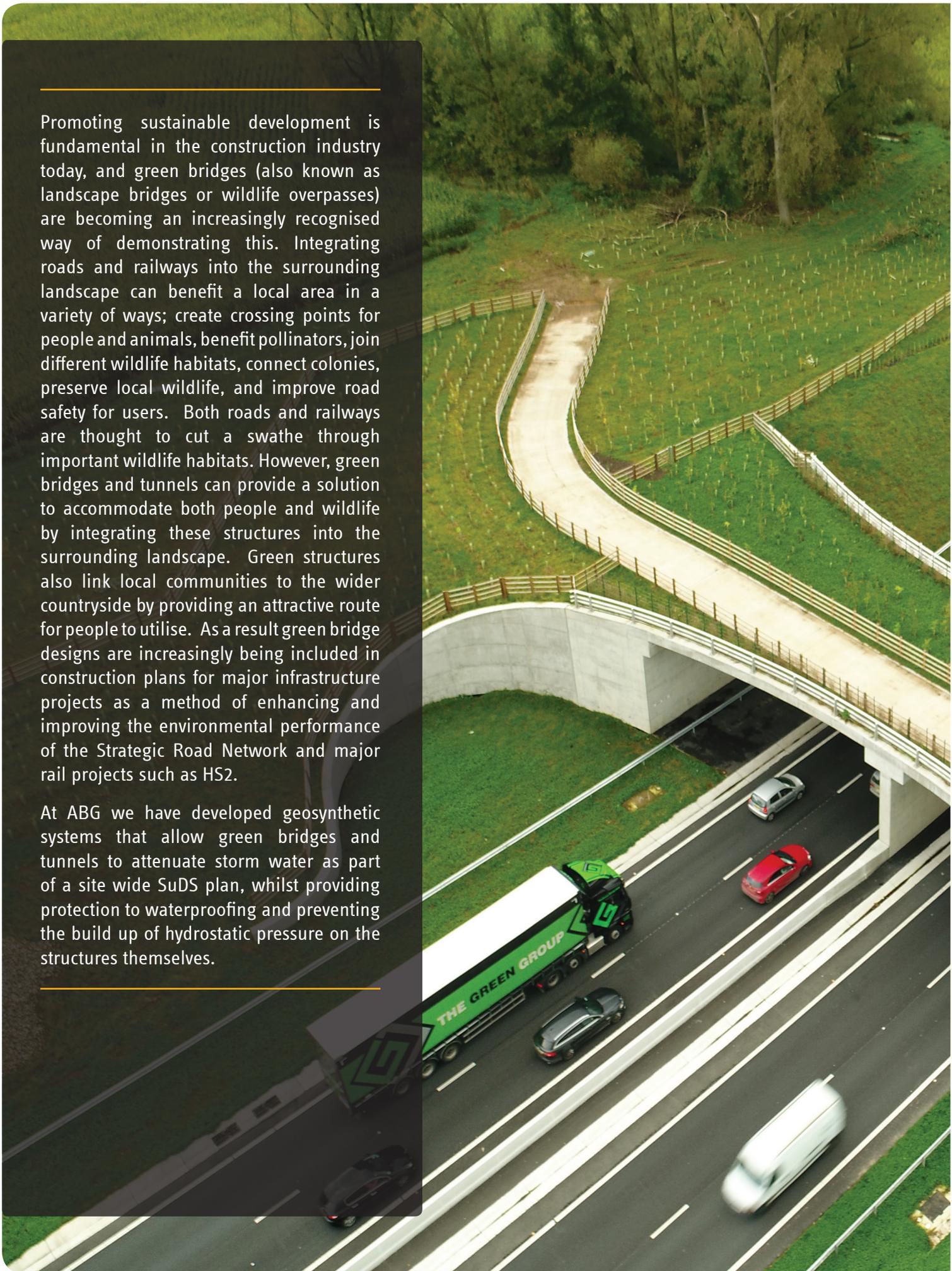
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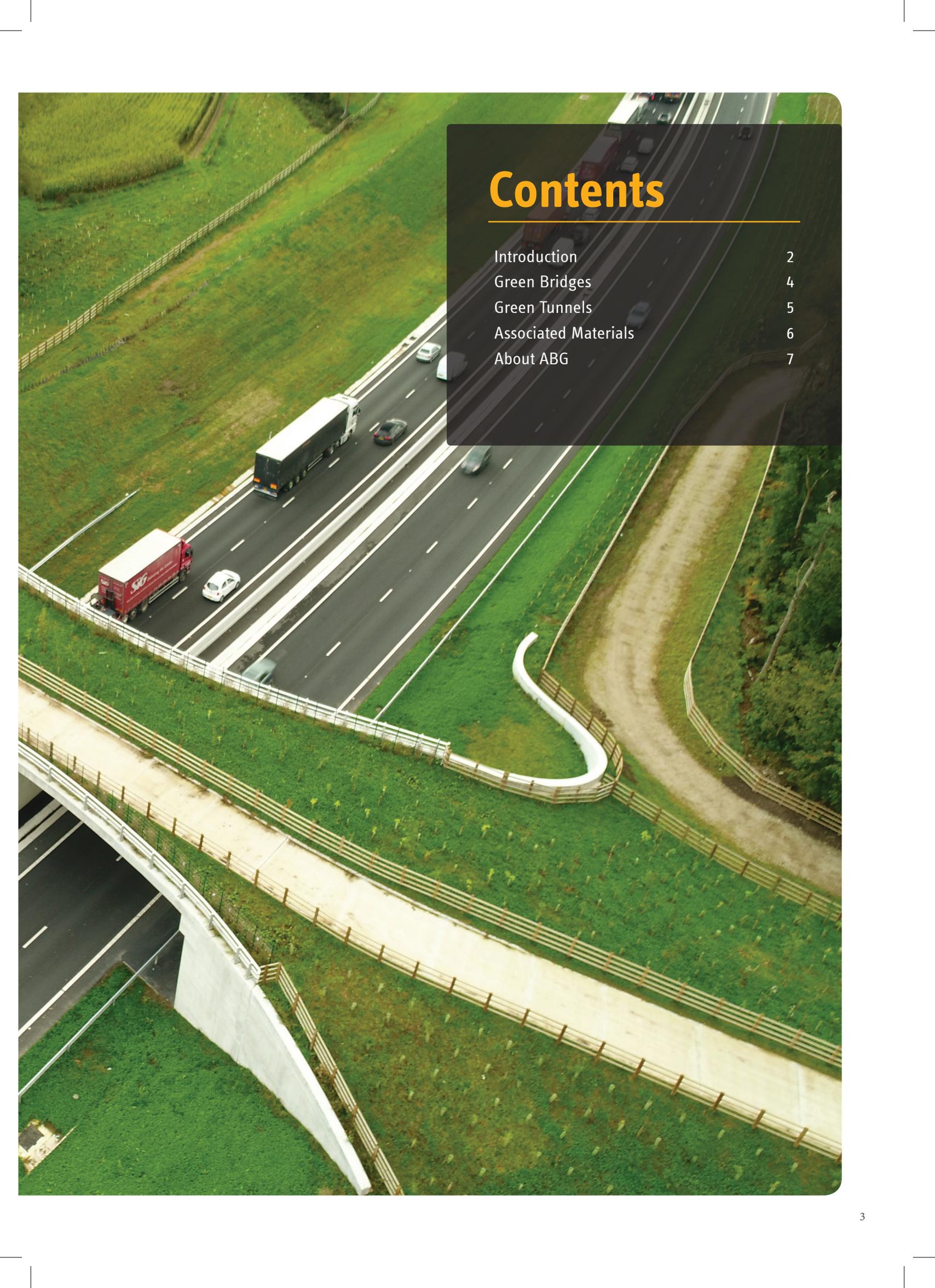
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Promoting sustainable development is fundamental in the construction industry today, and green bridges (also known as landscape bridges or wildlife overpasses) are becoming an increasingly recognised way of demonstrating this. Integrating roads and railways into the surrounding landscape can benefit a local area in a variety of ways; create crossing points for people and animals, benefit pollinators, join different wildlife habitats, connect colonies, preserve local wildlife, and improve road safety for users. Both roads and railways are thought to cut a swathe through important wildlife habitats. However, green bridges and tunnels can provide a solution to accommodate both people and wildlife by integrating these structures into the surrounding landscape. Green structures also link local communities to the wider countryside by providing an attractive route for people to utilise. As a result green bridge designs are increasingly being included in construction plans for major infrastructure projects as a method of enhancing and improving the environmental performance of the Strategic Road Network and major rail projects such as HS2.

At ABG we have developed geosynthetic systems that allow green bridges and tunnels to attenuate storm water as part of a site wide SuDS plan, whilst providing protection to waterproofing and preventing the build up of hydrostatic pressure on the structures themselves.

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# Green Bridges

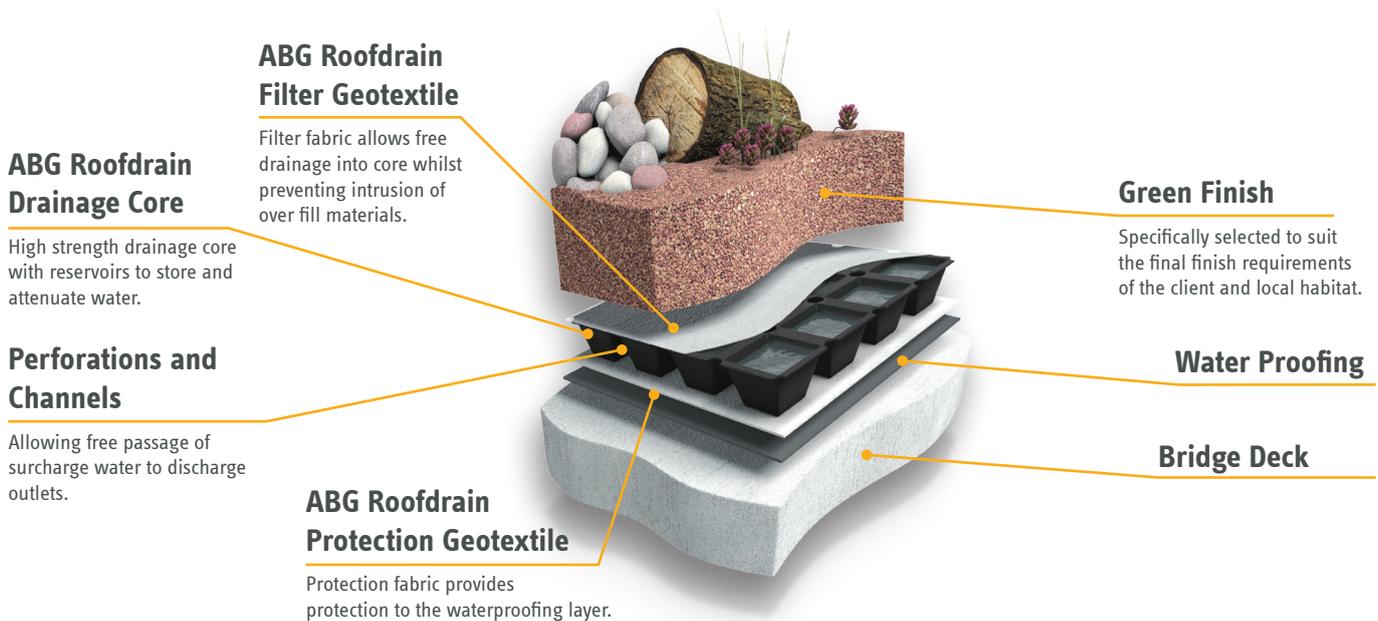
ABG's green bridge technology provides both structural drainage and physical protection to the structure, allowing attenuation of rain water to mitigate the effects of storm water, with an element of storage to sustain trees and vegetation through dry periods. The ABG system is lighter-weight than traditional methods, minimising dead loading, and can be applied to both new build and retrofit schemes.

Natural England are a UK government conservation agency who give advice on environmental impacts to developers and planning authorities, with their aim being on conserving, enhancing and managing the natural environment. They commissioned the first worldwide study of green bridges, "Green Bridges: A Literature Review (NECR181)" where they identified the important contribution to sustainability offered by green bridges and tunnels. The key points were:

- Integrating roads and railways into surrounding landscape
- Creating a crossing point for people and wildlife
- Providing a home for wildlife
- Joining up habitats and connecting colonies
- Facilitating movement of beneficial pollinators

By addressing the severance effect it is possible to significantly reduce the environmental impact of linear assets such as highways or railways, providing they are designed sensitively. Basic design factors for green bridges and tunnels should include engineering considerations for drainage and water management.

ABG's green bridge technology provides both structural drainage and physical protection to the structure, allowing attenuation of rain water to mitigate the effects of storm water, as well as sustaining trees and vegetation through dry periods. The ABG system is also considerably lighter than traditional methods, minimising dead loading, and can be applied to both new build and retrofit schemes.



## Green Bridge and Tunnel Finishes

### Natural Bridge

- Larger green bridge structures.
- Provide continuity of habitats.
- Varied topography.



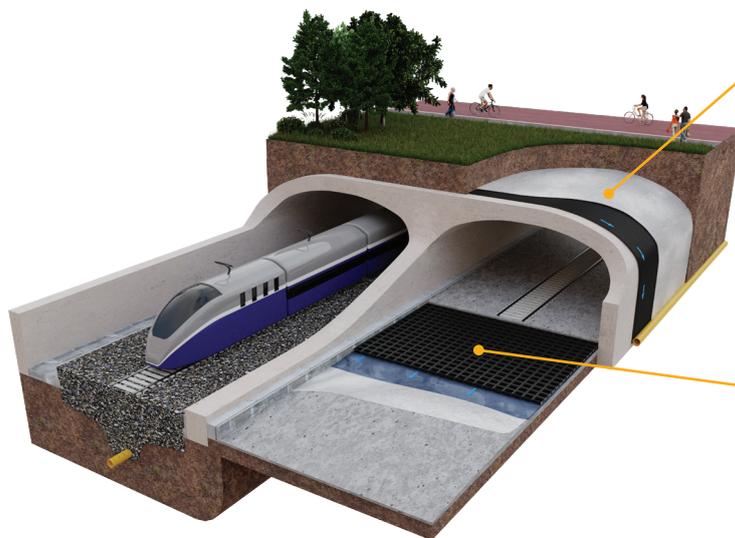
### Wildlife Bridge

- Max. width of 50m.
- Facilitate movement of wildlife.
- Commonly hourglass shaped.



# Green Tunnels

ABG's green tunnel technology eliminates the build-up of hydrostatic pressure on the structure. ABG's high-performance drainage geocomposites provide a highly efficient and environmentally friendly alternative to traditional structural drainage.



## ABG Deckdrain

High performance drainage composite and geotextile used to protect waterproofing systems and provide free flowing omnidirectional drainage.

## ABG Cavidrain Invert

Preformed drainage layer that replaces a crushed stone invert trench and pipe, used to collect and carry infiltration water.

Green Tunnels, or cut and cover tunnels as they are more commonly known, are typically constructed over long, large stretches of land by excavating the ground to the required level and covering the tunnel once it has been erected. Traditionally, green tunnels can provide immense logistical challenges as a result of importing crushed stone for drainage of the structure. In turn, the carbon cost related to this can be significant, and as green structures tend to be designed from an ecological perspective, this is not always the most suitable solution.

ABG's BBA certified Deckdrain drainage geocomposite provides a free flowing drainage void in all directions, whilst protecting and enhancing the waterproofing and eradicating any requirement for crushed stone on the structure and offering carbon savings of more than 90% compared with traditional methods. Deckdrain can also be combined with ABG Cavidrain Invert - replacing crushed stone and pipes traditionally used to collect

and transport infiltration water with a preformed 40-60mm drainage layer into which the concrete floor can then be cast. This is optimised for high in-plane flow to mitigate problems caused by calcareous deposits. ABG's green tunnel technology is able to provide increased protection to the tunnel structure whilst relieving the effects of water penetration from particulate or soil interfaces.

Lawton's independent review "Making Space for Nature" was published in 2010 and provides recommendations on achieving a healthy natural environment by reviewing England's wildlife sites and the connections between them. It breaks down what needs to be done in four simple words; "More, bigger, better and joined." Green tunnels can be a key step in achieving this by addressing the severance effects of linear transport infrastructure on landscape, access and wildlife, ultimately enhancing the resilience and coherence of the ecological network.

## Mixed Use Bridge

- Primarily used for access.
- Usually split into two areas.
- Pedestrian and wildlife areas ideally on different levels.



## Modified Green Bridge/Green Overbridge

- Typically a lower cost solution.
- Ideal for adapting existing structures.
- Creates wider biodiversity benefits.



# Associated materials

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## Stabilisation of Temporary and Permanent Roads

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Frequent trafficking by vehicles with heavy loads will result in ruts and constant regrading of the road. ABG offers a range of solutions for road base stabilisation that minimise the amount of stone and subsequent maintenance required. The solution could be based on a robust woven geotextile, a geogrid or a geocellular web, whichever is the most economical and practical for each design situation.



## Retaining Walls

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Webwall is a geosynthetic system designed for the construction of retaining walls. It uses a geocellular mattress which is laid in layers, each expanded and filled with site won materials then planted to form a structure with a vegetated face.



## Findrains

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ABG findrains (Fildrain) offer a high performance, economic alternative to traditional stone groundwater drainage solutions and are used extensively in a wide range of applications, from highway edge drainage and cess drainage through to landscape drainage. Fildrain offers a viable cost-effective alternative to traditional drainage systems using geotextile filter fabrics and stone drainage medium.



## Structural Drainage

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ABG Deckdrain drainage geocomposites offer high performance, cost-effective alternatives to traditional stone or hollow block drainage solutions, and have been used extensively in highway and rail projects as back of wall drainage significantly reducing the import of granular stone to site and reducing carbon emissions.



## About ABG

ABG is a market leader in the design, development, manufacture and technical support of high performance geosynthetic systems for use in a wide range of civil engineering, environmental and sustainable building projects.

Formed in 1988, based in Meltham, in the heart of the Pennines, ABG have developed an excellent reputation for developing quality products and delivering outstanding service. The ability for rapid product development ensures that the most innovative, up-to-date and cost-effective solution can be found for many engineering problems.

ABG's involvement in green infra structure drainage goes back over twenty five years and we have a complete range of products developed specifically for use in this technically demanding application.

Technical support is provided by our trained and experienced staff, many of whom are Chartered Civil Engineers. This extensive support extends to full design, design validation, feasibility studies, cost advice and advice on meeting regulatory requirements.

Part of this technical support includes developing and driving knowledge within our active markets including working with both international and local regulatory bodies on developing guidance and best practice in the use of innovative geosynthetics to solve complex engineering issues.

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