

Date: 4 February 2015

**Item 10: Structures and Tunnels Investment Portfolio –
Hammersmith Flyover Strengthening**

This paper will be considered in public

1 Summary

ST-PJ406		STIP Work Package 3		
Existing Financial Authority	Estimated Final Cost (EFC)	Existing Project Authority	Additional Authority Requested	Total Authority
£ 93.0m	£ 101.11m	£ 76.78m	£ 24.33m	£ 101.11m

Authority Approval: An increase in Financial Authority of £8.1m and Project Authority of £24.33m (of which £8.1m is unbudgeted) to be funded by a draw down of centrally held management contingency, and an increase in Procurement Authority of £24.24m.

Outputs and Schedule: The project will deliver a significant upgrade of a key structure including the provision of a new strengthening system, with replacement of post tensioning, replacement of bearings, new drainage and safety barrier, new waterproofing and resurfacing of the deck, new expansion joints and improved maintenance access to the flyover. The project milestones will not be met and have been reforecast.

- 1.1 A detailed cost and funding breakdown is provided in Section 5 of this paper.
- 1.2 At its meeting on 22 January 2015, the Finance and Policy Committee endorsed the recommendations in this paper.
- 1.3 A paper is included on Part 2 of the agenda which contains exempt supplementary information. It is exempt by virtue of paragraph 3 of Schedule 12A of the Local Government Act 1972.

2 Recommendations

- 2.1 **The Board is asked to note the paper and the supplemental information on Part 2 of the agenda and:**
 - (a) **approve an increase in Financial Authority of £8.1m which is currently unbudgeted, to be funded by a draw down of centrally held management contingency;**
 - (b) **approve an increase in Project Authority of £24.33m for the Structures and Tunnels Investment Portfolio – Work Package 3, giving a total Project Authority of £101.11m;**

- (c) approve an increase in Procurement Authority of £24.24m for the Structures and Tunnels Investment Portfolio – Work Package 3, giving a total Procurement Authority of £97.41m.**
- (d) authorise the TfL Officers and the Subsidiaries (as described in paragraph 2.2 below) of the authority to finalise the terms of the agreement to be entered into pursuant to the related paper on Part 2 of the agenda (the Agreement);**
- (e) authorise the Agreement and execution (whether by deed or otherwise on behalf of TfL or any Subsidiary (as appropriate)) any documentation to be entered into in connection with the completion and implementation of the Agreement and any of the matters referred to in it (including, without limitation, all agreements, deeds, guarantees, indemnities, announcements, notices, contracts, certificates, letters or other documents); and**
- (f) authorise the TfL Officers and Subsidiaries to do all such other things as they consider necessary or desirable to facilitate the execution and implementation of the Agreement and the matters referred to in it.**

2.2 The following Officers and Subsidiaries shall have delegated authority:

- (a) TfL Officers: the Commissioner, Managing Director Finance, Managing Director Surface Transport; and**
- (b) Subsidiaries: Subsidiaries of TfL including Transport Trading Limited and any other subsidiary (whether existing presently or to be formed) of Transport Trading Limited and any of the directors of the relevant company shall be authorised to act for and on behalf of that company.**

3 Background

- 3.1 The Hammersmith Flyover Strengthening project forms part of the Structures and Tunnel Investment Portfolio (STIP), which comprises strengthening, refurbishment or replacement of eight structures on the Transport for London Road Network (TLRN) that have been identified as having serious structural and/or safety risks.**
- 3.2 In October 2013, the Finance and Policy Committee approved the start of the construction phase and a Project Authority of £76.78m for the Hammersmith Flyover project.**
- 3.3 The Finance and Policy Committee was informed in November 2014 that during the construction phase a number of risks and unforeseen issues had been realised which had increased costs and that TfL were pursuing negotiations with the contractor, Costain.**
- 3.4 The negotiations have now concluded (subject to approvals) and an increase in Financial Authority to £101.11m is required. Financial Authority of £93.01m is included in the 2014 TfL Business Plan. The additional £8.10m unbudgeted Financial Authority required now is to be funded by a draw down of centrally held management contingency. This will then be included in the 2015/16 budget to be**

submitted for approval to the Board in March 2015. An increase in Project Authority of £24.33m to £101.11m is required, and an increase in Procurement Authority of £24.24m to £97.41m is required.

- 3.5 The project will deliver significant upgrades and a new strengthening system to the structure including:
- (a) replacement of post tensioning;
 - (b) replacement of bearings;
 - (c) new drainage and safety barrier;
 - (d) new waterproofing and resurfacing of the deck;
 - (e) new expansion joints; and
 - (f) improved maintenance access to the flyover.
- 3.6 The strengthening and refurbishment of the Hammersmith Flyover is being carried out with the objective of seeking to minimise the impact of the works on the travelling public. Closures of the flyover are restricted to night-time one directional closures, Monday to Sunday, 22:30hrs – 05:00hrs to avoid the need for daytime closures of the structure. Where works cannot practically be carried out during night-time possessions, weekend closures are required. The first tranche of closures was carried out across eight weekends in the summer of 2014, and the remaining weekend closures will be required in the spring/summer of 2015.

4 Progress Update

- 4.1 TfL and the integrated design and construction teams developed the design sufficiently to allow the construction to commence as early as practical, so as to ensure the structure remained safely operational and to reduce the potential for any future failures and associated closures to traffic. Construction commenced on 28 October 2013, in line with the published milestone date.
- 4.2 The works carried out to date have been divided into those above and below the flyover. For the works above the flyover, two lanes of traffic have been maintained in both directions during the day, with one-way directional closures implemented at night. To maintain two lanes in both directions and to allow the works to be carried out to the central reserve during the day, 'narrow lanes' were installed, restricting HGVs to the nearside lane. This has enabled the existing central reserve to be successfully removed, repairs undertaken, waterproofing laid and a new drainage system and safety barrier installed.
- 4.3 Works to remove the main carriageway surfacing, carry out concrete deck repairs, and re-waterproof and resurface the carriageway were carried out during eight weekend one directional closures in the summer of 2014. Weekend closures were required as these works could not practically be carried out during the short working window of a night-time closure. Weekend possessions took place from Friday 22:30hrs until Monday 05:00hrs. Further weekend closures will be required in 2015 to install the expansion joints and complete the waterproofing and surfacing.

- 4.4 The works below the flyover deck have also been carried out with minimal disruption to the local road network, with all road/lane closures being implemented at night. The works include the creation of openings within the piers to provide better access into the structure for labour and materials and the construction of an off site mock-up of part of the flyover to allow training of the workforce to be undertaken and optimise methods of working.
- 4.5 The main post tensioning works have also started, with the installation of anchor blocks and strengthening cables.
- 4.6 The highest risk area that has caused much of the extra works and has seen risks occur is related to the jacking of the bridge to replace the bearings. There are 15 piers that require jacking four times each and the project took a significant step forward to prove the solution when the first 'jacking' of the flyover to facilitate the replacement of the bearings was successfully completed on 27 November 2014.
- 4.7 To replace the bearings, each pier of the flyover has to be lifted on jacks to allow the old bearings to be removed and the new bearings to be installed. The jacks lift about 2,500 tonnes of flyover. The flyover is then lowered back into the exact position onto the new bearings. These intricate works require monitoring of their impact on the pier base and the existing post tensioned cables with a great deal of accuracy. As a result, the flyover is closed to all traffic during these specific works, to prevent any movement through traffic loading.
- 4.8 When the existing pier bases and bearing pits were exposed during the preparatory works they were found to be defective and not in a condition to allow the flyover to be safely lifted to accommodate the replacement of the bearings. This has resulted in a significant amount of additional works being required within the bearing pits to install additional strengthening and temporary works to safely allow the flyover to be jacked up and the existing bearings removed and replaced with new.
- 4.9 In addition, the proposed bearing solution, to replace the existing roller bearings on a like-for-like basis, was no longer a viable solution and an alternative spherical bearing solution has been agreed.
- 4.10 The bearing replacement works (comprising both temporary works and bearing replacement) are on the critical path and delays here have had a significant impact on the overall programme, resulting in the works completion milestone of August 2015 being delayed. The contracted completion date is now 31 December 2015 and an additional TfL time risk of three months has been included to give a revised completion milestone date of 31 March 2016.

Benefits (and value)

- 4.11 The benefit of delivering this project is to ensure the continued safe use of the flyover. Without the works the flyover is at risk of imminent closure with the associated traffic impact and reputational damage for TfL. The project addresses the immediate closure risk and avoids the need for significant maintenance for decades to come.

Key Milestones

- 4.12 Due to the significant amount of additional works affecting the programme critical path, the published milestones are unlikely to be met. These have been reforecast and are summarised in the table below.

Milestone	Type	Original Target	Forecast/Proposed Target	Commentary
Bearing Installation Completed	BD	31/12/2014	21/10/2015	The significant additional works required have delayed these Milestone dates
Finish on Site Completed	CD	30/08/2015	31/03/2016	
Project Close Completed	PAM	27/11/2016	31/03/2017	

Realised Construction Risks and Unforeseen Issues

- 4.13 During the early contractor involvement (ECI) phase, a number of key risks were identified by TfL and the contractor. Surveys and investigations were carried out to mitigate the risks where possible, however, some residual risk was accepted which would require further investigations that were only possible once construction had commenced. Some risks were retained by TfL due to their unknown nature and to avoid the contractor pricing an unknown quantum of risk within their target price. The contractor retained the risk for design development and construction methodology.
- 4.14 The approved £76.78m EFC included a P50 monte-carlo risk allocation of £11.31m and an 18 week schedule risk allowance. Since October 2013, the project has seen all significant risks materialise along with a number of unforeseen issues equating to £24.33m and a 31 week delay. The additional authority request is in part a function of the P80 evaluation and a reflection of the risk profile where the impact has been at the high end of the risk assessment.

Residual Risk Allowance

- 4.15 Some significant risks remain on the project, principally the jacking and stressing operations; however, confidence in the jacking has increased significantly since the last submission to the Finance and Policy Committee, as a result of the initial jacking operations being successful. The tendon installation has also commenced in line with expectations. A review of the current TfL risk exposure gives a risk allowance at P80 of £12.39m. This provision has been allowed for rather than a P50 of £9.77m to completion, due to the unique design of the flyover and complex construction methods required. A schedule risk allowance of three months has also been allowed for. The top five TfL risks are:

Top Five Risks	
Risk	Mitigation
Unexpected behaviour of structure during stressing and jacking.	Structure to be extensively monitored during jacking and stressing. From now to June 2015.
Contractor's risks realised at P100 (not P80) and increased sub-contractor costs, resulting in increased 'pain' to TfL.	Closely monitor actual costs incurred. Continuous challenge on design and construction methods to reduce costs. From July 2014 onwards.
Possessions cancelled during construction.	Known events London Surface Traffic Control Centre (LSTCC) included in construction programme. Close contact between LSTCC/surface forward planning team and construction team to coordinate. From January 2014 onwards.
Unexpected differences in the physical condition of the structure.	Use of BIM 3D model for clash detection. From January 2014 onwards.
Phase 1 blisters crack during re-stressing.	Main post tension stressing to be carried out in stages with close monitoring. Beginning June 2015.

4.16 Due to the expenditure of the allocated risk allowance, a drawdown of £24.33m is required from centrally-held management contingency.

4.17 The level of residual contingency for the project has been reassessed as part of the recent Quarter 3 forecast and has been reset at £2.4m, which, in addition to the project risks, means the project is funded to the P95 level. The overall change in management contingency in the Quarter 3 forecast was funded through savings elsewhere across Surface Transport.

5 Financial Implications

5.1 The significant risks and issues incurred and those remaining on the project will require an increase in the Financial and Project Authority of the project, to be funded from the transfer of £24.33m from centrally held management contingency, along with an increase in Procurement Authority of £24.24m.

5.2 Financial Authority of £93.01m is included in the 2014 TfL Business Plan. The additional £8.10m Financial Authority will be included in the 2015/16 budget to be submitted for approval to the Board in March 2015.

Financial Breakdown				
£m	Approved EFC (October 2013)	Current EFC (December 2014)	Difference in EFC	Comments on variances
Replacement Post Tensioning including Structure Refurbishment	46.73	64.03	(17.30)	Additional prelims and subcontractor costs due to realised risks (physical conditions and additional pit strengthening).
Monitoring	2.10	2.21	(0.11)	Additional costs due to realised risks
Cantilever Strengthening	0.00	0.00	0.00	
Bearing Replacement	6.97	12.64	(5.67)	Additional costs due to realised risks (bearing solution)
Subtotal: Construction Defined Cost	55.80	78.87	(23.07)	
Lane Rental	0.42	0.46	(0.04)	Minor amendment
Insurances (OCIP)	0.25	0.34	(0.09)	Insurance has increased as the cost of main works has increased.
Sub-Total	56.47	79.67	(23.20)	
TfL Staff Costs	3.50	2.90	0.60	Consultants removed and detailed in Consultants costs below.
Ramboll Parsons Brinkerhoff Design Cost pre Novation	2.25	2.17	0.08	Pre-Novation Design Costs efficiencies gained.
Consultants	increase in Staff	1.15	(1.15)	Consultants removed from TfL Staff Costs. Specialist support required to reach the agreement and additional experienced project and commercial consultancy support.
ECl - Costain & Survey Costs	3.00	2.37	0.63	ECl and Survey cost efficiencies gained.
CAT3 Checker	0.75	0.46	0.30	Forecasted costs have been reduced.
Sub-Total	65.97	88.72	(22.75)	
TfL Risk	10.81	12.39	(1.58)	Approved value based on P50; current value at P80.
Total EFC	76.78	101.11	(24.33)	
Current EFC	76.78	101.11	(24.33)	
Delta	0.00	(24.33)	24.33	

5.3 The table below summarises the project profile and Project Authority.

Financial Profile					
£m	Prior Years	2013-2014	2014-2015	2015-2016	Total
Construction Defined Cost	-	12.26	50.57	16.04	78.87
Lane Rental	-	0.22	0.20	0.04	0.46
Insurances (OCIP)	-	0.07	0.16	0.12	0.35
TfL Staff	0.20	0.73	0.96	1.01	2.90
Ramboll Parsons Brinkerhoff Design Cost pre Novation	0.76	1.41	-	-	2.17
ECl Costain & Survey Costs	-	2.36	-	-	2.36
CAT3 Check	-	0.16	0.21	0.09	0.46
Consultants	-	0.37	0.24	0.54	1.15
Risk	-	-	-	12.39	12.39
Total	0.96	17.58	52.34	30.23	101.11
Previously Approved Project Authority					76.78
Increase Project Authority Requested					24.33
Investment Funding (as per 2014 Business Plan)					
TfL Funding (per Business plan)	0.96	17.58	57.92	16.54	93.00
Plan Surplus/ (Shortfall)¹	-	-	5.58	(13.70)	(8.11)

¹ The unbudgeted £8.11m will be included in the draft 2015/16 TfL Budget to be submitted to the Board in March 2015.

Commercial

- 5.4 The construction contract is a target cost, open book contract with full visibility of the contractors cost build up and charges.
- 5.5 The original target cost was £55.79m and the contractor's current forecast to completion is £83.46m.
- 5.6 Costain's current forecast to completion of £83.46m is £9.17m above the new target cost of £74.29m. TfL and Costain will share this 'pain' 50:50, totalling a construction defined cost to TfL of £78.87m.

6 Assurance

- 6.1 The project has been subject to an annual independent assurance review by the TfL Programme Management Office (PMO) and the Independent Investment Programme Advisory Group (IIPAG) in July 2014 and also interim reviews by the PMO and the IIPAG in September and December 2014.
- 6.2 The interim review in December 2014 supports the recommendations within this paper.

7 Views of the Finance and Policy Committee

- 7.1 At its meeting on 22 January 2015, the Finance and Policy Committee endorsed the recommendations in this paper.
- 7.2 Members commended everyone involved in the project for keeping closures to the flyover to an absolute minimum, despite undertaking very complicated and challenging work.
- 7.3 The Committee suggested that particular consideration should be given to risk allocation when estimating costs for unique projects where the problems were unknown.

List of appendices to this paper:

A paper on Part 2 of the agenda contains exempt supplemental information.

Background papers:

Reports from the TfL Programme Management Office and the Independent Investment Programme Advisory Group and the management response to those reports.

Paper submitted to the Finance and Policy Committee on 22 January 2015

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