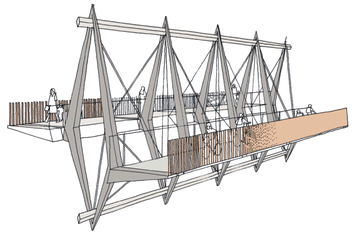
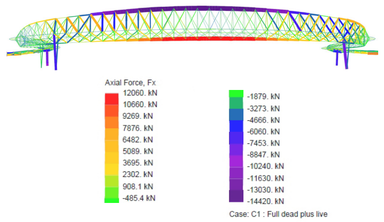
TEAM 004: Our curved bridge swoops up along each bank and then arcs across the river. The shape is suggestive of agility and movement, a memorable landmark for this reach of the Thames. The bridge 'kisses' its four landing points with ramps that touch both banks at the Dolphin Square axis and slender stairs ascending the main span at St George's Square Gardens and US Embassy. The curved design opens its arms to Battersea and the upper reaches of the river; in the other direction it leans out over the West End and downstream panorama.





The bridge structure:

The structure is an innovative and highly tuned three dimensional truss that responds precisely to bending and torsion. The sinuous form is composed of diamond shaped frames with chords linking the side, top and bottom vertices and kite-form cable cross-bracing creating the spatial truss. Cantilever brackets extend out from the side chords of each diamond frame to support the precast cycleway and footway decks.

The diamond frames making up the spine truss alter in height and width to resist the varying vertical, horizontal and torsional forces. The diamonds are tall and narrow at the main span (18x3m) over the navigation channel and shorter and wider (12x5m) to resist the higher torsion at the curves. There are more frequent supports as the bridge approaches the landing points and the diamonds reduce to become fabricated V-shaped upstands between cycle and footway.

All of the supports for the bridge at located in the width of the river outside the 150m wide clear navigation channel and the main supports are located outside the zone of the planned Thames Tideway Tunnel close to the south river wall. A set of piles placed in the river at the east and west ends of each of the ramps protects them from collision.

The bridge ramp on the north shore clears the high water level at the Westminster Boating base by 5m. Hence if the overhead truss of the gangway is substituted for an under-truss, access to the floating jetty can be maintained even at high tide.

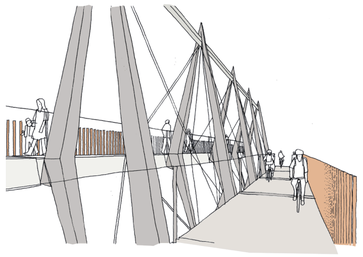
Challenge 01:

Cycle and pedestrian traffic

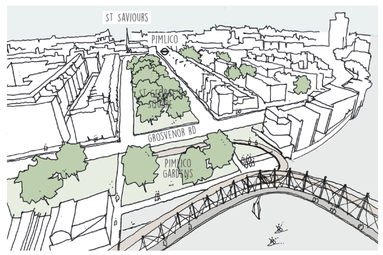
The parcels of land on the Dolphin Square, Option 2, axis provide adequate space for cyclists and pedestrians in the numbers predicted. With its established trees, the Option 1 landing point is not appropriate for large volumes of bike traffic.

As they ascend the 1:22 ramps, cyclists and pedestrians are separated by a central steel spine which develops into open diamond trusses. The deck might be broadened in width (from the notional 4m) at corners to give cyclists more clearance space and add to the dynamic experience.

The segregated arrangement is inherently safe and gives each mode a unique vantage point with cyclists occupying the lower inner curve, partly sheltered by a taller balustrade on one side and the higher pedestrian deck on the other.



Separated decks for cyclists and pedestrians



View to St Saviours showing pedestrian ramp

Aerial view downstream towards the West End showing consolidated river gardens

Challenge 02:

Placemaking across the river and landing points

The two landing points on the (Option 2) Dolphin Square axis are developed into handsome public places that relate to their immediate surroundings with impressive views of the river and the new bridge. The twin ramps are elegant approaches to the main span across the Thames but also provide river walks in an area deficient of good public access to the water; so pedestrians can climb the stairs and walk down the ramp on the same side of the river or vice versa.

The mature trees of the Pimlico Garden Shrubbery (Option 1 axis) are unaffected by a delicate stair link to the main span of the bridge which is partially hidden from St George's Square by tree canopies. At the southern end of the main span is a stair link to a new landscaped space that threads a route to the US Embassy.

The four bridge landings and the asymmetric bridge geometry create the opportunity for different experiences approaching and leaving the bridge; choices for those crossing as part of a longer journey, a daily commute or those seeking to linger for view of the river and its banks.

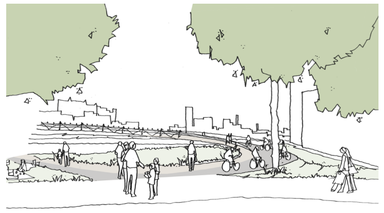
Each landing is sculpted to flow with the lines of the bridge, with fresh planting, lighting, grassy banks and new stone seats overlooking the river.

Illumination

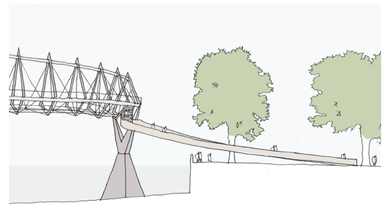
The decks are lit to promote good recognition, but in a way that does not detract from views. Illumination will limit energy, maximise maintenance periods and avoid light spill into the sky or into the river. The feature lighting will be a slow and subtly changing identity using a range of hues from amber through warm and cool whites through to blue. More saturated colours will be used for festivals and special events such as Valentine's Day, Remembrance Day, Christmas and New Year.

Ecology

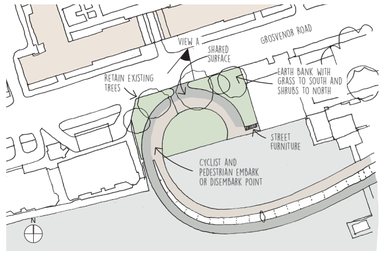
Although the ramps to the bridge are placed over the water, the effect of shadowing is minimised by the separation of the decks which allows light to pass between them. Their white precast soffits are also effective reflectors of daylight and sunlight. Ramp and bridge balustrades are made of light vertical steel balusters or glass, again permitting maximum passage of light.



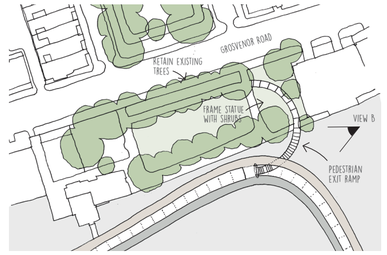
View A: Access onto bridge from the north bank landing point 02



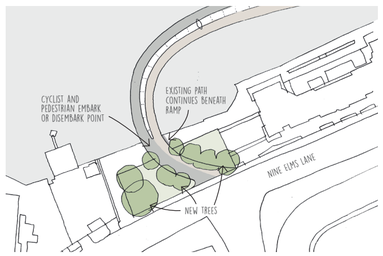
View B: Section showing pedestrian stair onto the north bank point 01



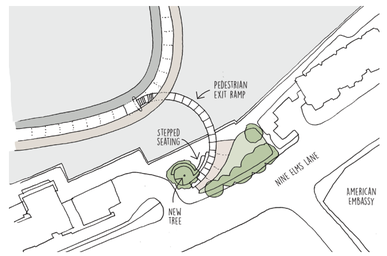
North Bank landing point 02



North Bank landing point 01



South Bank landing point 02



South Bank landing point 01

Challenge 03:

Height across the river and the inherent access issue

The main span clears the 150m navigation zone and is accessed by river based ramps for pedestrians and cyclists at 1:22 gradient, without switchbacks or hairpin bends.

Pedestrians also have the option of a curved slender stair to rise up to the main bridge span. Once there they can cross the river and descend on the other side by a similar stair or ramp.

Lifts are inappropriate being expensive to install and run. Experience of lifts on the Hungerford Bridge and the London Millennium Funicular on the Millennium Bridge is that they are frequently out of order.

To meet the required flood level, gradients on the landings are supplemented by waterproofing to the ramps for approximately 30m out into the river. The design of these waterproof 'tubs' appears consistent with the rest of the bridge save only for glazed panels placed inside the standard vertical steel balustrading.

View from the southern bank looking downstream

Challenge 04:

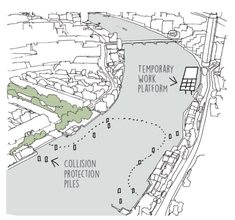
Approach to construction to minimise impact on river traffic

Our approach minimises disruption to river traffic, interference with the Thames Tideway Tunnel under the south bank of the river or disturbance to people living or working close to the site.

We propose floating pile caps to form the subsidiary supports for the ramps, so (more intrusive) cofferdams are only required for the main bridge piers. A temporary assembly platform is located at the south bank of the river next to an open area between buildings a short distance downstream from the site. Here bridge sections are assembled from components delivered by barge.

The ramps and completed sections of bridge are transferred by floating platforms and lifted into position onto the pre-prepared supports. The main span of the bridge is lifted into position from a floating platform using synchronized strand jacking from the bridge sections previously erected.

We anticipate that the lifting of the subsidiary bridge sections and ramps will take place over five weekends during which navigation is restricted to one half of the river. Only the lift of the final section requires a full traffic closure.



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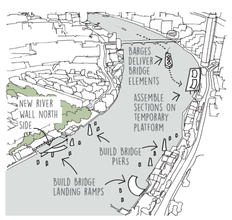

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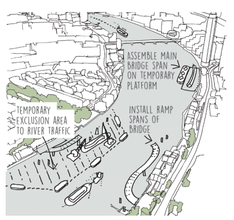

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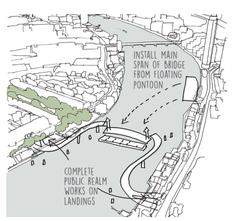

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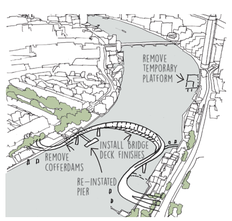

Phase 5:

Phase 6:

TEAM 004

NINE ELMS TO PIMLICO PEDESTRIAN AND CYCLE BRIDGE

Team 004

The "Handlebar" Bridge

Our curved bridge swoops up along each bank to arc across the river. The handlebar shape suggests agility and movement, creating a **landmark** for this reach of the Thames and the emerging Nine Elms Quarter; there is no other bridge like it in London. The curving bridge offers different experiences of the upstream and downstream vistas. It opens its arms to the upper reaches of the river and Battersea and leans out toward the downstream and West End panorama. Whether seen from the pedestrian deck above or from the river banks below, the curved profile of the bridge has the elegance of a banked velodrome track.

Bikes and pedestrians are separated in plan and in section; pedestrians on the outside of the curve walk above the cyclists riding around the inside and beneath them. The arrangement is dynamic but safe and gives all users spectacular views on both sides.

At Dolphin Square and on the south bank opposite, twin ramps with a gentle gradient of 1:22, suitable for **cycles, wheelchair users or walkers**, lead up to the bridge. Two slender flights of stairs at Pimlico Garden Shrubbery and on the south bank opposite offer alternative routes for **pedestrians only**. The bridge structure, ramps and stairs are all supported above the water merely kissing the banks. The four landings thus become linked public gardens, especially valuable in an area currently dominated by roads and traffic. Importantly, there is **minimal disruption** to Pimlico Garden Shrubbery. Its magnificent trees are retained and the bridge superstructure partly concealed from St George's Square Gardens by their foliage.

The access points offer a **convenient journey** for commuters, but also provide new river walks in an area lacking good public access to the water. To **enjoy the riverside** on each side of the Thames, pedestrians need only climb the stairs and walk down the ramp, or vice versa.

The bridge **structure** is an innovative and highly tuned three-dimensional truss. The sinuous form is made up of diamond shaped frames linked at top and bottom by slender steel sections and at the sides by concealed members supporting the precast cycleway and footway. The diamonds alter in width and height to respond precisely to bending and torsion, appearing to dance free of the decks and at night this is accentuated by subtle illumination that washes the structure.

We have purposely avoided mechanical lifts or any element likely to create significant **maintenance costs** over the long term. Although minimal in terms of tonnage, the bridge is **designed to be robust** and withstand the challenges of time. The fabricated diamond sections are easily accessible for maintenance without requiring the bridge to be closed. Steelwork is painted Corten to give the longest life between maintenance. Cable connections are sheltered from the weather and sealed. The decks are made of precast concrete and the surface of non-slip bound granite. Our cost estimates show our design to be achievable within the £40m budget.