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Oxpens River Bridge | Design and Access Statement

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Knight Architects

Stantec

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Introduction

This design and access statement has been prepared by Knight Architects and Stantec, on behalf of Oxford City Council. It sets out the design process undertaken for a new pedestrian and cycle bridge across the Thames in Oxford. The bridge will form an important new connection between the future Osney Mead and Oxpens development, as well as to the wider walking and cycling networks within the city beyond.



Oxpens River Bridge Proposal

Strategic Need

The Oxford Local Plan identifies the West End as a strategic area for growth. This area will be host to a number of new development sites; the largest of which being the Osney Mead and Oxpens developments, which sit to either side of The Thames. This growth will create the demand for new connections – critical links upon which people will come to rely. The Thames forms a barrier to movement, and whilst other bridges do exist in the vicinity, the location or reliability (due to flooding) of the other crossings do not provide sufficient connectivity across this barrier, and would not by themselves effectively connect the West End sites.

An additional connection is therefore necessary, and to meet sustainability goals, it is important that the connection is focused on facilitating walking, cycling or rolling. As such, the proposed bridge forms a critical inclusive-access ‘active mobility’ connection, and will help to reduce reliance upon vehicular connectivity in the city. The new bridge will allow access for all levels of mobility, ensuring comfortable and safe gradients (lower than 5%) on the bridge and approaches.



Extract from Oxford Strategic Cycle Network

Design Aspirations

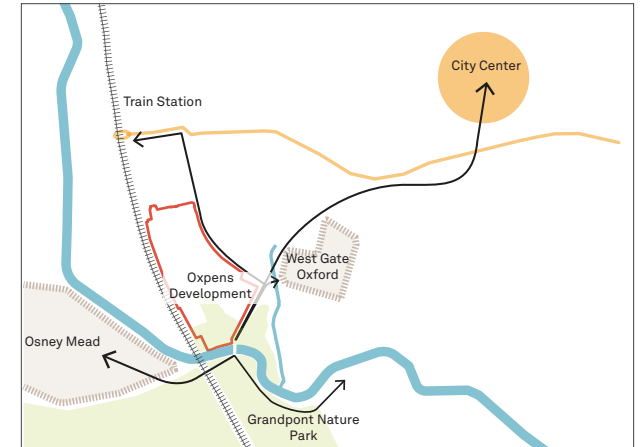
In addition to critical **connectivity**, the bridge will form an important, visible addition to the context, and as such it must contribute to the **placemaking** ambitions of the site. The two aims of **connectivity** and **placemaking** have been the guiding aspirations throughout the design process.

The **connectivity** aspirations are:

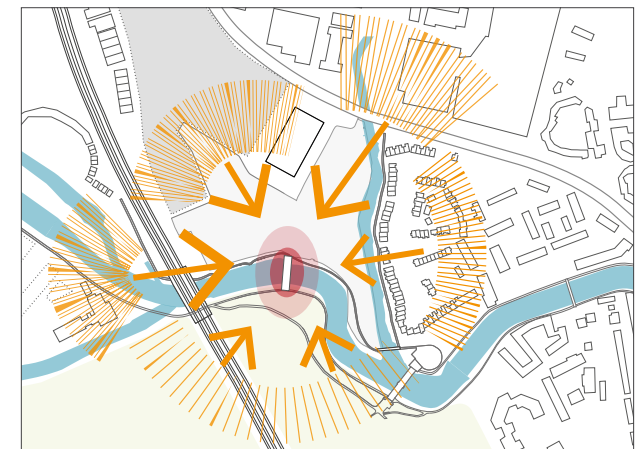
- Provide a critical connection across the Thames, facilitating journeys between the West End and the City Centre, as well as to the train station.
- Promote inclusive active-mobility journeys to reduce reliance on vehicles
- Provide a year-round link which can be relied upon in both dry and flood conditions.
- Maintain strong east-west connectivity underneath the structure, along the towpath and across the Meadows.
- Provide a safe, attractive, welcoming journey for all users.

The **placemaking** aspirations are:

- Respond to the unique natural characteristics and beauty of the site
- Enhance the identity of the site, contributing to its 'sense of place'.
- Achieve a strong integration with the future Oxpens Development.
- Provide a clear, elegant yet understated visual identity to the new structure.
- Promote open views from the structure and achieve a visual connection to the River and Meadows.
- Deliver a structurally honest, efficient design that is constructible within a reasonable budget.



Connectivity



Placemaking

The Site

The site is characterised by the meandering Thames which passes through it. It is both the barrier to **connectivity** which the bridge must overcome, and the primary **placemaking** feature of the site which the bridge must enhance.

To the south of the river, a wooded embankment climbs up from the towpath edge, and offers an opportunity to land the bridge at a high level, connecting to existing paths which run through the woodland.

By contrast, to the north of the river the 'Meadows' is an area of flat open grassland which sits at towpath level, and as such is prone to flooding. The characterful ice rink sits at the heart of this area, on a raised 'podium' level which the majority of the Oxpens Development is also going to sit – raising it above the flood plain. In order to provide a reliable 'dry route' it is the ambition to connect into this podium level, rather than down to the level of the Meadows.

Between the open Meadows and the river, a group of trees creates enclosure, punctuating the site and separating it into areas of different character. The combination of openness and enclosure with the meandering river creates a dynamic, varied site which changes dramatically based on viewpoint, season and time of day.



Satellite image of the site



Oxpens Meadows (1)



Grandpont Nature Park (2)



River Thames (North Bank) (3)

The Site

Trees

Trees form a critical component of the site's ecology, character and arrangement. They define areas of openness and enclosure. The bridge alignment has been set to limit the number of trees that would need to be removed for construction, and a key component of the bridge's design response is focused on the relationship between the structure and the trees. Additionally, new planting will be in place to enhance the existing landscape features.

Flooding

The meadows sits at a low level and floods with some regularity. Maintaining the flood capacity of the site is a key consideration in the design of the bridge. The need to keep a reliable 'dry route' through the flood plain also strongly influences the alignment of the bridge.

Maintaining the flood capacity is often in-line with other aspirations to maintain open views, and minimise severance across the meadows. It supports the use of structural bridge approach-spans rather than embankments which would occupy flood capacity as well as limit views and connectivity underneath the structure.

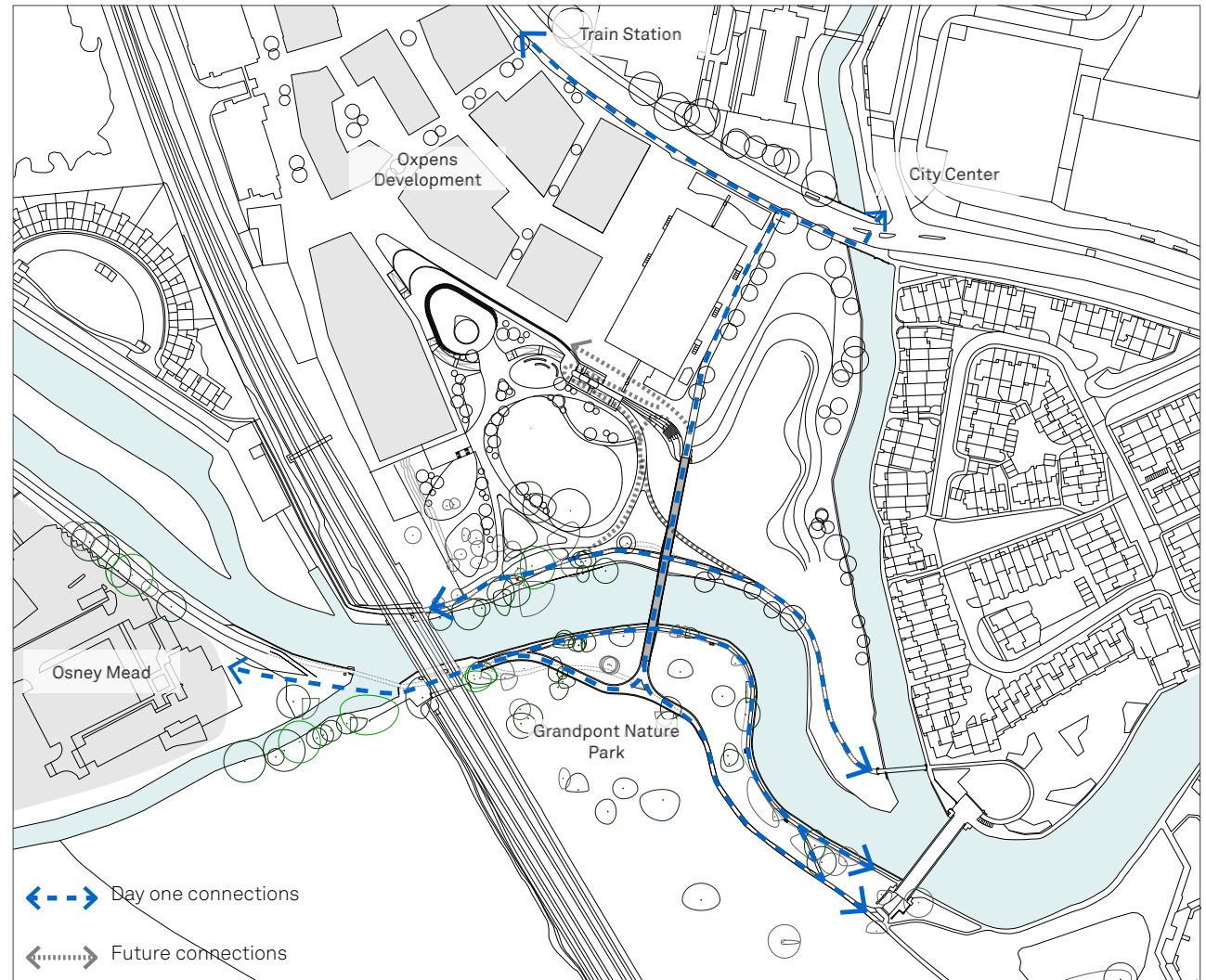
Connectivity - Alignment

To be successful, a bridge has to be well used, and to be well used it must be on the correct alignment. After the key challenges and opportunities of the site were understood, a series of alignments were studied, compared and scored against one another to understand which one was best. In essence, the goal was to find an alignment which most closely matched the natural desire-lines of the potential bridge users, but also responded positively to the natural characteristics of the site, the proposed developments and the existing 'non-bridge' routes which run both sides of the river. Alignment has two components – vertical (its gradient) and horizontal (its plan arrangement).

Horizontal Alignment

Establishing the correct horizontal (plan) alignment is an exercise in understanding origins and destinations. Most bridge users will be coming from the new developments south of the river such as Osney Mead, as well as existing communities such as Botley and Hinksey. The key destinations will likely be the City Centre and the train station, as well as (to a lesser extent) the Oxpens development itself. Immediate 'towpath to towpath' connectivity may be needed, but is expected to be far less desired than longer-range journeys.

The key destinations of the city centre and railway station create a 'Y' shaped arrangement of desire lines. This can lead to key cycle desire lines moving through the central Oxpens 'amphitheatre' area.



Connectivity Plan

Connectivity - Alignment

Vertical Alignment

The river has a navigation clearance zone which the bridge must sit above, and the towpaths to either side also have a minimum height which must be maintained. This creates an initial envelope which defines the minimum height of the 'main span' of the bridge (the portion over the river). As an accessible crossing, the primary approaches to the main span will be a ramp. The challenge, then is to ramp from the main span level, back down to ground level, whilst maintaining accessible gradients.

On the south of the river, the high ground profile meant that tying into the hillside at a high level greatly reduced the need for ramps, with connections back down to the river level being provided through existing footpaths.

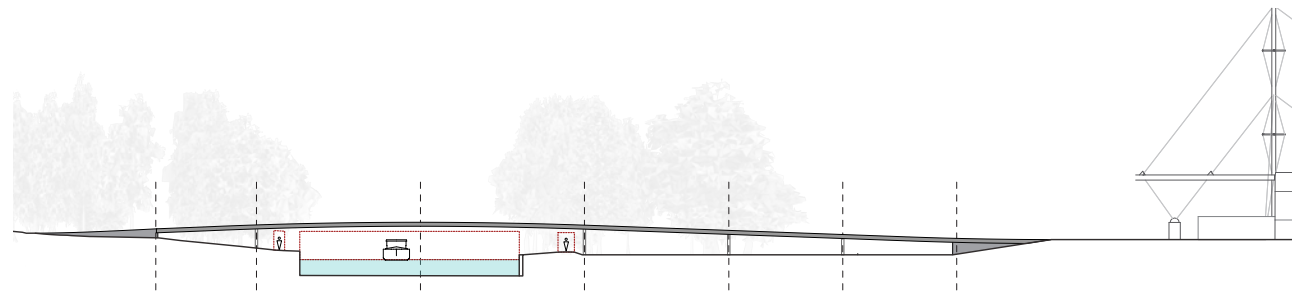
On the north of the river, given that the primary connections were to the city centre and train station beyond, an alignment which continued at high-level across the Meadows, and tied into the podium level of the Oxpens development was seen to be most efficient. This reduced the need for further ramps, and also reduced the effort required for most users to climb back up to podium level if the bridge delivered them to meadows level. Critically, it achieves a 'dry route' providing a year-round reliable connection over the meadows when in flood conditions.

Alignment Conclusion

After several iterations a 'north south' alignment which runs down the east side of the ice rink was selected. It offers one of the shortest journey lengths for most key routes, and also the most intuitive and legible. It crosses the river broadly perpendicularly, reducing the span (and cost/carbon of the bridge). It follows most closely the main city centre desire line, whilst allowing those heading to/from the railway station to branch off through the Oxpens development in a logical way. It also allows natural segregation within the development between cyclists and pedestrians, limiting conflict points and reducing the need for excessive signage/formal segregation.

The selected alignment places the bridge relatively centrally with the meadows, and so existing routes in the east-west direction will pass under the bridge structure. This imposes the need to carefully consider the potential 'severance' that the bridge may have on the meadows, the design response to which formed a fundamental consideration throughout the design development process.

The project will experience staging in ground level on the meadow on the north (area below approach spans). There will be an interim ground level, close to existing once the bridge constructed. At a later stage, when the Oxpens development is completed the ground level will be lowered to desired 55.3m AOD. Following discussions and coordination with Oxpens development the bridge design is based on the future ground level.








Vertical Alignment Elevation (including resulting levels of Oxpens Development enabling works)

Placemaking

With the bridge sitting centrally within the site – its placemaking ambitions become even more important. It is not enough for the bridge to simply connect people across the site – it must help to define the site, and attract people towards it.

The bridge's placemaking response to its context is most clearly understood as an exploration of two 'views' – the 'view from' and the 'view of'. The 'view from' analyses the experience for users on the bridge – the new views it provides, the experience it offers – how it makes you feel. The 'view of' looks at how the bridge sits within its site, the identity of the structure, how it enhances the natural context through which it passes, and how it appears to onlookers and those passing through the site – particularly those passing underneath the bridge in an east-west direction.

-  Views From
-  Views Of
-  Proximity to River
-  Proximity to Site
-  Integration with context



Placemaking Diagram

Placemaking

View From

The View 'From' describes not just a new viewpoint, but a new experience of crossing the bridge itself. Here, the way the structure of the bridge frames and directs views will allow users to understand the site which they are crossing, it makes them feel safe, welcomed and informed. It encourages them to linger to enjoy the site, and allows them to understand their journey ahead.

The 'view from' is an important one, as it is the journey to the site, and to the city. It must balance onward visibility with peripheral interest. It must choreograph the key moments of the journey to convey the character of the site to users on the deck.

The bridge will take users from the urban centre of Oxford through a much more rural setting south of the Thames. It is essential, therefore, that the bridge is welcoming, and makes users feel safe. A shared-use deck has been selected as the most suitable arrangement. The 3.5m wide shared-use deck provides a welcoming environment for all users, allowing pedestrians to meander from side to side, to take in the new views provided by the bridge which were not previously available.

This surface tends to result in slower cycle speeds than if a segregated deck was provided. It also results in less 'clashes' at either end of the bridge, where cycle lanes would inevitably end, and conflict points might arise between pedestrians and cyclists.

Beyond creating a safe and welcoming experience, it is also important to recognise that this will be a reasonably long walk. Many will want or need to rest at certain points along the route, and so the deck environment must be punctuated by these activities.

Legibility is also of the utmost importance – the route should be logical, intuitive and easy to follow, with minimal reliance on signage.



Aerial view of the site. Source:OxWed Development

Placemaking

View Of

The View Of is a journey which currently exists, and will be modified and enhanced by a careful response to this viewpoint. There are many routes that exist that do not use the bridge. The bridge does, however, interact with these routes, and must respond to them too. Several broadly east-west desire lines exist across the meadows, or along the towpaths. These will pass underneath the northern approach spans of the bridge, and as such the structure will become a 'moment' on those journeys.

As the site is developed, the number of journeys across the meadows and along the river is likely to increase, and the bridge form as viewed from below will become an important component in defining the identity of the site, and attracting users towards the river.

This is not a uniform site, and it is important that the bridge reflects the varied nature of its context. The 'main span' over the river forms only a small part of the whole crossing. A holistic design is required, which responds to the changing constraints/characteristics but does so in a connected and identifiable way.



View from towpath on south bank looking East

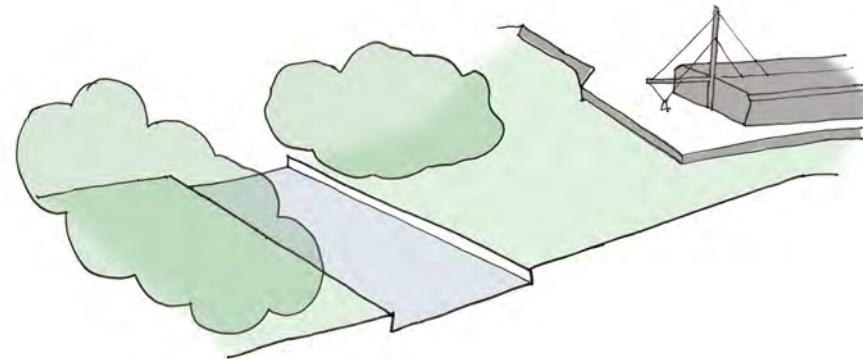
Bridge Response

With the bridge in the correct alignment to provide the required connectivity, and an understanding of the placemaking requirements, the challenge then remains to establish a suitable bridge typology and form.

Rather than selecting from a list of existing typologies, the right solution from this site comes from a step-by-step process which responds to the unique challenges and opportunities of the site. Doing so will ensure that this bridge is specific response to this site, not a generic solution seen elsewhere. It also ensures the structural response is appropriate to its context in scale and identity. There is a careful balance that must be struck between imposing an 'icon' on a site (which may dominate and detract from it) or providing something too recessive which does not properly respond to the unique nature of the context.

The following sets out the series of steps taken to establish the correct structural form for the bridge.

1. The centrepiece of the site is the winding and characterful Thames, bounded by a treeline which controls and frames views.



Existing Site Sketch (1)

Grandpont Nature Park

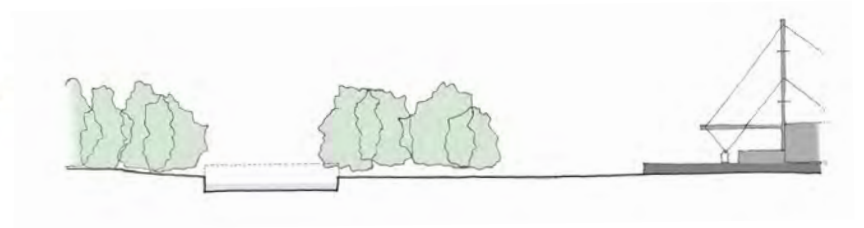
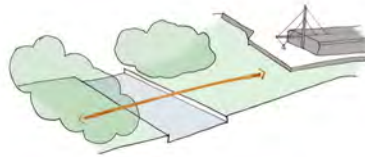
Oxpens Meadows



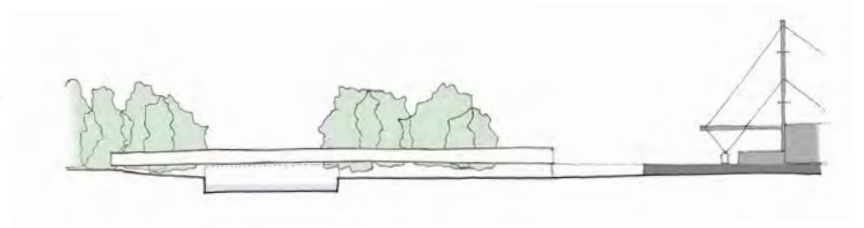
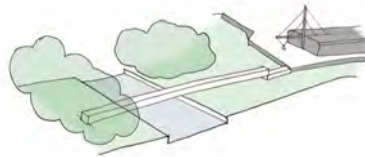
View from towpath on north bank looking West (1)

Bridge Response

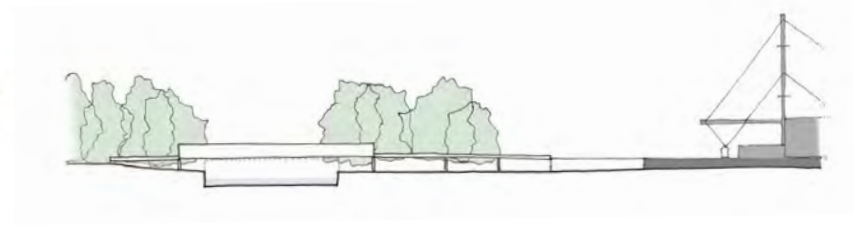
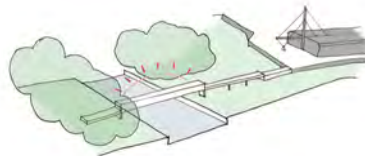
2. A north/south section of the site demonstrates its changing character - open over the river, framed by surrounding treelines, followed by openness in the meadows to the north.



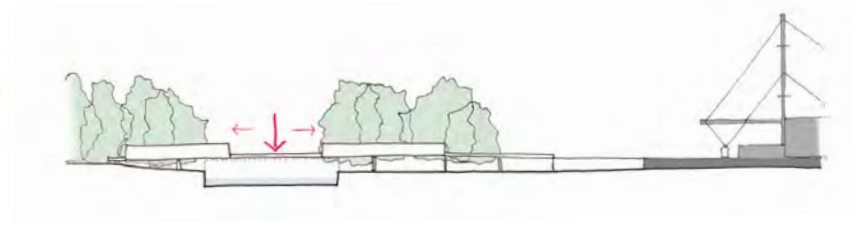
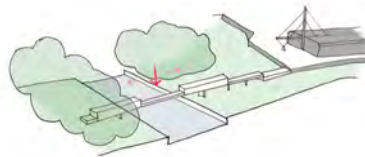
3. Given the navigation clearance over the river and headroom required throughout the meadows, and 'above deck' structural solution is necessary. However, a uniform beam would not respond properly to the varied characteristic of the site.



4. A traditional approach would be to add visual mass / interest over the main span, leaving the approach spans as recessive. This is a typical response. However, positioning mass in the open area opposes, rather than enhances the existing characteristics of the site, which has an open river, with density/mass either side.

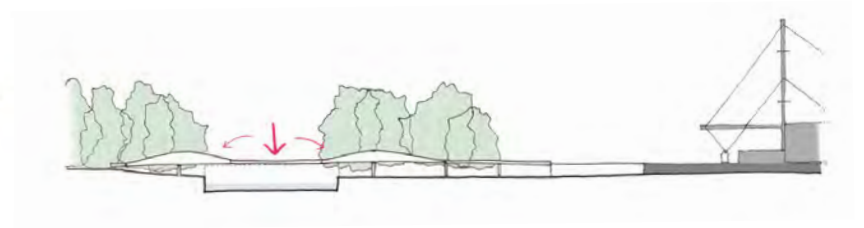
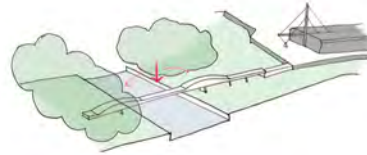


5. Removing structural mass from the main span and shifting it to the tree line is a unique way to enhance, rather than oppose this natural existing condition, matching the visual mass of the bridge with the natural solidity of the site.

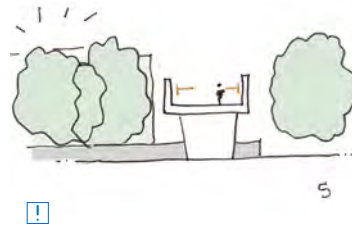


Bridge Response

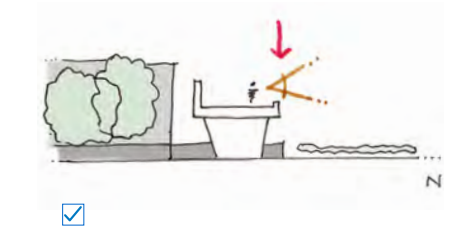
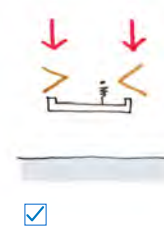
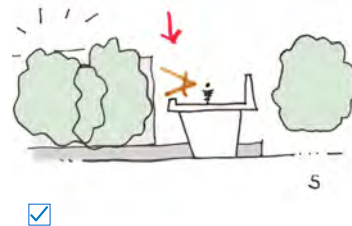
6. An undulating above deck structure maximises clearance below, and offers maximum transparency at mid span, contrasted by characterful waves which reflect the varying nature of the surrounding site.



7. Given the spans of the bridge, the height (or structural depth) of these waves would come above eye height, and potentially limit views for users on the deck.

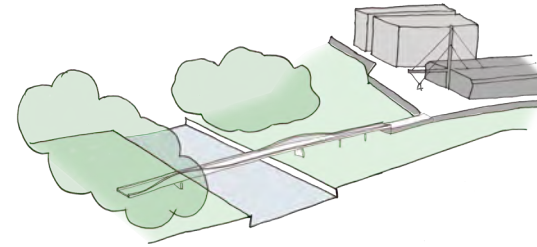


8. The site is not symmetrical and nor should this journey be. The site has moments of openness, and moments of enclosure. An asymmetric structure frames, directs and guides key viewpoints, and conveys the story of the site to users on the bridge.

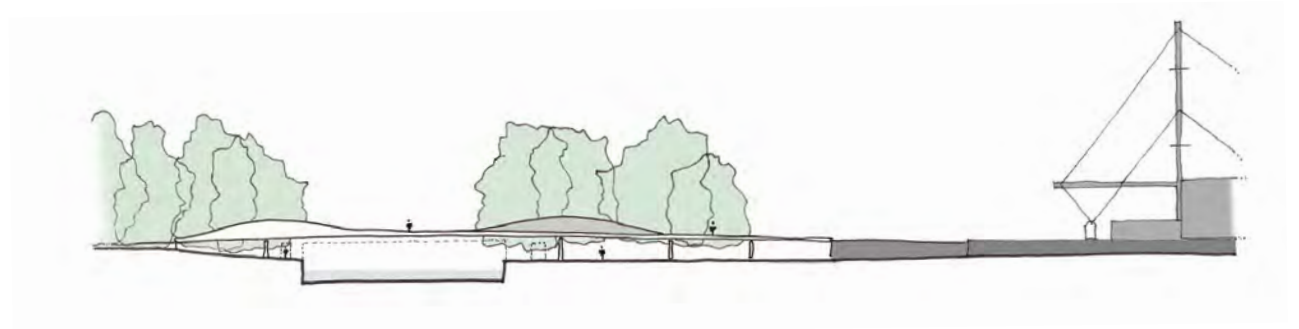


Bridge Response

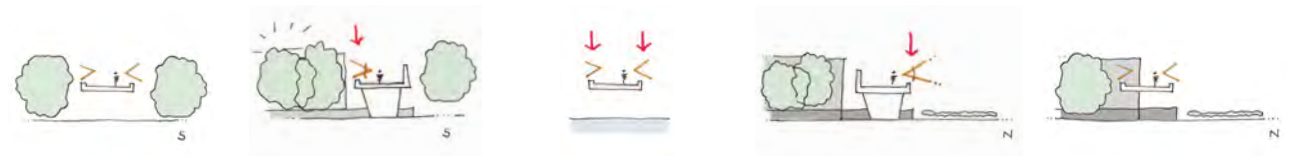
9. The result is an above deck, asymmetric undulating Vierendeel truss, which enhances the two key journeys through the site by reflecting their natural characteristics. It removes structure where it is best avoided in order to let the site itself take centre stage, and places structure where it is most complimentary to the site to enhance it. It is a unique response as it is driven through the characteristic of the site. What works elsewhere would not here, and vice versa. It is telling the story of the site through the structure of the bridge.



View Of - Perspective (9)



View Of - Elevation (9)



View From - Sections (9)

Bridge Characteristics

Superstructure

Two Vierendeel trusses form the primary structure, arranged as asymmetric 'waves' one on the north west of the deck, the other on the south east. These are the primary structure for the bridge, and support the deck which spans between the main piers positioned on either side of the river. The waves allow for the deck itself to be very slender, improving headroom below.

Two approach spans to the north continue the slender deck across the meadows, presenting a razor-like edge which merges into a clean, uncluttered and subtly curved soffit, encouraging those walking east/west to continue seamlessly underneath. The curved soffit also encourages light to permeate below the deck, which improves the likelihood of the meadow grass growing uninterrupted underneath the bridge, and reducing the likelihood of a bare strip, which may act as a 'threshold' to east-west movement.

On deck, the waves create a dynamic experience which reflects the nature of the site through which it passes. Each wave offers the opportunity to stop and rest, with wide timber or similar material chord acting either as a perch to sit and look across the deck, or as a lean-rail to rest and look through the wave itself. The vertical members of the truss are bunched towards the ends of each wave, but open out in the middle to offer framed views of the site beyond.



Deck View

At mid-span, the structure of the bridge is as recessive as possible, maximising the user's connection with the water below. The cylindrical handrail smoothly transitions to a flatter lean-rail at this point, acknowledging that many will want to pause for this 'pooh-sticks' location.

The parapet is comprised of a series of slender inclined vertical posts, with a cable-mesh infill. A lightweight cable mesh is a durable infill which maintains excellent transparency, even at oblique angles. This allows the undulations of the waves to be expressed throughout a wide variety of viewpoints, and avoids a 'flattening' effect that would occur with a more solid parapet. The mesh infill also continues throughout the apertures within the waves, ensuring adequate containment is maintained.

Bridge Characteristics

Abutments

As the bridge approaches its northern abutment, the headroom below reaches its minimum height. Whilst walking underneath the bridge at this location is still possible, the more likely east-west desire line for most will be closer to the river. A series of terraces is suggested (with adjacent ramped access) that offer steps down from podium level to the meadows. The terraces also offer a place to sit and rest, before wrapping underneath the bridge to form the northern abutment. These terraces occupy the area of lowest headroom whilst maintaining visibility underneath the bridge. The bridge parapet stops as soon as is permissible to encourage bridge users to explore the meadows and local development, rather than simply continuing on to destinations further afield.

The continuation of the bridge's shared surface beyond the northern abutment will help to integrate the bridge with the surrounding masterplan, and limit potential clashes as pedestrian and cycle routes start to fan-out throughout the development.

Main Piers

Below the northern wave, the main pier sits at the heart of what is hopefully going to become a popular riverside destination. The pier itself conveys the asymmetric forces flowing through it, with a larger concrete vertical member sitting below the wave picking up the main forces, and a smaller steel prop on the opposing side taking the minor forces and resisting the torsion in the deck.



Wave View

To the side of the pier a re-aligned towpath sits besides an informal river edge which may become a place to launch a paddleboard, or simply one to stop and rest in the shade of the trees, or the bridge itself.

The southern main pier echoes the design of its northern counterpart, and offers a simple bench for those on the towpath to stop and rest.

Approach Piers

The approach piers are designed to be as slender as possible – simple steel cylinders on concrete plinths which minimise their footprint on the meadows and sit recessively in the landscape, allowing the deck to continue uninterrupted above them. The exact connection between these piers and the deck above is still in development, but the ambition is to provide a very clean detail which does not provide ledges for birds/dirt/litter to collect.

Bridge Characteristics

Materiality

It is important that the asymmetric arrangement of the structure is legible to onlookers. The inner surfaces of the waves will have a dark grey painted finish to contrast the lighter painted finish of the external surfaces. This makes clear to onlookers that they are seeing the inside of one wave and the outside of the other.

Lighting

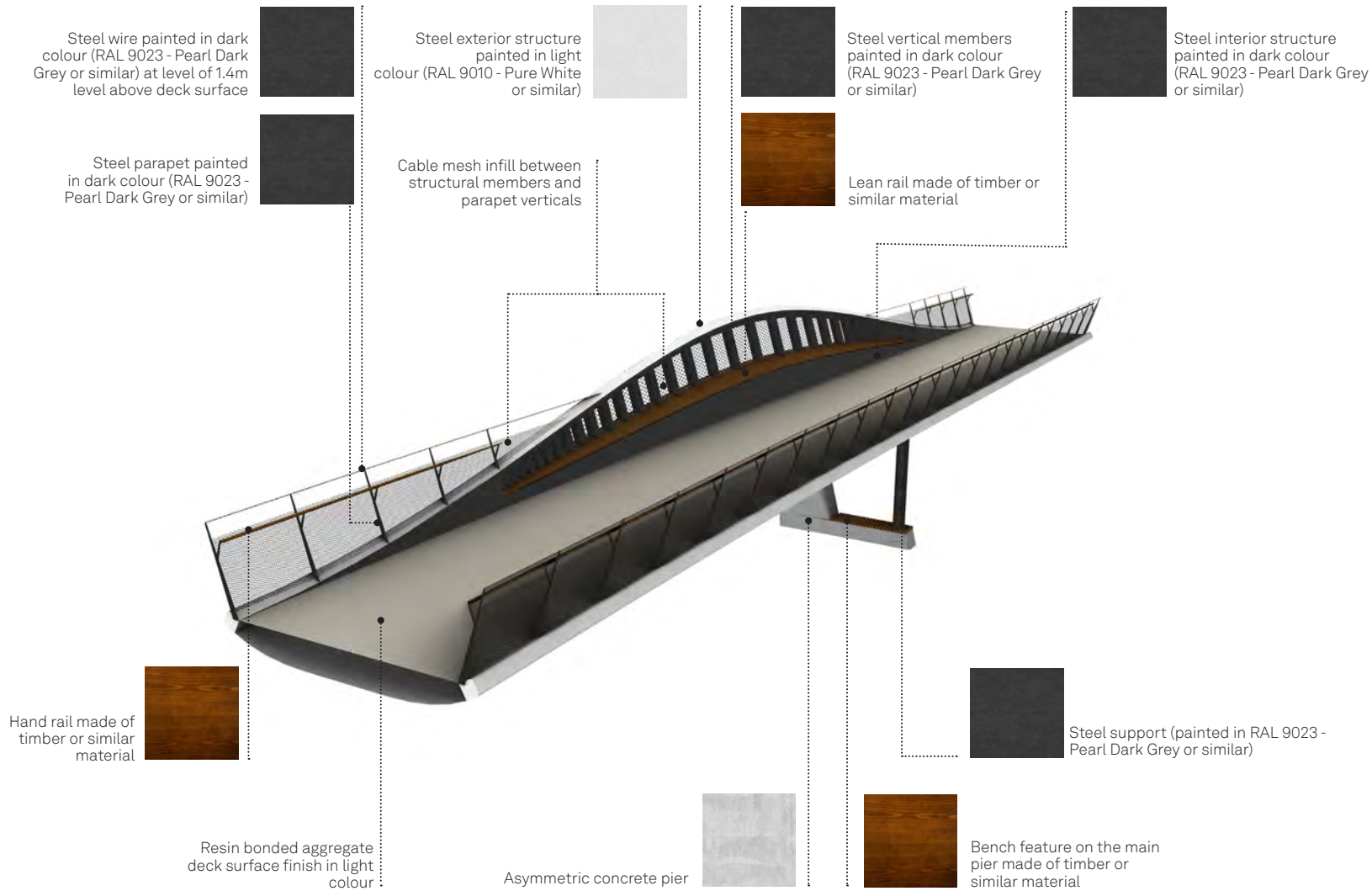
The bridge will sit at the threshold of the city, and itself become a transition from an urban centre to a more rural setting. The well-lit environment of the city streets will give way to unlit paths through the woodland on the south of the river, and it is important to establish the best location and extent of this 'lighting transition'. The bridge will be unlit. For those who are traveling north to south, the transition from lit space to unlit space

will be more gradual if it happens before the northern abutment of the bridge, than it would be if it happened at the south abutment, which does not benefit from the spilt light of surrounding streets and buildings. It is also arguably a safer proposition to allow users to decide if they are comfortable entering an unlit bridge, than forcing them to decide if they are comfortable exiting a lit bridge into an unlit woodland.



Elevation View

Schedule of Materials



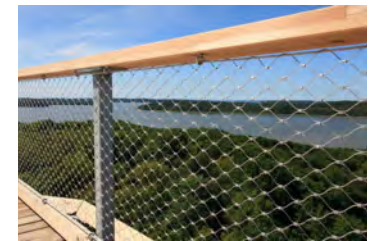
Painted Steel Structure



Painted Steel Parapet



Concrete Pier



Cable Mesh Parapet Infill

Section of Structural Wave of the Bridge

Sustainability Assessment

Active Mobility

Bridges influence the way people move around our cities. The Oxpens River Bridge forms a part of a wider active-mobility agenda within the city. Reliable, enjoyable and safe crossings such as this promotes a modal shift towards walking, cycling and rolling, and ensures that the embodied carbon that is spent on the scheme is spent wisely. Its design follows all official guidance for designing infrastructure for cycling and provides a legible between area of Osney Mead in the south and City Center and Railway station on the north side of the river Thames. What is more, once the future Oxpens development and the bridge interface is completed, a new connection into the development will be created giving users a wider choice of possible routes depending on their destinations and type of journey. With gentle gradient and deck width resulting in comfortable separation distances between users the bridge will provide a safe connection.

Lightweight Design

The design focuses on providing as lightweight structure as possible responding to several contextual characteristics. One of them is to allow for open views across Oxpens Meadow on the north bank. The bridge has been designed to be a fitting, lasting addition to the site, with a design life of 120 years. Crossings that become integrated with the identity of their sites tend to be well looked after, and last longer than utilitarian structures.

Operation and Maintenance

The bridge will be owned, managed and maintained by Oxfordshire, who have been involved in the design development process.

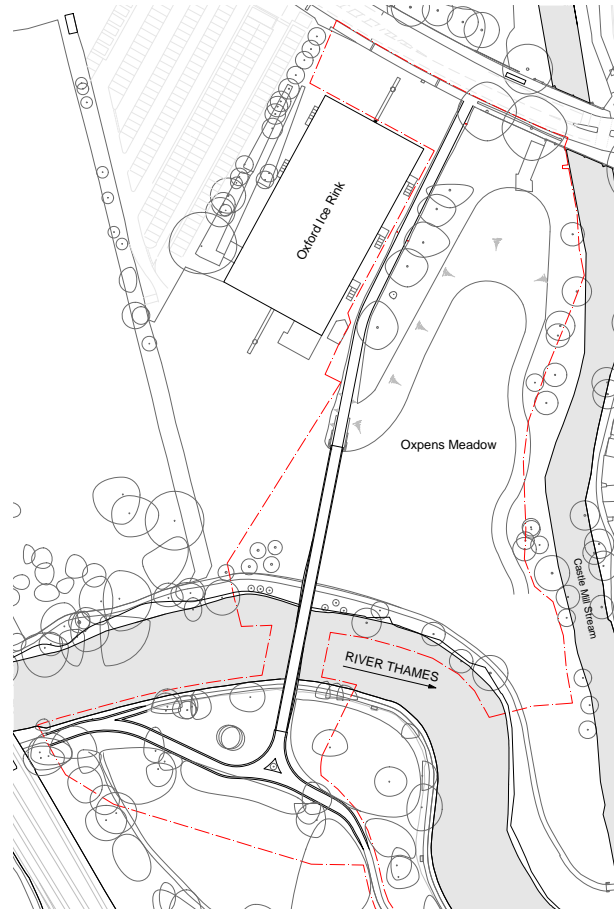
Materials used for bridge construction are selected due to their durability and low maintenance properties. It is suggested to use flouropolymer paint system on the steelwork, which requires less aesthetic maintenance than traditional paint systems. The structure will still require some regular cleaning to ensure its appearance and general condition are well maintained and commensurate with the quality of the wider development. The handrail and leanrail, influence direct user experience will be made of a high-quality hardwood or similar material. Previous projects have demonstrated if properly detailed then this is durable component. Parapet mesh is made of stainless steel wires that is a durable and low maintenance product.

Constructability

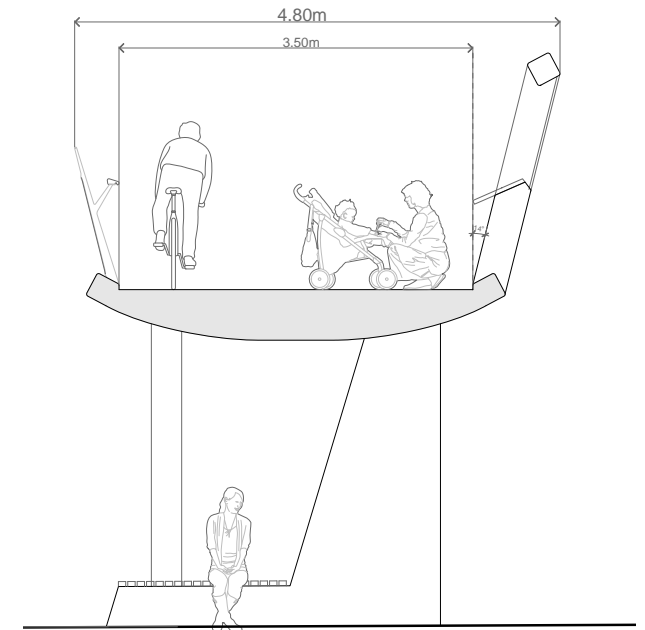
Since the scheme was initially presented to the planners, public and design review team, the bridge design has gone through an exercise of ensuring it is a more constructable and affordable structure. Whilst the bridge has largely remained unchanged, a couple of refinements are highlighted below:

The alignment of the bridge is now straight and located in its entirety on Oxford City Council land. The straightness of structure reduces the complexity of the manufacturing. The location on Oxford City Council land allows the bridge to be constructed independently from the Oxpens Development.

The usable deck width is now 3.5m, in compliance with regulations and available guidance. This allows the bridge to be built in full width sections. The widest section would have a total external structural width of 4.8m at its widest point, which allows it to be fabricated in fewer sections and transported to site as single pieces. This approach contributes to reduction of construction time spent on site, hence reduction in noise and disruption.



Bridge Alignment



Bridge Cross Section

Verified Views

A series of verified views have been prepared for this design to show how the new structure will sit within the current site. The complete report prepared by Cityscape Digital is included separately with this application.

1. View from Grandpont Park

View from path in Grandpont Park showing the south abutment of the proposed bridge. It ties to the paths running through the forest providing a legible route across the river towards the Oxpens Road



1. View from Grandpont Park

2. View from towpath along northern river bank.

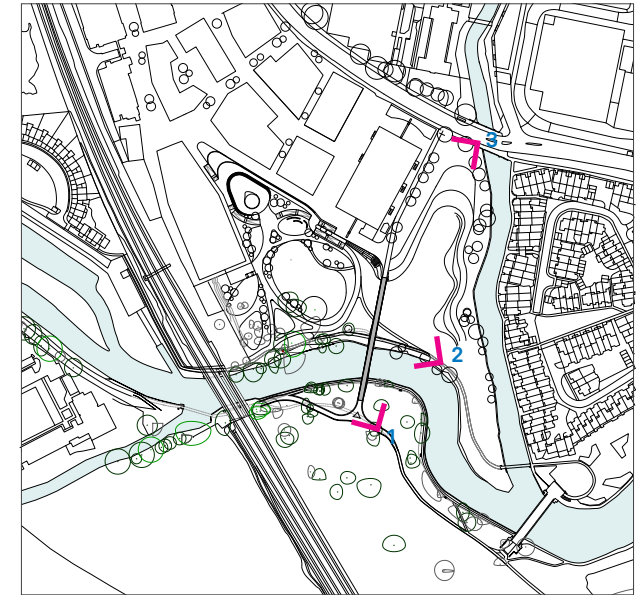
View looking north east from towpath in Oxpens meadows showing the proposed bridge emerging from the trees to the south of the river. The structure of the bridge is slim in the open areas to allow a wide range of views of the site.

3. View from Oxpens Road

View looking south west showing the proposed bridge perceived by users of Oxpens Road. It shows the approach ramps on the north and both main structural elements - waves. The bridge vanishes in trees of Grandpont Park in the south.



2. View from towpath along northern river bank



Map



3. View from Oxpens Road

