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<b>Committees:</b>	<b>Dates:</b>
Corporate Projects Board - for decision Planning & Transportation Service Committee - for decision Projects Sub - for decision	08 July 2020 14 July 2020 30 July 2020
<b>Subject:</b> Tower Bridge – Replacement of Defective Bridge Driving Machinery Hydraulic Components  <b>Unique Project Identifier: 12222</b>	<b>Gateway 1-5 Authority to Start Work Regular</b>
<b>Report of:</b> Director of Open Spaces  <b>Report Author:</b> Jamie Bottono, Operations Manager, Tower Bridge	
<b>PUBLIC</b>	

**Recommendations**

<p><b>1. Approval track, next steps and requested decisions</b></p>	<p><b>Project Description:</b> To replace defective hydraulic pipework, components and upgrade hydraulic power units associated with the bridge lifting machinery at Tower Bridge.</p> <p>The estimation is that this will deliver another 30 plus years of hydraulic performance once the project is successfully delivered.</p> <p>A budget of £1.02M is included in the 50 Year Maintenance Plan for Tower Bridge to be delivered in 2020/ 21 approved by Planning and Transportation Committee on 28<sup>th</sup> January 2020. This will be updated in the autumn review to reflect the revised costs.</p> <p><b>Next Gateway:</b> Gateway 6 Outcome Report</p> <p><b>Next Steps:</b></p> <p>To proceed with placing the works with Bosch Rexroth Limited.</p> <p><b>Requested Decisions:</b></p> <ol style="list-style-type: none"> <li>1. Note the total estimated cost of the project at <b>£1,151,565</b> (excluding risk),</li> </ol>
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	<p>2. Approve a revised budget of <b>£1,151,565</b> to get to the next gateway (excluding risk),</p> <p>3. That a Costed Risk Provision of <b>£114,000</b> is approved (to be drawn down via delegation to Chief Officer),</p> <p>4. Approve the use of a sole supplier waiver, Bosch Rexroth Limited, as per the recommended option.</p>							
<p><b>2. Budget</b></p>	<table border="1"> <thead> <tr> <th data-bbox="528 539 847 685">Item</th> <th data-bbox="847 539 1007 685">Reason</th> <th data-bbox="1007 539 1230 685">Funds/ Source of Funding</th> <th data-bbox="1230 539 1422 685">Cost (£)</th> </tr> </thead> </table>				Item	Reason	Funds/ Source of Funding	Cost (£)
	Item	Reason	Funds/ Source of Funding	Cost (£)				
	<p><b>Hydraulic Components</b> (Power Units, pipework, pump set, fluid reservoir, filtration, fluid cooling/ heating, manifold blocks, instrumentation and painting)</p>	<p>Project Cost</p>	<p>Bridge House Estates Trust 50 Year Maintenance Fund for 2020/ 21</p>	<p>214,150</p>				
	<p><b>Strip out and Installation</b> (fixings, fasteners &amp; anchorage devices, transition spools, adaptors and fittings for hydraulic services, termination &amp; joining of hydraulic pipework, draining of existing equipment fluid, filling, priming of equipment and labelling)</p>	<p>Project Cost</p>	<p>Bridge House Estates Trust 50 Year Maintenance Fund for 2020/ 21</p>	<p>896,870</p>				
<p><b>Lifting Services</b> (removal of motors, tank and pumps from machinery rooms under towers)</p>	<p>Project Cost</p>	<p>Bridge House Estates Trust 50 Year Maintenance Fund for 2020/ 21</p>	<p>15,000</p>					

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	<b>Disposals</b> (hydraulic fluid)	Project Cost	Bridge House Estates Trust 50 Year Maintenance Fund for 2020/ 21	14,825
	<b>Refuelling</b> (Oils)	Project Cost	Bridge House Estates Trust 50 Year Maintenance Fund for 2020/ 21	10,720
	<b>Total</b>			<b>1,151,565</b>
<b>Costed Risk Provision requested for this Gateway: £114,000</b> (as detailed in the Risk Register – Appendix 2)				
<b>3. Governance arrangements</b>	<ul style="list-style-type: none"> <li>• Jamie Bottono, Operations Manager, Tower Bridge</li> <li>• Chris Earlie, Head of Tower Bridge,</li> <li>• Colin Buttery, Open Spaces Director,</li> <li>• Planning and Transportation Committee</li> </ul>			
<b>4. Progress reporting</b>	Monthly updates to be provided via Project Vision and any project changes will be sought by exception via Issue Report to Spending and Projects Sub Committees.			

**Project Summary**

<b>5. Context</b>	<ol style="list-style-type: none"> <li>1. Bosch Rexroth Limited are the original manufacturer, supplier and installer of the hydraulic power packs and motors undertaken in 1974, which are used to raise Tower Bridge,</li> <li>2. They have maintained their own systems at the Bridge since installation and there has been no major works undertaken aside from reactive and planned maintenance over the past 45 years,</li> <li>3. A condition survey of the whole system, located in the 4 machinery rooms under the towers and within the accumulator and bascule chambers, was requested in</li> </ol>
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	<p>2018, due to a number of leaks occurring in the machinery rooms,</p> <ol style="list-style-type: none"><li>4. Their findings were that the pipework serving the bridge driving operational machinery has fittings which were widely used in the 1970's, 80's and 90's and contain internal seals which degrade over time,</li><li>5. There are a large number of fittings 'weeping' which is an indication that the seals need replacing and to facilitate this there are large sections of the pipework which will need to be removed and replaced due to the nature of the installation,</li><li>6. There are also many hydraulic leaks from pipework joints, leaking pressure switches and a number of other components are in poor condition and in need of replacing. Since the original survey there have been further issues experienced and it is therefore essential that extensive works are undertaken,</li><li>7. The project is to upgrade and replace existing defective equipment with up-to-date products and improve pipework layout where possible to ensure the system is more efficient and therefore more environmentally friendly,</li><li>8. Bosch have extensive engineering knowledge of the operations including the associated dependencies and interfaces in order to carry out a bridge lift,</li><li>9. It is therefore beneficial to place the works directly with them as it provides benefits in terms of time, cost and importantly assuring that bridge lifting can be undertaken throughout the duration of the works,</li><li>10. Unless a completely new system is installed (Est £14M - £20M) it is essential that Bosch Rexroth Limited undertake these works and use their own components which are compatible with the existing machinery,</li><li>11. Procurement has been consulted on the approach and it has been agreed to place these maintenance works via a sole supplier waiver with Bosch Rexroth Limited,</li><li>12. Tendering this work through a contractor under our Procurement Code would have resulted in the appointment of Bosch Rexroth as a subcontractor. Under the waiver the City gains efficiencies through the direct management of Bosch Rexroth and the cost of a subcontractor's management fee which would have been applied.</li><li>13. To use an alternative provider would not offer value for money as they would be required to heavily engage with Bosch Rexroth Limited for knowledge/ components etc and they would require a long lead in time to research and</li></ol>
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	<p>understand the system and engineering demands placed on the equipment. This is something that we are reliant on Bosch Rexroth Limited given their long-term association with Tower Bridge.</p> <p>14. Should there be an issue in future with regards to Bosch, as a trading company, the approach would be to completely replace the whole system</p> <p>15. If the City have intellectual property rights, suppliers would be reluctant to design, test, prove and warranty components and they would no doubt have their own in-house solution.</p>
<p><b>6. Brief description of project</b></p>	<ol style="list-style-type: none"> <li>1. To replace defective hydraulic pipework, components and upgrade hydraulic power units,</li> <li>2. It is also recommended to replace oil transfer pumps including switchgear, as well as review pipework labelling/ asset tags to assist with future fault finding, as some are missing, and these works are included as part of the project.</li> </ol>
<p><b>7. Consequences if project not approved</b></p>	<ol style="list-style-type: none"> <li>1. A major failure during a bridge lift could leave the bridge in the raised position severely impacting on pedestrian and road traffic as well as have reputational issues for the City,</li> <li>2. Increase in the risk of a significant oil loss and ‘flooding’ of any of the four machinery rooms contaminating high value plant as well as historic Victorian machinery and fabric. This also could impact on bridge lifting operations and affect our ability to carry out our statutory duty for booked vessels,</li> <li>3. It is expected that the components will continue to deteriorate resulting in ongoing reactive works, which cannot be anticipated, to replace and ‘patch up’ as necessary. There is the risk that additional strain could be placed on associated components such as the main power packs and any failure of these could incur significant costs to repair/ replace,</li> <li>4. Some of the issues require extensive works to inaccessible areas beneath plant and therefore it would be economically beneficial to carry out these works as one project rather than in isolation.</li> </ol>
<p><b>8. SMART project objectives</b></p>	<ol style="list-style-type: none"> <li>1. The ability to continue providing bridge lifts during the works, for which we have a statutory duty to undertake, and conduct “business as usual”,</li> <li>2. To reduce the risk of failure of aged and deteriorating components which will result in long term downtime and commissioning,</li> <li>3. To reduce the amount of future reactive works and high costs to replace plant which can be measured through monitoring associated budgets.</li> </ol>

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<p><b>9. Key Benefits</b></p>	<ol style="list-style-type: none"> <li>1. Reduction in revenue costs for maintenance and reactive repairs of aged hydraulic components,</li> <li>2. Reduce the risk of an issue with hydraulic pipework before or during a bridge lift,</li> <li>3. The system will be more efficient and environmentally friendly delivering between 5 - 15% higher efficiency across the components in the system,</li> <li>4. Another 30 plus years of hydraulic performance once the project is successfully delivered,</li> <li>5. Fulfilling our duty to maintain an important asset of the City of London and the most famous bridge in the world.</li> </ol>
<p><b>10. Project category</b></p>	<p>7b. Major renewals, typically of a one-off nature (supplementary revenue)</p>
<p><b>11. Project priority</b></p>	<p>A. Essential</p>
<p><b>12. Notable exclusions</b></p>	<ol style="list-style-type: none"> <li>1. The project does not include for any other associated bridge driving operational components.</li> </ol>

**Options Appraisal**

<p><b>13. Overview of options</b></p>	<ol style="list-style-type: none"> <li>1. To do nothing would increase the risk of a major failure and could lead to serious impact on the ability to undertake bridge lifts and therefore not fulfil our statutory responsibility.</li> <li>2. This is a maintenance project to replace defective hydraulic pipework, components and upgrade hydraulic power units and therefore it is considered that the only option is to recommend.</li> <li>3. A project to completely renew all the bridge driving machinery has been considered, however, this will require extensive investigations and planning as well as years to deliver. Anticipated costs for this project have been broadly estimated as between £14M - £20M.</li> </ol>
<p><b>14. Risk</b></p>	<p><b>Overall project risk: Low</b></p> <p>The project is considered low risk as it is to replace existing components with modern equivalents and will be programmed so as not to impact on bridge lifts.</p> <p>Further information available within the Risk Register (Appendix 2) and Options Appraisal.</p>

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**Resource Implications**

<p><b>15. Total estimated cost</b></p>	<p>To replace defective hydraulic pipework, components and upgrade hydraulic power units.</p> <p><b>Total estimated cost (excluding risk): £1,151,565</b></p> <p><b>Total estimated cost (including risk): £1,265,565</b></p> <p>This is an increase in the original estimated budget due to additional issues being identified since the original survey.</p>							
<p><b>16. Funding strategy</b></p>	<p>Is the funding confirmed:</p> <p><b>All funding fully guaranteed</b></p>	<p>Who is providing funding:</p> <p><b>Internal - Funded wholly by City's own resource</b></p>						
<p><b><i>Recommended option</i></b></p> <table border="1" data-bbox="533 837 1382 1106"> <thead> <tr> <th data-bbox="533 837 1161 909">Funds/Sources of Funding</th> <th data-bbox="1161 837 1382 909">Cost (£)</th> </tr> </thead> <tbody> <tr> <td data-bbox="533 909 1161 1003">Bridge House Estates Trust 50 Year Repairs and Maintenance Fund</td> <td data-bbox="1161 909 1382 1003">£1,151,565 (excl risk)</td> </tr> <tr> <td data-bbox="533 1003 1161 1106" style="text-align: right;"><b>Total</b></td> <td data-bbox="1161 1003 1382 1106"><b>£1,151,565 (excl risk)</b></td> </tr> </tbody> </table> <p>The budget of £1.02M in the 50 Year Maintenance Plan for Tower Bridge to be delivered in 2020/ 21 will be updated in the autumn review to reflect the revised costs including risk.</p>			Funds/Sources of Funding	Cost (£)	Bridge House Estates Trust 50 Year Repairs and Maintenance Fund	£1,151,565 (excl risk)	<b>Total</b>	<b>£1,151,565 (excl risk)</b>
Funds/Sources of Funding	Cost (£)							
Bridge House Estates Trust 50 Year Repairs and Maintenance Fund	£1,151,565 (excl risk)							
<b>Total</b>	<b>£1,151,565 (excl risk)</b>							

**Appendices**

<b>Appendix 1</b>	Project Briefing
<b>Appendix 2</b>	Risk Register
<b>Appendix 3</b>	PT4 Procurement Form

**Contact**

<b>Report Author</b>	Jamie Bottono
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**Options appraisal table.**

Delete option numbers as appropriate

	<i>Option 1</i>	<i>Option 2</i>	<i>Option 3</i>
<b>1. Design Summary</b>	Do Nothing	Replacement of Defective Bridge Driving Machinery Hydraulic Components	Renew all the bridge driving machinery
<b>2. Scope and exclusions</b>	<ul style="list-style-type: none"> <li>There will be no replacement of defective items.</li> </ul>	<ul style="list-style-type: none"> <li>All previously identified defective hydraulic pipework and associated components,</li> <li>Upgrade hydraulic power units,</li> <li>Replace oil transfer pumps including switchgear,</li> <li>Review pipework labelling/ asset tags and label accordingly to assist with identification,</li> <li>The project does not include for any other bridge driving operational components.</li> </ul>	<ul style="list-style-type: none"> <li>Complete replacement of the bridge driving system in four machinery rooms including:               <ul style="list-style-type: none"> <li>All pipework,</li> <li>Hydraulic Power Units,</li> <li>Resting blocks,</li> <li>Auxiliary hydraulic functions,</li> <li>Electrical controls</li> </ul> </li> </ul>
<b><i>Project Planning</i></b>			
<b>3. Programme and key dates</b>	Not Applicable	<ul style="list-style-type: none"> <li>Following approval there is a lead in time of 2 months and the project is estimated to last 8 months,</li> </ul>	<ul style="list-style-type: none"> <li>This would be a major project requiring many months if not years to plan,</li> </ul>



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		<ul style="list-style-type: none"> <li>Start on site will be programmed around operational activities as well as consideration of bridge lifts.</li> </ul>	<ul style="list-style-type: none"> <li>There would be significant impact and disruption on bridge operations, and this would need to be captured and considered as part of any programme.</li> </ul>
<b>4. Delivery Team</b>	Not Applicable	Tower Bridge Operations Manager and Technical Team	City Surveyor, Tower Bridge, Department of Built Environment
<b>5. Risk implications</b>	<p>Overall project option risk: High</p> <ul style="list-style-type: none"> <li>Increased risk of a major failure which could lead to serious impact on the ability to undertake bridge lifts and therefore not fulfil our statutory responsibility,</li> <li>Increase in the risk of a significant oil loss and 'flooding' of the machinery room contaminating high value plant as well as historic Victorian machinery and fabric,</li> <li>Components will continue to deteriorate resulting in ongoing reactive works. There is the risk that additional strain could be placed on associated components such as the main</li> </ul>	<p>Overall project option risk: Low</p> <ul style="list-style-type: none"> <li>The project is considered low risk as it is to replace existing components with modern equivalents and will be programmed so as not to impact on bridge lifts.</li> </ul>	<p>Overall project option risk: Med</p> <ul style="list-style-type: none"> <li>This would be a significant engineering project requiring complete strip out of existing components throughout Tower Bridge operational areas which have been in situ for over 40 years,</li> <li>Similarly, any introduction of new components will have to be carefully considered and therefore an extensive risk assessment of all elements of the works will need to be made due to the unique structure and layout of the Bridge.</li> </ul>

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	<b>Option 1</b>	<b>Option 2</b>	<b>Option 3</b>
	power packs and any failure of these could incur significant costs to repair/ replace as well as time.		
<b>6. Benefits</b>	<ul style="list-style-type: none"> <li>• None – Costs will continue to be incurred to maintain and replace components as required and risk of complete failure remains.</li> </ul>	<ul style="list-style-type: none"> <li>• Reduction in revenue costs for maintenance and reactive repairs of aged hydraulic components,</li> <li>• Reduce the risk of an issue with hydraulic pipework before or during a bridge lift,</li> <li>• The system will be more efficient and environmentally friendly delivering between 5 - 15% higher efficiency across the components in the system,</li> <li>• Can be delivered in a timely fashion with minimal impact on bridge operations,</li> <li>• A lower project cost compared to full replacement with the benefit of providing another 30 plus years of hydraulic performance therefore representing better value for money.</li> </ul>	<ul style="list-style-type: none"> <li>• Reduction in revenue costs for maintenance and reactive repairs of aged hydraulic components,</li> <li>• Reduce the risk of an issue with hydraulic pipework and all associated components before or during a bridge lift,</li> <li>• A new modern bespoke efficient system designed to meet all current day criteria in terms of efficiency, consumption and environmental considerations.</li> </ul>

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	<b>Option 1</b>	<b>Option 2</b>	<b>Option 3</b>
<b>7. Disbenefits</b>	<ul style="list-style-type: none"> <li>Continued risk of a major failure resulting in failure during a bridge lift or not being able to raise the Bridge as part of our statutory duty,</li> <li>On-going maintenance and management of issues and uncertainty of integrity of system.</li> </ul>	<ul style="list-style-type: none"> <li>May discover issues with components associated with the bridge driving machinery as pipes and plant are removed from usually inaccessible areas.</li> </ul>	<ul style="list-style-type: none"> <li>Major project requiring extensive planning, design and investigations to prepare proposals,</li> <li>Likely to severely impact on bridge operations with possibility of no bridge lifts being accommodated for period throughout the project,</li> <li>Project costs estimated at between £14M - £20M which are not currently identified in the Bridge House Estates Trust 50 Year Maintenance Plan for Tower Bridge.</li> </ul>
<b>8. Stakeholders and consultees</b>	<ul style="list-style-type: none"> <li>Department of Built Environment,</li> <li>City Surveyors,</li> <li>Chamberlain,</li> <li>Comptroller and City Solicitor</li> </ul>	<ul style="list-style-type: none"> <li>Department of Built Environment,</li> <li>City Surveyors,</li> <li>Chamberlain</li> </ul>	<ul style="list-style-type: none"> <li>Department of Built Environment,</li> <li>City Surveyors,</li> <li>Chamberlain</li> </ul>
<b>Resource Implications</b>			
<b>9. Total estimated cost</b>	Not Applicable	<b>£1,151,565</b> (excl. risk)	Estimated at: £14M - £20M (excl. risk).

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<b>10. Funding strategy</b>	Not Applicable	A budget of £1.02M is included in the 50 Year Maintenance Plan for Tower Bridge to be delivered in 2020/ 21 approved by Planning and Transportation Committee on 28 <sup>th</sup> January 2020. This will be updated in the autumn review to reflect the revised costs.	A funding bid would need to be made to the Chamberlain for consideration and allocation from the Bridge House Estates Trust 50 Year Maintenance Plan for approval by Planning and Transportation Committee.
<b>11. Estimated capital value/return</b>	Not Applicable		
<b>12. Ongoing revenue implications</b>	There is provision in the 50-year maintenance plan for breakdown maintenance.		
<b>13. Investment appraisal</b>	Not Applicable		
<b>14. Affordability</b>	Not Applicable	There is provision in the 50-year maintenance and compared to complete replacement this offers the most economically advantageous solution.	There is currently no provision in the 50-year maintenance plan.
<b>15. Procurement strategy/route to market</b>	Not Applicable	Procurement has been consulted on the approach and it has been agreed to place these maintenance works via a sole supplier waiver with Bosch Rexroth Limited.	Due to the value of this project it would require to be tendered via OJEU.

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		<p>They are the manufacturers who supplied and installed the original hydraulic systems at Tower Bridge in 1974. They have maintained their own systems at the Bridge ever since and have extensive engineering knowledge of the operations including the associated dependencies and interfaces in order to carry out a bridge lift.</p> <p>If an alternative supplier was appointed, they would be required to heavily involve Bosch Rexroth Limited at every stage which would incur additional costs as well as the potential to delay and extend the duration of the project.</p>	
<b>16. Legal implications</b>	<p>“Pursuant to The Corporation of London (Tower Bridge) Act 1885, the City (as trustees of BHE) is required to: (i) to maintain and repair the bridge (s.62) and (ii) open the bridge for navigation of vessels which would otherwise be prevented, delayed or interfered with, and cause it to be continuously open at or about the time of high water as the Conservators (now PLA) shall from time to time direct. (s.29).</p> <p>If we were unable to undertake bridge lifts the City could be subject to possible claims for breach of statutory duty in the event an injured party suffers loss due to their passage along the river being obstructed.</p>		

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<b>17. Corporate property implications</b>	Not Applicable	<p>The proposals in this report meet key objectives of the Corporate Property Asset Management Strategy;</p> <ul style="list-style-type: none"> <li>Operational assets remain in a good, safe and statutory compliant condition,</li> <li>Operational assets are fit for purpose and meet service delivery needs.</li> </ul> <p>As the proposals are confined to bridge operational machinery there are no significant overlaps with building repairs and maintenance works.</p>	
<b>18. Traffic implications</b>	<ul style="list-style-type: none"> <li>Not Applicable</li> </ul>	<ul style="list-style-type: none"> <li>There may be a requirement for a temporary traffic management system to close one lane of traffic at night for deliveries of large items and this will be managed by the contractor,</li> <li>Deliveries could be scheduled to take place during the planned quarterly bridge maintenance closures to minimise impact and costs.</li> </ul>	
<b>19. Sustainability and energy implications</b>	The Energy Team would support option 2 or 3 and it might be useful for the team to provide some input into the specifications on powerpacks and controls as there is likely to be energy savings potential here.		
<b>20. IS implications</b>	None		
<b>21. Equality Impact Assessment</b>	<ul style="list-style-type: none"> <li>An equality impact assessment will not be undertaken.</li> </ul>		
<b>22. Data Protection Impact Assessment</b>	The risk to personal data is less than high or non-applicable and a data protection impact assessment will not be undertaken.		

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	<b><i>Option 1</i></b>	<b><i>Option 2</i></b>	<b><i>Option 3</i></b>
<b>23. Recommendation</b>	Not recommended	Recommended	Not recommended