

Date: 11 July 2012

Item 6: A4 Hammersmith Flyover Further Strengthening Works

This paper will be considered in public

1 Summary

- 1.1 The purpose of this paper is to request Project Authority for £1.5m for Hammersmith Flyover Further Strengthening Works, to complete early design activity.
- 1.2 The Projects and Planning Panel will consider reports on the Corporate Gateway Approval Process Gate A review by the Programme Management Office (PMO) and the external scrutiny by the Independent Investment Programme Advisory Panel (IIPAG) at its meeting on 11 July 2011.
- 1.3 The Estimated Final Cost of the works is over £50m. Further authority will be sought from the Committee, following the completion of the early design activity.

2 Recommendations

2.1 The Committee is asked to

- (a) note the current status and scope of the Hammersmith Flyover Further Strengthening Works;**
- (b) approve Project Authority of £1.5m for early design activity for the Hammersmith Flyover Further Strengthening Works; and**
- (c) note that further authority will be sought from the Committee, following the completion of the early design activity.**

3 History and Progress to Date

- 3.1 Hammersmith flyover forms part of the A4, a key route into Central London from the West and part of the Olympic Route Network. The flyover was constructed in the early 1960s and carries the A4 over the Hammersmith gyratory. It has an unusual form of construction, consisting of a series of concrete boxes, held together by steel cables that are tensioned and anchored into the bridge deck. Ever since the flyover was constructed, water has been seeping into the deck causing the steel cables to corrode. TfL took over responsibility for the structure from the Highways Agency in 2000 and has been monitoring the condition and assessing its load bearing capacity since that time.
- 3.2 In 2009, TfL carried out detailed structural investigations and a load assessment, which highlighted some concerns over the longevity of the structure. This resulted in a sophisticated acoustic monitoring system being installed in the flyover to

monitor the ongoing deterioration and help ascertain the time remaining before significant structural works would be required. Previously, this situation was thought to be more than 10 years away.

- 3.3 During 2011, a significant increase in the rate of snapping of wires that make up the tendons was observed and a temporary propping solution was explored and implemented at one location in November 2011.
- 3.4 Following further physical inspections of the structure during December 2011, it became evident that the condition of the structure had deteriorated further than the model and monitoring suggested. On receipt of a structural engineering report, the flyover was closed fully on 22 December, as a precautionary measure, pending the immediate detailed examination and analysis of all of the structure.
- 3.5 The load carrying capacity of the flyover had been rated at 44 tonnes. During the closure of the flyover, a detailed assessment was undertaken to quantify how much load, other than its self weight, the structure could safely withstand until the strengthening measures could be implemented. This was undertaken by Amey and Aecom and independently verified by the Head of Structural Engineering at Cambridge University, an acknowledged expert in this type of structure. This assessment concluded that the flyover could be reopened with a maximum vehicular load of 7.5 tonnes. The flyover was re-opened on 13 January 2012 under a width restriction for vehicles over 2.0m.

4 Strengthening Works

- 4.1 Two distinct and separate phases of work are required to strengthen the flyover. The first phase was the pre-2012 Games strengthening, to enable full traffic load to utilise the flyover. This was completed with the flyover re-opening on 28 May 2012 to full highway loading. The second phase is the work required to strengthen the entire flyover fully, ensuring its safe operation for many future decades.

5 Pre-2012 Games Strengthening

- 5.1 The post-tensioning system design utilised a number of steel tendons across each span of the structure to take up the loading lost by the deterioration of the existing post tensioning. These are positioned within the central reserve of the structure. Due to the unique design of the Hammersmith flyover, the solution is innovative and has not been deployed anywhere else in the UK.
- 5.2 The implementation works started on the flyover in advance of the preliminary design being completed. This allowed the enabling and preparation works to commence prior to construction of the strengthening. The works could continue throughout the day and night within the lane restrictions without having any additional impact on traffic.
- 5.3 The post-tensioning solution was implemented in a number of phases:
 - (a) the casting of a new base slab in the bridge deck and new anchorages to anchor the tendons to the structure;

- (b) installation of the tendons, then their gradual, sequential tensioning to take up the load lost through deterioration; and
 - (c) encapsulating the steel tendons in sacrificial ducts, then injecting wax oil into these to protect from degradation.
- 5.4 There were also a number of necessary additional works due to the new central reservation design, including drainage, crash barriers, deck access and waterproofing.
- 5.5 The pre-2012 Games works commenced in January 2012 and were completed ahead of schedule on 28 May 2012, within the approved budget forecast of £17.7m.

6 Further Strengthening Works

- 6.1 The eleven spans not strengthened during pre-2012 Games strengthening will require intervention from autumn 2013.
- 6.2 The approach to the design of the further strengthening works is to learn from and complement the pre-2012 Games strengthening solution, while trying to improve upon buildability and reducing the disruption to traffic.
- 6.3 There is the potential to utilise alternative materials and to mount the post-tensioning tendons in alternative locations, which may improve life cycle costs as well as reducing the traffic management impact. These will be thoroughly investigated during the preliminary design phase.
- 6.4 The further strengthening works will introduce new post-tensioning tendons throughout the remainder of the structure, taking up the full load of the flyover and vehicular traffic. There are a number of additional activities not undertaken during pre-2012 Games works that are also needed:
- (a) strengthening of the transverse cantilever beams throughout the entire structure;
 - (b) renewal of the waterproofing membrane and resurfacing of areas not covered by the pre-2012 Games works;
 - (c) modification and renewal of the drainage system, to improve capacity and prevent flooding; and
 - (d) replacement and maintenance of the bearings, bearing assembly and support structure to ensure that the flyover articulates correctly.
- 6.5 It is anticipated that the project will be completed in a single phase commencing on site late summer/autumn 2013 and will take approximately 18 months to complete, based on experience gained during the pre-2012 Games works.

7 Governance

- 7.1 Hammersmith flyover further strengthening has been reviewed through Gate A of PMO's governance process. Furthermore, the IIPAG has reviewed the development of the proposed solution and has endorsed the approach and commended the delivery of the pre-2012 Games strengthening, having visited the construction site in April 2012.
- 7.2 The Projects and Planning Panel will consider the recommendations from the PMO and IIPAG reviews at its meeting on 11 July 2011.
- 7.3 Further project authority will be sought from the Committee following the completion of the early design activity.

List of appendices to this report:

None

List of Background Papers:

None

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