Introduction

Welcome to our engagement exhibition, where you are able to see our plans for the design and construction of the Sheephouse Wood bat mitigation structure, one of the Key Design Elements (KDE) of the HS2 railway in the Calvert area.

At this exhibition you can also find out more about our plans to protect local flora and fauna. You also have an opportunity to tell us what you think about our design by having your say on some of our design finishes.

Who is EKFB?

EKFB is a joint venture that brings together international, market-leading expertise from four renowned civil engineering and construction companies: Eiffage, Kier, Ferrovial Construction and BAM Nuttall.

All four partners bring specialist expertise in the design, construction, operation, financing and maintenance of railway networks, including some of Europe's high-speed rail projects.

EKFB is proud to have been appointed by HS2 to deliver civil engineering works across an 80km section of the new high-speed rail link between the Chiltern Tunnel and Long Itchington Wood.

Our scope of the works includes 15 viaducts, 6.9km of green tunnels, 22km of road diversions, 81 bridges and around 30 million cubic metres of excavation.

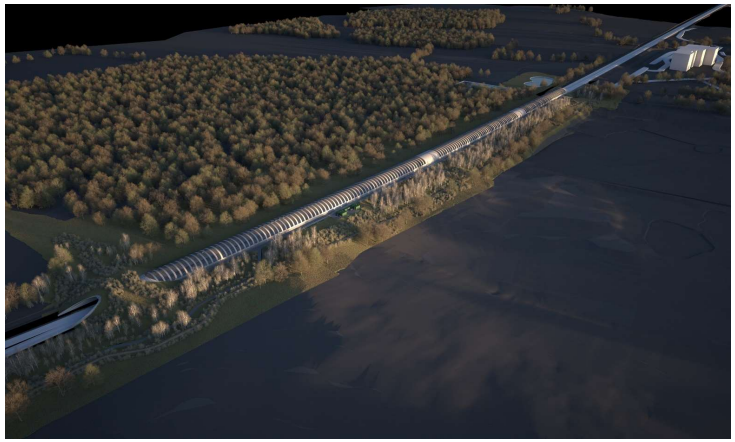
What are Key Design Elements?

These are structures along the route that have been recognised to be important.

This could be due to their size, proximity to stakeholders or their location within sensitive areas.

The design for the structure has been developed with consideration for technical and structural requirements as well as its importance for the protection of the bat species in this area.

Artist's impression of the structure looking North from the footpath 10 years post operation



Artist's impression of the aerial view of the structure, from North to South 10 years post operation

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Sheephouse Wood bat protection structure

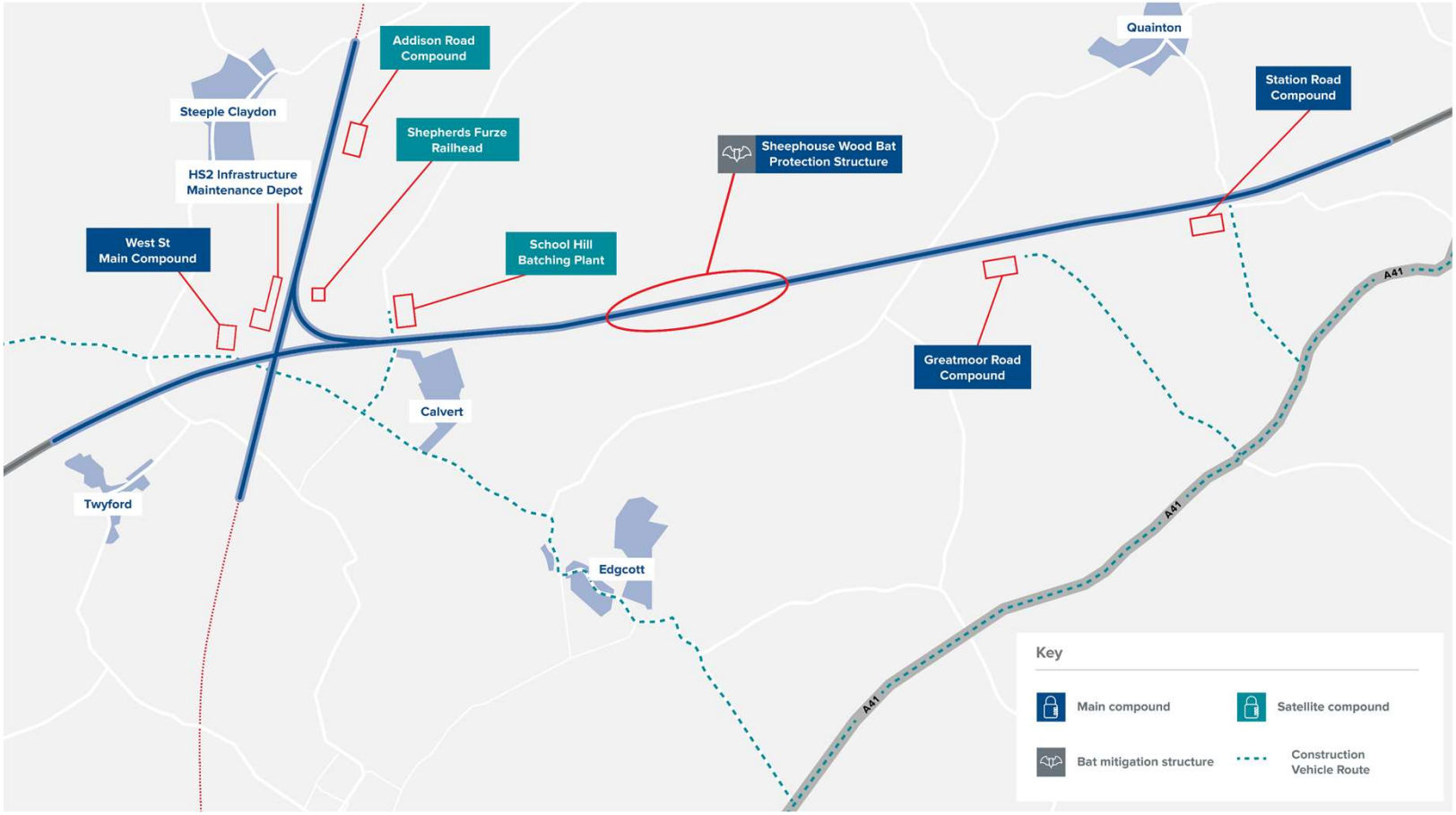
This structure is an important element of our design along the trace as it will run parallel to Sheephouse Wood, a section of recorded ancient woodland and a Site of Special Scientific Interest (SSSI).

The woodland houses a diverse array of wildlife and is a known conservation area and home to the protected species of Bechstein's bat.

With this taken into consideration, we have designed a unique structure which allows for the ecological sensitivities within the area .

Our objectives with our design is to provide a safe structure to ensure bat flight paths, for migratory and feeding purposes, are retained for bat species that are present in the surrounding woodland.

We have focused on creating a design which will be sympathetic to the local landscape and, in time, will embed itself into the backdrop of the surrounding local woodland.



Map above shows the Calvert Area work sites with bat structure located in the middle of the works area.

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Why is it important to protect bats?

Sheephouse Wood is located in an area known for its important bat habitats. As part of the HS2 Green corridor strategy, we are committed to protecting habitats and species along the railway line.

- Around the Sheephouse Wood area, 13 bat species have been identified including the rare Bechstein's bat.
- Bats use this area for foraging – finding food – and for reproduction. At least 5 colonies of breeding female Bechstein's bat have been found in the area.
- Radio tracking shows us that bats cross the railway line at multiple points. This makes them vulnerable to collision with passing trains. They can also be killed by the turbulence created by the high-speed trains.

The Bechstein's bat population in Sheephouse Wood is genetically different to other UK populations. Any decline in bat numbers could result in extinction of this unique population.

Protected species

Bats and their roosts are protected under UK and international law because of their declining numbers.

It is illegal to deliberately kill, capture or injure bats. It is also illegal to destroy or damage their roosts without a special licence.

Any development that will affect bats and their habitats can only go ahead if plans are in place to protect them.

These protection plans must demonstrate that the favourable conservation status of bats can be protected and that the number of bats will not decline.

Top tip!
Scan the QR code on your phone to watch how HS2 are protecting bats throughout the project.

Photographs show of examples of bat radio trackers being carefully fitted by experts to monitor bat behaviour.

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Design considerations

We explored a number of design options for the Sheephouse Wood Bat Structure to meet our requirements to protect the area's unique ecology. Below is summary the main considerations that led to the development of our designs...

Structural requirements

- Large enough to cover 4 railway lines over a distance of 1km
- Minimal footprint within a sensitive landscape
- Cost-effective construction with reduced need for materials
- Low maintenance requirements once in place
- Ability to include green overbridges.

Environmental concerns

- Robust structure that will prevent collision between bats and trains. This includes reducing the turbulent air flow around passing trains
- Reduce chances of fragmenting bat-foraging habitat, which spans both sides of the railway line
- Minimise the risk of a reduction in Bechstein's bat numbers and avoid extinction of the local population
- Reduce noise as trains enter and exit the tunnel
- Minimise lighting, which can affect bats' foraging habitats
- Reduced carbon emissions related to tunnel construction and operation.

Construction

- Precast concrete design reduces construction time
- Fewer heavy goods vehicle movements associated with construction
- Low maintenance requirements once tunnel is operational.

Taking into consideration the requirements above, we have designed a structure that encompass these elements.
The final design will span both sets of rail lines whilst forming an aesthetically unique structure, that will blend both function, design and landscaping.

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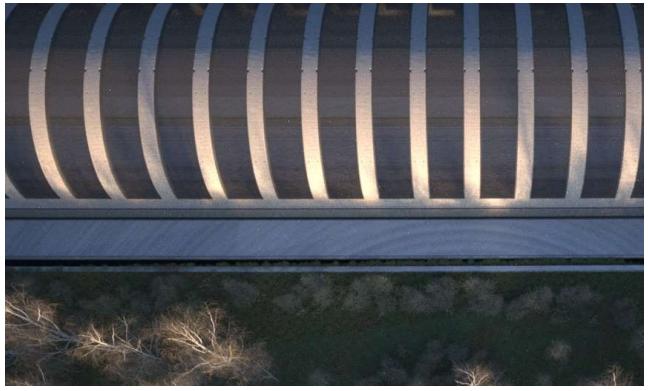
Design considerations

We have created a design which is based around a system of arches. Although not technically classed as a tunnel, this structure has been carefully chosen as being the most effective solution to match our design considerations.

We looked to create a structure which doesn't breach the skyline and surrounding trees, blends against natural landscaping and has smoother lines and finish to what we would normally recognise from a tunnel structure.

Artist's impression of the structure tunnel portal looking south 10 years post operation



Artist's impression of the aerial view including the mesh panels

Design approach

We have created a design that;

- enhances and protects the wildlife connectivity in the area
- is sympathetic to the existing landscape
- reduces the visual impact for users of the surrounding Public Rights of Way
- minimises land required and encroachment on the Sheephouse Wood Site of Special Scientific Interest and ancient woodland
- is screened from view by natural landscaping and native species of trees, hedges and wildflowers.

Design context

The design context includes;

- Sheephouse Wood Site of Special Scientific Interest and ancient woodland
- connectivity between Sheephouse Wood important bat habitats
- nearby well-used Public Rights of Way.

Detail

The design details include;

- train and air displacement noise mitigation at entrances and exits
- retention of access to the local Public Rights of Way
- green crossings for both people and wildlife
- detailed landscaping with the dual purpose of acting as a visual screen and providing enhanced local habitats and biodiversity.

What will the structure look like?

We will be using a design called a **BEBO** arch. It's name is derived from BEBO Arch International AG, the engineering company that invented, and now licenses this type of construction. It consists of precast concrete segments and mesh inserts. This creates a light, smooth structure, capable of self ventilation. Most importantly, it provides adequate shielding for bat flight paths.

BEBO facts.

The BEBO arch system is a standardised design, well established worldwide and cost effective to build.

The design uses precast concrete segments, manufactured off site, and minimal steel. Segments are lifted into place using standard machinery and with limited backfilling and overfilling material required.

The design is durable and requires little maintenance, reducing overall costs and materials.

Structure details...

- It will be around 1km in length and up to 10 m high, and cover four railway lines, two HS2 lines and two future lines for other services
- sustainably designed
- minimise the maintenance and materials used
- meet the technical requirements of the railway
- allow the arch to appear lower to visual sightlines
- sit low against the skyline; this structure will not be taller than the existing tree lines and nearby buildings.

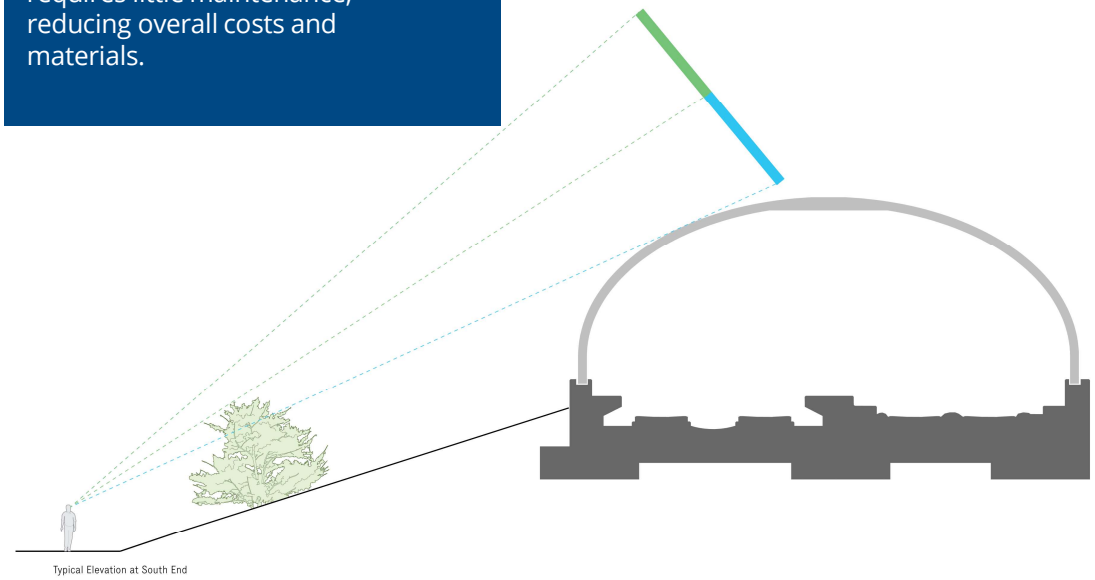
Using this type of structure will...

Protect fauna and bats in particular from collision with passing trains

Mitigate the turbulent air flow that trains cause, which can kill bats and birds

Align with other local conservation objectives

Reduces the chances of fragmenting the bats' foraging habitats, which span both sides of the railway line.



Typical Elevation at South End

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Mesh design options

While many elements of the design are fixed because of structural and operational considerations, there are still ways for you to have a say in what it will look like.

The mesh insets which span the length of the structure, in-between the precast segments can vary in colour and appearance.

Against a background of surrounding woodland to the east and semi visible to those users of the local footpaths, we want to ensure that the colour choices are sympathetic against the natural surroundings.

We have a selection of three options for the mesh inserts and we would like your input for your preferred choice...

Option A

Earthy coloured mid tone panels to create muted colouring designed to blend into the surrounding woodland

Option B

Dark grey panels to create a higher contrast against the pale concrete structure

Option C

Light grey colour panels in similar tones to the concrete structure to create a seamless blend between the concrete and panels

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Environmental mitigation

HS2 is mitigating the environmental impact of the project and delivering many miles of ecological and landscape investments alongside the construction of the new railway. Even before HS2 starts operating, there are countless environmental projects and innovations occurring up and down the route to protect, preserve and enhance Britain's precious natural environment.

HS2 have designed numerous planting sites to help offset the loss of vegetation caused during construction and to provide screening of the new railway. The commitment to achieving no net loss in biodiversity will be achieved through the planting of trees and woodland creation.

There has already been vast new tree planting in the local area. This is important to increase the connectivity of existing woodland and hedgerow features. We have planted species such as Field Maple, Silver Birch and English oaks. These trees reflected the current species that exist in that area.

It also plays an integral part in the flight paths of bats, helping them to navigate foraging routes and flight lines. By planting in this way, we are helping them to navigate the landscape and providing foraging habitat.

There have also been a number of bat boxes installed in the immediate areas to provide further protection and encourage new roosting areas.

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Landscape design

Landscape design is an important part of all KDEs. For the Sheephouse Wood structure, our designs have considered the need to protect and enhance local habitats and biodiversity.

The landscape design objective is to create a strong and simple new landscape, immediately adjacent to the structure that will provide adequate screening, amenity and seasonal interest for those users of the nearby PRoW. We have worked with the following landscape principals whilst developing this scheme.

1. Minimise the loss of ancient woodland and while this cannot be replaced, plant new a woodland area to the west of the line, which will also screen the structure from view;
2. The biodiversity of the area and how we can enhance it through the landscaping with additional planting of a wider variety of hedgerow, woodland and woodland edge species. This will also provide greater foraging and nesting habitats that will lead to population growth;
3. add new water storage habitats to promote invertebrates and further support wildlife populations;
4. maximise green infrastructure and opportunities to link ecology along the line;
5. retain as much of the existing habitat as possible and provide greater habitat connectivity with additional planting and by strengthening the links between the woodland blocks; and
6. use planting to support the protected green crossings: overbridges, underpasses and culverts.

Typically the area consists of a wide range of native UK plant species. We will be including into the landscape design native tree and shrub planting area including:

Birch

Hawthorn

Blackthorn

Bluebell

Wood Anemone

The above illustrations show the footpath and surround planting examples, 10 years post operation

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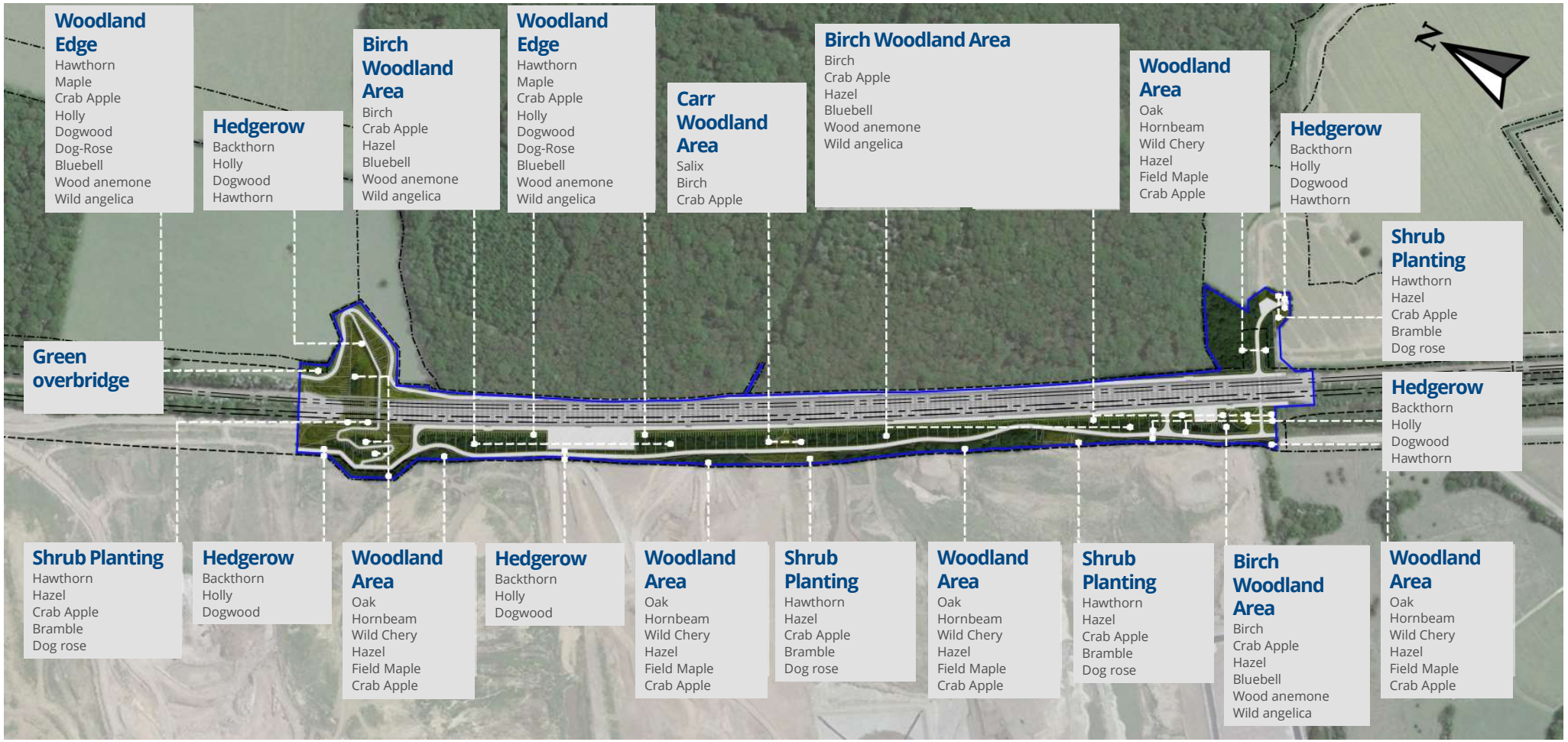
Master woodland planting plan

We have used detailed surveys to select the best plant choices to enhance the vast local biodiversity in the area. Alongside planting staples such as Birch and Hawthorn, we also have areas of wildflower planting which will sit at either end of the structure. There is a wide band of planting to the west which is designed to blend the structure into the woodland.

From walking along the footpath, the vision is for you to catch glimpses of the structure through the vegetation. The structure will sit sympathetically and low amongst the planting schemes and the skyline of mature woodland will not be interrupted at any time.



The above illustration shows some of the intended mix of woodland and hedgerow planting.

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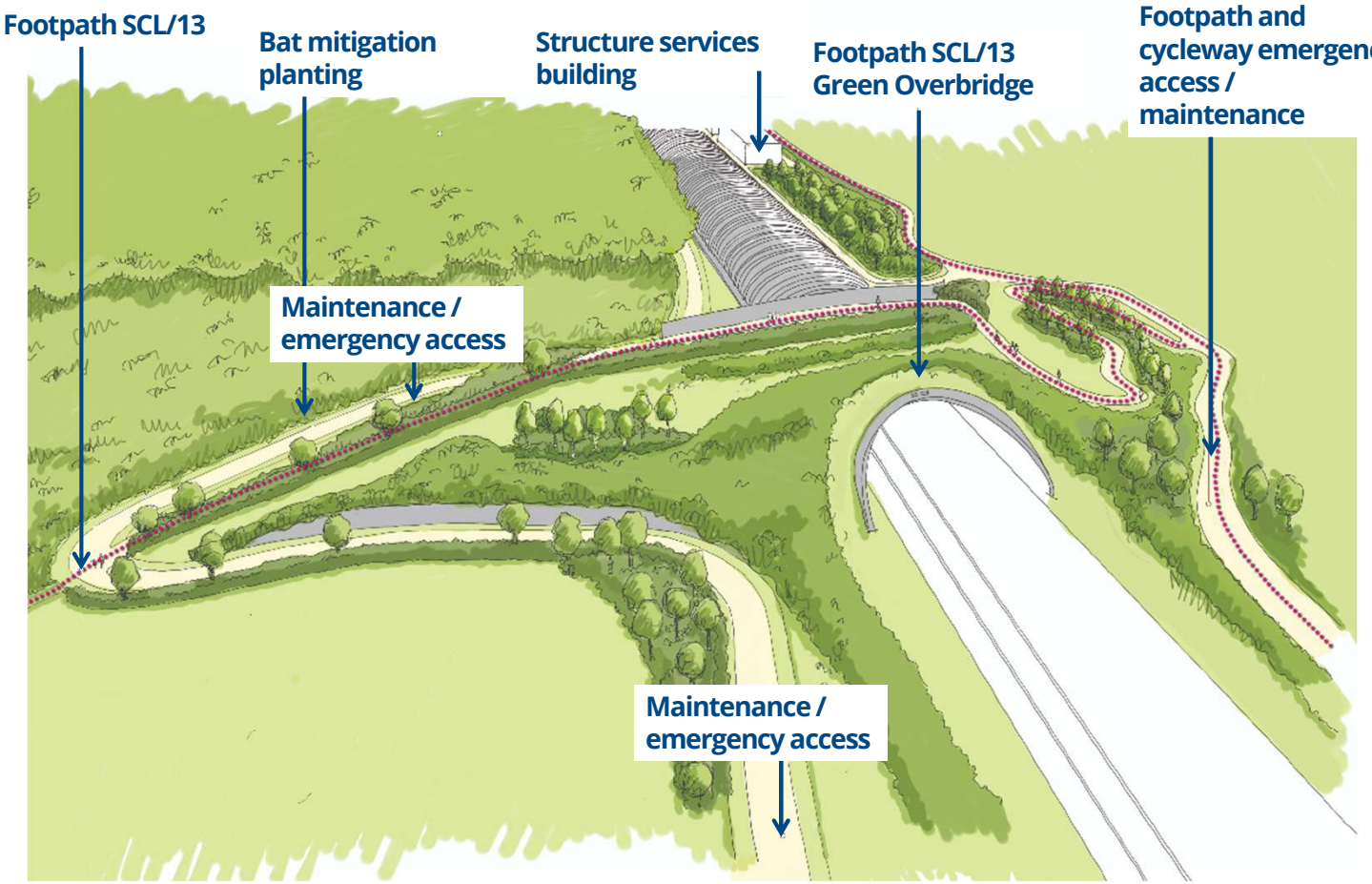
Green overbridge

To the northern end of the structure, we have incorporated a green overbridge into the design.
This is to enable the wildlife connectivity across the top of the arch structure and to facilitate footpath SCL/13 to travel across to the meet the proposed cycleway.



Enhanced planting
Our planting scheme allows us to blend the structure portal into the landscape as well as enhancing local species and wildflower planting

Ecology mitigation
As well as enhancing bat flight lines, this provides a completely green travel corridor across the trace

Public Rights of Way
Footpath SCL/13 travels over the top of the structure for connectivity to other local footpaths

Design
Greening the mouth of the structure from the north allows it to sympathetically sit amongst the existing vegetation

Cycle route
Complete connectivity for the proposed cycle route to the west

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Construction

We realise that construction can be disruptive. Wherever we can, we will reduce the length of time construction is taking place, and we are continually looking for opportunities to reduce it further.

Throughout the construction period, we will:

Minimise traffic

Using our internal site access road means we significantly reduce the amount of vehicles on the local road networks.

Maintain footpaths

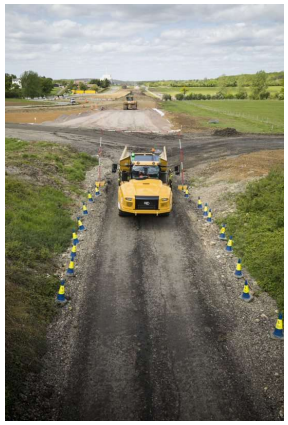
There are times where existing footpaths that come near to our works have to be closed for the safety of the public using these PRoWs but we will look to provide safe diversion routes where possible

Minimise noise, dust and vibration

Regularly inspecting and monitoring site and equipment. Cleaning of site roads and vehicles , managing earthworks to contain dust using bowsers where needed and monitoring air quality, noise and vibration on site and in neighbouring locatons

Community updates

keep you informed about the work in advance of it being carried out.



The are construction progress photos in the area which show the progress of the site access road, our wheel washer system in use and some the earth moving machinery we will be using on site.

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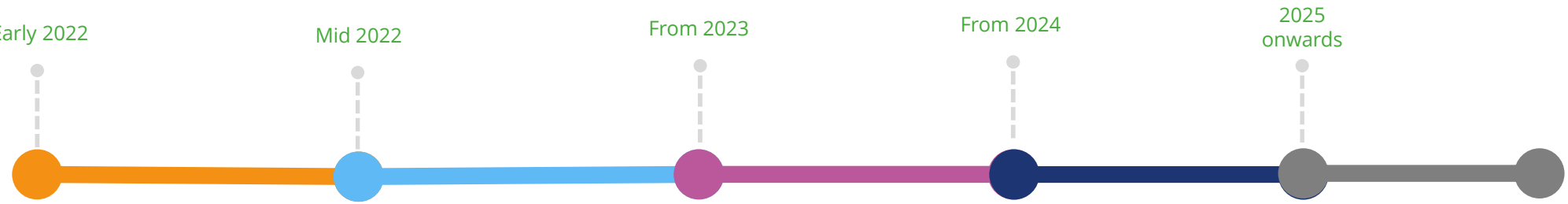
Construction

During construction we aim to utilise the most efficient construction methods to build the scheme safely and minimise the impact on the local community and environment. By mixing our own concrete on site, to using pre-cast segments for examples help us reduce our programme length and minimise the impacts on local residents.

We intend to keep the communities updated on our progress. We will provide regular notifications, newsletters and drop in events where you can come and view our progress and find out more details about our upcoming works.

Below is an indicative timescale for the key construction milestones.



Phase 1

Preparation of enabling works, surveys, utilities and site access roads to be completed

Phase 2

We start from the bottom upwards with the sub-structure, culverts, watercourse diversions, piling, flood modelling and drainage

Phase 3

Main earthworks will be in full flow for the structure. This will include building on the construction of the substructure, underpasses which will be constructed first and we will build upwards towards the headwalls and wingwalls which the fabricated arch will sit on.

Phase 4

The pre-fabricated arch segments arrive and will be constructed along with the fibre-reinforced mesh sections to complete the main 'arch' structure

Phase 5

Landscaping, rail systems

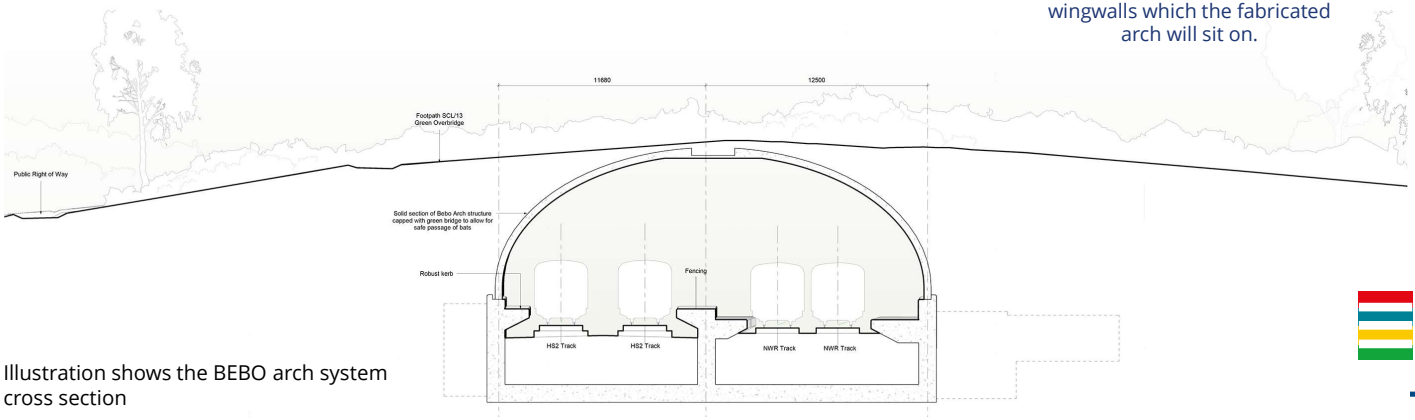


Illustration shows the BEBO arch system cross section

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Gallery images

Artist's impression showing the concrete and mesh segments through the landscaping 10-15 years post operation

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Gallery images

Artist's impression showing the tunnel portal looking North 10-15 years post operation

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Gallery images

Artist's impressions showing various viewpoints adjacent and above the side walling of the structure 10-15 years post operation

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Gallery images

Artist's impression looking north from the footpath 10-15 years post operation

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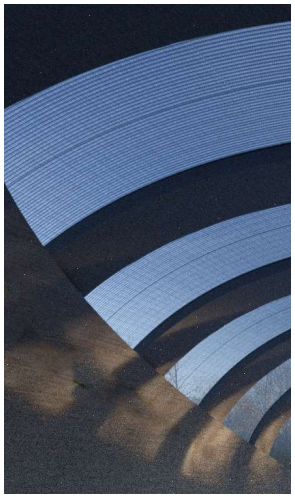
Gallery images



Artist's impression of aerial views of the structure in varying degrees of natural light 10-15 years post operation

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Community and social value

We are building more than just a railway

The construction and operation of the Sheephouse Wood bat mitigation structure will also bring some social benefits to the local area, particularly in terms of short- and long-term employment opportunities.

We focus on job and apprenticeship opportunities for all stages of construction and operation and are always looking for talented local people to join our teams in a variety of different disciplines.

We do this by:

- working with local companies to support construction work activities
- providing training, employment opportunities and apprenticeships
- providing opportunities for unemployed, disadvantaged and underrepresented groups
- providing long-term job opportunities for the operational phase of HS2
- developing relationships with local authorities and Local Enterprise Partnerships
- working with local schools and colleges.

EKFB's volunteer team litter picking at Sheephouse Wood, clearing allotments in Steeple Claydon, recruitment stand at the Bucks Skills Show 2022, the EKFB mobile visitors centre, local timber being gifted back to a local school and a student enjoying our virtual earthwork simulators at a school event.

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Objectives for your feedback

We think that the following objectives are important. Do you agree? Please let us know which of these issues is the most important to you in our feedback form, and any include other comments that you have about our plans.

Design

- Pay special attention to the appearance, concentrating on how the structure sits in the existing landscape
- Create a design which focuses on reducing the visual impact of the structure from nearby PRoW's
- Design the Bat Protection Structure to enhance and protect the wildlife connectivity within the area
- Use tree and shrub species that are in keeping with the immediate landscape environment

Construction

- Minimise disruption to traffic on roads
- Maintain footpaths
- Minimise noise generated by construction activity
- Minimise dust generated by construction activity
- Be kept informed about the work in advance of it being carried out
- Reduce the duration of works where possible

Landscape design

- Respect the landscape setting and design the structure to fit the existing terrain
- Preserve existing hedgerows, fence lines, water courses and existing woodland
- Plant different variations of species along the route to match existing vegetation in the local area
- Enhance biodiversity of the landscape
- Maximise green infrastructure and opportunities to link ecology along the line
- Retain as much of the existing habitat as possible, and provide habitat connectivity

Community and social value

- Work with local companies to support construction work activities
- Provide training, employment opportunities and apprenticeships
- Provide opportunities for unemployed, disadvantaged and underrepresented groups
- Provide long term job opportunities for the operational phase of HS2
- Develop relationships with Local Authorities and Local Enterprise Partnerships
- Work with local schools and colleges

Which design option do you prefer?

Tell us which mesh panel option you prefer:

- Option A – Earth tones
- Option B – Dark tones
- Option C – Light tones

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Have your say

We want your feedback.

Tell us what you think about our plans or let us know your thoughts on what our priorities should be.

Get involved with the design and choose your preferred option of the mesh insert design.

Next steps

Please follow the link to our online survey and leave your feedback against our key objectives.

We will then hold a You said, We did response event in the coming months where we will deliver the responses we've received from this event, and show how we have incorporated it into our emerging designs.

How to have your say

Please provide us with your feedback by 21 October 2022.

It is important we recieve your comments by this date so we can consider your feedback in the next stage of the design.

Online survey

Visit;

www.smartsurvey.co.uk/s/SheephouseWoodQuestionnaire/

where you can find an online survey to complete.

Alternatively scan the QR code below with the photo app on your phone to go directly to the page.

1. **Consider responses**
   We will consider the responses we receive and whether aspects of them can be incorporated into the final proposed design
2. **Feedback report**
   We will summarise your comments and confirm how they can inform the final design
3. **"You said, we did"**
   We will continue engagement with detailed information on the feedback that we receive and any changes made to the final design
4. **Submit schedule 17 application**
   We will submit our request for approval of the Schedule 17 application, seeking approval for the final design
5. **Construction engagement**
   We will continue engagement with the local community to describe and discuss the construction impacts and the mitigation that we will put in place

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Thank you

Keeping you informed

For more information and to find out how to receive regular updates, please visit: www.hs2.org.uk and visit the Buckinghamshire and Oxfordshire local area pages.

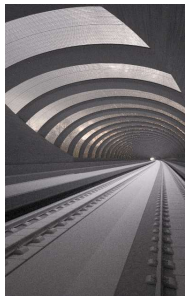
You can contact our HS2 Helpdesk team all day, every day of the year on:

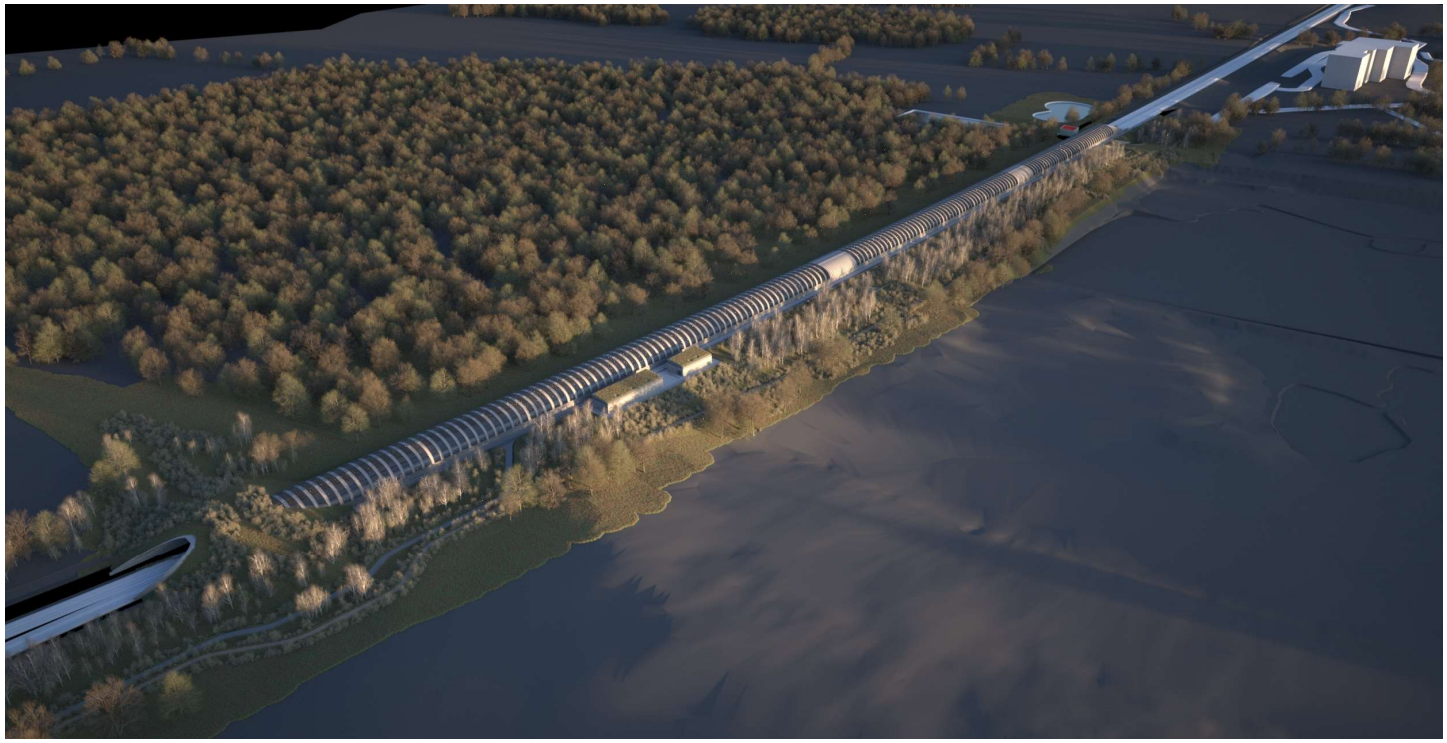
Freephone: 08081 434 434

Minicom: 08081 456 472

Email: hs2enquiries@hs2.org.uk

Scan : Hold the camera app on your phone over the QR code and you'll be taken directly to the HS2 website.





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