Appendix 3.6

Temporary Working Platform Constraints and Opportunity Tables

Description of Preliminary Route Options Identified

Option 1 – Conventional Working Platform Wrapped in Geotextile

Description	Opportunities	Constraints
Engineering	• Tried and trusted methodology and solution	• Source and transport suitable fill to site (unlikely any site won material will be available at the stage of construction when the working platform needs to be constructed). • Machinery would be operating at a higher level, and step-down platforms required to access, dig and pile. • Careful controls required to ensure the geotextile wrap is constructed correctly and not damaged.
Flooding	• Install culverts to allow floodwater pass through.	• Even with culverts, the platform would still be a barrier to flood water causing damming and would influence upstream and downstream flood levels. • Erosion of aggregate and fines around culvert headwalls. • Culverts would need to be sufficiently sized to ensure flood waters are not constrained up or downstream. • Culverts would need to be set at a level that allows for settlement of the platform over its life.
Environmental	• Geotextile wrap would control silt generation during operational phase • Temporary silt fences could be used during decommissioning of the platforms.	• Careful controls such as installation of silt fence and timing the decommissioning of the platform with the drier summer months would be required to reduce the potential of sediment run-off reaching the river. • Vegetation beneath platform would die leaving is susceptible to erosion once platform is removed. • Very large footprint required. • Would require a run-off collection and storage facility to prevent sediment laden surface run-off reaching the river. Pumping and treatment of this run-off would also be required. • A breach of the geotextile wrap would likely result in significant erosion of the fill materials which would then be free to enter the river.
Geotechnical	• Spreads loads on low bearing soils • Would cope very well with differential settlements	• Must be sufficiently thick to spread loads and prevent punching failure for machinery. • Settlement may continue through operational phase. • Potential for geotextile to be breached by flood waters.

Option 2 – Traditional Working Platform

Description	Opportunities	Constraints
Engineering	• Tried and trusted methodology and solution	• Source and transport suitable rockfill to site. (Unlikely any site won material will be available at the stage of construction when the working platform needs to be constructed). • Machinery would be operating at a higher-level, step-down platforms required to access dig and piling areas.
Flooding	• Install culverts to allow floodwater pass through.	• Even with culverts, the platform would still be a barrier to flood water causing damming and influencing upstream and downstream flood levels. • Erosion of aggregate. • Culverts would need to be sufficiently sized to ensure flood waters are not constrained up or downstream. • Culverts would need to be set at a level that allows for settlement of the platform over its life.
Environmental	• Material could be won on site reducing the further import of materials.	• Sections of the platform could be washed away during flood events • Increased sediment run-off loading to river from exposed areas of rockfill • Vegetation beneath the platform will die leaving soils susceptible to erosion once platform is removed. • Very large footprint required. • Would require a run-off collection and storage facility to prevent sediment laden surface run-off reaching the river. Pumping and treatment of this run-off would also be required.
Geotechnical	• Spread loads on low bearing soils • Would cope very well with differential settlements	• Must be sufficiently thick to spread loads and prevent punching failure for machinery. • Settlement of embankment may continue during operation • Potential for geotextile to be breached by flood waters.

Option 3 – Bunded Working Platform

Description	Opportunities	Constraints
Engineering	• Would allow all machinery to operate at a lower level.	• Would be challenging to seal liner around excavations / piling • Platform would act like a lagoon during heavy rainfall events. Implications on programme due to pauses in works while platform being dewatered. • Pumping and treatment for water removed during dewatering will be required.
Flooding	• Welded HDPE liner making working area waterproof and containing any surface contaminants within the confines of the platform. • Limited depth available for culverts under the working platform.	• Machinery and plant operating at level lower than flood level. Potential for breach of bund or liner during flood event • Barrier to flood water causing damming and influencing upstream and downstream flood levels. • Culverts would need to be sufficiently sized to ensure flood waters are not constrained up or downstream. • Culverts would need to be set at a level that allows for settlement of the platform over its life. • Stringent controls to ensure construction quality will be required. • Damming of flood water will likely increase flows and the potential for increased scour and erosion within the main river channel. • Bunds would need to be designed to be robust enough to survive 1 in 100 year flood event
Environmental	• Sump incorporated to collect oil and material spills • Consider use of geotubes for bunds which would lock up sediment and reduce / prevent silt run off from bund.	• Breach of bunds or seepage through bunds could carry concentrations of hydrocarbons and/or silt from platform to river • Large footprint. • Vegetation beneath the platform will die off leaving soils vulnerable to erosion once removed.
Geotechnical	• Spread loads on low bearing soils • Would cope very well with differential settlements	• Specialist geotechnical solution to ensure water-tightness of the bund and lining under the working platform. Higher potential for error in construction.

Option 4 – Modular Pontoons/ Floating Causeway/ Platform (Unifloat/ Linkflote/ Rigifloat)

Description	Opportunities	Constraints
Engineering	• Speed of assembly and decommissioning • Modular construction • Can be transported by standard vehicles • Rigid platform to work from (loads to be determined) • Relatively low profile, therefore piling rigs and cranes will operate closer to existing ground level. • Offers the option to extend the bridge across the main channel and provide an immediate access road connecting the north and south elements of the project.	• Availability & Supply • Transportation from UK or mainland Europe potentially. • Significant anchoring will be required to hold them in place in times of flooding. These will require excavation for anchor blocks and cause disturbance in themselves. • Hummocky ground will influence the founding of the pontoons and may cause tilt or roll of the decks rendering the unfit for purpose. • Bearing capacity of pontoon deck will not provide sufficient bearing capacity for the proposed loads from piling rigs and cranes. • The pontoons may require bespoke design to cater for the proposed loads as they are not typically designed to rest on ground surface. • Largely untried and untested solution for use on land, increasing project risk. • Founding on hummocky/uneven ground will likely destabilise the platform allowing it to rock thereby rendering it unfit for purpose. The mechanical connections between pontoons may also be compromised.
Flooding	• The platform floats therefore the operations (plant, material & machinery) would be kept above water. • Flooding would not be restricted. Therefore, no impact upstream or downstream in times of flood. • The platform would be located outside of the SPA by 10 m.	• Would need substantial anchorage and anchor points in times of flood. These would require significant excavations within the flood plain and installation of concrete anchor blocks (Typically 1 or 2 anchors per pontoon) • The design would need to be sufficient to resist water pressure in times of flood as the pontoons would be broadside to the flow of the river.
Environmental	• No import of soil or rock required thereby reducing the potential for silt sediment entering watercourses. • The ballast tanks within the pontoons could be used to store surface platform water and then pumped out by sucker trucks. A bespoke solution would be required to achieve this. • The edge of the platform could be bunded to prevent surface water from draining over the edge. • Minimum footprint resting on the ground surface. • Hydrocarbons would be collected in surface water and collected within the ballast tanks of the pontoons and/or pumped to containment. • Pontoons could be moved into place as required reducing the time they sit in one place	• Vegetation beneath the pontoons would likely die leaving it vulnerable to erosion from flood water once pontoons are removed. • To overcome the constraint of founding on hummocky ground, it would first need to be levelled requiring levelling of hummocks and hollows and subsequent exposure of soils to rainfall runoff and flood waters and substantially negating the main benefit of this type of construction. • The storage of water within the pontoons presents a significant logistical challenge. Furthermore, water stored within the pontoons may adversely affect buoyancy of each pontoon in times of flooding. • Anchors will require significant excavations within the SAC to found anchor blocks. • The excavations described above open-up clear pathways for sediment laden run-off to reach the river.
Geotechnical	• Loads would be spread reducing overall settlement of the founding soils.	• Differential settlement would need consideration. • Due to the lightweight nature of the pontoons, they would not induce significant settlement until such time operations commence. This poses a potential

Description	Opportunities	Constraints
		Health and Safety risk if rapid differential settlement were to occur during a girder lift. • The pontoons may have little tolerance to cope with uneven/hummocky ground making coupling difficult.

Option 5 – Bailey Bridge with Pontoons

Description	Opportunities	Constraints
Engineering	• Speed of assembly and decommissioning • Modular construction • Can be transported by standard vehicles • Rigid platform to work from (loads to be determined) • Relatively low profile, therefore piling rigs and cranes will operate closer to existing ground level. • Loads would be spread reducing overall settlement of the founding soils. • Wider platforms made from the pontoons could be used for crane locations. And the bailey bridge used for access. • Reduces the influence of hummocky ground on the founding of the pontoons and the potential for roll or tilt of the decks. • Offers the option to extend the bridge across the main channel and provide an immediate access road connecting the north and south elements of the project.	• Availability & Supply • Transportation from UK or mainland Europe potentially. • Anchoring of pontoons to resist flooding. • The stability of the bailey bridge would need to be assessed for cranes. • The bailey bridge would sit above the ground surface. The reach of piling rigs and excavators would need consideration. • Severely reduced footprint for plant and machinery to manoeuvre and operate. This option lacks flexibility and is only realistically available as a series of bridges at best. • The sides of the bailey bridge will restrict access for excavators and piling rigs to the point it is not fit for purpose. • The tight constraints of the bailey bridge would not allow plant and machinery pass and hence create significant logistical challenges which will increase the project cost and the programme. • Offers no benefit in relation to the required excavations and piling work needed for each bridge support and any mitigation needed to prevent uncontrolled run-off during construction. • Operations are working from height and confined space next to machinery will require additional health and safety measures.
Flooding	• The platform floats therefore the operations (plant, material & machinery) would be kept above water. • Flooding would not be restricted. Therefore, no impact upstream or downstream in times of flood. • The area of the pontoon exposed to the flow and press of water in times of flood is greatly reduced.	• Would need substantial anchorage and anchor points in times of flood. These would require significant excavations within the flood plain and installation of concrete anchor blocks (Typically 1 or 2 anchors per pontoon)
Environmental	• No import of soil or rock required thereby reducing the potential for silt sediment entering watercourses. • The platform would be located outside of the SPA by 10 m. • Minimum footprint resting on the ground surface. • Pontoons could be moved into place as required reducing the time they sit in one place • Ballast tanks could be used to store surface platform water and then pumped away. • The total ground area on which the pontoon sits would be greatly reduced and lessen the impact to underlying vegetation. • The movement of otters up and downstream within the fields away from the river's edge would not be restricted.	• Does nothing to mitigate run-off risk during excavation and piling. • Vegetation beneath the pontoons would likely die leaving it vulnerable to erosion from flood water once pontoons are removed. • Rainwater on the deck would wash through and down to the natural ground – controls will be required to ensure it is clean. • The edge of the pontoons could be bunded to prevent surface water from draining over the edge. • Hydrocarbons and sediment may be collected in surface water. Therefore, a formal drainage collection system may need incorporation into the design of the bailey bridge or alternatively operate a clean site with clean vehicles.

Description	Opportunities	Constraints
Geotechnical	• Spread loads on low bearing soils • Individual pontoons would cope with hummocky/uneven ground better than a single platform.	• Foundation design needs to be capable of carrying the operational loads and potential for differential settlement. This could result in more intrusive construction methods, e.g. piles.

Option 6 – Reno/Gabion Mattress Baskets

Description	Opportunities	Constraints
Engineering	• Enables a clean, flexible and robust temporary working platform for the bridge construction. • Can be designed for minimal design level over existing ground level consistent with depths necessary to cater for the proposed design loadings. • Offers a solution for a permanent access road that would be set at or just above existing ground level. Over-time the void space would fill in and vegetation would re-establish itself while still providing a firm base for bridge maintenance activities. • Due to their modular nature, slopes and ramps could be formed for machinery (such as piling rigs) operating at lower levels. Other required modifications (either planned or unplanned) during the sequence of construction works could be made easily. • Tried and trusted technique which contractors are familiar with. • Low tech and therefore less potential for adverse impacts to occur due to poor workmanship.	• Lifting and placement – straps and lifting eyes. • Labour intensive to fill baskets • Source of suitable aggregate. • Washing of aggregate prior to filling baskets outside of the SAC.
Flooding	• The platforms could be constructed to a height that is above the 1 in 100 flood level keeping material & machinery above water. • The platform could be constructed to minimum height that meets its engineering requirements. This will allow flood water pass over and through it. • As the gabions would be sewn together with steel wire the entire platform would be integrated and therefore robust enough to handle major flood events • As the stone within the gabion baskets is placed rather the compacted, some void space remains which will make the platform less likely to act as a dam. The use of larger aggregate will increase the void space. • Culverts at a higher level could be incorporated easily in matrasses constructed to higher levels if necessary.	• Sourcing of rock to fill gabions – carbon footprint for transport of aggregate – use of site -won material is not a likely prospect. • The higher the platform the greater the increase on river flows and flood levels upstream for a 1% AEP flood event. •
Environmental	• No need to consider run-off collection and treatment as rainfall will fall through the clean stone and will not be collect sediment prior to run-off to the river. • Reno or gabion mattresses are specifically designed for use on the banks and bed of rivers, lakes and other water bodies and are a tried and tested solution to reduce scour and erosion.	• Vegetation beneath platforms would likely die leaving it vulnerable to erosion from flood water upon decommissioning. • Would require a large footprint. • Some consideration needs to be given to reuse of the gabions after they are no longer required.

Description	Opportunities	Constraints
	• Clean stone would be placed in the gabions. The stone would be cleaned at source and prior to being placed in the gabions. The gabion wire would prevent stone being carried downstream in a food event. The size of aggregate would also be of sufficient size that it does not get entrained by flood waters and remains in place. • The gabion mattresses would be relatively straight forward to decommission as individual gabions could be lifted out by crane. • If the surface of the platform is above the flood level, a hydrocarbon barrier membrane could be incorporated to screen out hydrocarbons and silt from surface water. • If the surface of the platform is below the flood level, a clean site management procedure will be required to eliminate pathways and potential for silt and hydrocarbons entering the SAC. • Due to their modular nature, the decommissioning of the gabions could be phased to reduce the amount of bare earth exposed to potential flood events. In, addition the reinstatement could be phased allowing discrete areas of vegetation to re-establish themselves prior to the next area of gabions being removed.	• Rainfall passing through the embankment may transport contaminants (if present in sufficient quantities) to the SAC and mitigation measures will be required. • A small amount of settlement (approximately. <300 mm) is anticipated which may cause localised depressions (note the area is undulating and has many existing hummocks and depressions). Proof rolling after each lift will reduce undulations. • Depressions left behind after the mattresses are removed will be principally eliminated by the resodding and vegetation over the platform footprint.
Geotechnical	• Spread loads on low bearing soils • Would cope well with differential settlements	• Will likely require careful design to provide sufficient bearing capacity and trafficability for plant. • Geotextiles or geogrids may need to be incorporate between mattresses to increase the global stability of the platform.

Option 7 – Temporary Sheet Piles / Cofferdams

Description	Opportunities	Constraints
Engineering	• Ease of construction and speed of construction • Allow for working from lower levels • Potentially will allow for works at lower and higher levels as required	• Will likely require bracing / propping to cope with flood events • Braces may impede swing radius of crane or piling rig mast in tight locations. • Machinery may need to operate from outside of the cofferdam and reach down into it. • Alternatively, the cofferdam may need to be sized so that machinery can be craned down into it and operate within it. • Access to enter the coffer dam could be a challenge to design. • Access to/from discrete cofferdams at each foundation location would be difficult. Discrete coffer dams would not facilitate bridge girder lift operations.
Flooding	• Potential for smaller footprint than other options. • Would facilitate works that are required up to the 10m exclusion zone from the river (allow for vertical barrier / excavation) • Individual coffer dam areas could be established which are connected to each other by bailey bridges. River flows could be maintained under bridges. However full range of temporary operations need to be fully considered and sufficient flexibility incorporated to ensure the proposal is fit for purpose, i.e. being capable of facilitating bridge girder lift operations. • Potential for coffer dams to be arranged in circles or in diamond shape to allow for normal river flow to be maintained	• Difficult to incorporate culverts if required and maintain water-proofed environment. • May have an impact upstream and down on flood levels due to size of cofferdams
Environmental	• Piles form a continuous watertight barrier which prevents pollutants and sediment from leaving excavations / working areas. • Stage decommissioning not possible. However, the area within the coffer dam could be reinstated in its entirety prior to cut down/removal of sheet piles. This would protect the area from scour / flooding while reinstated vegetation takes hold. • The use of a “silent piler” could reduce noise and vibration impacts.	• Not possible to undertake staged decommissioning • All water collecting in the cofferdam (rain and groundwater) will need to be pumped out and treated. • Installing piles is typically a noisy activity causing environmental nuisance and adverse impact to sensitive receptor and potentially local fauna.
Geotechnical	• Ground conditions look suitable for sheet piling	• Rock head may be encountered at shallow depth reducing the embedment to less than that required. • Low strength overburden soils may not provide suitable lateral support for shallow embedment.

Working Platform Option Summary

Working Platform Options	Impact Potential: SAC Qualifying Interests and Flooding										Impact			Overall Rank
	Salmon		River Lamprey		Otters		Badgers*		Flooding		Engineering			1 = Best
	Direct	Indirect	Direct	Indirect	Direct	Indirect	Direct	Indirect	Property	Erosion	Construction	Operation	Removal	7 = Worst
Option 1 – Conventional Working Platform Wrapped in Geotextile	○	◑	○	◑	◑	◑	○	◑	●	◕	◕	◔	◕	6
Option 2 – Traditional Working Platform	●	◕	●	◕	◑	◕	○	◑	●	◕	○	◔	◕	7
Option 3 – Bunded Working Platform	○	◔	○	◔	◑	○	○	◑	●	◕	◕	◑	◕	4
Option 4 – Modular Pontoons/Floating Causeway/Platform (Unifloat/Linkflote/Rigifloat) with anchors	○	◕	○	◔	◕	○	○	◑	○	○	◕	●	◕	3
Option 5 – Bailey Bridge with Pontoons & Anchors or Piers with Foundations	○	◑	○	◑	◔	○	○	◑	○	○	◕	●	◑	2
Option 6 – Gabion Mattress Baskets (low level)	○	◔	○	◔	◔	○	○	◑	○	○	◔	◔	◔	1
Option 7 – Temporary Sheet Piles / Coffer Dams (Full Platform)	○	○	○	○	◕	○	○	◑	●	◕	●	◑	●	5

Legend	
Potential Impact	
○	None to Neglible
◔	Low
◑	Low to Medium
◕	Medium to High
●	High

* = Badgers relocated prior to commencement of work