Thames Tideway Tunnel
Thames Water Utilities Limited

Application for Development Consent

Application Reference Number: WWO10001

Transport Assessment

Doc Ref: **7.10.04**

Putney Embankment Foreshore

Main Report

APFP Regulations 2009: Regulation **5(2)(q)**

Hard copy available in

Box **50** Folder **A**
January 2013

Thames Tideway Tunnel

Creating a cleaner, healthier River Thames

This page is intentionally blank

Thames Tideway Tunnel

Transport Assessment

Section 7: Putney Embankment Foreshore

List of contents

Page number

7 Putney Embankment Foreshore 1
7.1 Introduction 1
7.2 Proposed development 2
7.3 Assessment methodology 17
7.4 Baseline 23
7.5 Construction assessment 61
7.6 Operational assessment 85
7.7 Summary of site specific Transport Assessment 87
References 90

List of plates

Page number

Plate 7.2.1 Estimated construction lorry profile 8
Plate 7.2.2 Estimated construction barge profile 9
Plate 7.4.1 Thames Path along Embankment 24
Plate 7.4.2 Footway along Embankment 25
Plate 7.4.3 Footway along Lower Richmond Road (B306) 26
Plate 7.4.4 Cycle Stands at Embankment 27
Plate 7.4.5 Weekday ATC profile 49
Plate 7.4.6 Saturday ATC profile 50
Plate 7.4.7 Sunday ATC profile 51
Plate 7.4.8 Existing on-street car parking 54

List of tables

Page number

Table 7.2.1 Construction traffic details 5

Table 7.2.2 Maximum estimated construction worker numbers 11
Table 7.2.3 Transport mode split 12
Table 7.2.4 Peak construction works movements 13
Table 7.4.1 Existing day time local bus services and frequency (number of buses per hour)* 29
Table 7.4.2 Existing London Underground services and frequency (number of services per hour) 32
Table 7.4.3 Existing national rail services and frequency (number of services per hour) 33
Table 7.4.4 Frequency of Services at Putney Pier (number of services per hour) 35
Table 7.4.5 Aggregated frequency (passing craft per hour)* 35
Table 7.4.6 Existing on-street car parking 37
Table 7.4.7 Off-street parking charges 38
Table 7.4.8 Survey types and locations 40
Table 7.4.9 Existing pedestrian flows 43
Table 7.4.10 Existing cycle traffic 46
Table 7.4.11 Parking bay usage* 52
Table 7.4.12 Baseline LinSig model outputs 56
Table 7.4.13 Baseline PICADY model outputs 58
Table 7.4.14 Accident severity 59
Table 7.5.1 Construction base case LinSig model outputs 64
Table 7.5.2 Construction base case PICADY model outputs 66
Table 7.5.3 Construction development case LinSig model outputs (AM peak hour). 74
Table 7.5.4 Construction development case LinSig model outputs (PM peak hour). 75
Table 7.5.5 Construction development case PICADY model outputs (AM peak hour) 77
Table 7.5.6 Construction development case PICADY model outputs (PM peak hour) 78
Table 7.5.7 Putney Embankment Foreshore design measures 79
Table 7.5.8 Construction development case LinSig model outputs (AM peak), for sensitivity test 81
Table 7.5.9 Construction development case LinSig model outputs (PM peak), sensitivity test 82
Table 7.5.10 Construction development case PICADY model outputs (AM peak), sensitivity test 83
Table 7.5.11 Construction development case PICADY model outputs (PM peak), sensitivity test 84
Table 7.7.1 Putney Embankment Foreshore Transport Assessment results 88

7 Putney Embankment Foreshore

7.1 Introduction

7.1.1 This site specific Transport Assessment (TA) presents the findings of the assessment of the transport issues of the Thames Tideway Tunnel project at the Putney Embankment Foreshore site located within the London Borough (LB) of Wandsworth.

7.1.2 The assessment takes into consideration the changes as a result of all other Thames Tideway Tunnel project sites to ensure that results indicate the significance of each individual site in combination with construction works being undertaken at other sites.

7.1.3 The purpose of this Transport Assessment is to identify the Putney Embankment Foreshore site context, development proposals and any transport implications arising from these proposals to ensure that appropriate mitigation measures are identified, where necessary.

7.1.4 The TA draws on a number of project-wide or common documents which include the Transport Strategy and the Code of Construction Practice (CoCP). Further detail on these documents which form the background to the Transport Assessment can be found in Section 1 of the TA.

7.1.5 The *TA* structure is as follows:

a. Section 5.2 includes a description of the proposed development, detailing construction phasing, vehicle and person trip generation and construction traffic routing. It also provides details of the operational phase.

b. Section 5.3 outlines the assessment methodology used for the *TA* for the construction and operational phases.

c. Section 5.4 details the baseline conditions on the transport network surrounding the site, including survey data analysis and accident analysis.

d. Section 5.5 provides the assessment of the construction phase of the project, including a comparison between the construction base case and the construction development case. This section also outlines sensitivity testing for the highway network.

e. Section 5.6 provides the assessment of the operational phase of the project.

f. Section 5.7 – Summaries the *TA* findings.

7.2 Proposed development

7.2.1 The proposed development is located in the southern foreshore of the River Thames, to the west of Putney Bridge, within the LB of Wandsworth.

7.2.2 The site comprises an area of foreshore, running between points approximately 120m and 30m to the west and east of Putney Bridge respectively. A further site area (Putney Embankment Temporary Slipway site for a temporary slipway) is located adjacent to Embankment and located approximately 300m to the west of Putney Bridge. The south of the site is bounded by Embankment and Lower Richmond Road (B306). A public drawdock / slipway is situated within the site at the eastern end of Embankment. Putney Pier lies to the west of the site

7.2.3 Figure 7.2.1 in the Putney Embankment Foreshore *Transport Assessment* figures indicates the Putney Embankment Foreshore site location. The development at the Putney Embankment Foreshore site would intercept flows from the Putney Bridge Combined Sewer Overflow (CSO) and convey these to the Thames Tideway Tunnel.

Construction

Putney Embankment Foreshore site

7.2.4 The Putney Embankment Foreshore site is bounded to the south by Embankment and Lower Richmond Road (B306). Access to the site would be via a new access point close to the junction of Embankment and Lower Richmond Road (B306) for the main construction works and via Glendarvon Road and Embankment during the construction of the temporary slipway works. More detail is provided in the following paras.

7.2.5 The route of construction vehicles approaching the site will be along Putney Bridge Road, then Putney High Street (A219) and Lower Richmond Road (B306). Putney High Street (A219) forms part of the Transport for London (TfL) Strategic Road Network (SRN) while Upper Richmond Road (A205) forms part of the Transport for London Road Network (TLRN).

7.2.6 There would be three principal phases of construction, phase 1 covering site set-up, phase 2 covering shaft construction and tunnelling and phase 3 covering the construction of other structures. The construction of the temporary slipway would be undertaken prior to these three phases. Construction is anticipated to last for three and a half years. Early works, such as utility connections and diversions may be undertaken in advance of the main works.

7.2.7 The access plan and highway layout during construction (options A and B) plans are provided in the Putney Embankment Foreshore site *Transport Assessment* figures.

7.2.8 Stage 1 Road Safety Audits have been carried out on the illustrative highway layouts proposed for this site. The *Road Safety Audit* reports for this site are contained in Appendix E.

7.2.9 During construction it is anticipated that transport elements may be affected as a result of the additional construction traffic associated with the Putney Embankment Foreshore site as well as pedestrian diversions along the Thames Path.

7.2.10 The pedestrian refuge at the Lower Richmond Road / Embankment junction would need to be removed to enable access to Embankment for larger construction vehicles.

7.2.11 Embankment is currently one-way west bound between Lower Richmond Road and Thames Place. However, during the construction period construction vehicles accessing the site would do so via Lower Richmond Road. A short length of the existing one way arrangement on Embankment between the new site access and the junction with Lower Richmond Road (B306) would be converted to two way operation during the construction period of the main site works.

7.2.12 A section of on-street parking on the eastern end of Embankment would be suspended during construction. This would be required to enable large construction vehicles to reverse into the site during periods when it would not be possible for them to turn on-site.

7.2.13 The existing slipway at this location would be suspended during construction at the Putney Embankment Foreshore site. During this time, a temporary slipway would be available for use.

Putney Embankment Temporary Slipway site

7.2.14 A temporary slipway would be constructed to maintain access to the river whilst the existing drawdock / slipway is unavailable. The temporary slipway would be located approximately 300m west of Putney Bridge and would be completed before the existing drawdock / slipway is suspended. The works to construct this temporary slipway would last for approximately three months. The temporary slipway would be removed once the original slipway has been reinstated at the end of the construction works.

7.2.15 Construction vehicles to the Putney Embankment Temporary Slipway site would arrive to, and depart from, Lower Richmond Road (B306) using the same routes as for the main site. From Lower Richmond Road (B306) vehicles would then approach the Putney Embankment Temporary Slipway site via Glendarvon Road and Embankment and exit back onto Lower Richmond Road (B306) via Thames Place.

7.2.16 Temporary traffic management, including suspension of parking, would be required along a short stretch of Embankment (approximately 40m in length) at the site access point as Embankment would be reduced to a single lane during the slipway construction. Signed priority would be given to westbound vehicles which would include HGVs exiting the site via Thames Place. This would also reduce the amount of on-street parking that would need to be suspended on this stretch of Embankment.

7.2.17 During the construction of the temporary slipway, a small section of on-street parking at the southern end of Glendarvon Road would also be suspended to facilitate the turning movement of construction vehicles.

7.2.18 During construction of the temporary slipway, the carriageway width of the westbound lane of Embankment would be reduced by approximately 2m for approximately 80m (adjacent to the boat repair premises and the rear gardens of properties on Ruvigny Gardens). This would facilitate the protected pedestrian diversion route (of the footway and Thames Path) across the site access. This would reduce the overall carriageway to 4.5m, which would not be sufficient for two-way traffic movements. This traffic management will be removed during the operational phase of the temporary slipway.

7.2.19 The temporary slipway would be removed once the existing slipway at Putney Bridge is back in operation following completion of construction at the Putney Embankment Foreshore site.

Parking

7.2.20 During the construction of the main site, 18m of parking on the northern side of Embankment and 13mof parking on the southern side of Embankment would be removed, equating to a loss of five spaces.

7.2.21 During the construction of the temporary slipway it would be necessary to suspend 38m of parking on Embankment to the northwest of the Putney Embankment Temporary Slipway site and 130m of parking to the southeast of the site. This equates to approximately 34 parking spaces. It would also be necessary to suspend 28m of parking at the southern end of Glendavon Street representing a further six spaces.

Thames Path

7.2.22 The Thames Path runs along the riverside footway of Embankment past both the main site and the Putney Embankment Temporary Slipway site. During the construction of the temporary slipway, pedestrians would be diverted from the northern footway of Embankment onto a protected diversion route within the carriageway across the access to the Putney Embankment Temporary Slipway site. This would add approximately 4m to the length of the pedestrian route.

Cycling

7.2.23 There are ten cycle stands in place at the eastern end of Embankment within the footpath. These would be relocated approximately 20m to the west along Embankment.

7.2.24 During construction of the temporary slipway, cyclists would be diverted from the off-road cycle lane on the northern side of Embankment (NCN Route 4 / Thames Path) onto the carriageway past the Putney Embankment Temporary Slipway site access before re-joining the off-road cycle lane.

Construction traffic

7.2.25 Construction details for the site relevant to the construction transport assessment are summarised in Table 7.2.1

Table 7.2.1 Construction traffic details

Description	Assumption
Assumed peak period of construction lorry movements	Site Year 2 of construction
Assumed average peak daily construction lorry vehicle movements and duration	42 movements per day (21 vehicle trips) 1 month
Assumed peak period of construction barge movements	Site Year 3 of construction
Assumed average peak daily construction barge movements	4 movements per day (2 barge trips)
Types of lorry requiring access (comprising rigid-bodied, flatbed and articulated vehicles)	Excavated material lorries Ready-mix concrete lorries Steel reinforcement lorries Temporary construction materials including formwork lorries Plant and equipment lorries Office and general delivery lorries Imported fill lorries

Note: a movement is a construction vehicle moving either to or from the site. A Site Year is a 12 month period, one in a series of Site Years; Site Year 1 commences at the start of construction.

7.2.26 During construction, the cofferdam fill (both import and export) and 90% of shaft and other excavated material would be transported by barge. This allows for periods that the river is unavailable and material unsuitable for river transport. All other material transported by road.

Construction routes

7.2.27 Figure 7.2.2 in the Putney Embankment Foreshore *Transport Assessment* figures shows the construction traffic routes for access to/from the Putney Embankment Foreshore site. Construction routes have been discussed with both TfL and the Local Highway Authority, within the LB of Wandsworth.

7.2.28 The Putney Embankment Foreshore site would be accessed via a new access point close to the junction of Embankment and Lower Richmond Road (B306). Construction vehicles accessing the Temporary Slipway site would route through the following junctions:

a. Putney High Street (A219) / Upper Richmond Road (A205)

b. Lower Richmond Road (B306) / Putney High Street (A219)

c. Glendarvon Road / Lower Richmond Road (B306)

d. Embankment / Glendarvon Road

e. Thames Place / Embankment

f. Lower Richmond Road (B306) / Thames Place

7.2.29 Vehicles arriving from the east would access Lower Richmond Road (B306) via the Wandsworth Gyratory, Putney Bridge Road (A3209), Putney High Street (A219).

7.2.30 Putney High Street (A219) forms part of the TfL Strategic Road Network (SRN) while Upper Richmond Road (A205) forms part of the Transport for London Road Network (TLRN).

7.2.31 The exact routing depends on the material origin and destinations which is detailed in the *Project-wide TA*.

Proposed construction flows

Construction vehicles and barges

7.2.32 During construction 90% of excavated material from the main tunnel and shaft (export) and 90% of secondary lining aggregates (import) would be transported by barge from the site and all other materials would be transported by road.

7.2.33 The proposed working hours are set out in the *CoCP* and vehicle movements would take place during the standard day shift of ten hours on weekdays (08:00 to 18:00) and five hours on Saturdays (08:00 to 13:00).

7.2.34 Construction activity would occur twenty four hours a day for some periods but during such periods, construction vehicle movements would only occur during the ten and five hour periods stated above.

7.2.35 A limited number of extensions to working hours may be required to cover certain construction activities at Putney Embankment Foreshore site such as major concrete pours. The site would also require continuous working hours when the tunnelling and secondary lining construction activities are taking place. These underground works would occur on a continuous 24 hour cycle seven days a week. However, construction vehicle movements would be limited to the hours stated in 7.2.33 other than in exceptional circumstances.

7.2.36 In exceptional circumstances HGV and abnormal load movements could occur up to 22:00 for large concrete pours and later at night on agreement with the LB of Wandsworth.

7.2.37 A site-specific peak construction assessment year has been identified. The histograms in Plate 7.2.1 and Plate 7.2.2 show that the peak site-specific activity at the Putney Embankment Foreshore site would occur in Site Year 2 for construction lorries, and in Site Year 3 for construction barges. This site-specific peak is earlier than the overall project-wide construction peak activity year of 2019.

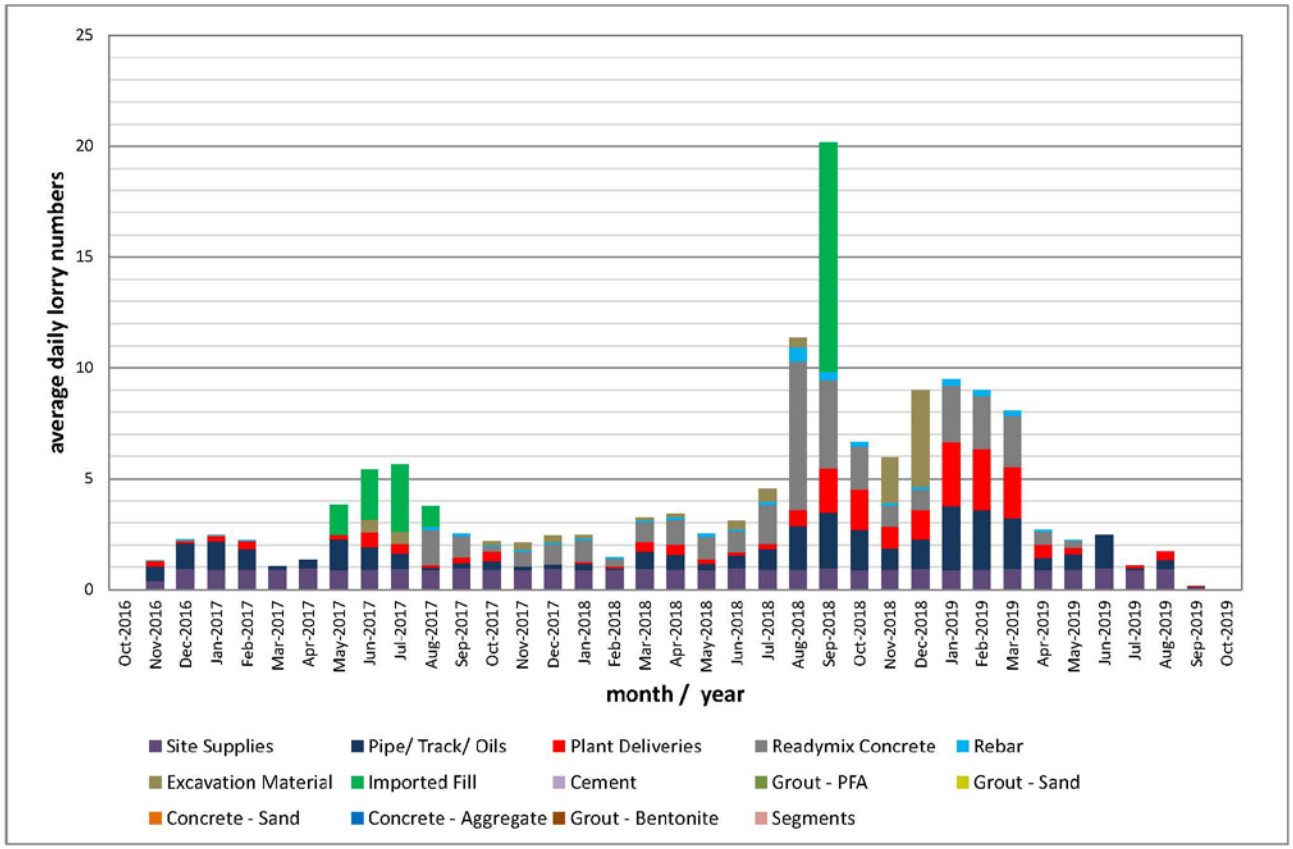
7.2.38 This *TA* assesses the site-specific peak construction year. As detailed in Table 7.2.1 there would be an estimated 42 average peak daily construction lorry vehicle movements which would last approximately one month and an estimated four peak daily construction barge movements in Site Year 3 of construction.

7.2.39 The assessment is based on 10% of the daily number of lorry journeys occurring in the peak hours, which has been agreed with TfL as a reasonable approach. It is recognised that it may be desirable to reduce the number of construction lorry movements in peak hours and the mechanisms for addressing this would form part of the *Traffic Management Plans* which are required as part of the *CoCP*.

7.2.40 The number of vehicular movements will vary throughout the construction period, and the histogram in Plate 7.2.1 indicates the construction vehicle profile during construction.

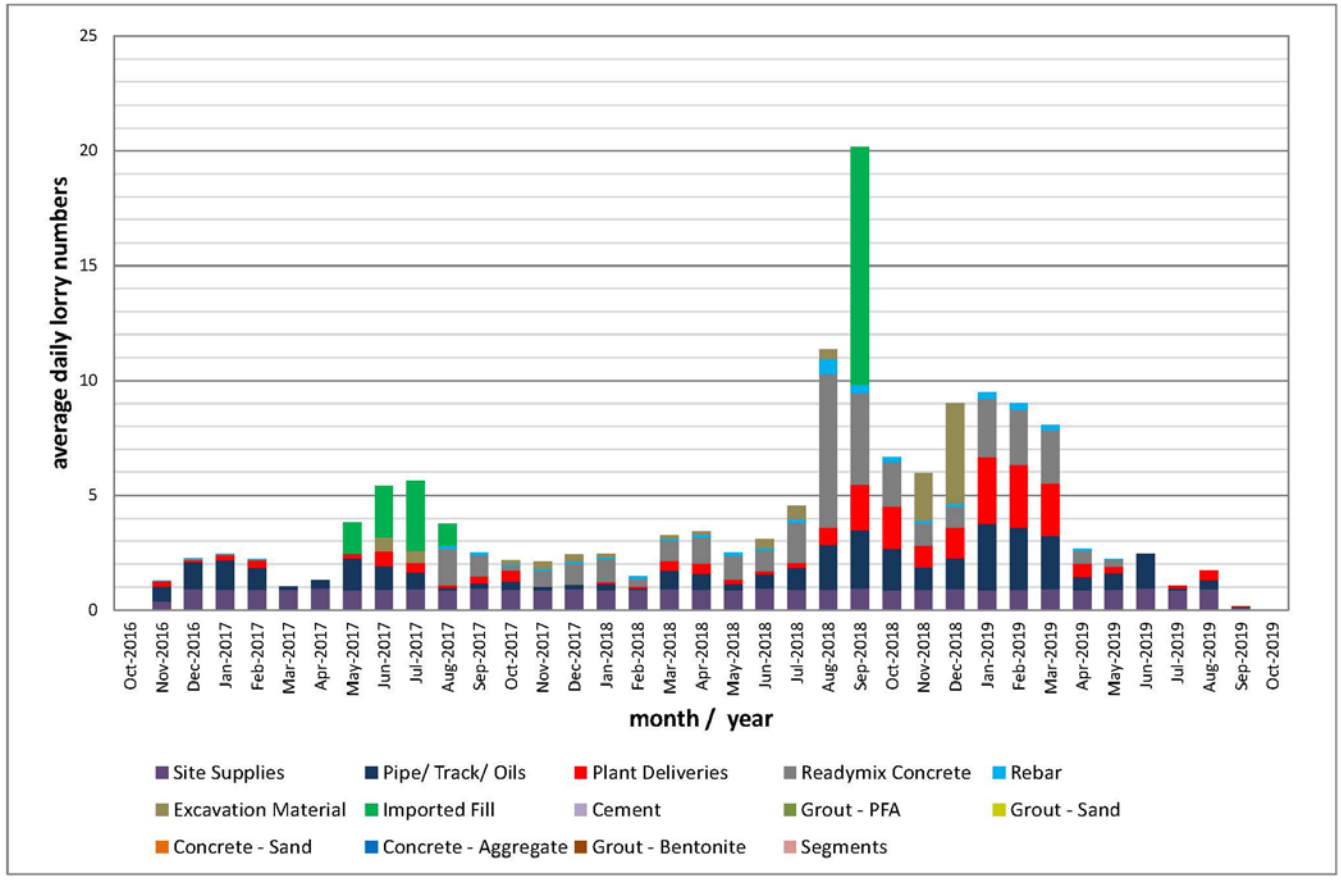
.

Plate 7.2.1 Estimated construction lorry profile



Note: Figure shows approximate volumes and number of vehicle trips based upon assumed timings for the works. It is not a programme and remains subject to change.

Plate 7.2.2 Estimated construction barge profile



Note: Plate shows approximate volumes and number of barge trips based upon assumed timings for the works. It is not a programme and remains subject to change.

7.2.41 The histograms in Plate 7.2.1 and Plate 7.2.2 show that the number of vehicular movements varies throughout the three and a half year construction period. It is anticipated that the peak monthly average of 42 HGV movements per day would occur for approximately one month. For a period of approximately eight months it is anticipated that the peak monthly average would be between 5 and 10 HGV movements per day. It is anticipated that the remainder of the construction period would have a peak monthly average of less than 5 HGVs per day.

7.2.42 As the Project-wide TA explains, the TfL Highway Assignment Models (HAMs) used for the strategic highway modelling represent peak hours of 08:00 to 09:00 and 17:00 to 18:00 and these have been taken as being the network-wide AM and PM peak hours in the project-wide and site-specific assessments.

7.2.43 The 07:00 - 09:00 and 17:00 - 19:00 periods identified from the local traffic surveys are busier on the network in the weekday than those encountered at the weekends (this is discussed in Section 16.4). Whilst the AM and PM peak hours differ slightly from these network-wide peak hours, in practice the number of vehicle movements at this site would be low in comparison to base case traffic flows on the adjacent network and is expected to be constant throughout the day.

7.2.44 Hourly construction vehicle trips during the inter-peak period are not expected to exceed the hourly trips generated between 08:00 - 09:00 and 17:00 - 18:00. The peak travel periods hours utilised for the modelling assessments in this report are therefore the weekday periods between 08:00 - 09:00 and 17:00 - 18:00.

7.2.45 Other construction vehicle movements associated with the site operations and contractor activities would be cars and light goods vehicles (LGVs). The construction vehicle movements expected to be generated by the Putney Embankment Foreshore are shown in Table 7.2.4.

Construction workers

7.2.46 The construction site is expected to require a maximum workforce of 50 workers on site at any one time. The number and type of workers are shown in the Table 7.2.2.

Table 7.2.2 Maximum estimated construction worker numbers

Contractor		Client
Staff*	**Labour****	**Staff*****
08:00-18:00	**08:00-18:00**	**08:00-18:00**
20	20	10

** Contractor Staff – engineering and support staff to direct and project manage the engineering work and site.*
*** Contractor Labour – those working on site doing engineering, construction and manual work.*
**** Client Staff – engineering and support staff managing the project and supervising the Contractor.*

7.2.47 The worker mode split has been derived by taking the highest number of workers during the peak month and calculating the percentage of trips based on the 2001 Census[i] journey to work data for the area in the vicinity of Putney Embankment Foreshore site.

7.2.48 The Census data indicates that the predominant mode of travel for journeys to work in this area is public transport. There is no parking available on-site for workers and there would be no parking provided within the site boundary, parking on surrounding streets is also restricted, and measures to reduce car use would be incorporated into a site-specific Travel Plan which means that workers would be unlikely to drive to the site. Therefore, the Census mode shares have been adjusted to reflect increased levels of non-car use by workers at this site. In order to assess a scenario which represents the most likely mode split at a construction site within this area, the mode split outlined in Table 7.2.3 has been used to assess the impacts of worker journeys on the highway and public transport networks.

7.2.49 The method of distribution of worker trips on the transport networks, including the public transport services, has been agreed with the Local Highway Authority and TfL.

i Based on 2001 Census. This type of data had not been released from the 2011 Census at the time of the assessment.

Table 7.2.3 Transport mode split

Mode	Percentage of trips to site	Equivalent number of worker trips (based on 65 worker trips)	
		AM peak	PM peak
Bus	23%	11	11
National Rail	29%	14	14
Tube	23%	11	11
Car Driver	<1%*	0	0
Car Passenger	<1%*	0	0
Cycle	5%	3	3
Walk	16%	8	8
River	1%	<1	<1
Other (taxi/motorcycle)	3%	2	2
Total	100%	50	50

** assuming to be zero for the purpose of this assessment*

7.2.50 Information regarding the travel arrangements of these workers would be included in the *Construction Management Plan* and *Site-Specific Travel Plan* documents for the site.

7.2.51 It is difficult to predict with certainty the directions to and from which workers at the site would travel. Staff could potentially be based in the local area or in the wider Greater London area and are unlikely to have the same trip attraction to primary A roads as construction lorries.

7.2.52 As indicated in Table 7.2.3, it is assumed that the predominant mode of travel for journeys to work in this area is public transport and it is assumed that the primary public transport services used would be from Putney Bridge Rail and Underground Stations.

Vehicle movements summary

7.2.53 Other construction vehicle movements associated with site operations and contractor activities would be cars and light good vehicles. The construction worker vehicle movements expected to be generated by the Putney Embankment Foreshore site is shown in Table 7.2.4.

7.2.54 Table 7.2.4 also shows the construction lorry movement assumptions for the local peak traffic periods. These are based on the peak months of construction activity at this site. The table also shows the construction worker vehicle movements expected to be generated by the site.

Table 7.2.4 Peak construction works movements

Vehicle type	Vehicle movements per time period				
	Total Daily	0700 to 0800	0800 to 0900	1700 to 1800	1800 to 1900
Construction lorry vehicle movements 10%*	42	0	4	4	0
Other construction vehicle movements**	36	4	4	4	4
Worker vehicle movements***	nominal	0	0	0	0
Total	**78**	**4**	**8**	**8**	**4**

** The assessment is based on 10% of the daily construction lorry movements associated with materials taking place in each of the peak hours.*
*** Other construction vehicle movements includes cars and light goods vehicles associated with site operations and contractor activity.*
**** Worker vehicle numbers are based on less than 1% of workers driving, on the basis that there would be no worker parking on site, on-street parking in the area is restricted, and site-specific Travel Plan measures would discourage workers from driving by car. In practical terms, this would be close to zero.*

7.2.55 An average peak flow of 78 vehicle movements a day is expected during the months of greatest activity during Site Year 2 of construction at this site. This is based upon 90% of imported and exported cofferdam fill, and 90% of shaft and other excavated material are transported by barge with all other material by road.

7.2.56 The assessment has been based on a combination of the peak hour of movements for construction and worker vehicle movements between 07:00 to 09:00 and 17:00 to19:00. These have been applied to the peak hours to take into account the highest number of movements generated by the site. In reality, not all peaks for these movements would occur concurrently and the peak for worker trips would be outside of the highway network peak hour, therefore the assessment is considered to be a robust case.

7.2.57 Table 7.2.4 shows that in both the AM and PM peak periods, the Putney Embankment Foreshore site would generate approximately 12 vehicle movements.

Code of Construction Practice

7.2.58 Measures incorporated into the CoCP Part A (Section 5) to reduce transport impacts include:

a. site specific *Traffic Management Plans* (TMP): to set out how vehicular access to the site would be managed so as to

minimise impact on the local area and communicate this with the local borough and other stakeholders. This includes any works on the highway, diversion or temporary closure of the highway or public right of way

b. HGV management and control: to ensure construction vehicles use appropriate routes to the sites and the vehicle fleet and/or drivers meet current safety and environmental standards

c. site specific *River Transport Management Plans* (RTMP) are to be produced for each relevant worksite. As with the TMP's this would set out how river access to site would be managed so as to minimise impact on the river and communicate this with the PLA, local borough and other stakeholders.

7.2.59 In addition to the above general measures within the *CoCP Part A*, the following measures have been incorporated into the *CoCP Part B* (Section 5), relating to the Putney Embankment Foreshore site:

a. the existing public slipway/drawdock is to be maintained until the secondary site is operational. The secondary site would be maintained until reinstatement of the public slipway/drawdock.

b. emergency egress points for vaults located beneath Lower Richmond Road (B306), egress across Waterman's Green to be maintained during the majority of the construction period, and their use should remain unaffected should existing planning permission into cafes or restaurants be implemented.

c. access across Watermans Green would be restricted during the later stages of construction. During this period, pedestrian access to the eastern end of the Green would be available by utilising the existing stairway located adjacent to the disused public convenience.

d. access to Putney Pier would be maintained for the duration of the construction works. The contractor would liaise with the pier owner and TfL (London River Services).

e. the site would be accessed from Putney High Street (A219) via Putney Bridge Road, traffic would then turn left onto Lower Richmond Road (B306) and right into the site from the Embankment.

f. during the construction of the secondary site construction traffic would access the site by turning right from Lower Richmond Road (B306) into Glendarvon Street and turning right into Embankment. Construction vehicles would then stop at a designated location on Embankment adjacent to the site to load/unload. When leaving the site construction vehicles would route east along Embankment and turn right into Thames Place then left turn into Lower Richmond Road (B306).

Main site:

g. it is proposed to change the operation of Embankment between the new site access and the junction with Lower Richmond Road to two-way for construction vehicles only during the main site works. A minimum carriageway width of 3.25m would be retained in each direction.

h. two-way flow on Embankment at THE secondary site construction to be maintained for general traffic using a priority traffic management system as required.

i. construction vehicles associated with the main construction site would not use Glendarvon Street.

j. small section of on-street parking to be suspended on the eastern end of Embankment where Embankment would operate as two-way for construction vehicles.

Secondary site:

k. construction vehicles associated with either the construction or subsequent dismantling of the secondary site would only access via Glendarvon Street between the hours of 10:00 and 15:00 Monday to Friday. Construction vehicles would not be permitted to use Glendarvon Street outside this period.

l. suspension of the majority of on-street parking on Embankment between Thames Place and Glendarvon Street during construction of slipway and subsequent removal.

m. suspension of a small section of parking on the southern end of Glendarvon Street to facilitate the passing of vehicles during construction of the slipway and subsequent removal.

n. parking bays located at the southern end of Glendarvon Street to facilitate construction vehicle movements would be replaced (subject to agreement with LB of Wandsworth) with parking restrictions, such that local residents may park during evenings/overnight when the parking restrictions are inactive.

o. a traffic marshal would be in place if large vehicles are required to reverse out of the site onto Embankment.

p. traffic management plan to address potential conflict between construction vehicles and other large vehicles such as vehicles transporting boats at Glendarvon Street junction with Embankment by measures such as timed deliveries, traffic marshals or priority signage.

q. construction vehicle drivers to be aware of the restricted road width along Glendarvon Street and to look out for potential conflicts with oncoming vehicles.

r. cycle stands on Embankment would be relocated approximately 20m west along Embankment.

7.2.60 Based on current travel planning guidance including TfL's 'Travel planning for new development in London'[1], this development falls

within the threshold for producing a Strategic Framework Travel Plan. A *Project Framework Travel Plan* has been prepared based on the TfL ATTrBuTE guidance[ii]. The *Project Framework Travel Plan* addresses Project-wide travel planning measures and CoCP Part B addresses site-specific measures including the need for a Project-wide Travel Plan Manager, initial travel surveys during construction and a monitoring framework. It also contains requirements and guidelines for the development of site-specific plans. The site-specific travel planning requirements of relevance to the *Project Framework Travel Plan* are as follows:

a. information on existing transport networks and travel initiatives for the Putney Embankment Foreshore site

b. a mode split established for the Putney Embankment Foreshore site construction workers to establish and monitor travel patterns

c. site-specific targets and interim targets based on the mode share which would link to objectives based on local, regional and national policy

d. a nominated person with responsibility for managing the Travel Plan monitoring and action plans specifically for this site

e. a nominated person with assigned responsibility for managing the Travel Plan monitoring and action plans specifically for the Putney Embankment Foreshore site.

Other measures during construction

7.2.61 Embedded design measures which are not outlined in the *CoCP* but are of relevance to the transport assessment at the Putney Embankment Foreshore site include the widening of the Embankment/Lower Richmond Road (B306) junction to accommodate construction vehicle movements and the new site access. This would be achieved via the removal of a traffic island rather than any kerb or footway modifications.

Operation

7.2.62 In the operational phase the highway layout and car parking provision would be reinstated to the existing layout. The site would be accessed from Embankment for maintenance visits.

7.2.63 During operation it is anticipated that there would be no significant effects on the transport infrastructure and operation within the local area because maintenance trips to the site would be infrequent and short-term. On this basis the only elements considered are:

a. effects on car parking

[ii] Assessment Tool for Travel plan Building Testing and Evaluation, (ATTrBuTE) is a web based travel planning tool, which ensures that Travel Plans are in accordance with TfL's published guidance on travel planning for new development in London, http://www.attrbute.org.uk/.

b. effects on highway layout and operation

7.2.64 The potential for operational impacts on these elements is low, due to the short-term effects of the physical aspects of access to the site for maintenance. These are only considered qualitatively because the changes required to the highway network during maintenance activity would be minor and temporary meaning that a quantitative assessment is not required. The scope of this analysis has been discussed with the LB of Wandsworth and TfL.

7.2.65 On completion of the construction phase the existing highway layout would be returned to the existing layout, with public access to the CSO shaft provided via the Thames Path

7.2.66 For routine three or six monthly inspections vehicular access would be required for light commercial vehicles, typically a transit van. On occasions there may be a consequent need for small flatbed vehicles to access the site.

7.2.67 Additionally, there would be more significant maintenance visits approximately every ten years, requiring access to enable two mobile cranes to be brought to the site and associated support vehicles, which would require temporary suspension of on-street parking in the vicinity of the site.

7.2.68 During operation maintenance, vehicles would enter the site via the new access point from Embankment via the Lower Richmond Road (B306).

7.2.69 The access arrangements for the operational phase are shown on the permanent highway layout plans provided in the Putney Embankment Foreshore *Transport Assessment* figures.

7.3 Assessment methodology

Engagement

7.3.1 An extensive scoping and technical engagement process has been undertaken. All consultee comments relevant to this site are presented in Volume 7 of the *Environmental Statement*.

7.3.2 Whilst the effects associated with transport for the operational phase have been scoped out of the *Environmental Statement*, the *TA* examines the operational phase in order to satisfy the relevant stakeholders that technical issues have been addressed (for example, those associated with access for maintenance activities).

Consultees

7.3.3 Throughout the scoping and technical engagement process, the key stakeholders with regards to transport; primarily TfL and the relevant local borough for each site have been consulted. For Putney Embankment Foreshore, the LB of Wandsworth has been consulted and the comments which have arisen relating directly to Putney Embankment Foreshore have been recorded and

responded to accordingly. The key issues arising from stakeholder engagement are:

a. details of traffic generation for all sites during operation and construction phases should be provided.

b. both individual and cumulative impacts should be considered where necessary.

c. it would be preferable for construction vehicles to reverse into the site and exit in a forward gear, if they cannot turn within the site area.

d. the statue at the Embankment / Putney High Street junction should be avoided if at all possible.

e. a safe crossing point will need to be provided on Embankment while a section of footpath leading to the existing crossing point is closed.

f. it was confirmed that it would be acceptable to split the existing cycle stands that are currently located close to where the proposed site access would be, into groups of 3 and locate them further west on Embankment, within the trees between the temporary slipway and the site entrance.

g. there are Borough plans to upgrade and improve Embankment.

h. the cycle route along Embankment will need to be maintained.

i. if effective vehicle marshalling were put in place at the temporary slipway site and on the approach from Lower Richmond Road, the Borough is satisfied kerb realignment works on Thames Place would not be required.

j. maximise the quantity of materials transported by barge to minimise HGV movements in relatively constrained local roads.

k. the feasibility of operating two-way movement on a section of Embankment should be investigated.

l. consideration should be given to whether bus stops on Lower Richmond Road require relocation.

m. consideration should be given to whether parking bays on Embankment require suspension. If so, relocation must be considered.

n. LB Wandsworth is opposed to the use of Glendarvon Street for routing of HGV's.

7.3.4 The key technical issues raised have been addressed as far as is practicable at this stage within this *TA*, *Project-wide TA* and the ES, in consultation with both TfL and the LB of Wandsworth.

Construction

7.3.5 The assessment methodology for the construction phase follows that described in the *Project-wide TA*. There are no site specific

variations for undertaking the construction assessment of the Putney Embankment Foreshore site.

Construction assessment area

7.3.6 The assessment area for the Putney Embankment Foreshore site includes the site access on Embankment, the junction between Embankment and Lower Richmond Road (B306) and the junction of Lower Richmond Road (B306) / Putney High Street (A219) / Putney Bridge Road (A219). It also includes the Glendarvon Road and Thames Place junctions on Embankment and Lower Richmond Road (B306).

7.3.7 These roads and junctions have been assessed for highway, cycle and pedestrian impacts. The Thames Path has been included within the assessment due to its proximity to the development site. Effects on local bus services within 640m (see para. 7.4.25) and rail services within 960m (see paras. 7.4.32 and 7.4.36) of the Putney Embankment Foreshore site have also been assessed.

7.3.8 The Public Transport Accessibility Level (PTAL) of the site, calculated using TfL's approved PTAL methodology assumes a walking speed of 4.8km/h and considers rail stations within a 12 minute walk (960m) of the site and bus stops within an eight minute walk (640m).

7.3.9 The assessment for each site takes account of construction vehicle movements associated with Putney Embankment Foreshore, together with construction traffic from other Thames Tideway Tunnel sites that would use the highway network in the vicinity of this site being assessed in Year 2 of construction.

7.3.10 The extent of the assessment area for the local highway network modelling has been informed by considering the volume of construction traffic at this site and the degree of impact that would be experienced at the nearest junction of the construction vehicle route with the SRN or TLRN. Where the assessment shows that the forecast impacts at this junction would not be significant, junctions further afield on the strategic network have not been assessed. Where impacts are forecast to be significant, a wider area of the local network has been considered in the assessment.

Construction assessment years

7.3.11 2019 has been used as the peak construction assessment year for the assessment of project-wide effects. This has been agreed with TfL and is reported in the *Environmental Statement*.

7.3.12 To assess the busiest case scenario for the Putney Embankment Foreshore locality, the peak construction traffic years have been identified. This ensures that the assessment for Putney Embankment Foreshore takes into consideration the heaviest flow of construction vehicles on local roads for the local modelling assessment.

7.3.13 The site-specific peak construction traffic years at Putney Embankment Foreshore are Site Year 2 of construction. This site-specific peak is earlier than the overall project-wide construction peak activity year of 2019.

7.3.14 The assessment of the aggregated Thames Tideway Tunnel construction traffic flows on the wider highway network is included within the *Project-wide TA*.

Highway network modelling

7.3.15 The assessment for each site takes account of construction vehicle movements associated with Putney Embankment Foreshore, together with construction traffic from other Thames Tideway Tunnel project sites that would use the highway network in the vicinity of this site in Site Year 2 of construction and Year 3 for construction barge movements.

7.3.16 As indicated in the Development Schedule (see Vol 7 Appendix N of the *Environmental Statement*) all of the other developments identified within 1km of the Putney Embankment Foreshore site would be complete and operational by Site Year 2 of construction and therefore form part of the base case.

7.3.17 As indicated in the *Project-wide TA*, the TfL HAMs have been used as part of the assessment. The strategic highway modelling has used three of the HAMs, which cover west, central and east London. These three models cover the locations of all of the Thames Tideway Tunnel project sites and this approach has been agreed with TfL.

7.3.18 The HAMs have been developed by TfL using GLA employment and population forecasts, which are based on the employment and housing projections set out in the London Plan . As a result the assessment inherently takes into account a level of future growth and development across London. For future year assessments the TfL WeLHAM has been used for the Putney Embankment Foreshore site. The model provides factors for the increase in vehicle-kilometres in the borough between the construction base year and 2021. The relevant growth factor for the site was applied to the traffic survey flows collected in 2011 to produce 2021 flows for existing traffic.

7.3.19 Construction traffic associated with other Thames Tideway Tunnel project sites using routes in this area has been included in the WeLHAM scenarios.

7.3.20 Office and operational trips associated with the site were assigned to the TfL WeLHAM model using the EIA scenario and the project peak month. The assigned flows were added to the 2021 existing flows and the construction flows provide the turning movements for local modelling.

7.3.21 This provides a robust assessment case as the background traffic is growthed to 2021 rather than 2019 and no allowance has been

made for existing traffic diverting away from the routes which run past the site as a consequence of the use of these roads by the additional project related traffic.

Sensitivity testing

7.3.22 The 'core' assessment presented in the *TA* is based on the Transport Strategy. It examines the month(s) in which construction vehicle activity at this site would be greatest and uses the average daily number of construction lorry movements that would occur in that month. This is considered to be reasonable because it addresses:

a. The time at which construction vehicle movements would be greatest at this site and there would be longer periods when the number of vehicle movements would be lower

b. Although there may be occasions in the peak month when the number of lorry movements in one day might exceed the average daily figure, these would be limited. The number of instances would be small in the context of the overall construction period at this site and would be offset by other times when the number of construction vehicle movements would be lower than the average daily figure for the peak month

c. If lorry movements are required outside the typical hours of 08:00 to 18:00, this would be agreed in advance with TfL and the Local Highway Authority.

7.3.23 The need for sensitivity testing has been discussed with TfL. Such a test could be used to address:

a. variation in construction vehicle numbers around the average daily figure for the peak month

b. a lower level of river transport for construction materials (leading to an increased number of lorry movements)

c. changes in programme which might lead to construction activity peaking at different times and/or a greater coincidence of peaks at adjacent sites which could lead to higher construction lorry flows on the surrounding highway network.

7.3.24 As para. 7.3.22 explains, if construction vehicle numbers were to exceed the average daily figure for the peak month, this would be an infrequent occurrence and should be seen in the context that the assessment is based on the peak month of construction activity at each site, rather than a lower 'typical' month.

7.3.25 It is expected that river transport will be used for certain construction materials and this forms part of the Transport Strategy. It is therefore not likely that all materials would be moved by road at all sites. However, there is the possibility that river transport might not be available at a particular site or sites for short periods of time and this might be the result of temporary

navigational constraints, local issues temporarily preventing access to the river, or wider issues restricting river movements to a number of sites (such as the closure of the Thames Barrier).

7.3.26 In practice the potential for increased coincidence of construction peaks between sites is limited because of the sequential nature of the construction activities required. Whilst it is possible that individual site peaks might change slightly, it is very unlikely that all sites would experience peak activity in the same period.

7.3.27 Although these events, if they were to arise, would be limited and short-term, it has been agreed with TfL that sensitivity testing would be undertaken within the *TA* to identify the potential impacts associated with such occurrences. It has also been agreed that for consistency, the test would be based on the number of construction lorry movements that would be related to moving all construction materials by road. This has been assumed to act as a proxy for events of this nature and represents an upper bound on the level of construction traffic that could be expected

Operation

7.3.28 The assessment methodology for the operational phase follows that described in the Project-wide TA. There are no site specific variations for undertaking the operational assessment of the Putney Embankment Foreshore site.

7.3.29 Given the local impact of the transport activity associated with the Thames Tideway Tunnel during the operational phase, only the localised transport effects around the Putney Embankment Foreshore site are assessed. Other Thames Tideway Tunnel sites would not alter the local effects around Putney Embankment Foreshore and they are not considered in the assessment.

7.3.30 With regard to other developments in the vicinity of the Putney Embankment Foreshore site all developments within 1km of the site and would be complete and operational by Year 1 of operation. As a result, these developments have been included within the operational base case which takes into consideration the effects on highway layout and operation.

Operational assessment area

7.3.31 The assessment area for the operational assessment remains the same as for the construction assessment as set out in paras. 7.3.6 and 7.3.10.

Operational assessment year

7.3.32 The operational assessment year has been taken as Year 1 of operation. As transport activity associated with the operational phase is very low, there is no requirement to assess any other year beyond that date.

7.4 Baseline

7.4.1 This section sets out the baseline conditions on the local transport network in the vicinity of the Putney Embankment Foreshore site in 2012, with the exception of the traffic survey data which was collected in 2011.

Policy review

7.4.2 The site is located within the LB of Wandsworth; the relevant national, regional and local policy documents have been reviewed and included within Appendix A.

Existing land use

7.4.3 The site is located in the reclaimed foreshore area and currently includes a public slipway.

7.4.4 There is a residential area along the southern edge of Lower Richmond Road (B306), with the closest properties to the Putney Embankment Foreshore site located opposite the site entrance, approximately 30m away.

Existing access

7.4.5 The site is currently accessed by the existing public slipway at the east end of Embankment, which will be used to access the construction area located within in the foreshore. There is pedestrian and cycle access to the site via the Thames Path along Embankment and Lower Richmond Road (B306).

Pedestrian network and facilities

7.4.6 The key existing pedestrian network to and from the site are directly related to the local public transport service including bus stops and rail stations. The key pedestrian network related to the Putney Embankment Foreshore site are:

a. The Thames Path

b. Embankment and Lower Richmond Road (B306) to Embankment bus stops

c. Putney Bridge to Putney London Underground station

d. Putney High Street (A219) to Putney National Rail station.

7.4.7 The existing pedestrian network and facilities in the vicinity of the site are shown in Figure 7.4.1 in the Putney Embankment Foreshore Transport Assessment figures.

Thames Path

7.4.8 The Thames Path routes along Embankment past the site and continues along the section of Lower Richmond Road (B306), to the south of the site towards Putney Bridge.

Plate 7.4.1 Thames Path along Embankment

Embankment

7.4.9 There are footways in place on both sides of this section of Embankment, to the southeast of Thames Place. The footway on the northern side is approximately 4.6m wide and accommodates several benches, while the footway on the southern side is 0.8m wide. There is also a footpath on the northern side of the section of Embankment to the northwest of the Thames Place. This footpath is approximately 4.8m wide.

7.4.10 There is an informal pedestrian crossing located on Embankment, to the west of the slipway, which includes dropped kerbs and tactile paving.

Plate 7.4.2 Footway along Embankment

Lower Richmond Road (B306)

7.4.11 Footways are also in place on both sides of Lower Richmond Road (B306). These are range between 1.4m and 5.4m wide on the northern and southern sides of the road respectively. Pedestrian crossing facilities are included within the signalised junction of Lower Richmond Road (B306) and Putney High Street (A219). The signal timings operate with an all-red pedestrian phase in each signal cycle which provides pedestrians with a period of safe crossing by stopping all traffic.

7.4.12 Lower Richmond Road (B306) is an east-west link between Putney Lower Common and Putney High Street.

7.4.13 Pedestrian crossing facilities are included at the signalised junction of Lower Richmond Road (B306) and Putney High Street (A219), with a dedicated pedestrian crossing phase provided in each signal cycle.

Plate 7.4.3 Footway along Lower Richmond Road (B306)

Cycle network and facilities

7.4.14 The existing cycle network and facilities in the vicinity of the site are shown in Figure 7.4.1 in the Putney Embankment Foreshore *Transport Assessment* figures.

7.4.15 The main cycle route within the area is National Cycle Network (NCN) Route 4 (on road), which routes across the Lower Richmond Road (B306) and then off-carriageway along Embankment. This route forms part of the Thames Path which passes the site. The cycle path continues westwards towards Barnes along the riverside footpath and northeast via Putney Bridge and Fulham High Street.

7.4.16 There are no marked cycle lanes along the Lower Richmond Road (B306), although there is a marked advanced cycle stop line at its junction with Putney High Street (A219). There is a marked cycle lane heading north over Putney Bridge, fed from a southbound bus lane along Putney High Street (A219).

7.4.17 Advanced cycle stops are provided for cyclists at the Lower Richmond Road (B306) / Putney High Street (A219) junction.

Barclays Cycle Superhighways

7.4.18 Barclays Cycle Superhighways (CS) are new cycle routes that run between central London and outer London, providing cyclists with safer, faster and more direct journeys into the city. The cycle lanes have bold road markings and signage which increase awareness among other road users. They incorporate information about journey times and links to other cycle routes along these CS routes.

7.4.19 There are currently no CS cycle routes within the vicinity of the site and none are currently planned up to 2015.

Barclays Cycle Hire Scheme

7.4.20 There are no Barclays Cycle Hire facilities in the vicinity of the site. However it is understood that there are plans to extend the scheme into south and west London.

Cycle parking

7.4.21 Ten Sheffield cycle stands are situated within the northern footway at the eastern end of Embankment, approximately 100m to the west of the Lower Richmond Road (B306) / Putney High Street (A219) junction. These are approximately 20m from the site entrance and these are available for public use.

Plate 7.4.4 Cycle Stands at Embankment

7.4.22 There are an additional five Sheffield Cycle Stands approximately 130m west of the site access along the eastern footway of Thames Place; midway between its junctions with Embankment and lower Richmond Road (B306).

Public transport

Public Transport Accessibility Level

7.4.23 The Public Transport Accessibility Level (PTAL) of the Putney Embankment Foreshore site has been calculated using TfL's approved PTAL (TfL, 2010)[2] (analysis is included in Appendix B). The PTAL methodology assumes a walking speed of 4.8km/h and considers rail stations within a 12 minute walk (960m) of the site and bus stops within an eight minute walk (640m).

7.4.24 Using this methodology the Putney Embankment Foreshore site has a PTAL rating of 6a, rated as 'excellent' (with 1a being the lowest accessibility and 6b being the highest accessibility). The following sections detail the public transport services in the vicinity of the site. Figure 7.4.2 in the Putney Embankment Foreshore Transport Assessment figures indicates the public transport network around the Putney Embankment Foreshore site.

Bus services

7.4.25 As shown in Figure 7.4.2, a total of 12 daytime bus routes and two night-time bus routes operate within 640m of the site.

7.4.26 These bus routes operate from the following bus stops:

a. Putney/St Mary's Church north bound stop on Putney High Street (A219) 180m walking distance South East of the site

b. Putney/St Mary's Church south bound stop on Putney High Street (A219) 210m walking distance South East of the site

c. Embankment bus stop west bound on Lower Richmond Road (B306) 25m walking distance south of the site.

d. Embankment bus stop east bound on Lower Richmond Road (B306) 45m walking distance south of the site.

7.4.27 Table 7.4.1 provides a summary of the bus services and their frequencies during the weekday periods.

Table 7.4.1 Existing day time local bus services and frequency (number of buses per hour)*

Bus number	Weekday two-way frequency		Nearest bus stop to the site	Approximate distance from the site (m)	Origin - destination
	AM peak (08:00-09:00)	PM peak (17:00-18:00)			
14	8	14	Putney/St Mary's Church	210	Putney Heath/Green Man - Warren Street
14	10	8	Putney/St Mary's Church	185	University College Hospital - Putney Heath/Green Man
22	10	10	Embankment	45	Putney Common to Piccadilly Circus
22	9	9	Embankment	25	Piccadilly Circus -Putney Common
39	10	10	Putney/St Mary's Church	210	Putney Bridge Station - Clapham Junction Station/Falcon Road
39	9	9	Putney/St Mary's Church	185	Clapham Junction Station/Falcon Road - Putney Bridge Station
74	9	8	Putney/St Mary's Church	210	Putney Bridge Road - Baker Street Station
74	7	8	Putney/St Mary's Church	185	Baker Street Station - Putney Exchange
85	7	8	Putney/St Mary's Church	210	Kingston Hall Road - Putney Bridge Station
85	8	8	Putney/St Mary's Church	185	Putney Bridge Station - Kingston Hall Road
93	11	11	Putney/St Mary's Church	210	Priory Road - Putney Bridge Station
93	10	10	Putney/St Mary's Church	185	Putney Bridge Station - Priory Road
220	8	8	Putney/St Mary's Church	185	Willesden Junction Station - Mapleton Crescent

Bus	Weekday two-way frequency		Nearest bus	Approximate	Origin - destination
220	9	7	Putney/St Mary's Church	210	Mapleton Crescent - Willesden Junction Station
265	5	5	Embankment	25	Putney Bridge Station - Tolworth/King Charles Road
265	5	5	Embankment	45	Tolworth/King Charles Road - Putney Bridge Station
270	6	7	Putney/St Mary's Church	185	Putney Bridge Station - Mitcham
270	6	6	Putney/St Mary's Church	210	Mitcham - Putney Bridge Station
424	2	2	Putney/St Mary's Church	210	Putney Heath/Green Man – Fulham, Craven Cottage
424	1	3	Putney/St Mary's Church	185	Fulham, Craven Cottage - Putney Heath/Green Man
430	8	8	Putney/St Mary's Church	210	Danebury Avenue/Minstead Gardens - South Kensington Station
430	7	7	Putney/St Mary's Church	185	South Kensington Station to Danebury Avenue/Minstead Gardens
485	2	2	Embankment	45	Hammersmith Bus Station - Ram Street
485	1	2	Embankment	25	Ram Street - Hammersmith Bus Station

** Transport for London (TfL) (2011) Timetables. Available at: http://journeyplanner.tfl.gov.uk/user/XSLT_SEL_STT_REQUEST?sessionID=0&language=en&mode=line&linePreSel=tfl:25:*&linePreSel=tfl:63:* (Accessed: September 2011)*

7.4.28 These bus services form a comprehensive network, extending outwards in all directions from the site.

7.4.29 These routes would also serve other stops further from the site as shown in Figure 7.4.2 in the Putney Embankment Foreshore *Transport Assessment* figures.

7.4.30 On average, there are 221 daytime bus services per hour in the AM peak and 184 bus services per hour in the PM peak within a 640m walking distance of the Putney Embankment Foreshore site.

7.4.31 On average there are 31 night-time bus services per hour Monday – Friday (00:00 – 06:00) and 33 bus services per hour on Saturdays (00:00 – 06:00) within a 640m walking distance of the Putney Embankment Foreshore site.

London Underground

7.4.32 As shown on Figure 7.4.2, in the Putney Embankment Foreshore *Transport Assessment* figures, Putney Bridge London Underground station, which lies on the District Line, is located approximately 600m walking distance to the northeast of the Putney Embankment Foreshore site, north of the River Thames. Trains from this station travel east to Tower Hill or north to Edgware Road via Earls Court and south to Wimbledon.

7.4.33 In both the AM and PM peak hour, the frequency of northbound and southbound trains at Putney Bridge is currently approximately one train every four minutes, providing an average of 15 services in each direction per hour.

7.4.34 East Putney London Underground station is approximately 1.1km walking distance to the southeast of the Putney Embankment Foreshore site. This station is the next station on the district line in the southern direction of Putney Bridge London Underground station. The frequencies of trains at this station would be the same as at Putney Bridge London Underground station.

7.4.35 Table 7.4.2 provides a summary of the London Underground rail services and their frequencies during the weekday and weekend peaks.

Table 7.4.2 Existing London Underground services and frequency (number of services per hour)[3]

Line	Weekday two-way frequency		Nearest London Underground station to the site	Approximate distance from the site (m)	Origin – destination
	AM peak (08:00-09:00)	PM peak (17:00-18:00)			
District Line	15	15	Putney Bridge	600	Upminster Underground Station
District Line	15	15	Putney Bridge	600	Wimbledon Underground Station

National Rail

7.4.36 The closest National Rail station to the Putney Embankment Foreshore site is Putney National Rail station situated approximately 650m walking distance to the southeast. Trains from Putney National Rail station travel between London Waterloo and Weybridge.

a. In the AM peak hour ten northbound and eight southbound trains call at Putney National Rail station. In the PM peak hour there are eight trains in both the northbound and southbound direction.

7.4.37 Table 7.4.3 provides a summary of the National Rail services and their frequencies during the weekday peaks.

Table 7.4.3 Existing national rail services and frequency (number of services per hour)[4]

National Rail station	Weekday two-way frequency		Approximate distance from the site (m)	Origin - destination
	AM peak (08:00-09:00)	PM peak (17:00-18:00)		
Putney	10	8	650	London Waterloo: Wandsworth Town, Clapham Junction, Queenstown Road, Vauxhall, London Waterloo
Putney	6	6	650	Hounslow: Barnes, Mortlake, North Sheen, Richmond, St Margarets, Twickenham, Whitton, Hounslow, Isleworth, Syon Lane, Brentford, Kew Bridge, Chiswick, Barnes Bridge, Barnes, Putney, Wandsworth Town, Clapham Junction, Queenstown Road, Vauxhall, London Waterloo
Putney	2	2	650	Weybridge: Barnes, Barnes Bridge, Chiswick, Kew Bridge, Brentford, Syon Lane, Isleworth, Hounslow, Feltham, Ashford, Egham, Virginia Water, Chertsey, Addlestone, Weybridge

River services

7.4.38 The Putney Embankment Foreshore site is east of Putney Pier, which is served by the TfL River Bus. This is shown on Figure 7.4.2. Putney Pier is accessed via Embankment.

7.4.39 This service operates from Putney to Blackfriars from Monday to Friday during peak hours. Eastbound services from Putney operate at 07:00 and 08:00 in the AM peak. Westbound services from Blackfriars do not serve Putney Pier in the AM peak period.

7.4.40 In the PM peak period there is one eastbound service from Putney to Blackfriars at 18:10 and three18:05, 19:20 and 20:05.

7.4.41 The Wandsworth Riverside Quarter Pier is located 1.6km walking distance from the Putney Embankment Foreshore site. It is the next stop from Putney Pier in the Blackfriars direction. The services would be the same as for Putney Pier.

River navigation

7.4.42 An analysis has been made of the typical volume of river vessel traffic passing the Putney Embankment Foreshore site, based on published river passenger service timetables and estimates of freight traffic based on discussions with operators. It is estimated that the peak hours for river vessel traffic passing the site is between 18:00 and 19:00, Monday to Friday. During these periods around seven vessels are estimated to pass the site. However, this figure is not constant as freight vessel transit patterns, which are included in the traffic, are influenced by the rising and falling tide. Therefore, such a peak will only occur every ten to 12 days when the tide is at its highest.

7.4.43 Table 7.4.4 and Table 7.4.5 indicate the aggregated river services at Putney Pier and river services passing the Putney Embankment Foreshore site.

Table 7.4.4 Frequency of Services at Putney Pier (number of services per hour)

	Time of day																	
	0600 - 0700	0700 - 0800	0800 - 0900	0900 - 1000	1000 - 1100	1100 - 1200	1200 – 1300	1300 - 1400	1400 - 1500	1500 – 1600	1600 - 1700	1700 – 1800	1800 – 1900	1900 – 2000	2000 - 2100	2100 - 2200	2200 - 2300	2300 - 0000
Putney Pier	0	1	1	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0

Surveys were undertaken in May 2012. Other sources include: http://www.tfl.gov.uk/gettingaround/1131.aspx [Accessed December 2012]

Table 7.4.5 Aggregated frequency (passing craft per hour)*

	Time of day																	
	0600 - 0700	0700 - 0800	0800 - 0900	0900 - 1000	1000 - 1100	1100 – 1200	1200 - 1300	1300 - 1400	1400 – 1500	1500 - 1600	1600 - 1700	1700 – 1800	1800 – 1900	1900 – 2000	2000 - 2100	2100 - 2200	2200 - 2300	2300 - 0000
Putney Embankment Foreshore site	0	1	1	1	0	3	3	0	0	0	0	9	1	2	1	0	0	0

**the frequency of river crafts is dependant on the time of year, season and weather conditions. Surveys were undertaken in May 2012. Other sources include: http://www.tfl.gov.uk/modalpages/2648.aspx and consultation with aggregates companies, West London Waste Authority, barge operators, Port of London Authority.*

Taxis

7.4.44 There are no taxi ranks in the immediate vicinity of the site. However, there are eight taxi bays provided on Putney High Street and two taxi bays on Werter Street, approximately 550m walking distance southeast of the site.

Highway network and operation

7.4.45 The site is located on Embankment which is a narrow (6.7m) road with a 30mph speed limit and has parking on both sides of the road, which effectively provides carriageway varying in width between 2.7m and 3.4m wide between the main construction site and Thames Place. There is a one-way westbound section between the junctions of Lower Richmond Road (B306) and Thames Place. Wide footways, a cycle lane and cycle parking are present on the northern side of the road. In its current mode of operation, with on-street parking on both sides, Embankment is unsuitable for long and heavy vehicles due to the restricted road width.

7.4.46 All construction vehicles would approach the site via the Lower Richmond Road (B306) / Putney High Street (A219) signalised junction, as shown in Figure 7.2.2 in the Putney Embankment Foreshore *Transport Assessment* figures.

7.4.47 Lower Richmond Road (B306) forms part of the SRN and has two lanes eastbound, and one lane westbound, approaching it's junction with Putney Bridge (A219), with a 30mph speed limit. There are no weight restrictions on this road.

7.4.48 The Embankment / Lower Richmond Road (B306) junction is a priority junction, with traffic permitted to enter from Lower Richmond Road (B306) into Embankment. Vehicles may not exit Embankment onto Lower Richmond Road (A306) from this junction.

7.4.49 Thames Place is a two-way single carriageway that links Embankment to Lower Richmond Road (B306).

7.4.50 The junction between Lower Richmond Road (B306), Putney High Street (A219) and Putney Bridge Approach (A219) is a three arm signalised junction. Lower Richmond Road (B306) has three eastbound lanes on the approach to and one westbound lane on the exit from the junction. Putney High Street (A219) has three northbound approach lanes and two southbound exit lanes. Putney Bridge Approach (A219) has three southbound approach lanes and one northbound exit lane.

7.4.51 The modelling outputs for the baseline situation of the Putney High Street (A219) / Lower Richmond Road (B306) / Putney Bridge Road (A219) and Lower Richmond Road (B306) / Embankment junctions are shown in this section in Table 7.4.13 and Table 7.4.14. The modelling outputs demonstrate that the network is currently operating within the theoretical capacity in the weekday AM and PM peak hours as indicated in para. 7.4.111.

Parking

7.4.52 Figure 7.4.3 in the Putney Embankment Foreshore *Transport Assessment* figures shows the locations of the existing car parking within the vicinity of the site.

Existing on-street car parking

7.4.53 The on-street parking that is provided on both sides of Embankment is subject to Controlled Parking Zones (CPZ) A1 and A5. Different permits are required to park in each.

7.4.54 A1 permits allow parking on the eastern end of Embankment while A5 permits allow parking on the western end of Embankment.

7.4.55 Parking is also permitted on the eastern end of Embankment on a shared use basis, which includes A1 permits and on a pay and display basis, with a maximum stay of four hours within restricted time periods.

7.4.56 Additionally there is on-street parking available on the northern side of Lower Richmond Road (B306) to the west of the Embankment / Lower Richmond Road (B306) junction. This is also subject to a CPZ.

7.4.57 There are no dedicated disabled parking bays within the immediate vicinity of the site.

7.4.58 There are no dedicated motorcycle parking bays in the immediate vicinity of the site. However, the nearest motorcycle parking bays are approximately 200m walking distance southeast of the site on Weimar Road.

7.4.59 Table 7.4.6 summarises the parking restrictions and the number of bays on the roads in the vicinity of the Putney Embankment Foreshore site. The availability and usage of parking capacity on a weekday and a Saturday on the roads in the vicinity of the site is shown in Table 7.4.6.

Table 7.4.6 Existing on-street car parking

Road name	Type of parking restrictions and number of bays			
	Pay and display	Resident	Blue badge	Shared Use
Ardshiel Close	0	0	0	0
Bemish Road	0	43	2	1
Bendemeer Road	0	0	2	84
Biggs Row	0	0	0	2
Embankment	0	37	0	63
Felsham Road	15	0	0	76
Festing Road	0	0	0	104
Gladwyn Road	0	0	0	49
Glendarvon Street	2	22	0	2

Road name	Type of parking restrictions and number of bays			
	Pay and display	Resident	Blue badge	Shared Use
Henry Jackson Road	0	17	0	0
Kingsmere Close	0	13	0	0
Lower Richmond Road	23	0	0	0
Roskell Road	18	0	0	28
Rotherwood Road	0	0	0	88
Ruvigny Gardens	0	31	1	20
Salvin Road	0	0	1	49
Thames Place	0	3	0	0
Waterman Street	0	28	0	0
Weimar Street	0	10	0	13
Weiss Road	0	39	2	7
Total	**58**	**243**	**8**	**586**

Existing off-street/private car parking

7.4.60 There is a multi-storey car park located approximately 500m walking distance south from Putney Bridge at the Exchange Shopping Centre which is available to members of the public between 08:00 and 20:00 Mondays to Saturdays and 11:00 and 17:00 on Sundays. The capacity of the car park is 250 vehicles and the charges are shown in Table 7.4.7.

Table 7.4.7 Off-street parking charges

Duration	Charge
0-1 Hour	£2.20
1-2 Hours	£4.20
2-3 Hours	£6.00
3-4 Hours	£7.80
4-5 Hours	£10.00
5-6 Hours	£12.00
6-7 Hours	£14.00
7-8 Hours	£16.00
8-9 Hours	£18.00
9+ Hours	£30.00

Coach parking

7.4.61 There is no coach parking available in the immediate vicinity of the site.

Car clubs

7.4.62 The closest car club parking space to the site is operated by Zipcar and is approximately 50m walking distance to the south of the Putney Embankment Foreshore site at the entrance of Kenilworth Court, where two car spaces are provided.

7.4.63 The next closest car club parking space is located 250m northwest of the Putney Embankment Foreshore site on Bemish Road, also operated by Zipcar where one space is provided.

Servicing and deliveries

7.4.64 There are no formal on-street loading bays on Embankment. However, customers of the Chas Newens Marine boat hire company often park in the carriageway adjacent to the workshop when visiting the premises. This is an informal arrangement as no formal customer parking is provided. This is taken account of in the assessment.

7.4.65 There is an on-street loading bay on Glendarvon Road and another 60m away on Ruvigny Gardens.

7.4.66 On-street loading is also permitted on the northern side of Lower Richmond Road (B306), to the east of its junction with Thames Place, outside the hours of 07:00 to 10:00 and 16:00 to 19:00, Monday to Saturday.

Baseline survey data

Description of data

7.4.67 Automatic Traffic Count (ATC) data for the Putney Bridge Road (A3209) east of Skelgill Road was collected from TfL and was analysed to identify the traffic flows along this road in July 2011. The flows are discussed in paras 7.4.97 to 7.4.106.

7.4.68 Five year accident data on the roads local to the Putney Embankment Foreshore site was obtained from TfL. This data is discussed in paras 7.4.127 to 7.4.128.

7.4.69 Baseline survey data was collected in May, July and August 2011 and in June 2012 to establish the existing transport movements in the area. Figure 7.4.4 in the Putney Embankment Foreshore *Transport Assessment* figures shows the survey locations in the vicinity of the site.

7.4.70 Section 3 of the Project-Wide *TA* includes a baseline report which provides full detail of the surveys undertaken and the data collected.

7.4.71 The scope of the surveys in terms of location and time periods was considered to ensure that the data required for assessment was collected. Junction turning count data was collected at junctions that TfL had advised required assessment. In some cases ATC data was collected on links to validate the junction count data and provide information for noise and air quality assessments. Pedestrian and cycle count data was collected at

locations where flows could be affected either through diversions or the generation of additional trips or where conflicts could occur with construction vehicles. Parking surveys data was collected where parking suspensions would be necessary or where additional parking demand could be generated.

7.4.72 As part of the surveys in May and July 2011, manual and automated traffic surveys were undertaken to establish specific traffic, pedestrian and cycle movements, including turning volumes, queue lengths, saturation flows, degree of saturation and traffic signal timings.

7.4.73 Traffic surveys were carried out on a weekday and a weekend to represent a weekly profile of traffic at particular locations. Where two weekly profiles are surveyed, the busiest survey was used.

7.4.74 Parking surveys were undertaken to establish the usage of pay and display parking, in addition to coach parking, loading bays and motorcycle bays. Further surveys were conducted in August 2011 to establish the summer usage of the Thames Path.

7.4.75 The surveys undertaken and their locations are summarised in Table 7.4.8.

Table 7.4.8 Survey types and locations

Survey type and location	Date
Junction turning movement survey (including pedestrian and cycle movements)	
Putney Bridge Approach (A219) / Lower Richmond Road (B306)/ Putney High St (A219)	7th and 10th May 2011
Lower Richmond Road (B306) / Embankment	7th and 10th May 2011
Lower Richmond Road (B306) / Thames Place	7th and 10th May 2011
Putney Hill / Putney Bridge Road (A3209)	7th and 10th May 2011
Lower Richmond Road (B306)/ Glendarvon Street/ Biggs Row/ Weiss Road	7th and 10th May 2011
Putney Bridge Road (A219)/ (A308)	7th and 10th May 2011
Automatic Traffic Count (ATC)	
Putney Bridge Road (A3209) east of Skelgill Road	5th to 18th July 2011
Pedestrian and cycle surveys	
Embankment at Putney Pier (W of Putney Br, S side)	1st and 3rd September 2011
Lower Richmond Rd parallel to Embankment (P4)	1st and 3rd September 2011
Parking surveys	
Festing Road	9th June 2011 and 11th June 2011
Roskell Road	

Survey type and location	Date
Rotherwood Road	
Salvin Road	
Gladwyn Road	
Bendemeer Road	
Henry Jackson Road	
Bigg's Row	
Glendarvon Street	
Weiss Road	
Ruvigny Gardens	
Bemish Road	
Ardshield Close	
Waterman Street	
Thames Place	
Kingsmere Close	
Weimar Street	
Felsham Road (from Putney High Street to Roskell Road)	
Lower Richmond Road (from Festing Road to Putney High Street)	
Embankment (from Festing Road to Lower Richmond Road)	

7.4.76 Pedestrian and cyclist flow data from the pedestrian and cyclist surveys provided the baseline pedestrian traffic data sets which are set out in Table 7.4.9 and Table 7.4.10.

7.4.77 Vehicular traffic flow data from the junction turning movement surveys provided the baseline vehicular traffic data sets which were input into the junction assessment models described in para. 7.4.111.

7.4.78 The following ATC and junction turning movement surveys are on the construction traffic routes to and from the Putney Embankment Foreshore site:

a. Putney Bridge Road (A3209) east of Skelgill Road

b. A219 Putney Hill Slip / A205 Upper Richmond Road / Putney Hill

c. Putney Bridge Approach (A219) / Putney High St (A219) / Lower Richmond Road (B306)

d. Lower Richmond Road (B306) / Embankment

e. Lower Richmond Road (B306) / Thames Place

f. Putney Hill / Putney Bridge Road (A3209).

Results of the surveys

7.4.79 The surveys inform the baseline situation in the area surrounding the Putney Embankment Foreshore site and are summarised in the following paras.

Pedestrians

7.4.80 Pedestrian surveys were undertaken at two locations around the site as indicated in Figure 7.4.4 in the Putney Embankment Foreshore *Transport Assessment* figures during the AM and PM peak hours. Table 7.4.9 indicates the flows of pedestrians along the main routes surrounding the Putney Embankment Foreshore site.

Table 7.4.9 Existing pedestrian flows

Road/route	Direction	Weekday			Weekend
		AM peak (08:00 - 09:00)	Inter-peak (12:00 - 13:00)	PM peak (17:00 - 18:00)	(13:00-14:00)
Embankment at Putney Pier (west of Putney Bridge, south side)	Westbound	82	52	92	139
	Eastbound	81	79	86	156
Lower Richmond Rd parallel to Embankment -	Westbound	56	57	126	120
	Eastbound	139	64	128	157
Putney High Street / Lower Richmond Rd junction pedestrian crossings -					
Putney Bridge (north arm)	Southeastbound	71	42	54	21
	Northwestbound	57	42	82	74
Putney High Street (south arm)	Westbound	4	17	42	13
	Eastbound	61	29	35	86
Lower Richmond Road (northwest arm)	Southwestbound	39	96	116	124
	Northeastbound	182	120	118	225
Lower Richmond Rd / Thames Place junction pedestrian crossing -					

Road/route	Direction	Weekday			Weekend
		AM peak (08:00 - 09:00)	Inter-peak (12:00 - 13:00)	PM peak (17:00 - 18:00)	(13:00-14:00)
Lower Richmond Road (west arm)	Southbound	26	12	31	54
	Northbound	47	17	37	59
Putney High Street / Putney Bridge Road junction pedestrian crossings -					
Putney Bridge Road (east arm)	Southbound	135	n/a	445	370
	Northbound	329	n/a	254	363
Putney High Street (south arm)	Westbound	108	n/a	230	292
	Eastbound	155	n/a	167	226

7.4.81 Pedestrian surveys in the vicinity of the site during the AM and PM peak hours indicate that:

7.4.82 The pedestrian flows along Embankment are balanced in both directions in the AM peak with around 80 pedestrians using this footway each way. In the PM peak hour the surveys show there to be approximately 92 pedestrians travelling westbound and approximately 86 eastbound.

7.4.83 Lower Richmond Road has approximately 56 westbound pedestrians and 139 eastbound in the AM peak hour. Greater flows of approximately 126 westbound and approximately 128 eastbound occur in the PM peak hour.

7.4.84 The pedestrian crossings at the Putney High Street / Lower Richmond Rd junction have approximately 155 pedestrians utilising the Lower Richmond Road crossing in the AM peak hour and approximately 300 in the PM hour peak.

7.4.85 The Putney Bridge approach (A219) pedestrian crossing at the Putney High Street / Lower Richmond Rd junction has approximately 125 pedestrians utilising the crossing in the AM peak hour and approximately 136 in the PM peak hour.

7.4.86 The Putney High Street (A219) approach pedestrian crossing at the Putney High Street / Lower Richmond Rd junction has approximately 46 hour pedestrians utilising the crossing in the AM peak and approximately 77 hour in the PM peak.

Cyclists

7.4.87 Cyclist surveys were undertaken at the same locations as the pedestrian surveys during the AM and PM peak hours.

7.4.88 Table 7.4.10 summarises the flows of cycles along the main routes surrounding the Putney Embankment Foreshore site.

Table 7.4.10 Existing cycle traffic

Road/route	Direction	Weekday			Weekend
		AM peak (08:00-09:00)	Inter-peak (12:00-13:00)	PM peak (17:00-18:00)	(13:00-14:00)
Embankment at Putney Pier (west of Putney Bridge, south side) -	Westbound	62	20	37	28
	Eastbound	52	17	48	19
Lower Richmond Road parallel to Embankment -	Westbound	0	0	1	1
	Eastbound	0	0	6	1
Putney High Street / Lower Richmond Rd junction on carriageway					
Putney Bridge (north arm)	Northbound	849	69	123	81
	Southbound	92	52	394	87
Putney High Street (south arm)	Southbound	101	39	281	71
	Northbound	481	57	111	39
Lower Richmond Road (northwest arm)	Northwestbound	81	30	202	64
	Southeastbound	458	29	101	90
Lower Richmond Rd / Embankment junction on carriageway -					
Embankment (one way)	Northbound	44	5	24	15
Lower Richmond Road (southeast arm)	Southeastbound	377	23	68	76
	Northwestbound	105	30	230	77
Lower Richmond Road (northwest arm)	Northwestbound	61	25	206	62

Road/route	Direction	Weekday			Weekend
		AM peak (08:00-09:00)	Inter-peak (12:00-13:00)	PM peak (17:00-18:00)	(13:00-14:00)
	Southeastbound	377	23	68	76
Lower Richmond Rd / Thames Place junction :- On Carriageway -					
Thames Place (north arm)	Northbound	5	3	2	10
	Southbound	26	3	12	6
Lower Richmond Road (southeast arm)	Southeastbound	424	20	67	77
	Northwestbound	55	25	194	58
Thames Place (south arm)	Southbound	0	0	0	1
	Northbound	1	0	0	0
Lower Richmond Road (west arm)	Westbound	52	24	192	49
	Eastbound	399	19	55	73
Putney High Street / Putney Bridge Road junction on carriageway -					
Putney High Street (north arm)	Northbound	304	n/a	61	56
	Southbound	59	n/a	198	56
Putney Bridge Road (east arm)	Eastbound	34	n/a	71	24
	Westbound	116	n/a	18	31
Putney High Street (south arm)	Southbound	25	n/a	127	32
	Northbound	188	n/a	43	25

Cyclists

7.4.89 The cycle surveys indicate that almost all cyclists prefer to cycle along Embankment (also part of the Thames Path), which is largely a traffic-free route, in preference to cycling in traffic along Lower Richmond Road (B306). Table 7.4.10 shows that during the AM peak hour there were 62 westbound and 52 eastbound trips on Embankment and 37 westbound and 48 eastbound during the PM peak hour. On Lower Richmond Road (B306) there were no trips recorded during the AM peak hour with one westbound and six eastbound trips in the PM peak hour.

7.4.90 The cyclists surveys in the vicinity of the site during the AM and PM peak hours indicate that:

7.4.91 Two-way cyclist flows along Embankment in the AM peak are approximately 114 in the AM peak and 85 in the PM peak with a fairly balanced flow in each direction

7.4.92 Lower Richmond Road has very low cycle usage in both the AM and PM peaks

7.4.93 Travelling southwest from the Putney Bridge approach (A219), there are approximately 92 cyclists in the AM peak hour and approximately 394 in the PM hour, and the results indicate that the majority of these cyclists carry straight on into Putney High Street (A219).

7.4.94 In the opposite direction; the survey shows a large number of cyclists travelling north across Putney Bridge (A219), where there are approximately 849 cyclists in the AM peak hour and approximately 123 in the PM peak hour. This indicates that this route is utilised as a cycle commute route in the AM peak hour.

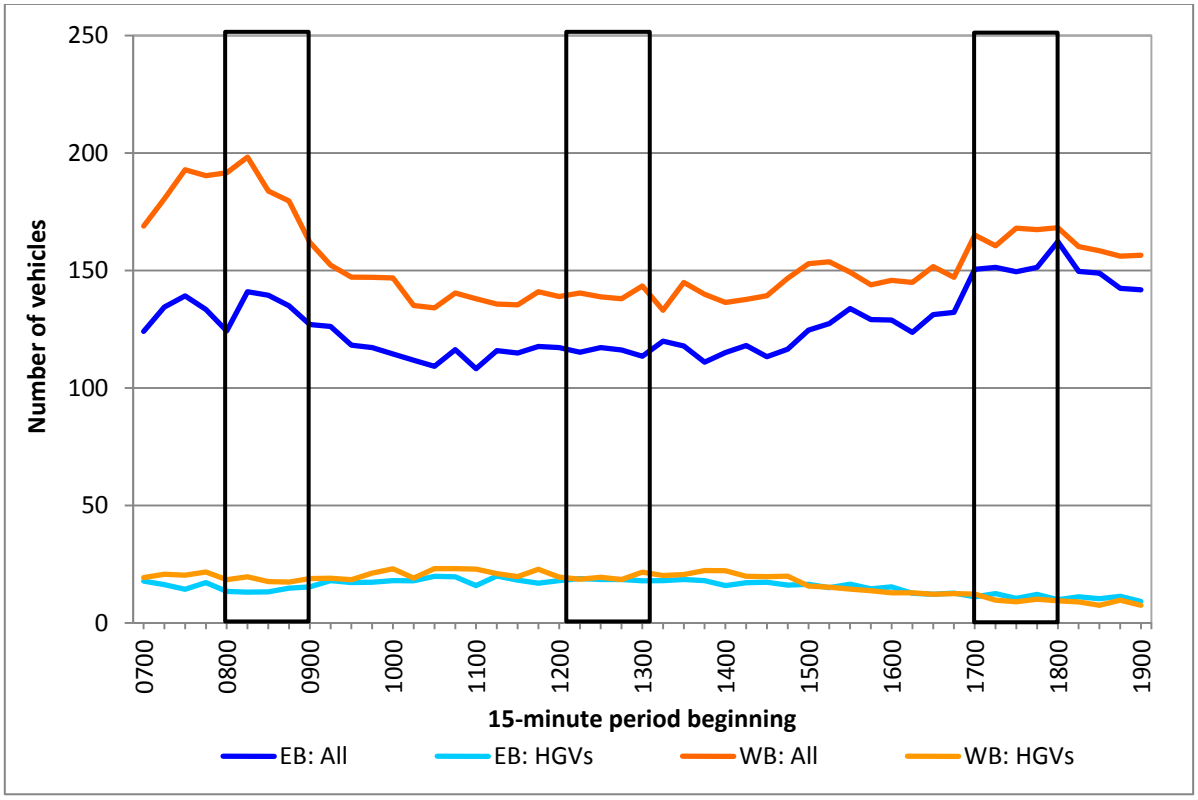
7.4.95 Cycle traffic at the Lower Richmond approach to the Putney High Street (A219)/ Lower Richmond Road junction were recorded at approximately 458 cyclists travelling towards the junction in the AM peak hour and approximately 101 in the PM peak hour. This indicates that the inbound AM flow contributes significantly towards the northeast bound cycle commuters travelling across the bridge.

7.4.96 In general terms, the Putney High Street (A219)/ Lower Richmond Road junction appears to be well used by cycle commuters in the AM peak hour; with strong cycle demands from both Lower Richmond Road and Putney High Street.

Traffic flows

7.4.97 The ATC data have been analysed to identify the existing traffic flows along Putney Bridge Road (A3209). The weekday vehicle and HGV flows for a 12-hour period (07:00-19:00) are shown in Plate 7.4.5. The Saturday and Sunday vehicle and HGV flows for a 12-hour period (07:00-19:00) are shown in Plate 7.4.5 and Plate 7.4.7.

Plate 7.4.5 Weekday ATC profile



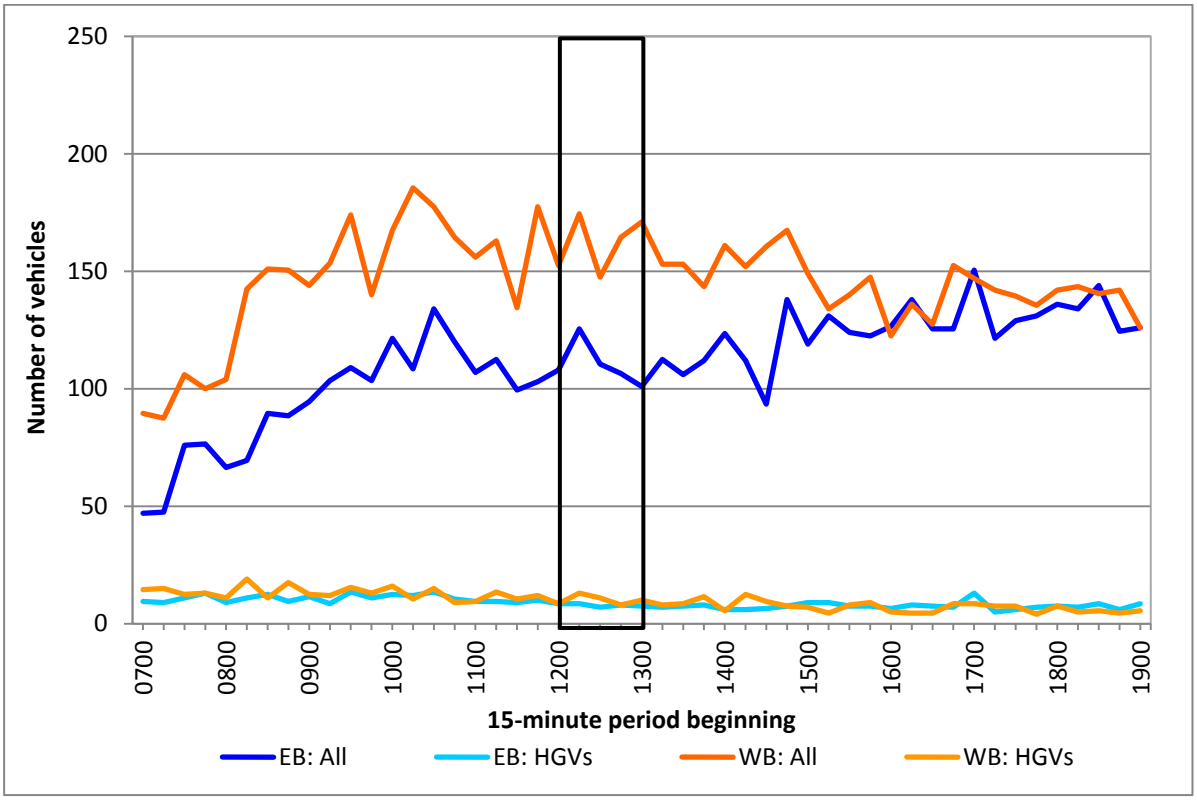
EB – Eastbound, WB – Westbound. The black box represents the peak hour traffic flows used for the traffic assessment

7.4.98 Plate 7.4.5 indicates that for Putney Bridge Road (A3209) the AM peak is the busiest hour with a maximum two way flow of 1,293 vehicles of which, there was approximately 200 westbound vehicles in the peak 15 minute period with approximately 140 vehicles travelling eastbound during the same period (753 and 540 vehicles for the peak hour respectively).

7.4.99 The PM peak has a more balanced flow with a two way flow of 1,264 vehicles of which, there was approximately 170 vehicles travelling eastbound and 160 travelling westbound in the peak 15 minute period (603 and 661 for the peak hour respectively).

7.4.100 These have been calculated as the average flows from the ATC data set.

Plate 7.4.6 Saturday ATC profile

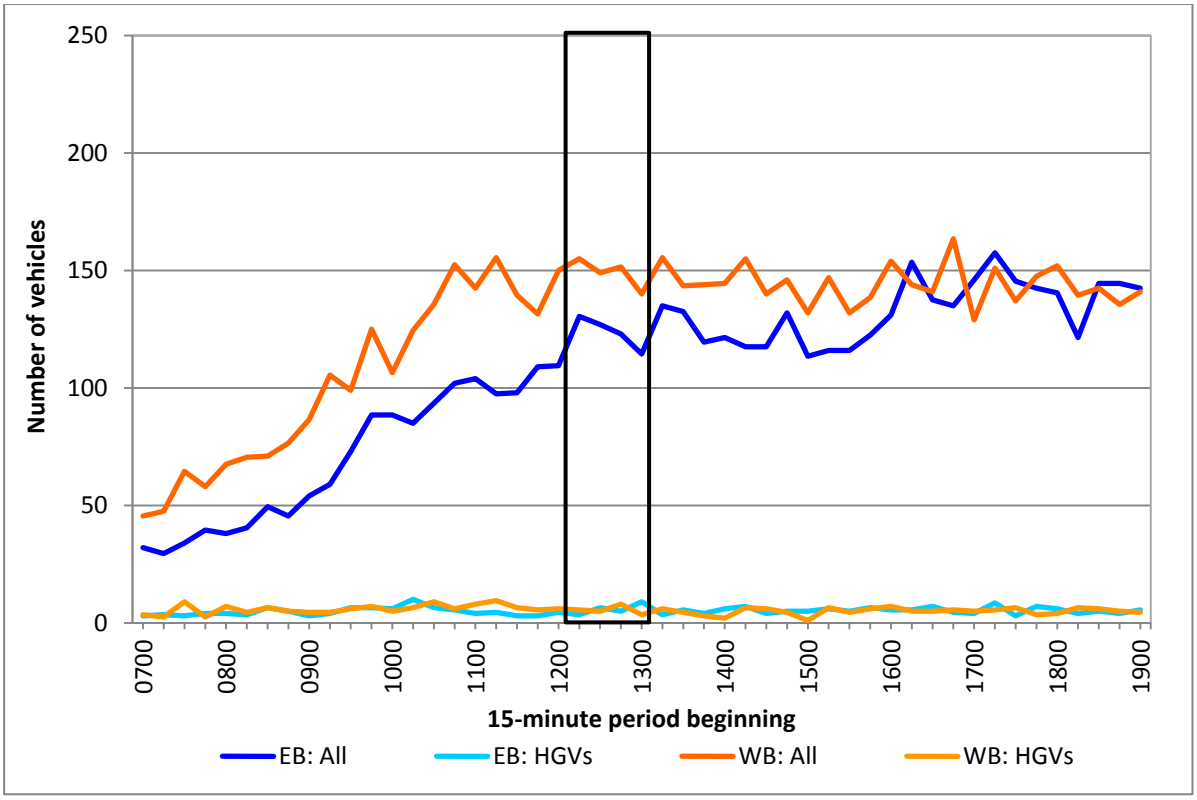


EB – Eastbound, WB – Westbound. The black box represents the peak hour traffic flows used for the traffic assessment

7.4.101 Analysis of the data showed that the Saturday peak travel period occurred between 10:00 – 11:00 with 1040 two-way vehicle movements recorded. These have been calculated as the average flows from the ATC data. This is less than the peak weekday two-way traffic flows.

7.4.102 Plate 7.4.7 indicates the Sunday peak hour.

Plate 7.4.7 Sunday ATC profile



EB – Eastbound, WB – Westbound. The black box represents the peak hour traffic flows used for the traffic assessment.

7.4.103 Analysis of the data showed that the Sunday peak travel period occurred between 16:00 – 17:00 with 1,160 two-way vehicle movements recorded. These have been calculated as the average flows from the ATC data. This is less than the peak weekday two-way traffic flows and the period falls outside of the normal weekend construction works vehicle movements period of between 08:00 – 13:00.

7.4.104 Traffic surveys indicate that there is a total traffic flow of 4,234 and 3,468 vehicles in the AM and PM peak hours respectively using the junction Putney Bridge (A219)/Putney Bridge High Street/Lower Richmond Road (B306) with a predominant traffic flow of 1,388 vehicles from Putney High Street to Putney Bridge Approach (B306) in the AM peak hour and 1,034 vehicles from Putney Bridge Approach (B306)/Putney Bridge High Street in the PM peak hour.

7.4.105 The TfL data for the junction of Putney Bridge (A219)/Putney High Street/Lower Richmond Road (B306) indicates that there is a total traffic flow of 4,251 and 3,698 vehicles using this junction in the AM and PM peak hours respectively.

7.4.106 Comparison of the junction survey against the TfL junction survey data used in the TRANSYT modelling shows that the junction survey data is slightly lower, but of a similar order of magnitude, to that indicated in the TRANSYT model for this junction obtained from TfL.

Parking

7.4.107 Surveys were undertaken to establish the availability of parking stock in the vicinity of the site to understand existing occupancy and capacity. Surveys were also undertaken to establish the availability of Pay and Display parking.

7.4.108 Table 7.4.11 indicates the parking capacity availability throughout a weekday. Plate 7.4.8 provides a histogram of the car parking in the area surrounding Putney Embankment Foreshore during the weekday AM, inter-peak and PM peaks and the weekend peak periods.

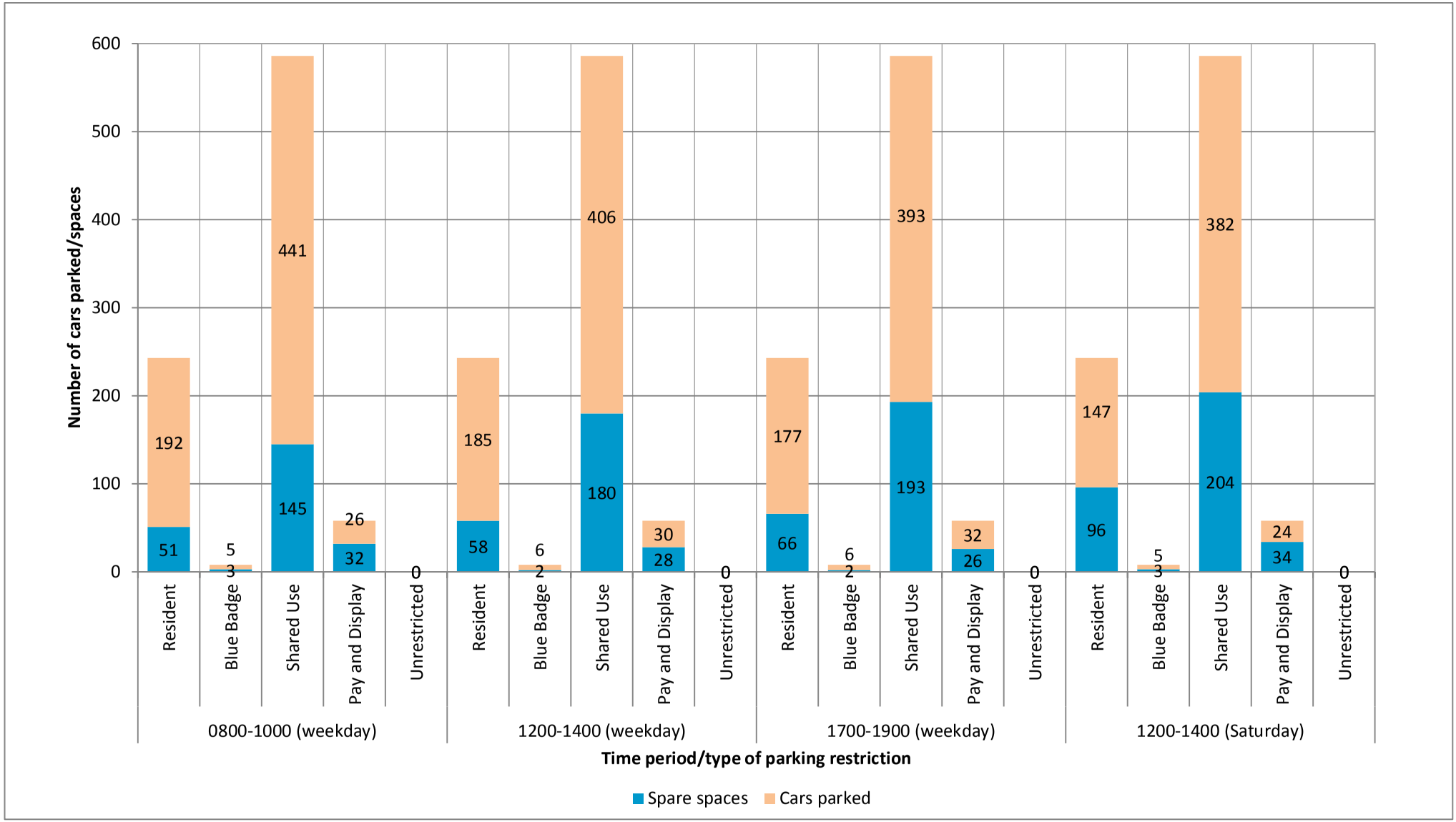
Table 7.4.11 Parking bay usage*

Location	Number and Type of Parking	No. of spaces available - weekday			No. of spaces available Saturday 12:00-14:00
		08:00-10:00	12:00-14:00	17:00-19:00	
	Resident only				
Bemish Road	**43**	4	9	10	18
Embankment	**37**	20	18	16	23
Glendarvon Street	**22**	8	11	4	1
Henry Jackson Road	**17**	3	5	4	7
Kingsmere Close	**13**	9	10	13	10
Ruvigny Gardens	**31**	3	5	5	6
Thames Place	**3**	3	3	3	3
Waterman Street	**28**	2	5	6	5
Weimar Street	**10**	4	4	5	6
Weiss Road	**39**	11	10	8	17
	Blue badge only				
Bemish Road	**2**	1	1	0	1
Bendemeer Road	**2**	1	0	0	0
Ruvigny Gardens	**1**	0	0	1	0
Salvin Road	**1**	1	1	1	0
Weiss Road	**2**	0	0	0	2
	Shared use				
Bemish Road	**1**	0	0	0	0
Bendemeer Road	**84**	18	23	23	21
Biggs Row	**2**	0	0	0	0
Embankment	**63**	34	34	35	26

Location	Number and Type of Parking	No. of spaces available - weekday			No. of spaces available Saturday 12:00-14:00
		08:00-10:00	12:00-14:00	17:00-19:00	
Felsham Road	**76**	17	19	24	39
Festing Road	**104**	23	46	45	40
Gladwyn Road	**49**	9	9	16	9
Glendarvon Street	**2**	2	1	1	1
Roskell Road	**28**	6	7	11	13
Rotherwood Road	**88**	19	18	16	31
Ruvigny Gardens	**20**	4	4	6	4
Salvin Road	**49**	9	12	13	14
Weimar Street	**13**	3	4	2	4
Weiss Road	**7**	1	3	1	2
	Pay & Display				
Felsham Road	**15**	7	9	9	9
Glendarvon Street	**2**	2	1	1	1
Lower Richmond Road	**23**	20	14	14	18
Roskell Road	**18**	3	4	2	6

**Motorcycle spaces available based on an assumed width of 1m per motorcycle*

Plate 7.4.8 Existing on-street car parking



7.4.109 The surveys showed that the greatest number, and hence demand, is for shared use bays. The use of both the shared used and resident bays is fairly evenly distributed across all time periods, with between 60%-80% occupied.

7.4.110 The results of the Pay and Display parking survey indicated that on average approximately half of the spaces are available.

Local highway modelling

7.4.111 To establish the existing capacity on the local highway network, a scope was discussed with TfL and LB Wandsworth to assess the junction of Putney High Street (A219) / Lower Richmond Road(B306)/ Putney Bridge Street (A219) using LinSig models and the Lower Richmond Road (B306 / Embankment junction using PICADY models.

7.4.112 Traffic models for the junction have been developed for this assessment and where possible suitable models from TfL have been used. The models have been constructed using on-site measurements of classified vehicle volumes and queue lengths.

7.4.113 The TfL modelling guidelines and Modelling Audit Process (MAP) have been used as the basis for preparing and checking models and their outputs. All required input data has been used in order to calibrate the model. Where TfL models have been used, saturation flows have been retained where no change is proposed to junctions; where changes are proposed, saturation flows have been calculated and compared with site observations to determine suitable values. Validation of the models has been based on observed data including signal timings, vehicle volumes and queue lengths to provide the key criteria for comparison with modelled queue lengths.

7.4.114 The models are considered suitable for this planning stage and are intended to demonstrate the nature of the effects of the additional vehicles generated by the Thames Tideway Tunnel project in this location. It is acknowledged that these models may require further refinement as the project moves from planning to detailed design stage; however as a period of time will elapse before construction commences at this site, it will be necessary in any case to review and revalidate the models against traffic conditions at that time, as is normal practice.

7.4.115 The baseline model therefore accounts for the current traffic and transport conditions within the vicinity of the site. The weekday AM and PM baseline model queues for the junction of Putney High Street (A219) and Lower Richmond Road (B306) were compared against observed queue lengths (from junction surveys) for the peak periods to validate the LinSig model and ensure reasonable representation of existing conditions.

7.4.116 Figures 7.4.5 and 7.4.6 show the observed traffic flows used for the baseline AM and PM peak hour assessments.

7.4.117 Table 7.4.12 below summarises the baseline performance of the Putney High Street (A219) / Lower Richmond Road (B306) junction.

7.4.118 Table 7.4.13 below summarises the baseline performance of the Lower Richmond Road (B306) / Embankment junction. .

Table 7.4.12 Baseline LinSig model outputs

Approach	Movement	Weekday							
		AM peak hour (08:00-09:00)				PM peak hour (17:00-18:00)			
		Flow (PCU)	DoS	MMQ (PCUs)	Delay (seconds per PCU)	Flow (PCU)	DoS	MMQ (PCUs)	Delay (seconds per PCU)
Putney Bridge Road (bridge approach) (A219)	Ahead (Bus Lane)	158	12%	2	7	197	16%	2	9
	Ahead	664	71%	13	16	672	77%	15	22
	Right	321	84%	11	63	403	86%	14	59
Lower Richmond Road (B306)	Left	706	68%	12	22	339	27%	2	10
	Right	289	86%	11	74	359	85%	13	64
Putney High Street (A219)	Ahead / left	728	85%	16	41	659	88%	13	54
	Ahead	585	80%	17	42	424	82%	14	54
		PRC		Total delay (PCU Hours)		PRC		Total delay (PCU Hours)	
Overall junction performance		5.3%		34		2.2%		35	

Notes: DoS represents Degree of Saturation; the ratio of flow to capacity. MMQ represents Mean Maximum Queue for the busiest-case 15 minute modelled period (in vehicle lengths). Delay represents the mean delay per PCU. PRC represents Practical Reserve Capacity; measure of how much additional traffic could pass through a junction whilst maintaining a maximum DoS of 90% on all lanes. PCU value for a car is one PCU. Vans and three-axle vehicles are 1.5 PCUs, vehicles with four or more axles are 2.3 PCUs. Buses and coaches are two PCUs. Motorcycles are 0.4 PCUs and pedal cycles are 0.2 PCUs

7.4.119 The weekday AM and PM baseline model queues for the Putney High Street (A219) / Lower Richmond Road (B306)/ Putney Bridge Street (A219) junction were compared against observed queue lengths for the peak periods to validate the LinSig model and ensure reasonable representation of existing conditions.

7.4.120 Figures 7.4.5 and 7.4.6 in the Putney Embankment Foreshore site *Transport Assessment* figures show the traffic flows which were used for the baseline AM and PM peak hour assessments which take into account the observed flows.

7.4.121 The PM peak hour is the busiest period and the Putney High Street (A219) ahead left movement is operating at near capacity in the baseline, with maximum queues of approximately 13 vehicle lengths.

7.4.122 The delay to vehicles is most significant during the AM peak hour on the Lower Richmond Road (B306) eastbound turning right into Putney Bridge Road (A219) movement, which currently experiences an average of 74 seconds of delay per vehicle.

7.4.123 The LinSig junction model output shows that total junction delay is 34 PCU hours in the AM peak and 35 PM peak period assessed. These equate to 35 seconds per PCU in the AM peak period and 41 seconds per PCU in the PM peak periods assessed.

7.4.124 More detailed model outputs are included in Appendix D which also supplies diagrams showing the lane structure used for the assessment of the junctions.

Table 7.4.13 Baseline PICADY model outputs

Approach	Movement	Weekday							
		AM peak hour (08:00-09:00)				PM peak hour (17:00-18:00)			
		Flow (Vehs)	RFC	Max Queue (vehs)	Delay (seconds/ Vehs)	Flow (Vehs)	RFC	Max Queue (vehs)	Delay (seconds/ Vehs)
Embankment*	Entry only	0	0	0	0	0	0	0	0
Lower Richmond Road (B306)	Ahead / right	59	16%	0.19	12	44	9%	0.1	8

Notes: RFC represents Ratio of Flow to Capacity. Queue represents number of vehicles in queue. Delay represents the mean delay per vehicle.

7.4.125 The PICADY model output for the Lower Richmond Road (B306) / Embankment indicates that the junction operates well within capacity in the baseline case.

7.4.126 Model outputs are included in the Putney Embankment Foreshore *Transport Assessment* figures which indicate the lane structure used for the assessment of the junction.

Accident analysis

7.4.127 Data has been obtained for a 5 year period, up until the 31st March 2011. Figure 7.4.7 in the Putney Embankment Foreshore *Transport Assessment figures* indicates the accidents that have occurred within the vicinity of the site. The following roads and junctions have been analysed

a. Putney High Street/ Putney Bridge Approach Junction

b. Lower Richmond Road/ Embankment Junction

c. Lower Richmond Road/ Putney Bridge Approach Junction.

7.4.128 Table 7.4.14 indicates the accidents that have occurred within the vicinity of the site. Appendix D provides a full analysis of accidents within the local area surrounding Putney Embankment Foreshore.

Table 7.4.14 Accident severity

Location	Slight	Serious	Fatal	Total
Putney High Street	3	1	0	4
Putney High Street/ Putney Bridge Approach Junction	5	2	0	7
Putney High Street/ Putney Bridge Road Junction	1	0	0	1
Putney High Street/ Weimar Street Junction	1	1	0	2
Putney High Street/ Lower Richmond Junction	1	0	0	1
Lower Richmond Road	1	1	0	2
Lower Richmond Road/ Bemish Road Junction	1	0	0	1
Lower Richmond Road/ Biggs Row Junction	2	0	0	2
Lower Richmond Road/ Embankment Junction	4	2	0	6
Lower Richmond Road/ Ruvigny Gardens Junction	1	0	0	1
Lower Richmond Road/ Putney Bridge Approach Junction	10	0	0	10
Lower Richmond Road/ Putney	2	1	0	3

Location	Slight	Serious	Fatal	Total
Bridge Road Junction				
Lower Richmond Road/ Waterman Street Jn.	1	0	0	1
Lower Richmond Road/ Weiss Road Junction	1	0	0	1
Embankment/ Glendarvon Street Junction	1	1	0	2
Total	**35**	**9**	**0**	**44**

7.4.129 A total of nine serious accidents and 35 slight accidents occurred in the Putney Embankment Foreshore assessment area over the five years of accident data analysed. There were no fatal accidents.

7.4.130 The largest number of road traffic accidents (ten) occurred at the junction of Putney Bridge Approach (A219) with Lower Richmond Road (B306). All of these were classified as slight accidents. This is the only significant cluster of accidents within the area.

7.4.131 The largest number of serious accidents (two) occurred at the junction of Lower Richmond Road (B306) with Embankment. These involved a car and a motorcyclist and a car and a cyclist.

7.4.132 Of the total accidents, five involved HGVs and none included MGVs or LGVs. A total of 11 accidents involved pedestrians and seventeen involved pedal cycles.

7.4.133 As shown in Figure 7.4.8 in the Putney Embankment Foreshore *Transport Assessment* figures there were 21 accidents involving pedestrians and cyclists. 20 occurred on the roads to be taken by construction vehicles within the study area, of which, two pedestrian and two cyclist accidents were classed as serious (with six and 11 slight accidents respectively). Inspection of the data showed that eight of these occurred at junctions with signalised control facilities, with the remaining accidents occurring at locations without signal control.

7.4.134 In the context of the temporary HGV movements associated with the Putney Embankment Foreshore site, the accident risk to these modes of travel will be managed by providing pedestrian and cyclist awareness training for commercial drivers associated with the construction works as set out in the Construction Management Plan. For sections of road affected by roadworks, the risk to all road-users will be managed by the contractor(s) in accordance with the provisions made under the Traffic Signs Manual Chapter 8 - Traffic Safety Measures and Signs for Road Works[5].

7.5 Construction assessment

7.5.1 The *TA*, including both qualitative and quantitative analysis, has been undertaken following in discussions with TfL and the Local Highway Authorities, drawing on their knowledge of the transport network and operational characteristics in the vicinity of each site. The assessments also detail the anticipated construction programme, duration and levels of construction activity.

7.5.2 The construction assessment compares a construction base case, which represents transport conditions in the assessment year without the Thames Tideway Tunnel project, with a construction development case, which represents conditions with the Thames Tideway Tunnel under construction. The construction base case does not include any traffic related to the Thames Tideway Tunnel, whether from the Putney Embankment Foreshore site or from other sites.

Construction base case

7.5.3 As described in Section 7.3, the construction assessment year for transport effects in relation to this site is Site Year 2 of construction for construction vehicle movements, and Site Year 3 for construction barge movements.

Pedestrians and cyclists

7.5.4 There are no proposals to change the cycle or pedestrian network by Site Year 2 of construction and the network will operate as indicated in the baseline situation.

Public transport

7.5.5 In terms of the public transport network it is expected that as a result of the TfL London Underground Upgrade Plan, there would be a 24% increase in capacity on the District Line, which serves Putney Bridge station. It is envisaged that London Underground and National Rail patronage will also increase by Site Year 2 of construction.

7.5.6 All other planned line upgrades included in the TfL London Underground Upgrade Plan, such as capacity improvements on Jubilee, Victoria, Northern, Hammersmith and the City, Circle, Metropolitan and District lines, are also planned to be in place by the construction base case.

7.5.7 Due to traffic growth in the construction base case compared to the baseline situation, bus journey times along Lower Richmond Road (B306) and Putney Bridge Approach/Putney High Street (A219) as well as within the wider area will be affected. The effect on journey times is detailed under the highway operation and network assessment and will result in additional road network delay of a maximum of approximately eight and ten seconds respectively.

7.5.8 It is anticipated that patronage on public transport services may change between the baseline situation and Year 2 of construction. Future patronage changes on bus and rail networks will be driven by a range of complex factors and there are inherent uncertainties in setting a patronage

level for a future year. There are further capacity improvements anticipated on the Bakerloo, Piccadilly and Central lines, however, the best way of delivering these improvements, within the timescales, are currently being investigated by TfL. The extent of TfL upgrade works which will have been delivered by the commencement of the Thames Tideway Tunnel construction stage has not been determined.

7.5.9 Therefore, in order to ensure a robust assessment, the capacity for National Rail and Underground in the base case has been assumed to remain the same as capacity in the baseline situation.

River navigation

7.5.10 The underlying pattern of river use has not substantially changed in recent years, but the Mayor of London and TfL actively promote the use of passenger services and encourage the provision of more piers. Greater freight use is also encouraged through policies in the London Plan. Consequently it is possible that the nature and number of vessel movements on the River Thames might change over time.

7.5.11 However, it is difficult to determine what the scale and nature of any change might be and at the time of writing there were no specific proposals to alter river navigation patterns from the current baseline conditions in the vicinity of the Putney Embankment Foreshore site. For this assessment, therefore, the construction base case has been assumed to be the same as the baseline position.

7.5.12 It is noted that a separate navigational risk assessment has been undertaken for the temporary construction works and barges to be used at the Putney Embankment Foreshore site. This is reported separately outside of the *TA*.

Highway network and operation

7.5.13 Baseline traffic flows (from the junction surveys) have been used and forecasting carried out to understand the capacity on the highway network in the vicinity of the Putney Embankment Foreshore site in Site Year 2 of construction without the Thames Tideway Tunnel project. The scope of this analysis has been discussed with LB of Wandsworth and TfL. The construction base case traffic flows at the junction of Putney Bridge Approach (A219) with Lower Richmond Road (B306) are shown on in the Putney Embankment Foreshore *Transport Assessment* figures

7.5.14 Strategic highway network modelling has been undertaken at a project-wide level using the TfL HAMs, which include forecasts of employment and population growth in line with the London Plan. Growth factors have been derived at individual Borough level by comparing the 2008/9 base and 2021 forecast years in the HAMs, as described in the *Strategic Modelling Methodology Note* in the *Project-wide TA*.

7.5.15 For the Putney Embankment Foreshore site, the TfL WeLHAM has been used. The model provides factors for the increase in vehicle-kilometres in the borough between the construction base year and 2021. The relevant growth factor for the site was applied to the traffic surveys collected in 2011 to produce 2012 flows.

7.5.16 It should be noted that these represent growth over the period to 2021, which is beyond Year 4 of construction at Putney Embankment Foreshore and therefore ensures that the construction base case for the highway network is robust.

Committed developments

7.5.17 All the other developments located within 1km of the Putney Embankment Foreshore site would be completed and operational by Year 2-3 of construction.

Local highway modelling

7.5.18 The growth factors for the LB of Wandsworth, based on the WeLHAM, have been discussed with TfL and the LB of Wandsworth and applied to all the baseline traffic flows. The growth factors are:

a. Weekday AM Peak: +4.7%

b. Weekday PM Peak: +5.0%

7.5.19 The resulting construction base case LinSig model for the Putney High Street (A219) / Lower Richmond Road/ Putney Bridge Street (A219) junction indicates that there will be an increase in queue lengths and changes to average delays at the junction in the construction base case, compared to baseline conditions. The construction development case includes the optimisation of traffic signal timings in order to minimise journey time increases within the local area.

7.5.20 Para. 7.3.7 to 7.3.13 explains the definition of the assessment area for local highway network modelling.

7.5.21 Table 7.5.1 summarises the construction base case performance of the Putney High Street (A219) / Lower Richmond Road/ Putney Bridge Street (A219) junction.

7.5.22 Table 7.5.2 summarises the construction base case performance of the Lower Richmond Road / Embankment junction.

Table 7.5.1 Construction base case LinSig model outputs

Approach	Movement	Weekday							
		AM peak hour (08:00-09:00)				PM peak hour (17:00-18:00)			
		Flow (PCU)	DoS	MMQ (PCUs)	Delay (seconds per PCU)	Flow (PCU)	DoS	MMQ (PCUs)	Delay (seconds per PCU)
Putney Bridge Approach	Ahead (Bus Lane)	158	12%	2	8	197	17%	3	12
	Ahead	702	78%	16	21	716	90%	22	40
	Right	336	88%	12	71	424	91%	16	69
Lower Richmond Road	Left	739	72%	13	23	356	29%	2	10
	Right	303	90%	12	84	377	89%	14	72
Putney High Street	Ahead Left	758	88%	18	45	687	91%	16	60
	Ahead	617	84%	19	45	450	87%	15	60
		Practical Reserve Capacity (PRC)		Total Delay (PCU Hours)		Practical Reserve Capacity (PRC)		Total Delay (PCU Hours)	
Overall junction performance		0.4%		40		-1.6%		44	

Notes: DoS represents Degree of Saturation; the ratio of flow to capacity. MMQ represents Mean Maximum Queue for the busiest-case 15 minute modelled period (in vehicle lengths). Delay represents the mean delay per PCU. PRC represents Practical Reserve Capacity; measure of how much additional traffic could pass through a junction whilst maintaining a maximum DoS of 90% on all lanes. PCU value for a car is one PCU. Vans and three-axle vehicles are 1.5 PCUs, vehicles with four or more axles are 2.3 PCUs. Buses and coaches are two PCUs. Motorcycles are 0.4 PCUs and pedal cycles are 0.2 PCUs

7.5.23 The resulting construction base case LinSig model for the Putney High Street (A219) / Lower Richmond Road/ Putney Bridge Street (A219) junction will be operating borderline at capacity in the AM and PM peaks when taking into account the construction base case traffic flows and signal optimisation. The main capacity issues occur on the Putney Bridge right turn approach to Lower Richmond Road and the Putney High Street ahead and left turn approach to Lower Richmond Road.

7.5.24 The maximum delay per vehicle is 84 seconds in the AM peak and 72 seconds in the PM peak an increase of 10 seconds and eight seconds respectively. The delay to vehicles is most significant during the AM peak hour for vehicles turning right from Lower Richmond Road (B306) southbound into Putney Bridge Road (A219) southbound.

7.5.25 The LinSig junction model output shows that total junction delay is 40 PCU hours in the AM peak and 44 PM peak period assessed. These equate to 40 seconds per PCU in the AM peak period and 49 seconds per PCU in the PM peak periods assessed, an increase of two and 20 seconds respectively.

Table 7.5.2 Construction base case PICADY model outputs

Approach	Movement	Weekday							
		AM peak hour (08:00-09:00)				PM peak hour (17:00-18:00)			
		Flow	RFC	MMQ (PCU)	Delay (seconds)	Flow	RFC	MMQ (PCU)	Delay (seconds)
Embankment*	Entry only	0	0	0	0	0	0	0	0
Lower Richmond Road	Ahead Right	62	17%	0.21	12	46	11%	0.11	8

Notes: RFC represents Ratio of Flow to Capacity. Queue represents number of vehicles in queue. Delay represents the mean delay per vehicle.
**Existing traffic enforcement is in place for one way entrance only onto Embankment through this junction.*

7.5.26 The resulting construction base case PICADY model for the Lower Richmond Road (B306) / Embankment junction indicates that the junction performs within capacity for both peaks.

Construction development case

7.5.27 This section summarises the findings of the assessment undertaken for the peak year of construction at the Putney Embankment Foreshore site (Site Year 2 of construction for road traffic and Site Year 3 of construction for river traffic).

Pedestrian routes

7.5.28 The construction phase layout – phase 1, phase 2, phase 3, phase 4 and temporary slipway plans provided in the Putney Embankment Foreshore *Transport Assessment* figures show the effect on the pedestrian footways during construction.

7.5.29 The Thames Path runs along the riverside footway of Embankment past both the main site and the Putney Embankment Temporary Slipway site. During the construction of the temporary slipway pedestrians would be diverted from the northern footway of Embankment onto a protected diversion route within the carriageway across the access to the Putney Embankment Temporary Slipway site. This would add approximately 4m to the length of the pedestrian route. Pedestrians would have to cross the Putney Embankment Temporary Slipway site access. Traffic marshals would be posted on the site entrance to minimise conflicts between HGVs and pedestrians.

7.5.30 The Embankment / Lower Richmond Road (B306) junction would be widened to facilitate HGV access to the site. This would involve removing a traffic island, to provide a wider carriageway to allow large vehicles to enter and exit Embankment without encroaching onto pavements.

7.5.31 To assess a busiest case scenario it has been anticipated that all worker trips would finish their journeys by foot. As a result the 50 worker trips generated by the site have been added to the construction base case pedestrian flows during the AM and PM peak hours. When these additional worker trips are added to the base case pedestrian flow no footway capacity issues are expected.

7.5.32 The assessment assumes that all construction workers would travel in the peak hours, the increase in pedestrian numbers against baseline usage during the peak hours due to construction workers walking is considered to be a conservative estimate because, due to the site working start and finish times, many workers will be travelling outside of peak network hours.

7.5.33 The diversion of the footway past the Putney Embankment Temporary Slipway site along an adjacent protected route would not noticeably increase journey times and therefore the impact of that diversion on pedestrian delay and amenity would be negligible.

7.5.34 Pedestrians would have to cross the Putney Embankment Temporary Slipway site access as part of the diversion, although pedestrian flows would be low and construction vehicle flows would be less than four HGV movements an hour.

7.5.35 In the surrounding area however, the impact on pedestrian amenity on other pedestrian routes would be negligible. The impact on accidents and safety would be very low given that construction vehicle flows would be approximately four HGV movements an hour.

7.5.36 During all construction work and on any section of road subject to temporary diversions or restrictions imposed by roadworks associated with the Putney Embankment Foreshore site, the risk to all road-users would be managed by the contractor(s) in accordance with the provisions made under the Traffic Signs Manual Chapter 8 - Traffic Safety Measures and Signs for Road Works. This will include compliance with the Equality Act 2010[6] to ensure safe passage for mobility and vision impaired pedestrians

Cycle routes

7.5.37 There are ten Sheffield cycle stands in place at the eastern end of Embankment within the footpath. These would be relocated approximately 20m to the west along Embankment in order that they do not conflict with the main site access.

7.5.38 During construction of the temporary slipway cyclists would be diverted from the off-road cycle lane on the northern side of Embankment (NCN Route 4 / Thames Path) onto the carriageway past the Putney Embankment Temporary Slipway site access before re-joining the off-road cycle lane.

7.5.39 This represents a negligible impact in relation to cycle delay.

7.5.40 More generally, cyclists using the highway could experience an additional delay to journey time as a result of the construction works at the Putney Embankment Foreshore site. The effect on journey times is identified in the highway operation and network assessments (para. 7.5.76) and would be an increase of a maximum of some five seconds over that in the construction base case. This represents a negligible impact in relation to cycle delay.

7.5.41 Construction vehicles serving the site will comprise a range of sizes and types, including light vans, rigid bodied vehicles and longer articulated vehicles. At this site the majority of the vehicles are expected to be medium or heavy rigid bodied goods vehicles.

7.5.42 During the construction period, the operation of Embankment between the new site access and the junction with Lower Richmond Road will change to two-way for construction vehicles. A minimum carriageway width of 3.25m will be retained for traffic in each direction. Measures set out in the *CoCP* described in para. 7.2.59 include Traffic marshals, a *Traffic management Plan* to address vehicle conflicts, signage and construction vehicles drivers being instructed upon narrow road widths.

7.5.43 During all construction work and on any section of road subject to temporary diversions or restrictions imposed by roadworks associated with the Putney Embankment Foreshore site, the risk to all road-users would be managed by the contractor(s) in accordance with the provisions made under the Traffic Signs Manual Chapter 8 - Traffic Safety Measures and

Signs for Road Works. This would include compliance with TfL guidance (Cyclists at Roadworks - Guidance[7]) to ensure safe passage for cyclists.

7.5.44 During the construction period, a minimum carriageway width of either 4m (where HGVs can safely overtake cyclists) or 3.25m (where HGVs cannot overtake cyclists) would be retained for traffic in each direction. Where necessary, carriageway widths of less than 3.25m would be agreed with the LB of Wandsworth prior to execution of any works.

Bus routes and patronage

7.5.45 No bus services route immediately past the site on Embankment. However, bus stops P and Q served by routes 22, 265, 485 and N22 are approximately 25m south of the site on Lower Richmond Road (B306).

7.5.46 Additional construction vehicles serving the site may affect some bus journey times along Lower Richmond Road (B306) as well as within the wider area. The effect on journey times is detailed under the highway operation and network assessment in para. 7.5.76 and would be an increase of a maximum of approximately five seconds. This represents a negligible impact.

7.5.47 It is expected that approximately 11 additional two-way worker trips would be made by bus during the AM and PM peak hours, which would result in less than one worker trip per bus (based on a service of 221 buses and 184 buses within a 640m walking distance during the AM and PM peak hours respectively).

7.5.48 The additional worker journeys do not represent a significant increase and therefore would not have a significant impact on bus patronage.

London Underground patronage

7.5.49 No Underground rail stations are directly adjacent to the site and therefore none would be directly affected by construction works at the site. It is anticipated that approximately 25 construction workers and labourers would use London Underground or National Rail services to access the site, which would result in 11 additional person trips on Underground services in both the AM and PM peak hours.

7.5.50 This equates to less than one person per train during the AM and PM peak hours based on a frequency of 30 trains per hour during the peaks.

7.5.51 The additional worker journeys do not represent a significant increase and therefore would not have a significant impact on London Underground services patronage.

National Rail and patronage

7.5.52 No National Rail stations are directly adjacent to the site and therefore none would be directly affected by construction works at the site. It is anticipated that approximately 25 construction workers and labourers would use London Underground or National Rail services to access the site, which would result in 14 additional person trips on National Rail services in both the AM and PM peak hours.

7.5.53 On National Rail services there would be less than one additional passenger per train based on the AM peak hour service of 16 arrivals and PM peak hour service of 16 departures.

7.5.54 The additional worker journeys do not represent a significant increase and therefore would not have a significant impact on National Rail services patronage.

River passenger services and patronage

7.5.55 During construction, river passenger services would not be directly affected. Services from Putney Pier would continue to operate as scheduled. It is anticipated that 1% of construction workers and labourers would use the river services to access the construction site, which would result in less than one construction worker per boat service.

River navigation and access

7.5.56 During construction it is anticipated that 90% of cofferdam fill (import and export) and 90% of shaft and other excavated material would be transported by barge. The peak number of barge movements would occur within Site Year 3 of construction with a daily average of four barge movements (ie, two barges) a day.

7.5.57 It is anticipated that 350T barges would be hauled by tugs which typically haul two barges at a time where possible. This means that there would be one tug movement in each direction (two in total) per day at this site.

7.5.58 Public access to the river would be maintained throughout the construction phase through the provision of the temporary slipway and reinstatement of the permanent slipway after construction. These works would not impact upon river services or traffic during the construction phases. However, with the relocation of the slipway being less than 200m from the original slipway this would mean a low adverse impact on public access to the river.

7.5.59 Due to the low number of barges arriving at the site, it is anticipated that impact on river navigation in the vicinity of the site as a result of the barges arriving at Putney Embankment Foreshore would be negligible.

7.5.60 It is noted that a separate navigational risk assessment has been undertaken for the construction works and barges to be used at the Putney Embankment Foreshore site. This is reported separately outside of the *TA*.

Parking

7.5.61 Parking for five essential maintenance vehicles would be provided on site. However, there would be no on-site parking for workers and Travel Plan measures would discourage workers from travelling by car to and from the site. Additionally, parking on the surrounding streets is restricted. Therefore there would be no impact on on-street parking or private parking in the vicinity of the site from construction worker parking during the construction phase.

7.5.62 While there would be no construction worker parking, it would however be necessary to suspend some parking bays during the construction works at

the Putney Embankment Foreshore site as shown in highway layout during construction plans provided in the Putney Embankment Foreshore *Transport Assessment* figures. .

7.5.63 During the construction of the temporary slipway it would be necessary to suspend 38m of parking on Embankment to the northwest of the Putney Embankment Temporary Slipway site and 130m of parking to the southeast of the site. This equates to approximately 34 parking spaces. It would also be necessary to suspend 28m of parking at the southern end of Glendarvon Street representing a further six spaces. The suspensions would be necessary to create a protected pedestrian diversion route past the Putney Embankment Temporary Slipway site and to allow HGV routing along Glendarvon Street by facilitating the turning movements of construction vehicles.

7.5.64 This car parking would not be re-provided elsewhere in the vicinity as there is no available kerbside space. Parking surveys show that while there is spare capacity in some parking bays, it is largely found in the bays to be suspended. Therefore the remaining capacity in the area would not be sufficient to accommodate displaced parking demand.

7.5.65 On this basis the impact on parking on Embankment during construction of the temporary slipway would be significant.

7.5.66 There will be periods during construction, i.e. during construction and removal of the cofferdam, when construction vehicles will not be able to turn on site and will therefore need to reverse into the site. To enable this 18m of parking on the northern side of Embankment and 13m of parking on the southern side of Embankment would be removed, equating to a loss of five spaces. This would not be re-provided elsewhere. However, the parking suspended for the construction of the temporary slipway would be reinstated during construction at the main site, thus much of the baseline spare capacity would be available.

7.5.67 There would therefore be spare capacity in other parking bays on this stretch of road and in adjacent streets to accommodate this loss of parking provision and consequently the magnitude of the impact on parking on Embankment has been assessed as low during construction at the main site.

Highway assessment

Highway layout

7.5.68 The highway layout during construction plans provided in the Putney Embankment Foreshore *Transport Assessment* figures shows the highway layout during construction at the Putney Embankment Foreshore and Putney Embankment Temporary Slipway construction works. Both sites are on the northern side of Embankment, from which they would be accessed.

7.5.69 The highway layout during construction vehicle swept path plans in the Putney Embankment Foreshore *Transport Assessment* figures show the swept path movements and show that construction vehicles are able to safely access the Putney Embankment Temporary Slipway site

loading/unloading bay. The swept path movements are also provided and show that the construction vehicles would be able to safely enter and leave the main site.

7.5.70 During construction of the temporary slipway the carriageway width of the westbound lane of Embankment would be reduced by approximately 2m for approximately 80m (adjacent to the boat repair premises and the rear gardens of properties on Ruvigny Gardens) to facilitate the protected pedestrian diversion route (of the footway and Thames Path) across the site access. This would reduce the overall carriageway width to 4.5m, which would not be sufficient for two-way traffic movements.

7.5.71 A signed traffic management system would therefore be implemented on Embankment between Thames Place and the site entrance during construction of the temporary slipway. This would also reduce the amount of on-street parking that would need to be suspended.

7.5.72 The loading/unloading area at the secondary site would be located upon the carriageway. Vehicles accessing the unloading area would access it from the west and then depart in an easterly direction. The loading area would either be fenced with gates or comprise a barriered area to enable safe unloading. Traffic marshals would ensure HGV access is managed without conflict.

7.5.73 At the main site, access would be via a new access located approximately 10m northeast of the junction between Embankment and Lower Richmond Road (B306).

7.5.74 The junction of Embankment and Lower Richmond Road (B306) would require modification to accommodate construction vehicle movements and the new site access. This would require the removal of a traffic island. Footway widths would remain unchanged.

7.5.75 A short length of the existing one-way operation on the Embankment carriageway would be temporarily converted to two way operation during the construction period. This would enable construction vehicles to leave the site directly via the Embankment / Lower Richmond Road (B306) junction and avoid the need for construction vehicles to travel westbound along Embankment.

Highway network

7.5.76 Table 7.2.4 in Section 2 shows the vehicle movement assumptions for the local peak traffic periods based on the peak months of construction activity at this site.

7.5.77 Table 7.2.4 shows that an average peak flow of 76 vehicle movements a day is expected during the months of greatest activity during Site Year 2 of construction at this site.

7.5.78 The busiest peak in the AM and PM period for each type of movement (construction lorries, other construction vehicles and worker vehicles) has been combined in the development case and assessed against the peak hour operation of the highway network. In reality not all peaks for these movements will occur concurrently and the peak for worker trips will be

outside of the highway network peak hour, therefore the assessment is considered to be robust.

7.5.79 The *Project-wide TA* explains the method used to assign construction traffic to the HAMs, from which the likely changes in turning movements at local junctions have been identified and added to the construction base case flows.

7.5.80 The assignment of construction lorry trips has been undertaken using OmniTrans[iii] software, which enables a fixed assignment to be created for these trips in order to ensure that they are assigned only to the proposed construction routes. The OmniTrans outputs also identify lorry traffic which would be associated with the Putney Embankment Foreshore site, or with other Thames Tideway Tunnel project sites, that would use routes in the vicinity of the Putney Embankment Foreshore site.

7.5.81 Figure 7.5.1 in the Putney Embankment Foreshore *Transport Assessment* figures shows the OmniTrans plot for the local road network around the Putney Embankment Foreshore site. Changes to the highway network during construction and the additional construction traffic generated by the project may lead to local changes in traffic flow and capacity. Local modelling has been undertaken to assess the effect on the highway operation resulting from these changes.

7.5.82 The local LinSig (for the Putney High Street (A219) / Lower Richmond Road/ Putney Bridge Street (A219) junction) and PICADY (for the Lower Richmond Road / Embankment junction) models have been used to apply the construction traffic demands and local geometrical changes to the construction base case to determine the changes in the highway network operation due to the project (i.e. comparison of base and development cases).

7.5.83 The construction base and development case models include the optimisation of traffic signal timings in order to maximise capacity and minimise overall delay at the Putney High Street (A219) / Lower Richmond Road / Putney Bridge Street (A219) junction.

7.5.84 Summaries of the construction assessment models for both junctions are presented in Table 7.5.3 to Table 7.5.6.

[iii] OmniTrans is a software package used for multi-modal transport network modelling and in this case has been used to produce assignments of construction traffic across the proposed network of routes to be used for the project.

Table 7.5.3 Construction development case LinSig model outputs (AM peak hour)

Approach	Arm	Flow (PCU)	Weekday								
			AM peak hour (08:00-09:00)								
			DoS			MMQ (PCUs)			Delay (seconds per PCU)		
			Base case	Devt case	Change	Base case	Devt case	Change	Base case	Devt case	Change
Putney Bridge Road (bridge approach) (A219)	Ahead (Bus Lane)	158	12%	12%	0%	2	2	0	8	8	0
	Ahead	702	75%	80%	+5%	14	16	+2	21	23	+2
	Right	337	88%	88%	0%	12	13	+1	71	71	0
Lower Richmond Road (A306)	Left	739	72%	71%	-1%	13	13	0	23	22	-1
	Right	309	90%	87%	-3%	12	12	0	84	75	-9
Putney High Street (A219)	Ahead / left	762	88%	90%	+2%	18	19	+1	45	48	+3
	Ahead	619	84%	87%	+3%	19	20	+1	45	49	+4
			Practical Reserve Capacity (PRC)						Total delay (PCU Hours)		
Overall junction performance			0.40%	-0.10%	-0.50%				39	41	+2

Notes: DoS represents Degree of Saturation; the ratio of flow to capacity. MMQ represents Mean Maximum Queue for the busiest-case 15 minute modelled period (in vehicle lengths). Delay represents the mean delay per PCU. PRC represents Practical Reserve Capacity; measure of how much additional traffic could pass through a junction whilst maintaining a maximum DoS of 90% on all lanes. PCU value for a car is one PCU. Vans and three-axle vehicles are 1.5 PCUs, vehicles with four or more axles are 2.3 PCUs. Buses and coaches are two PCUs. Motorcycles are 0.4 PCUs and pedal cycles are 0.2 PCUs. Thames Tideway Tunnel construction vehicles would be a mixture of three- and four-axle vehicles and have therefore been given a PCU value of two. Assessment has assumed that traffic signal optimisation has been undertaken as detailed in Section 2.

Table 7.5.4 Construction development case LinSig model outputs (PM peak hour)

Approach	Arm	Flow (PCU)	Weekday								
			PM peak hour (17:00-18:00)								
			DoS			MMQ (PCUs)			Delay (seconds per PCU)		
			Base case	Devt case	Change	Base case	Devt case	Change	Base case	Devt case	Change
Putney Bridge Road (bridge approach) (A219)	Ahead (Bus Lane)	197	17%	17%	0%	3	3	0	12	12	0
	Ahead	716	90%	90%	0%	22	22	0	40	40	0
	Right	424	91%	91%	0%	16	16	0	69	69	0
Lower Richmond Road (B206)	Left	356	29%	29%	0%	2	2	0	10	10	0
	Right	384	89%	91%	+2%	14	15	+1	72	77	+5
Putney High Street (A219)	Ahead / left	694	91%	92%	+1%	16	16	0	60	60	0
	Ahead	449	87%	87%	0%	15	15	0	60	60	0
			Practical Reserve Capacity (PRC)						Total delay (PCU Hours)		
Overall junction performance			-1.60%	-2.00%	-0.4%				41	45	+4

Notes: DoS represents Degree of Saturation; the ratio of flow to capacity. MMQ represents Mean Maximum Queue for the busiest-case 15 minute modelled period (in vehicle lengths). Delay represents the mean delay per PCU. PRC represents Practical Reserve Capacity; measure of how much additional traffic could pass through a junction whilst maintaining a maximum DoS of 90% on all lanes. PCU value for a car is one PCU. Vans and three-axle vehicles are 1.5 PCUs, vehicles with four or more axles are 2.3 PCUs. Buses and coaches are two PCUs. Motorcycles are 0.4 PCUs and pedal cycles are 0.2 PCUs. Thames Tideway Tunnel construction vehicles would be a mixture of three- and four-axle vehicles and have therefore been given a PCU value of two. Assessment has assumed that traffic signal optimisation has been undertaken as detailed in Section 2.

7.5.85 The construction development case model for the Putney High Street (A219) / Lower Richmond Road/ Putney Bridge Street (A219) junction indicates that the junction will be operating at borderline capacity in the AM and PM peaks without the Thames Tideway Tunnel proposals.

7.5.86 With inclusion of the construction traffic generated the construction development case indicates that the local highway will remain to operate at borderline capacity in the AM and PM peaks.

7.5.87 The increase in queue length is around 1 vehicle length and the increase in delay is between one to four seconds. The additional impact is considered to be negligible.

Table 7.5.5 Construction development case PICADY model outputs (AM peak hour)

Approach	Arm	Flow (vehs)	Weekday								
			AM peak hour (08:00-09:00)								
			RFC			Max Queue (vehs)			Delay (seconds per veh)		
			Base case	Devt case	Change	Base case	Devt case	Change	Base case	Devt case	Change
Embankment*	Left	4	0	1%	+1%	0	0.01	+0.01	0	11	+11
Lower Richmond Road (B306)	Ahead / right	67	17%	18%	+1%	0.21	0.23	+0.02	12	12	0

Notes: RFC represents Ratio of Flow to Capacity. Queue represents number of vehicles in queue. Delay represents the mean delay per vehicle.

Table 7.5.6 Construction development case PICADY model outputs (PM peak hour)

Approach	Arm	Flow (vehs)	Weekday								
			PM peak hour (17:00-18:00)								
			RFC			Max Queue (vehs)			Delay (seconds per veh)		
			Base case	Devt case	Change	Base case	Devt case	Change	Base case	Devt case	Change
Embankment*	Left	5	0	1%	+1%	0	0.01	+0.01	0	8	+8
Lower Richmond Road (B306)	Ahead / right	50	10%	10%	0%	0.11	0.12	+0.01	8	8	0

Notes: RFC represents Ratio of Flow to Capacity. Queue represents number of vehicles in queue. Delay represents the mean delay per vehicle.

7.5.88 The model suggested that it will take approximately 11 seconds and eight seconds for site traffic to gain access onto Lower Richmond Road (B306) in the AM and PM peak respectively.

7.5.89 The additional demand due to construction traffic flow will not impose any significant impact.

7.5.90 The resulting construction development case PICADY model for the Lower Richmond Road (B306) / Embankment junction indicates that the junction performs within capacity for both peaks.

Construction mitigation

7.5.91 The project has been designed to limit the issues arising on the transport networks as far as possible and many measures have been embedded directly in the design of the project, as described below. These are summarised in Table 7.5.7.

Table 7.5.7 Putney Embankment Foreshore design measures

Phase	Issues	Design measures
Construction	Creating access point	• Creation of a new site access some 10m northwest of Embankment / Lower Richmond Road for construction traffic.
	Safe passage for pedestrians and cyclists	• Diverting of a section of the Thames Path on Embankment adjacent to the Temporary Slipway site onto the carriageway with barrier segregation from vehicular traffic
	Street parking	• Suspension of existing parking at southern end of Glendarvon Street • Suspension of existing parking on Embankment adjacent to the Temporary Slipway site and the main construction site • Relocating cycle stands on Embankment.
	Movement of construction traffic flows on the local highway network	• Signed traffic management system to be put in place on Embankment between Thames Place and the site access to enable construction of the temporary slipway • Providing traffic marshals at the site access to minimise conflicts with construction traffic.

Phase	Issues	Design measures
Operation	Permanent access point	• Provision of permanent drop kerbing at site access to accommodate maintenance vehicles.

7.5.92 These embedded measures, discussed in Section 7.2, have been taken into account in the assessment. The outcomes indicate that with these measures in place the changes to be expected in the transport networks are not significant and therefore no additional measures are required for the construction phase.

Sensitivity testing

7.5.93 The assessment outcomes reported earlier are based on the Transport Strategy for this site as outlined in Section 7.3

7.5.94 A sensitivity test has been undertaken to examine the implications of variation in the number of construction vehicles in the peak month of activity at this site, including the possibility that river transport were not available for short periods of time which could temporarily increase vehicle numbers. In this sensitivity test, construction vehicle movements in the peak year of construction would be 10 per hour in the AM and PM peak hour.

7.5.95 The results of the local junction modelling using these figures are presented in Tables 7.5.8 to 7.5.9

.

Table 7.5.8 Construction development case LinSig model outputs (AM peak), for sensitivity test

Approach	Arm	Flow PCU	Weekday								
			AM peak hour (08:00-09:00)								
			DoS			MMQ (PCUs)			Delay (seconds per PCU)		
			Base case	Devt case	Stvity	Base case	Devt case	Stvity	Base case	Devt case	Stvity
Putney Bridge Approach	Ahead (Bus Lane)	158	12%	12%	12%	2	2	2	8	8	8
	Ahead	702	78%	80%	80%	16	16	16	21	23	23
	Right	337	88%	88%	88%	12	13	13	71	71	71
Lower Richmond Road	Left	739	72%	71%	71%	13	13	13	23	22	22
	Right	315	90%	87%	89%	12	12	12	84	75	79
Putney High Street	Ahead Left	767	88%	90%	90%	18	19	19	45	48	49
	Ahead	619	84%	87%	87%	19	20	20	45	49	49
			Practical Reserve Capacity (PRC)						Total Delay (PCU Hours)		
Overall junction performance			0.40%	-0.10%	-0.40%				39	40	42

Notes: DoS represents Degree of Saturation; the ratio of flow to capacity. MMQ represents Mean Maximum Queue for the busiest-case 15 minute modelled period (in vehicle lengths). Delay represents the mean delay per PCU. PRC represents Practical Reserve Capacity; measure of how much additional traffic could pass through a junction whilst maintaining a maximum DoS of 90% on all lanes. PCU value for a car is one PCU. Vans and three-axle vehicles are 1.5 PCUs, vehicles with four or more axles are 2.3 PCUs. Buses and coaches are two PCUs. Motorcycles are 0.4 PCUs and pedal cycles are 0.2 PCUs. Thames Tideway Tunnel construction vehicles would be a mixture of three- and four-axle vehicles and have therefore been given a PCU value of two. Assessment has assumed that traffic signal optimisation has been undertaken as detailed in Section 2.

Table 7.5.9 Construction development case LinSig model outputs (PM peak), sensitivity test

Approach	Arm	Flow (PCU)	Weekday								
			PM peak hour (17:00-18:00)								
			DoS			MMQ (PCUs)			Delay (seconds per PCU)		
			Base case	Devt case	Stvity	Base case	Devt case	Stvity	Base case	Devt case	Stvity
Putney Bridge Approach	Ahead (Bus Lane)	197	17%	17%	17%	3	3	3	12	12	12
	Ahead	716	90%	90%	90%	22	22	22	40	40	40
	Right	424	91%	91%	91%	16	16	16	69	69	69
Lower Richmond Road	Left	356	29%	29%	29%	2	2	2	10	10	10
	Right	390	89%	91%	92%	14	15	16	72	77	82
Putney High Street	Ahead Left	699	91%	92%	92%	16	16	16	60	60	61
	Ahead	450	87%	87%	87%	15	15	15	60	60	60
			Practical Reserve Capacity (PRC)						Total Delay (PCU Hours)		
Overall junction performance			-1.60%	-2.00%	-2.50%				41	45	46

Notes: DoS represents Degree of Saturation; the ratio of flow to capacity. MMQ represents Mean Maximum Queue for the busiest-case 15 minute modelled period (in vehicle lengths). Delay represents the mean delay per PCU. PRC represents Practical Reserve Capacity; measure of how much additional traffic could pass through a junction whilst maintaining a maximum DoS of 90% on all lanes. PCU value for a car is one PCU. Vans and three-axle vehicles are 1.5 PCUs, vehicles with four or more axles are 2.3 PCUs. Buses and coaches are two PCUs. Motorcycles are 0.4 PCUs and pedal cycles are 0.2 PCUs. Thames Tideway Tunnel construction vehicles would be a mixture of three- and four-axle vehicles and have therefore been given a PCU value of two. Assessment has assumed that traffic signal optimisation has been undertaken as detailed in Section 2.

Table 7.5.10 Construction development case PICADY model outputs (AM peak), sensitivity test

Approach	Arm	Flow (vehs)	Weekday								
			AM peak hour (08:00-09:00)								
			RFC			Max. Queue (vehs)			Delay (seconds per veh)		
			Base case	Devt case	Stvity	Base case	Devt case	Stvity	Base case	Devt case	Stvity
Embankment*	Left	7	0	1%	4%	0.0	0.01	0.04	0	11	18
Lower Richmond Road	Ahead Right	70	17%	18%	21%	0.21	0.23	0.27	12	12	13

Notes: RFC represents Ratio of Flow to Capacity. Queue represents number of vehicles in queue. Delay represents the mean delay per vehicle.

Table 7.5.11 Construction development case PICADY model outputs (PM peak), sensitivity test

Approach	Arm	Flow (vehs)	Weekday								
			PM peak hour (17:00-18:00)								
			RFC			Max. Queue (vehs)			Delay (seconds per veh)		
			Base case	Devt case	Stvity	Base case	Devt case	Stvity	Base case	Devt case	Stvity
Embankment*	Left	8	0	1%	3%	0.0	0.01	0.03	0	8	13
Lower Richmond Road	Ahead Right	53	11%	10%	12%	0.11	0.12	0.14	8	8	9

Notes: RFC represents Ratio of Flow to Capacity. Queue represents number of vehicles in queue. Delay represents the mean delay per vehicle.

7.5.96 The results suggest that under this scenario, the Putney Bridge Approach (A219) /Lower Richmond Road (B306) /Putney High Street (A219) junction would operate with up to a five second increase in delay at the Lower Richmond Road Right turn arm. The junction as a whole will experience around a two second delay. There will be negligible changes to the DoS at this junction and overall, it will remain operating at borderline capacity as the EIA scenario.

7.5.97 The Embankment / Lower Richmond Road (B306) junction will operate with an 18 second delay, an additional seven seconds for flows left turning out of Embankment in the PM peak. The maximum RFC will reach 21% at the AM peak for right turning traffic on Lower Richmond Road (B306). This junction will remain operating within capacity.

7.5.98 It should be noted that this analysis represents a maximum sensitivity test. If this scenario did occur over a prolonged period, which is unlikely for the reasons given in Section 7.3, there would be an insignificant impact on the highway operation and no further to mitigation would be required.

7.6 Operational assessment

7.6.1 This section summarises the findings of the assessment undertaken for Year 1 of operation at the Putney Embankment Foreshore site.

7.6.2 The assessment of the operational phase is limited to the physical issues associated with accessing the site from the highway network as outlined in Section 7.2. This has been discussed with LB of Wandsworth and TfL.

Operational base case

7.6.3 The operational assessment year for transport is Year 1 of operation.

7.6.4 As explained in para. 7.2.63 the elements of the transport network that would be affected during operation are highway layout and operation and parking. For the purposes of the operational base case, it is anticipated that the highway layout and parking will be as indicated in the construction base case.

Operational development case

7.6.5 The operational development case for the site includes any permanent changes in the vicinity of the Putney Embankment Foreshore site as a result of the Thames Tideway Tunnel project and takes into consideration the occasional maintenance activities required at the site.

7.6.6 Once the construction works at the Putney Embankment Foreshore site have been completed, the permanent foreshore structure would be constructed. This would form part of the public realm although access may be restricted periodically for inspection and maintenance purposes.

7.6.7 During the operational phase, the parking along Embankment would be reinstated to the current layout.

7.6.8 The transport demands created by the development in the operational phase would be extremely low and limited to occasional maintenance

visits every three to six months, with certain instances where larger mobile cranes may be required for access to the shaft and tunnel every ten years.

7.6.9 The operational assessment has taken into consideration the elements that would be affected, which comprise the short-term impacts upon on-street car parking and the highway layout and operation when maintenance visits are made to the site.

7.6.10 The permanent highway layout plans provided in the Putney Embankment Foreshore *Transport Assessment* figures indicates the operational phase permanent works.

Parking

7.6.11 When large vehicles are required to service the site, a maximum of six parking bays would have to be temporarily suspended to ensure the vehicles have sufficient space to manoeuvre into the site. This temporary suspension would be on an infrequent basis and would occur approximately every ten years.

7.6.12 This would result in a negligible impact on parking within the local area.

7.6.13 No impact on car parking is expected during the routine three to six month maintenance visits.

Highway layout and operation

7.6.14 For routine three or six monthly inspections vehicular access would be required for light commercial vehicles, typically a transit van. On limited occasions there may be a consequent need for small flatbed vehicles to access the site.

7.6.15 During ten-yearly inspections space to locate two large mobile cranes and associates support vehicles within the site area would be required. The cranes would facilitate the lowering and recovery of tunnel inspection teams, plant and equipment and provide duty/standby access for personnel.

7.6.16 To assess the effect of these on the highway layout swept path analyses have been undertaken for the largest vehicles anticipated to access the site; an 11.36m mobile cranes, a 10m rigid vehicle and a 10.7m articulated vehicle. The permanent highway layout vehicle swept path analysis plan provided in the Putney Embankment Foreshore site *Transport Assessment* figures show the swept path movements during operation and shows that maintenance vehicles would be able to safely enter and leave the site.

7.6.17 As identified above, as a result of the large turning circles of the cranes a maximum of six parking bays would have to be suspended to ensure the vehicles have sufficient space to manoeuvre into the site and provide space for the associated support vehicles. This would be approximately once every ten years.

7.6.18 When larger vehicles are required to service the site there may also be some temporary, short-term delay to other road users while manoeuvres are made. However, it is anticipated that the arrival of large vehicles

would normally be scheduled to take place outside of the peak hours to minimise the effect on the local highway network.

7.6.19 It is anticipated that there would be a negligible impact on road network delay.

7.6.20 Taking into consideration the various sensitivities of the receptors affected during the operational phase (private vehicle users and emergency vehicles) this would result in a negligible effect on highway layout and operation.

Operational mitigation

7.6.21 Due to there being no significant changes to transport during the operational phase, no mitigation is required.

7.7 Summary of site specific Transport Assessment

7.7.1 The outcomes of this *TA* and key findings are indicated in Table 7.7.1.

Table 7.7.1 Putney Embankment Foreshore Transport Assessment results

Phase	Mode of transport	Key Findings
Construction	Pedestrians	Approximately 4 second delay to pedestrian journeys due to diversions.
	Cyclists	Minimal delay (max. of approximately 19 seconds) experienced by cyclists using Embankment as a result of the highway network delay.
	Bus patronage and operators	Approximately 11 worker trips would be made by bus. A delay of five seconds to bus services would be anticipated due to highway network delay.
	London Underground and National Rail patronage	Worker trips would be made by London Underground or National Rail. No other impact on LUL or National Rail services.
	River passenger services and patronage	River services would not be impacted during construction.
	River navigation	There would be approximately four barge movements a day during Year 2 of construction which is not anticipated to impact on existing river navigation.
	Parking	During the temporary slip road construction 33 parking bays would be suspended. Taking into account existing spare capacity, alternative spaces would not be provided.
	Highway network and operation	The width of the southbound carriageway of Victoria Embankment would be reduced to a minimum of 5.2m during construction of the temporary slip road. During main construction, a short section of Embankment would be made two-way, and the Embankment / Lower Richmond Road (B306) junction adjusted to accommodate two-way flow on Embankment and HGV movements. Approximately 105 additional daily movements would be produced by the construction works at Putney Embankment Foreshore. The Embankment / Lower Richmond Road (B306) junction and the Embankment / new access road junction will be operating under capacity in the construction base case. The addition of the Thames Tideway Tunnel traffic (anticipated to be four two-way vehicle

Phase	Mode of transport	Key Findings
		movements during the peak hours) has negligible impact (max. 19 second delay) on the operation of the junction.
Operation	Parking	A maximum of six parking bays may require temporary suspension when large mobile cranes require access to the site, approximately every ten years.
	Highway layout and operation	A maximum of six parking bays may require temporary suspension when large cranes require access to the site, approximately every ten years. Some network delay may be experienced by other road users when large vehicles are accessing the site, however this will be infrequent and temporary and outside of peak periods.

References

[1] TfL, *Travel Planning for new development in London,* Transport for London (2011)

[2] Transport for London, Transport Assessment Best Practice guidance, April 2010

[3] Transport for London (TfL) (2011) *Timetables*. Available at: http://journeyplanner.tfl.gov.uk/user/XSLT_SEL_STT_REQUEST?sessionID=0&language=en&mode=line&linePreSel=tfl:25:*&linePreSel=tfl:63:* (Accessed: 26 October 2011)

[4] Rail Enquiries (2011) *Live departure boards*. Available at: http://www.nationalrail.co.uk/times_fares/ldb/ (Accessed: 26 October 2011

[5] Department for Transport (DfT), *Traffic Signs Manual Chapter 8 - Traffic Safety Measures and Signs for Road Works and Temporary Situations, 2009*.

[6] HM Government, Equality Act 2010 – Guidance, 2010.

[7] Traffic Advisory Leaflet 15/99 (December 1999) *Cyclists at Roadworks – Guidance* was produced by TfL and provides recommended lane widths at roadworks.

Thames Tideway Tunnel
Thames Water Utilities Limited

Application for Development Consent

Application Reference Number: WWO10001

Transport Assessment

Doc Ref: **7.10.04**

Putney Embankment Foreshore

Appendices

APFP Regulations 2009: Regulation **5(2)(q)**

Hard copy available in

Box **50** Folder **A**
January 2013

Thames Tideway Tunnel

Creating a cleaner, healthier River Thames

This page is intentionally blank

Thames Tideway Tunnel

Transport Assessment

Section 7 Appendices: Putney Embankment Foreshore

List of contents

Page number

Appendix A – Policy review 1
A.1 Introduction 1
A.2 National Policy 1
A.3 Regional policy 3
A.4 Local policy 6
Appendix B – PTAL analysis 11
Appendix C – Local modelling outputs 17
C.1 Baseline results, AM peak hour 18
C.2 Baseline results, PM peak hour 22
C.3 Construction base case results, AM peak hour 26
C.4 Construction base case results, PM peak hour 30
C.5 Construction development case results, AM peak hour 34
C.6 Construction development case results, PM peak hour 38
C.7 Construction development case results, 'all by road' sensitivity test, AM peak hour 42
C.8 Construction development case results, 'all by road' sensitivity test, PM peak hour 46
C.9 Construction base case results, AM peak hour 50
C.10 Construction base case results, PM peak hour 52
C.11 Construction development case results, AM peak hour 56
C.12 Construction development case results, PM peak hour 59
C.13 Construction development case results, 'all by road' sensitivity test, AM peak hour 63
C.14 Construction development case results, 'all by road' sensitivity test, PM peak hour 67
Appendix D – Accident analysis 70
D.1 Existing Highway Safety Analysis 70
D.2 Summary and conclusion 73
Appendix E – Road Safety Audit 74

List of tables

Page number

Table D.1 Accident severity 2006 to 2011 70

Appendix A – Policy review

A.1 Introduction

A.1.1 There are a number of documents containing planning policies that are relevant to transport matters for the proposed development at Putney Bridge. This includes national, regional and local policies relevant to the site.

A.1.2 This section reviews current documents relevant to the proposed development which is situated within the Borough of Wandsworth.

A.2 National Policy

National Planning Policy Framework (March 2012)

A.2.1 The Department for Communities and Local Government published the National Planning Policy Framework (NPPF) in March 2012. The NPPF replaces a variety of existing planning guidance, most notable the following document, Planning Policy Guidance 13: Transport (November 2010).

A.2.2 The key objective of the NPPF is to create a policy context to support economic growth. The principle of the guidance is to place an emphasis on sustainable development, where environmental conditions should be considered alongside economical and social matters.

A.2.3 It outlines the importance of local development plans and notes that where development accords with an up to date development plan then the proposals should be approved. Moreover, it suggests that local authorities should follow the approach of the presumption in favour of sustainable development.

A.2.4 With particular reference to transport matters the documents states:

A.2.5 “In preparing local plans, local planning authorities should therefore support a pattern of development which, where reasonable to do so, and facilitates the use of sustainable modes of transport.”

A.2.6 The guidance goes on to advise at paragraph 32:

- “All developments that generate significant amounts of movement should be supported by a Transport Statement or Transport Assessment. Plans and decisions should take account of whether:
- the opportunities for sustainable transport modes have been taken up depending on the nature and location of the site, to reduce the need for major transport infrastructure;
- safe and suitable access to the site can be achieved for all people; and
- improvements can be undertaken within the transport network that cost effectively limit the significant impacts of the development. Development should only be prevented or refused on transport

grounds where the residual cumulative impacts of development are severe."

A.2.7 The document also states that:

"Plans should protect and exploit opportunities for the use of sustainable transport modes for the movement of goods or people". Therefore:

"A key tool to facilitate this would be a Travel Pan. All developments which generate significant amounts of movement should be required to provide a Travel Plan".

National Policy Statement for Waste Water (March 2012)

A.2.8 The National Policy Statement for Waste Water was published by the Department of Environment, Food and Rural Affairs in March 2012. This National Policy Statement (NPS) sets out Government policy for the provision of major waste water infrastructures. The NPS does not recognise the Thames Tideway Tunnel project within the original thresholds which is contained within the Planning Act. However the document indicates that "the Government has already stated its intention that the project should be considered at a national level".

A.2.9 The Secretary of State announced that development consent for the Thames Tideway Tunnel project should also be dealt with under the regime for nationally significant infrastructure projects under the Planning Act 2008.

A.2.10 The NPS for Waste Water seeks a sustainable long term solution to address the untreated sewage discharged into the River Thames and the Thames Tideway Tunnel has been considered as the preferred solution.

A.2.11 With particular reference to transport matters the document states:

"The ES should include a transport assessment, using the NATA/WebTAG methodology stipulated in Department for Transport (DfT), or any successor to such methodology. Applicants should consult the Highways Agency and/or the relevant highway authority, as appropriate, on the assessment and on mitigation measures. The assessment should distinguish between the construction, operation and decommissioning project stages as appropriate".

A.2.12 The document states that the impacts on the surrounding transport infrastructure should be mitigated and where the mitigation measures are not sufficient the requirements to mitigate adverse impacts on transport networks should be considered.

A.2.13 Therefore it is advised to prepare a travel plan which includes demand management measures to mitigate transport impacts, and "to provide details of proposed measures to improve access by public transport, walking and cycling, to reduce the need for parking associated with the proposal and to mitigate transport impacts".

A.2.14 The NPS for Waste Water prefers water-borne or rail transport over road transport and where there is likely to be substantial HGV traffic, the following measures should be looked:

- "control numbers of HGV movements to and from the site in a specified period during its construction and possibly on the routing of such movements;
- make sufficient provision for HGV parking, either on the site or atdedicated facilities elsewhere, to avoid 'overspill' parking on public roads, prolonged queuing on approach roads and uncontrolled on-street HGV parking in normal operating conditions; and
- ensure satisfactory arrangements for reasonably foreseeable abnormal disruption, in consultation with network providers and the responsible police force".

A.2.15 The proposed development is located at a relatively moderate accessible transport hub and the proposed location has a Public Transport Accessibility Level (PTAL) rating of 3, rated as 'moderate'. It is assumed that construction workers would not travel by car to and from the site on the basis that there would be no worker parking on site; on-street parking in the area is restricted; and site-specific Travel Plan measures will discourage workers from travelling by car. Information regarding the travel arrangements of the workers associated with the site will be included in the Project Framework Travel Plan and site-specific Travel Plan documents.

A.3 Regional policy

The London Plan (July 2011)

A.3.1 The London Plan 2011 is produced by the Greater London Authority (GLA) and sets out the strategic planning guidance for London planning authorities. The Mayor of London is responsible for strategic planning and the production of a Spatial Development Strategy called The London Plan. The London plan sets out the integrated economic, environmental, transport and social framework for the development of London over the next 20-25 years. The Plan takes the year 2031 as its formal end date and its over-arching vision is supported by six detailed objectives for London:

- A city that meets the challenges of economic and population growth;
- An internationally competitive and successful city;
- A city of diverse, strong, secure and accessible neighbourhoods;
- A city that delights the senses;
- A city that becomes a world leader in improving the environment; and
- A city where it is easy, safe and convenient for everyone to access jobs, opportunities and facilities.

A.3.2 The last objective of the plan relates specifically to transport. Policies within the London Plan of relevance to the proposed development are outlined as follows:

A.3.3 **Policy 6.1 – Strategic Approach** advises that the mayor will work with all relevant partners to encourage the closer integration of transport and development by:

- Encouraging patterns and nodes of development that reduce the need to travel, especially by car;
- Seeking to improve the capacity and accessibility of public transport, walking and cycling, particularly in areas of greater demand;
- Supporting development that generates high levels of trips at locations with high public transport accessibility and/or capacity, either currently or via committed, funded improvement;
- Seeking to increase the use of the Blue Ribbon Network, especially the Thames, for passenger and freight use;
- Facilitating the efficient distribution of freight whilst minimising its impacts on the transport network;
- Supporting measures that encourage shifts to mode sustainable modes and appropriate demand management; and
- Promoting greater use of low carbon technology so that carbon dioxide and other contributors to global warming are reduced.

A.3.4 **Policy 6.2 – Providing public transport capacity and safeguarding land for transport** which notes that development proposals that do not provide adequate safeguarding for the schemes should be refused.

A.3.5 **Policy 6.3 – Assessing effects of development on transport capacity** outlines that development proposals should ensure that impacts on transport capacity and the transport network, at both a corridor and local level, are fully assessed. Development should not adversely affect safety on the transport network. Where existing transport capacity is insufficient for the travel generated by proposed developments, and no firm plans exist for an increase in capacity, boroughs should ensure that the development proposals are phased until it is known that these requirements can be met. The policy notes that the use of Travel Plans and addressing freight issues can help reduce the impact of development on the transport network.

A.3.6 **Policy 6.7 – Better streets and surface transport** notes that high levels of priority should be provided to bus routes and there should be direct, secure, accessible and pleasant walking routes to stops. The development would include provision of transport to and from public transport nodes where sites are at a distance from public transport services.

A.3.7 **Policy 6.9 – Cycling** presents measures to increase cycling mode share in London to 5 percent by 2026. Measures include completing the Cycle Super Highways and expanding the London cycle hire scheme. To support this, developments should provide cycle parking to at least the minimum standards, provide showers and changing facilities and facilitate the major cycling schemes in London (Super Highways / Cycle Hire).

A.3.8 **Policy 6.10 – Walking** recommends the use of shared space principles with simplified streetscape, de-cluttering and access for all. Developments should therefore ensure high quality pedestrian environments and emphasise the quality of pedestrian and street space.

It points to the 'Legible London' pedestrian wayfinding system as a successful measure to support walking journeys.

A.3.9 **Policy 6.13 – Parking** outlines the need to seek an appropriate balance between promoting new development and preventing excessive car parking provision that can undermine cycling, walking and public transport use. As such, car parking should reduce as public transport accessibility (measured by PTAL) increases. The policy advises that Transport assessments and travel plans for major developments should give details of proposed measures to improve non-car based access, reduce parking and mitigate adverse transport impacts.

A.3.10 **Policy 6.14 – Freight** notes that freight distribution should be improved and movement of freight by rail and waterway should be promoted. To support this, developments that generate high number of freight movements should be located close to major transport routes. In addition, the Freight Operators Recognition Scheme, construction logistics plans and delivery and servicing plans should be promoted. The policy also advises the increase in the use of the Blue Ribbon Network for freight transport.

The Mayors Transport Strategy (GLA, 2010)

A.3.11 In addition to the London Plan, the Mayor has prepared a number of strategies that are essentially an extension of the London Plan. Published by the GLA in 2010, the Mayor's Transport Strategy (MTS) (Greater London Authority, May 2010) envisages *"London's Transport system excelling among that of global cities, providing access to opportunities for all people and enterprises while achieving the highest environmental standards and leading the world in its move towards tackling the urban transport challenges of the 21st century".*

A.3.12 The MTS sets out a number of policy commitments or requirements which have implications for TfL and a range of other delivery partners including the GLA and the London boroughs. The policies that are relevant to the proposed development are:

- **Policy 4** indicating that the Mayor will seek *"to improve people's access to jobs, business' access to employment markets, business to business access, and freight access by seeking to ensure appropriate transport capacity and connectivity is provided on radial corridors into central London";*
- **Policy 5** seeks *"to ensure efficient and effective access for people and goods within central London";*
- **Policy 8** supports *"a range of transport improvements within metropolitan town centres for people and freight that help improve connectivity and promote the vitality and viability of town centres, and that provide enhanced travel facilities for pedestrians and cyclists";*
- **Policy 9** states that the Mayor *"will use the local and strategic development control processes";*
- **Policy 11** specifies that the Mayor will *"encourage the use of more sustainable, less congesting modes of transport, set appropriate parking standards, and aim to increase public transport, walking and cycling mode share";*

- **Policy 12** states that the Mayor *"will seek to improve the distribution of freight through the provision of better access to/from Strategic Industrial Locations, delivery and servicing plans, and other efficiency measures across London"; and*
- **Policy 15** and **Policy 16** indicate that the Mayor will seek to reduce emissions of air pollutants and noise impacts from transport respectively.

A.3.13 *The London Freight Plan, Sustainable Freight Distribution: a Plan for London* (TfL, June 2008) sets out the steps that have to be taken over the next five to ten years to identify and begin to address the challenge of delivering freight sustainably in the capital. Principles set in that document are expected to be relevant to the consideration of the construction logistics strategy for the proposed development.

A.4 Local policy

A.4.1 The London Borough of Wandsworth has a number of policies relevant to transport within the Local Development Framework (LDF) and the Unitary Development Plan (UDP). Both reflect national and regional focused policies and are referred to below where appropriate.

Local Development Framework

A.4.2 The emerging LDF aims to guide and manage development and regeneration in the borough until 2025. The Core Strategy of the LDF – adopted in October 2010 – now forms part of the statutory planning guidance for the borough, together with the saved policies of the borough's Unitary development Plan (UDP).

A.4.3 Transport policies within this document are concerned with ensuring improvements are made to the public transport, river wharves and accessibility, reducing carbon emissions, and encouraging the use of sustainable transport within the borough.

A.4.4 **Policy PL 3 – Transport** – outlines how the borough will improve the transport network by ensuring *'quality cycling conditions will be delivered'* and *'improved conditions for walking'* along the Thames Path and other accessible routes will be delivered.

A.4.5 **Policy PL 9 – River Thames and the riverside** - outlines that '*greater use will be made of the river'* and that the 'five wharves will continue to be safeguarded', while the redevelopment of these wharves will be accepted *'if the wharf is no longer viable or capable of being made viable for cargo handling uses'*. Further*'existing river infrastructure that provides access to the river and the foreshore, such as piers, jetties, drawdocks, slipways, steps and stairs will be protected and new facilities, including piers for river buses, promoted'.*

A.4.6 *'Putney Embankment's special recreational character and function'* will be protected, particularly for river sports. Also this policy commits to stating that *'development will not be permitted which encroaches onto the river foreshore'* and opportunities will be taken in consultation with partner agencies, to *'create habitat and reduce flood risk'*.

A.4.7 Also measures will be made to protect and enhance the river as a valuable resource for wild life, in particular at the mouth of the River Wandle.

A.4.8 **Policy PL 10 – The Wandle Valley** - identifies that *'improved accessibility within the corridor and to the riverside will be pursued including the provision of pedestrian and cycle ways'*.

A.4.9 It further outlines the council will support the recreation development of *'King George's Park and north of Wandsworth town centre to the River Wandle mouth'*.

A.4.10 **Policy PL 12 – Central Wandsworth and the Wandle Delta** outlines a number of proposals within central Wandsworth and the Wandle Delta. Amongst them are:

- The Ram Brewery development is to provide a 'high quality public realm' linking the riverside and the juinction of Wandsworth Plain and Armoury Way,
- The banks of the River Wandle will be improved to provide a resource for wild life and recreation and enhancing the existing open space at Causeway Island,
- Wandsworth Business Village 'will provide pedestrian and cycle links to the south via a new park side promenade at Neville Gill Close' which will access King George's Park.

A.4.11 The council further state that 'the impact of traffic on the town centre should be reduced in partnership with TfL' and they will achieve this 'through developer contributions and funds from TfL and other transport infrastructure providers'.

A.4.12 **Policy IS 1 – Sustainable development** - supports '*measures that mitigate and adapt to climate change and reduce emissions of carbon dioxide, and will promote a sustainable relationship between development and transport so as to minimise the need to travel'*.

Development Management Policies (LB of Wandsworth, Feb 2012)

A.4.13 The DMP was adopted by the LB of Wandsworth in February 2012 and supports the Core Strategy. It sets out the Council's detailed policies for managing development in the borough. The policies in the DMP and the SSA replace all of the remaining policies in the Councils Unitary Development Plan (UDP) which have not previously expired or been superseded by the policies in the Core Strategy.

A.4.14 Transport policies within this document are concerned with ensuring sustainable urban design, riverside walking and cycling and parking within the borough.

A.4.15 **Policy DMS 1 – General development principles - Sustainable urban design and the quality** – identifies that developments must ensure that they do *'not harm the amenity of occupiers/users and nearby properties through unacceptable'* traffic congestion, it *'is adequately served by public transport'*, is *'designed to reduce the need to travel and minimise car use'* and is *'accessible to people with disabilities'*.

A.4.16 **Policy DMO 6 – Riverside development** – distinguishes developments adjoining the River Thames and River Wandle which *'promotes sustainable transport'* and in particular *'provides access to public transport routes including the incorporation of a public riverside walk and cycle-path'*.

A.4.17 **Policy DMT1 – Transport impacts of development** – recognises that developments do *'not have a negative impact on the transport system, including public transport capacity and the highway network'*.

A.4.18 **Policy DMT 2 – Parking and servicing** – ascertains that developments will be permitted once 'off-street car parking is provided subject to the maximum levels' set out by the borough.

A.4.19 **Policy DMT 3 – Riverside walking and cycling routes** - permits developments along the Thames and Wandle once provision has been made *'for a riveside walk at least 6 metres wide (Thames) or 3 metres wide (Wandle)'*, *'new accesses lining the riverside walk to the surrounding area are a least 3 metres wide'* and *'riverside routes incorporate provision for cyclists, ensuring pedestrian safety'*.

Site Specific Allocations Document (LB of Wandsworth, Feb, 2012)

A.4.20 The SSAD was adopted by LB Wandsworth in February 2012 and supports the Core Strategy.

A.4.21 **Battersea Park Station** – is classified as being *'within the Vauxhall/Nine Elms/ Battersea Opportunity Area'* and is a key strategic site that will *'deliver transport improvements'* and *'significant public transport provision'* will be needed. Amongst this provision will be an extension to the London Underground Northern Line, river passenger pier including provision of a river bus service, a bus service between BPS and Wandsworth Road and enhancement for the strategic Nine Elms Lane/Battersea Park Road *'to overcome the hostile environment for pedestrians and cyclists that currently exists'*. A Thames Path *'linking with existing and proposed Thames paths must be provided'*.

A.4.22 **Riverlight Development** – identifies that improvements would be made to the *'Riverside walk and cycle route'* as well as the junction between Cringle Street and Nine Elms Lane. Also within this SSAD the importance of the safeguarded wharves at Cringle Dock, Kirtling Wharf and Middle Wharf will *'require their retention and continued operation'*. As for BPS there will be *'significant public transport provision*' here as well.

A.4.23 **US Embassy** – outlines the proposed realignment of Ponton Road, as well as potential for a proposed river crossing. As the same for BPS, there will be *'significant public transport provision*' here as well.

A.4.24 **Embassy Gardens –** ascertains that a public realm is expected to run through the site in conjunction with the proposed *'linear park linking Vauxhall to BPS*'. As the same for BPS, there will be *'significant public transport provision*' here as well.

A.4.25 **Nine Elms Parkside** - recognises that provisions are to be made for *'improved pedestrian and cycle links through the site to provide improved permeability particularly between Nine Elms Lane and Wandsworth Road'*.

There is to be a site access onto Nine Elms Lane at the junction of Cringle Street and Nine Elms Lane, making it a four arm junction. As for BPS there will be *'significant public transport provision*' here as well. As in Embassy Gardens there are proposals for a public realm to run through the site linking BPS and Vauxhall.

A.4.26 **New Covent Garden Market** – identifies that the public realm and the existing main access to NCGM 'will need particularly careful treatment' to ensure that the public realm will continue *'across what will continue to be a major junction'* at Kirtling Street/Battersea Park Road.

A.4.27 **Wandsworth Business Village** – outlines that provision will be given for three new connections providing public access through the site. A new pedestrian crossing facility on Buckhold Road will need to be provided, as well improvements to the King George Park entrance and Neville Gill Close promenade.

A.4.28 **Ram Brewey/ Capita Studios** – distinguishes that there should be *'provision for new riverside walks on both banks of the River Wandle'*. Proposals to change the trunk road system with the Wandsworth One-Way System will be required. Also, proposals are to be made to improve the bus services, provide a public realm and the provision of land to public highway, riverside walks and cycle paths surrounding the site.

Supplementary Planning Guidance

A.4.29 The SPG supports and is a document with important local views which support local areas within the borough and their relevant transport issues.

A.4.30 Transport policies within these documents are concerned with views of surrounding buildings and landmarks within the borough.

Unitary Development Plan (LB of Wandsworth, Aug 2003)

A.4.31 The UDP was adopted by the London Borough of Wandsworth in August 2003. Due to the merging LDF and the adoption of the Core Strategy, a number of policies have been deleted from the UDP. The relevant UDP policies which have been saved since September 2007 are outline below.

A.4.32 **Policy RDP1: Regeneration and Development Principles** - outline that without *'adequate and satisfactory provision for pedestrian access and for parking'* a development will not be permitted.

A.4.33 **Policy RDP5: Regeneration and Development Principles** – further identifies that the beneficial effects resulting from a lighting scheme on site must not affect 'vehicle users and pedestrians'.

A.4.34 **Policy TBE1: Townscape and Built Environment** - classifies that a development *'provides safe and convenient access for cyclists and pedestrians'*.

A.4.35 **Policy R2: River Thames and Riverside** - ascertains that developments will not be permitted unless *'provision is made for riverside walk at least 6m wide along the entire river frontage'* and *'any new accesses linking the riverside walk to the surrounding area are at least 3m wide'*.

A.4.36 **Policy R7: River Thames and Riverside** – further recognises that proposals for piers and jetties will be permitted provided *'they do not harm*

the use of the docks and working wharves or other existing uses of the river'.

A.4.37 **Policy R8: River Thames and Riverside** – identifies that the *'loss of drawdocks, slipways, steps and stairs which give safe access to the river and foreshore'* within development proposals will not be permitted.

A.4.38 **Policy R9: River Thames and Riverside** – distinguishes that for proposals adjoining the River Wandle the council will seek the provision of a riverside walk at least 3m wide and improved access to the riverside.

A.4.39 **Policy R11: River Thames and Riverside** – further identifies that the Council will seek developments within Causeway Island for *'river related uses'*.

A.4.40 **Policy R14: River Thames and Riverside** – further categorizes that the Council will not permit the loss of uses and facilities relying on access to the Thames within the Putney Embankment Area.

A.4.41 **Policy H3: Housing** – identifies that developments harming the *'amenities of predominantly residential areas'* because of traffic generation.

A.4.42 **Policy T2: Transport** – recognises that developments that would *'generate sufficient traffic to harm the environment, or create congestion or hazards on the road network'* would not be permitted by Council.

A.4.43 **Policy T5: Transport** – further pinpoints that *'new developments will only be permitted where they provide safe, secure and direct access for pedestrians, connected to existing pedestrian routes in the surrounding area'*.

A.4.44 **Policy T7: Transport** – distinguishes that for non-residential developments *'adequate servicing arrangements'* must be made for *'commercial vehicles'* in order for the Council to permit planning.

A.4.45 **Policy T8: Transport** – categorizes that developments that propose *'new or expanded wharves and railheads will be permitted where they do not cause harm to the environment and are located so that there is suitable road access'*.

A.4.46 **Policy T12: Transport** – classifies that the loss of off-street parking spaces in areas in or adjacent t the House Conversion Restraint Areas will be resisted.

Appendix B – PTAL analysis

This page is intentionally blank

PTAI Study Report File Summary

PTAI Run Parameters

PTAI Run	20120210101505
Description	20120210101505
Run by user	PTAL web application
Date	02/10/2012

Walk File Parameters

Walk File	PLSQLTest
Day of Week	M-F
Time Period	AM Peak
Walk Speed	4.8 kph
BUS Walk Access Time (mins)	8
BUS Reliability Factor	2.0
LU LRT Walk Access Time (mins)	12
LU LRT Reliability Factor	0.75
NATIONAL_RAIL Walk Access Time (mins)	12
NATIONAL_RAIL Reliability Factor	0.75
Coordinates:	524068, 175694

Mode	Stop	Route	Distance (metres)	Frequency (vph)	Weight	Walk time (mins)	SWT (mins)	TAT (mins)	EDF	AI
BUS	PUTNEY BDG L RICHMOND RD	485	47.04	2	0.5	0.59	17	17.59	1.71	0.85
BUS	PUTNEY BDG L RICHMOND RD	22	47.04	10	1	0.59	5	5.59	5.37	5.37
BUS	PUTNEY BDG L RICHMOND RD	265	47.04	5	0.5	0.59	8	8.59	3.49	1.75
BUS	PUTNEY BRIDGE SOUTH SIDE	424	144.65	2	0.5	1.81	17	18.81	1.6	0.8
BUS	PUTNEY BRIDGE SOUTH SIDE	430	144.65	7.5	0.5	1.81	6	7.81	3.84	1.92
BUS	PUTNEY BRIDGE SOUTH SIDE	39	144.65	8	0.5	1.81	5.75	7.56	3.97	1.98
BUS	PUTNEY BRIDGE SOUTH SIDE	74	144.65	7.5	0.5	1.81	6	7.81	3.84	1.92
BUS	PUTNEY BRIDGE SOUTH SIDE	85	144.65	8	0.5	1.81	5.75	7.56	3.97	1.98

Mode	Stop	Route	Distance (metres)	Frequency (vph)	Weight	Walk time (mins)	SWT (mins)	TAT (mins)	EDF	AI
BUS	PUTNEY BRIDGE SOUTH SIDE	93	144.65	9	0.5	1.81	5.33	7.14	4.2	2.1
BUS	PUTNEY BRIDGE SOUTH SIDE	14	144.65	13	0.5	1.81	4.31	6.12	4.91	2.45
BUS	PUTNEY BRIDGE SOUTH SIDE	220	144.65	7.5	0.5	1.81	6	7.81	3.84	1.92
BUS	PUTNEY BRIDGE SOUTH SIDE	270	144.65	6	0.5	1.81	7	8.81	3.41	1.7
BUS	PUTNEY BRIDGE GONVILLE S	414	495.82	7.5	0.5	6.2	6	12.2	2.46	1.23
LU LRT	Putney Bridge	District Line High Street Kensington to Wimbledon	643.03	2.3	0.5	8.04	13.79	21.83	1.37	0.69
LU LRT	Putney Bridge	District Line Wimbledon to Barking	643.03	1.7	0.5	8.04	18.4	26.43	1.13	0.57
LU LRT	Putney Bridge	District Line Wimbledon to Dagenham East	643.03	1.3	0.5	8.04	23.83	31.86	0.94	0.47
LU LRT	Putney Bridge	District Line Wimbledon to Edgware Road	643.03	8	1	8.04	4.5	12.54	2.39	2.39

Mode	Stop	Route	Distance (metres)	Frequency (vph)	Weight	Walk time (mins)	SWT (mins)	TAT (mins)	EDF	AI
		(Circle Line)								
LU LRT	Putney Bridge	District Line Upminster to Wimbledon	643.03	3.3	0.5	8.04	9.84	17.88	1.68	0.84
LU LRT	Putney Bridge	District Line Wimbledon to Tower Hill	643.03	2	0.5	8.04	15.75	23.79	1.26	0.63
NATIONAL_RAIL	PUTNEY BR	STAINES to LONDON WATERLOO BR	669.29	0.33	0.5	8.37	91.66	100.03	0.3	0.15
NATIONAL_RAIL	PUTNEY BR	LONDON WATERLOO BR to LONDON WATERLOO BR	669.29	2	1	8.37	15.75	24.12	1.24	1.24
NATIONAL_RAIL	PUTNEY BR	WEYBRIDGE to LONDON WATERLOO BR	669.29	1.67	0.5	8.37	18.71	27.08	1.11	0.55
NATIONAL_RAIL	PUTNEY BR	TWICKENHAM BR to LONDON WATERLOO BR	669.29	0.33	0.5	8.37	91.66	100.03	0.3	0.15
NATIONAL_RAIL	PUTNEY BR	READING to LONDON WATERLOO BR	669.29	0.67	0.5	8.37	45.53	53.89	0.56	0.28
NATIONAL_RAIL	PUTNEY BR	LONDON WATERLOO	669.29	2	0.5	8.37	15.75	24.12	1.24	0.62

Mode	Stop	Route	Distance (metres)	Frequency (vph)	Weight	Walk time (mins)	SWT (mins)	TAT (mins)	EDF	AI
		BR to WEYBRIDGE								
NATIONAL_RAIL	PUTNEY BR	LONDON WATERLOO BR to HOUNSLOW WINDSOR AND ETON	669.29	0.33	0.5	8.37	91.66	100.03	0.3	0.15
NATIONAL_RAIL	PUTNEY BR	RIVERSIDE to LONDON WATERLOO BR	669.29	2	0.5	8.37	15.75	24.12	1.24	0.62
NATIONAL_RAIL	PUTNEY BR	SHEPPERTON to LONDON WATERLOO BR	669.29	1	0.5	8.37	30.75	39.12	0.77	0.38
NATIONAL_RAIL	PUTNEY BR	LONDON WATERLOO BR to LONDON WATERLOO BR	669.29	2	0.5	8.37	15.75	24.12	1.24	0.62
NATIONAL_RAIL	PUTNEY BR	KINGSTON to LONDON WATERLOO BR	669.29	0.33	0.5	8.37	91.66	100.03	0.3	0.15

Total AI for this POI is 36.47.

PTAL Rating is 6a.

This page is intentionally blank

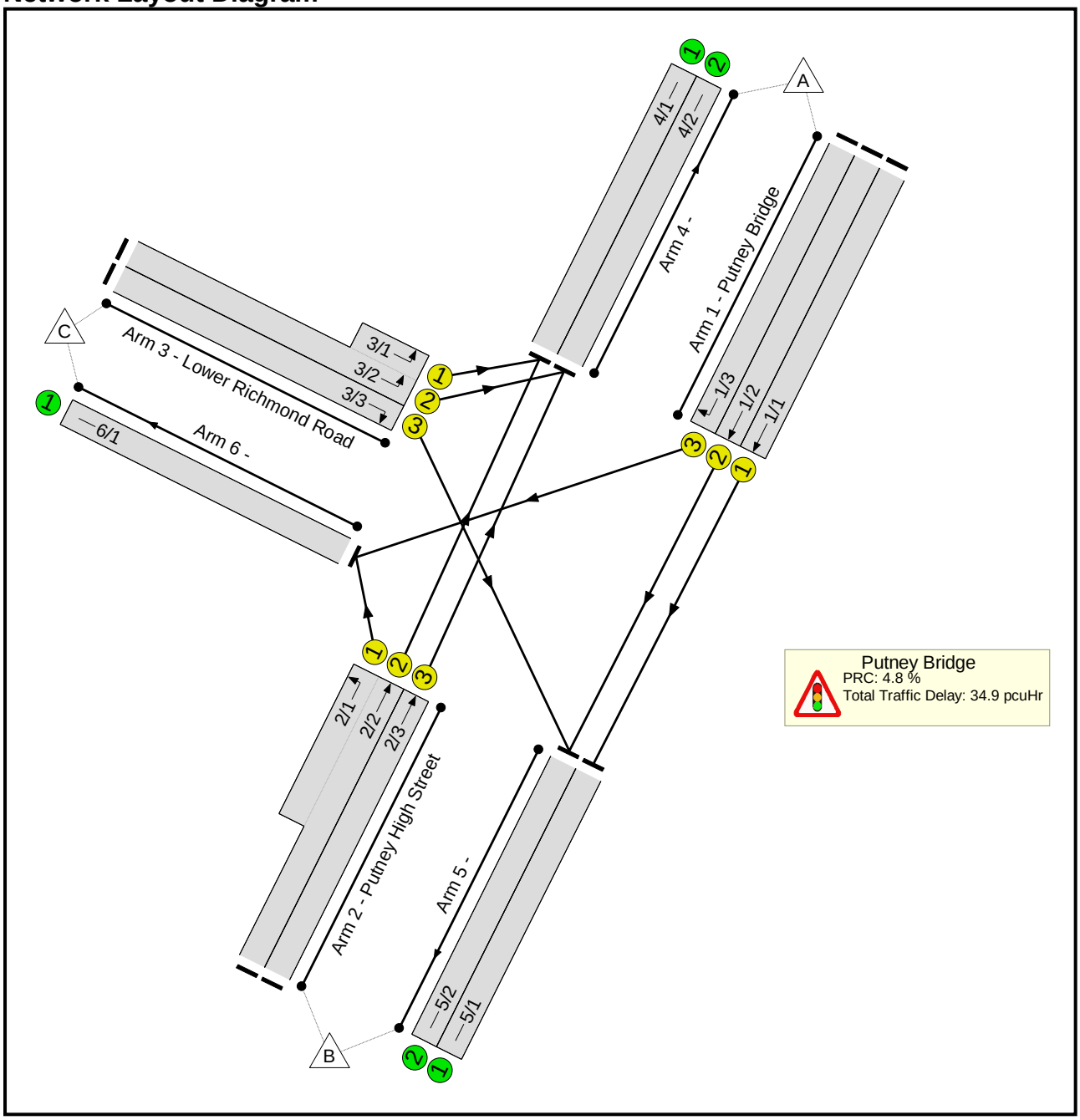
Appendix C – Local modelling outputs

This page is intentionally blank

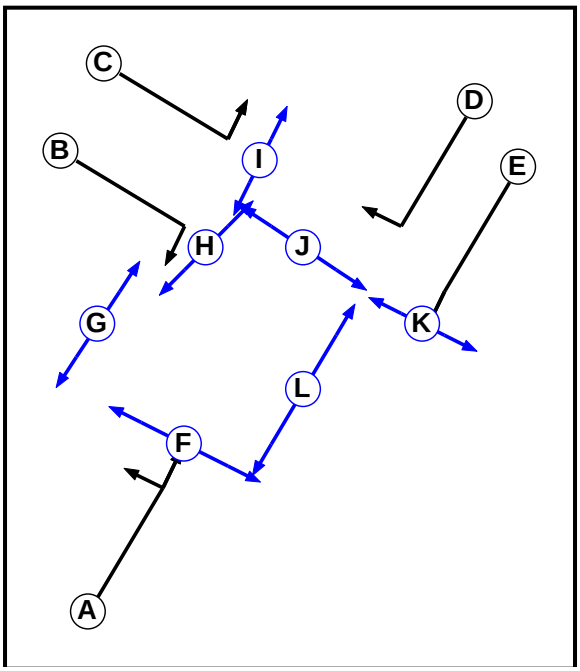
C.1 Baseline results, AM peak hour

Putney Bridge/Putney High Street/Lower Richmond Road Junction existing signalised layout

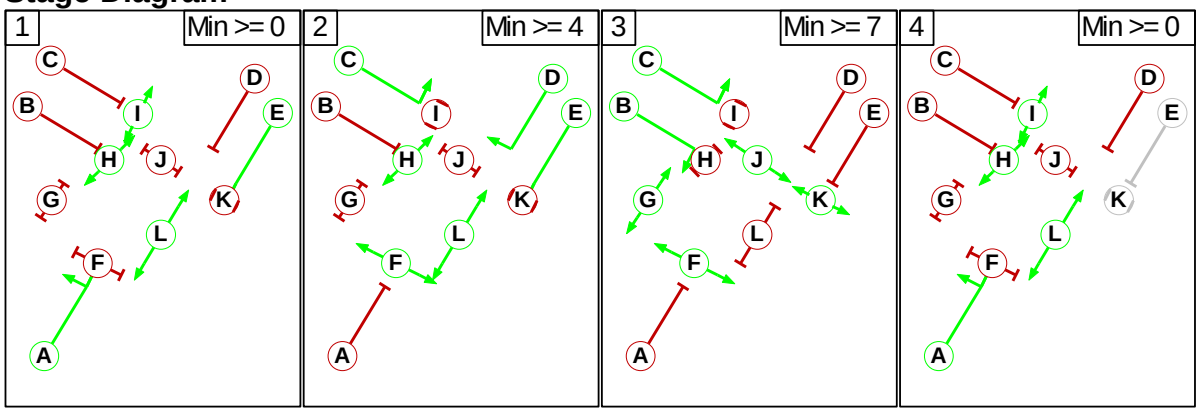
Network Layout Diagram



Phase Diagram



Stage Diagram



Phases in Stage

Stage No.	Phases in Stage
1	A E H I L
2	C D E F H L
3	B C F G J K
4	A H I L

Phase Intergreens Matrix

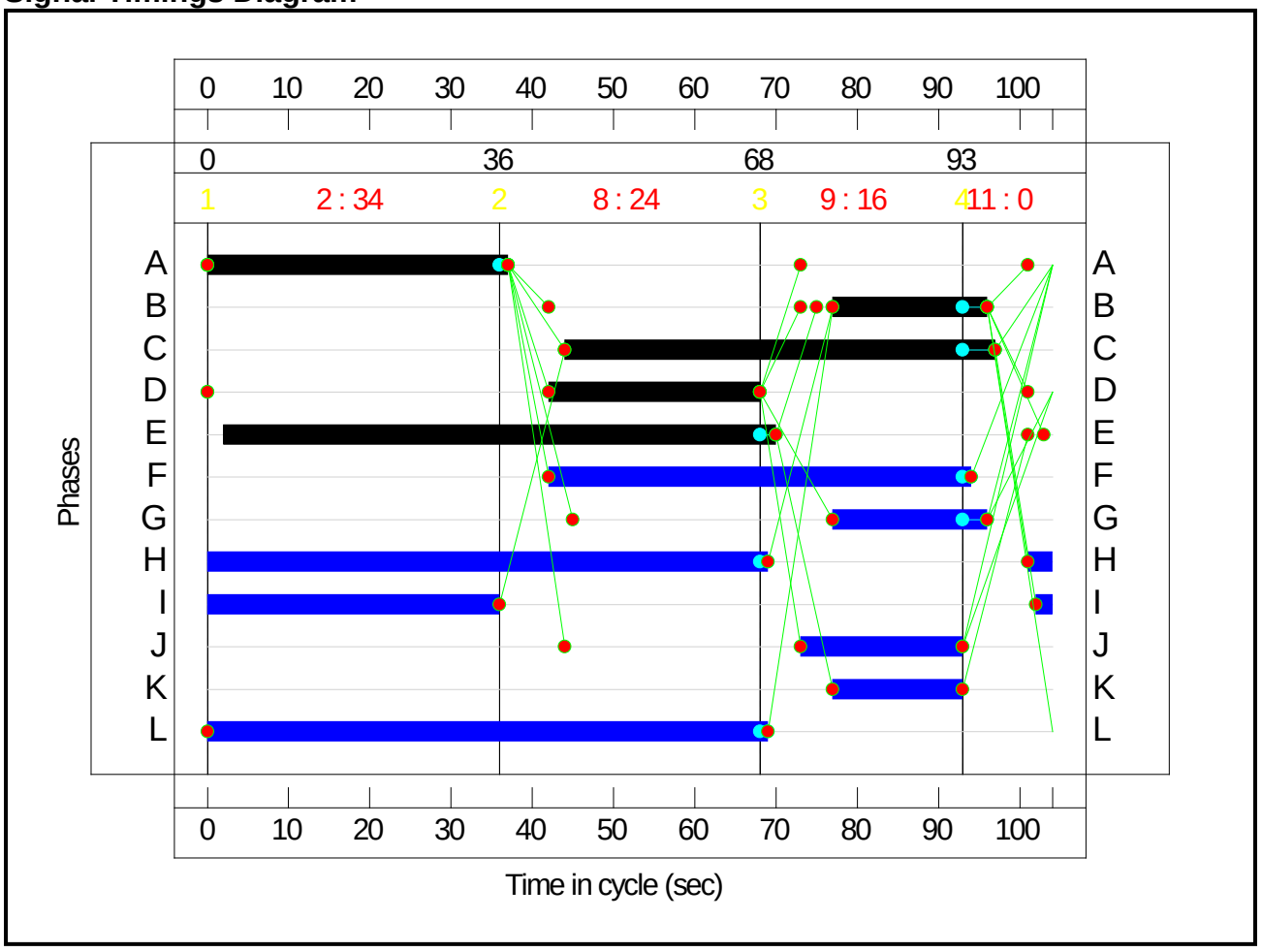
Terminating Phase \ Starting Phase	A	B	C	D	E	F	G	H	I	J	K	L
A		5	7	5	-	5	8	-	-	7	-	-
B	5		-	5	7	-	-	5	-	-	-	8
C	7	-		-	-	-	-	-	5	-	-	-
D	5	5	-		-	-	9	-	-	5	-	-
E	-	5	-	-		-	-	-	-	-	7	-
F	10	-	-	-	-		-	-	-	-	-	-
G	8	-	-	8	-	-		-	-	-	-	-
H	-	8	-	-	-	-	-		-	-	-	-
I	-	-	8	-	-	-	-	-		-	-	-
J	11	-	-	11	-	-	-	-	-		-	-
K	-	-	-	-	8	-	-	-	-	-		-
L	-	8	-	-	-	-	-	-	-	-	-	

Traffic Flows, Desired

Desired Flow :

Origin \ Destination	A	B	C	Tot.
A	0	822	321	1143
B	1047	0	266	1313
C	706	289	0	995
Tot.	1753	1111	587	3451

Signal Timings Diagram



Network Results

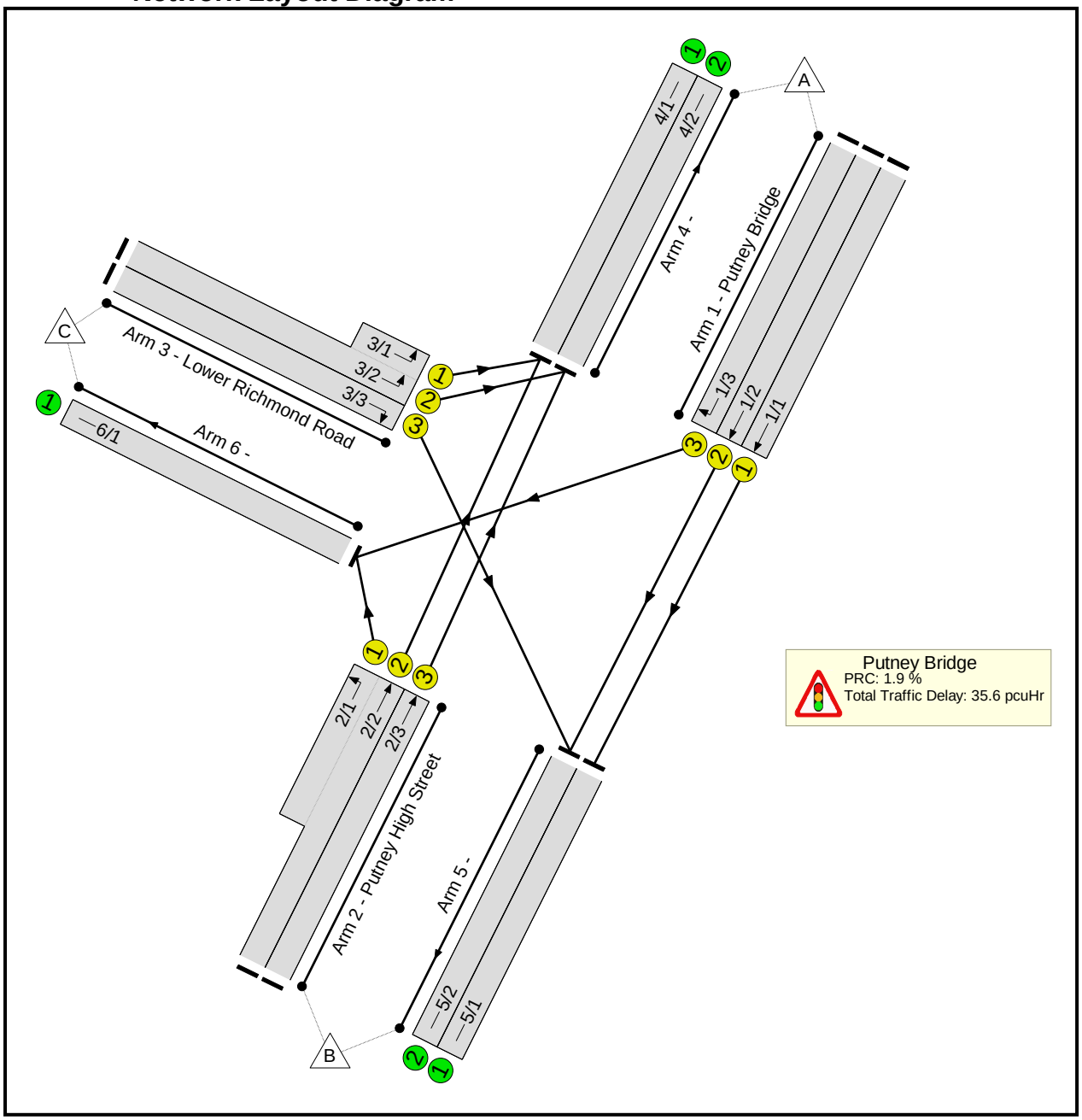
Item	Lane Description	Lane Type	Full Phase	Total Green (s)	Deg Sat (%)	Arriving (pcu)	Leaving (pcu)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
1/1	Putney Bridge Ahead	U	E	68	12.2%	158	158	8.0	1.7
1/2	Putney Bridge Ahead	U	E	68	74.1%	664	664	19.3	14.0
1/3	Putney Bridge Right	U	D	26	83.8%	321	321	63.4	11.1
2/2+2/1	Putney High Street Ahead Left	U	A	37	85.9%	734	734	41.7	16.5
2/3	Putney High Street Ahead	U	A	37	79.0%	579	579	40.9	16.6
3/2+3/1	Lower Richmond Road Left	U	C	53	68.8%	706	706	22.0	12.3
3/3	Lower Richmond Road Right	U	B	19	85.5%	289	289	73.7	10.7

C1 PRC for Signalled Lanes (%): 4.8 Total Delay for Signalled Lanes
PRC Over All Lanes (%): 4.8 Total Delay Over All Lanes

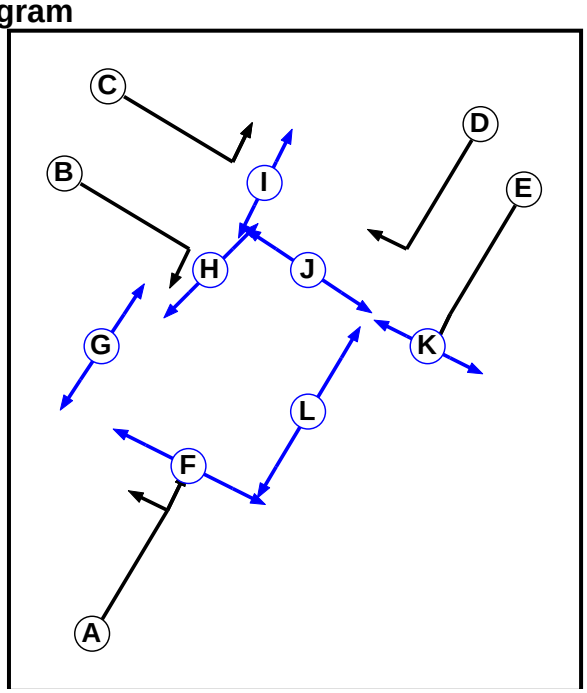
C.2 Baseline results, PM peak hour

Putney Bridge/Putney High Street/Lower Richmond Road Junction existing signalised layout

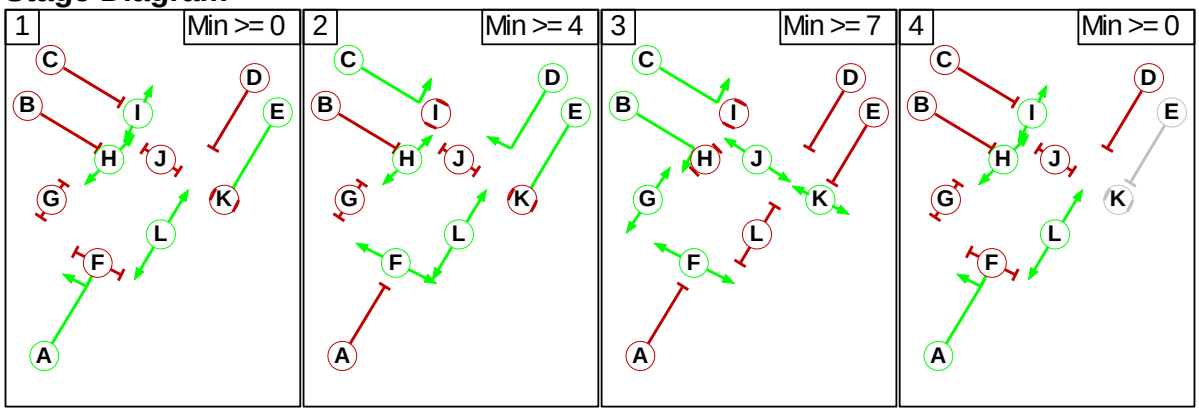
Network Layout Diagram



Phase Diagram



Stage Diagram



Phases in Stage

Stage No.	Phases in Stage
1	A E H I L
2	C D E F H L
3	B C F G J K
4	A H I L

Phase Intergreens Matrix

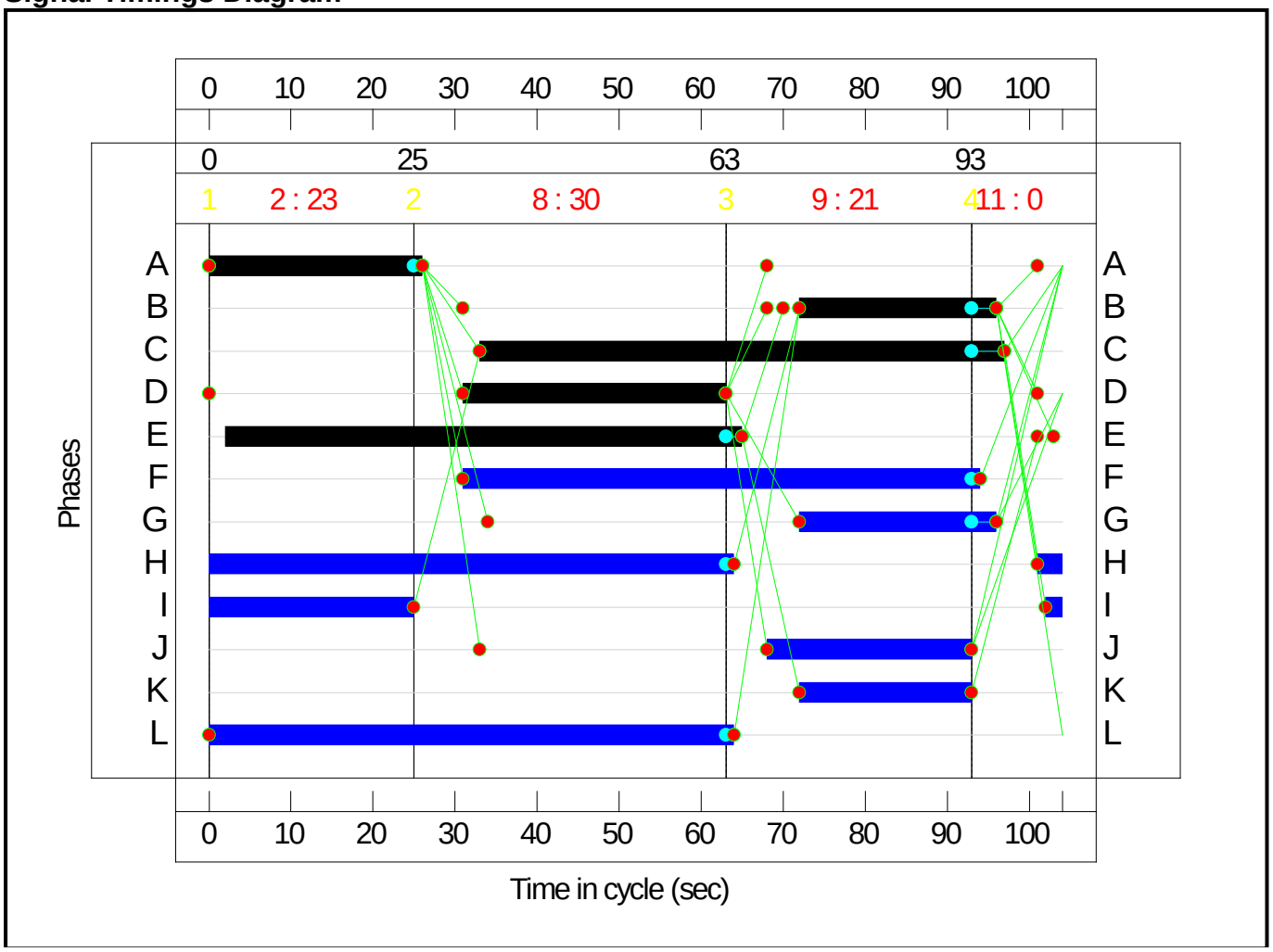
Terminating Phase \ Starting Phase	A	B	C	D	E	F	G	H	I	J	K	L
A		5	7	5	-	5	8	-	-	7	-	-
B	5		-	5	7	-	-	5	-	-	-	8
C	7	-		-	-	-	-	-	5	-	-	-
D	5	5	-		-	-	9	-	-	5	-	-
E	-	5	-	-		-	-	-	-	-	7	-
F	10	-	-	-	-		-	-	-	-	-	-
G	8	-	-	8	-	-		-	-	-	-	-
H	-	8	-	-	-	-	-		-	-	-	-
I	-	-	8	-	-	-	-	-		-	-	-
J	11	-	-	11	-	-	-	-	-		-	-
K	-	-	-	-	8	-	-	-	-	-		-
L	-	8	-	-	-	-	-	-	-	-	-	

Traffic Flows, Desired

Desired Flow :

Origin \ Destination	A	B	C	Tot.
A	0	869	403	1272
B	781	0	302	1083
C	339	359	0	698
Tot.	1120	1228	705	3053

Signal Timings Diagram



Network Results

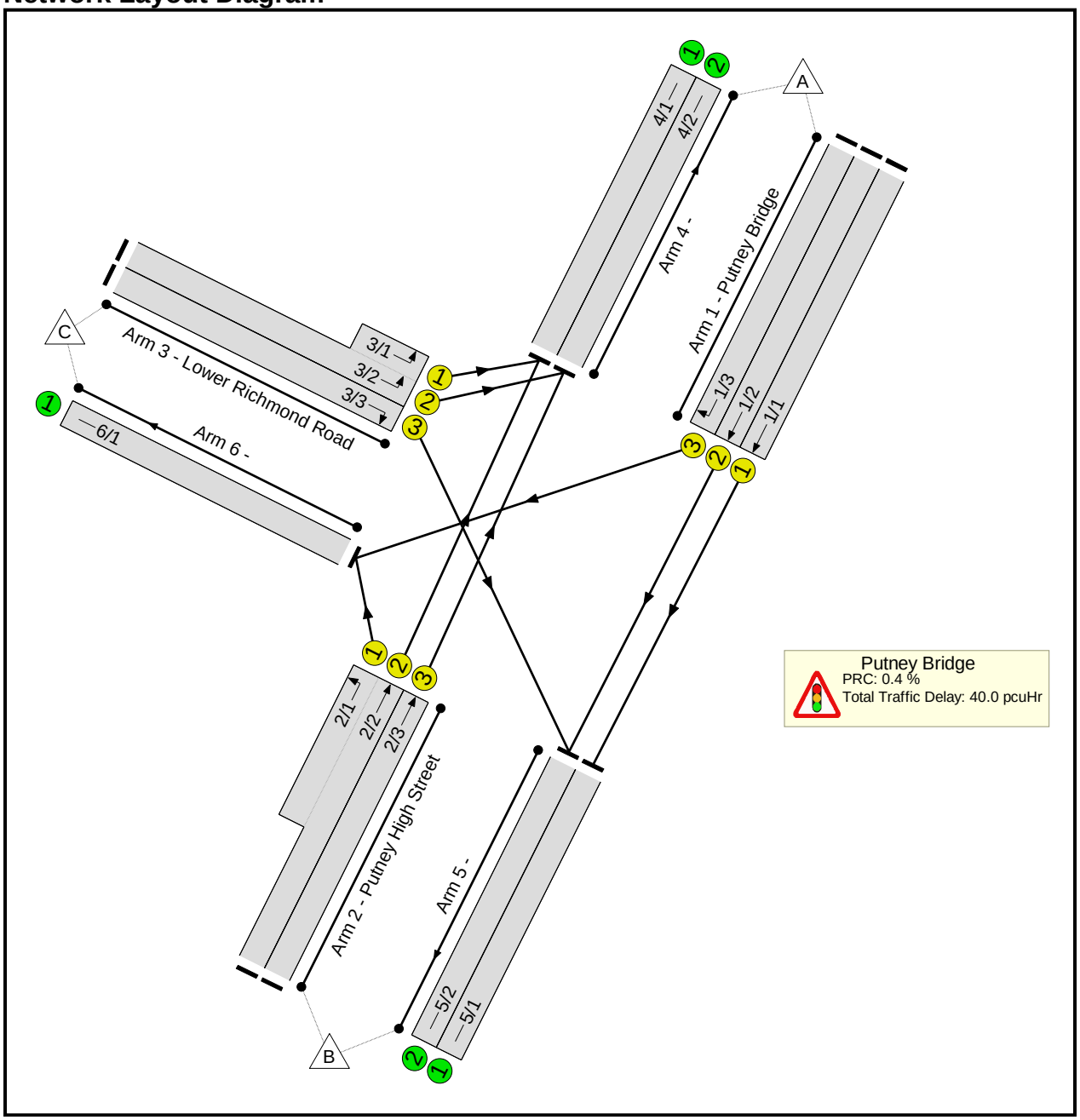
Item	Lane Description	Lane Type	Full Phase	Total Green (s)	Deg Sat (%)	Arriving (pcu)	Leaving (pcu)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
1/1	Putney Bridge Ahead	U	E	63	16.5%	197	197	10.4	2.5
1/2	Putney Bridge Ahead	U	E	63	80.9%	672	672	26.4	16.8
1/3	Putney Bridge Right	U	D	32	86.1%	403	403	58.8	13.7
2/2+2/1	Putney High Street Ahead Left	U	A	26	88.3%	660	660	54.0	13.6
2/3	Putney High Street Ahead	U	A	26	81.3%	423	423	53.8	13.5
3/2+3/1	Lower Richmond Road Left	U	C	64	27.4%	339	339	10.1	2.3
3/3	Lower Richmond Road Right	U	B	24	85.0%	359	359	63.9	12.5

C1 PRC for Signalled Lanes (%): 1.9 Total Delay for Signalled Lanes
PRC Over All Lanes (%): 1.9 Total Delay Over All Lanes

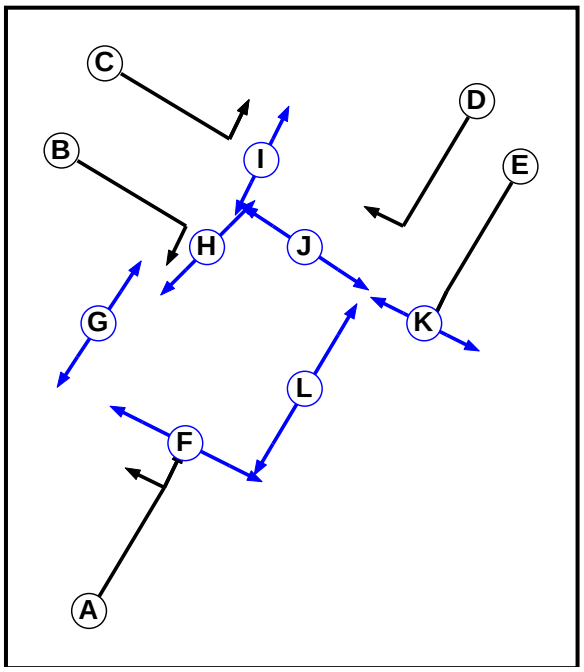
C.3 Construction base case results, AM peak hour

Putney Bridge/Putney High Street/Lower Richmond Road Junction existing signalised layout

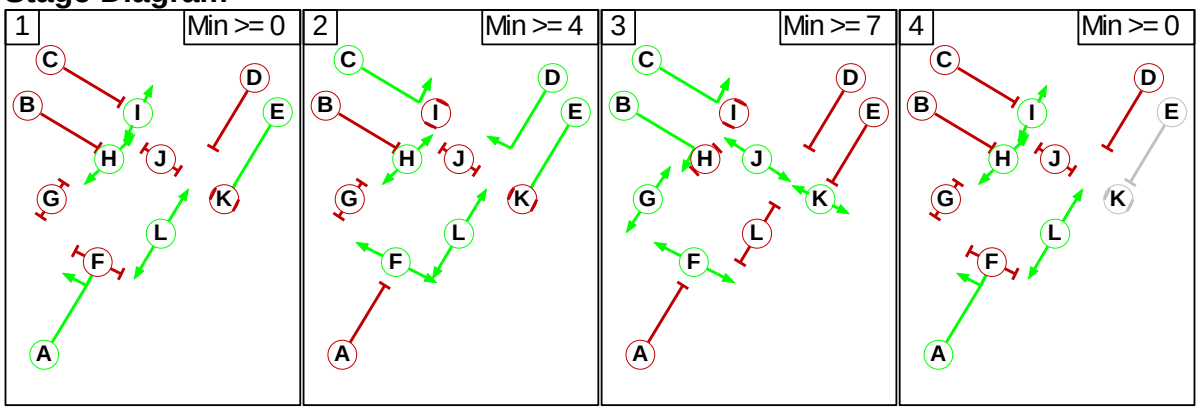
Network Layout Diagram



Phase Diagram



Stage Diagram



Phases in Stage

Stage No.	Phases in Stage
1	A E H I L
2	C D E F H L
3	B C F G J K
4	A H I L

Phase Intergreens Matrix

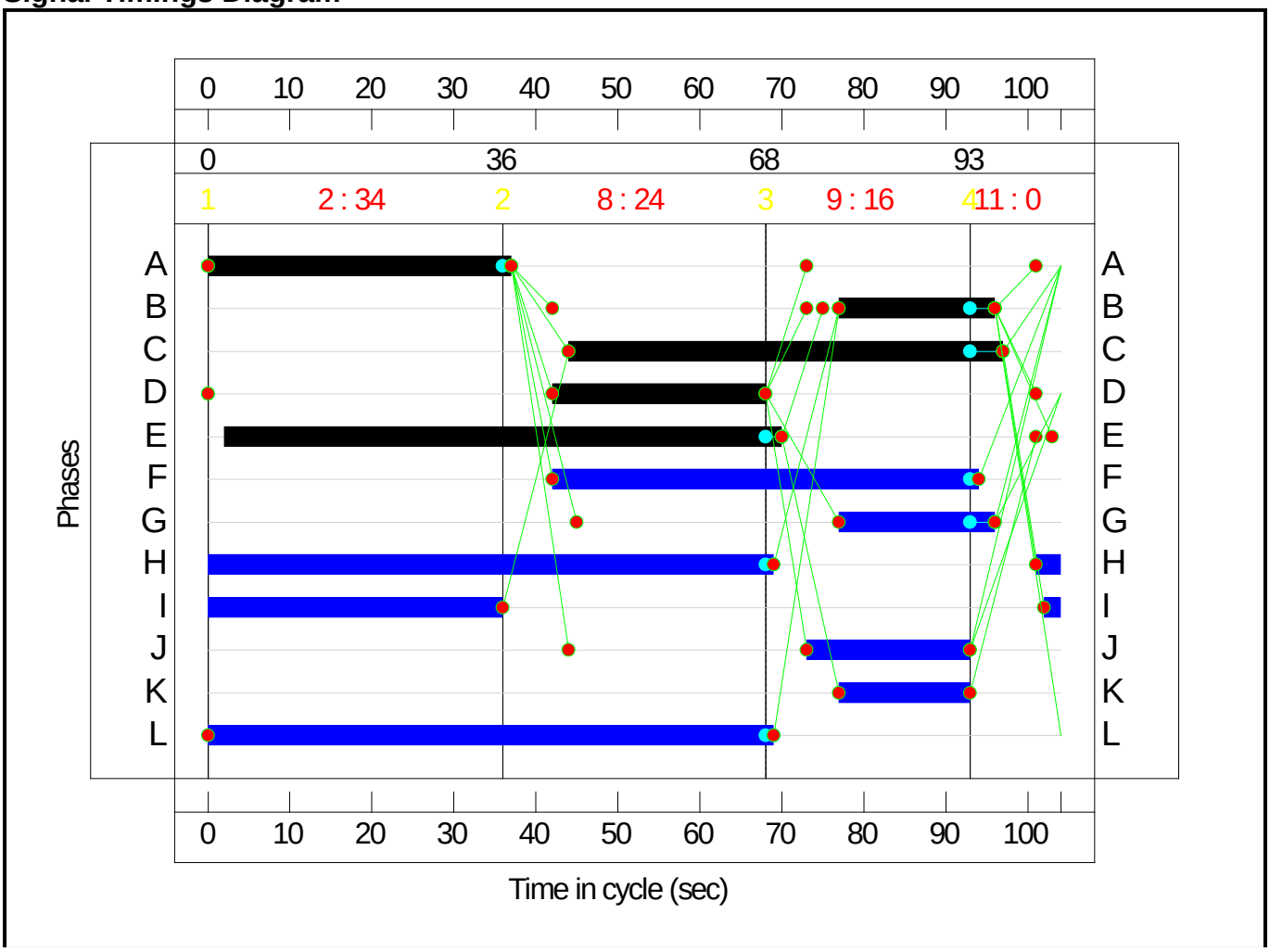
Terminating Phase \ Starting Phase	A	B	C	D	E	F	G	H	I	J	K	L
A		5	7	5	-	5	8	-	-	7	-	-
B	5		-	5	7	-	-	5	-	-	-	8
C	7	-		-	-	-	-	-	5	-	-	-
D	5	5	-		-	-	9	-	-	5	-	-
E	-	5	-	-		-	-	-	-	-	7	-
F	10	-	-	-	-		-	-	-	-	-	-
G	8	-	-	8	-	-		-	-	-	-	-
H	-	8	-	-	-	-	-		-	-	-	-
I	-	-	8	-	-	-	-	-		-	-	-
J	11	-	-	11	-	-	-	-	-		-	-
K	-	-	-	-	8	-	-	-	-	-		-
L	-	8	-	-	-	-	-	-	-	-	-	

Traffic Flows, Desired

Desired Flow :

Origin \ Destination	A	B	C	Tot.
A	0	860	336	1196
B	1096	0	279	1375
C	739	303	0	1042
Tot.	1835	1163	615	3613

Signal Timings Diagram



Network Results

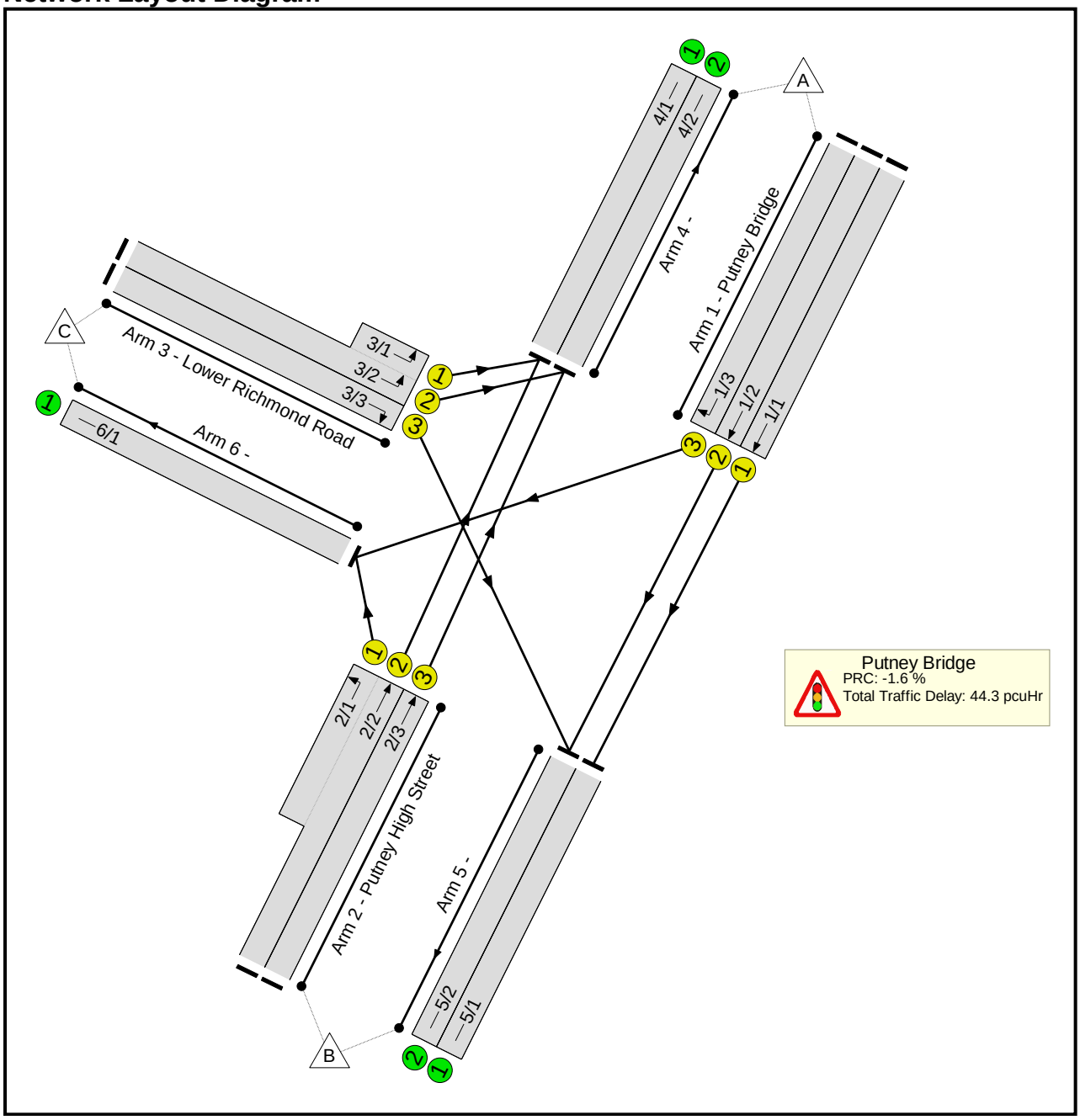
Item	Lane Description	Lane Type	Full Phase	Total Green (s)	Deg Sat (%)	Arriving (pcu)	Leaving (pcu)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
1/1	Putney Bridge Ahead	U	E	68	12.2%	158	158	8.0	1.7
1/2	Putney Bridge Ahead	U	E	68	78.4%	702	702	21.4	15.8
1/3	Putney Bridge Right	U	D	26	87.7%	336	336	70.7	12.4
2/2+2/1	Putney High Street Ahead Left	U	A	37	88.2%	758	758	44.5	18.1
2/3	Putney High Street Ahead	U	A	37	84.2%	617	617	45.2	18.8
3/2+3/1	Lower Richmond Road Left	U	C	53	71.7%	739	739	22.8	13.4
3/3	Lower Richmond Road Right	U	B	19	89.6%	303	303	83.6	12.1

C1 PRC for Signalled Lanes (%): 0.4 Total Delay for Signalled Lanes
PRC Over All Lanes (%): 0.4 Total Delay Over All Lanes

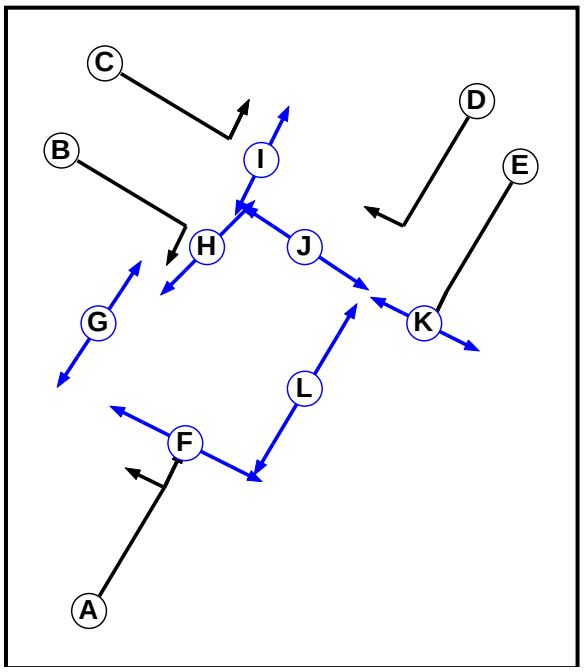
C.4 Construction base case results, PM peak hour

Putney Bridge/Putney High Street/Lower Richmond Road Junction existing signalised layout

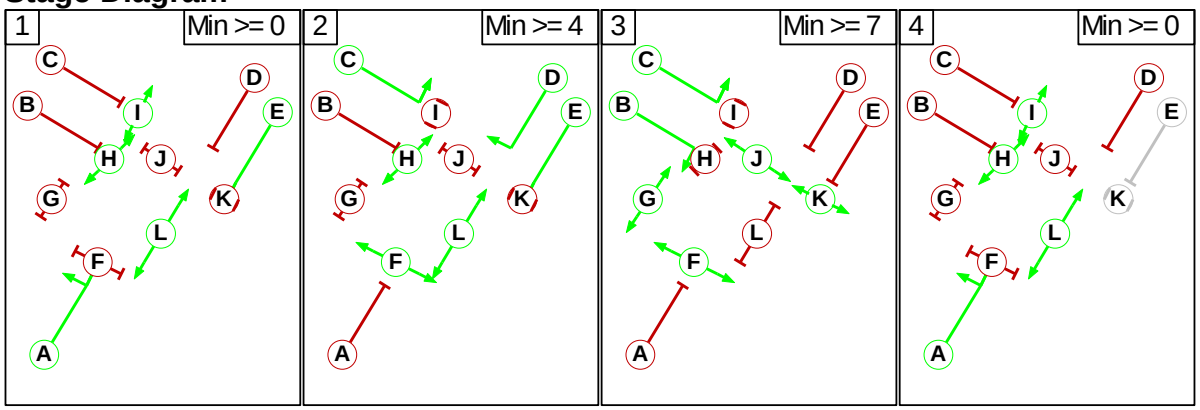
Network Layout Diagram



Phase Diagram



Stage Diagram



Phases in Stage

Stage No.	Phases in Stage
1	A E H I L
2	C D E F H L
3	B C F G J K
4	A H I L

Phase Intergreens Matrix

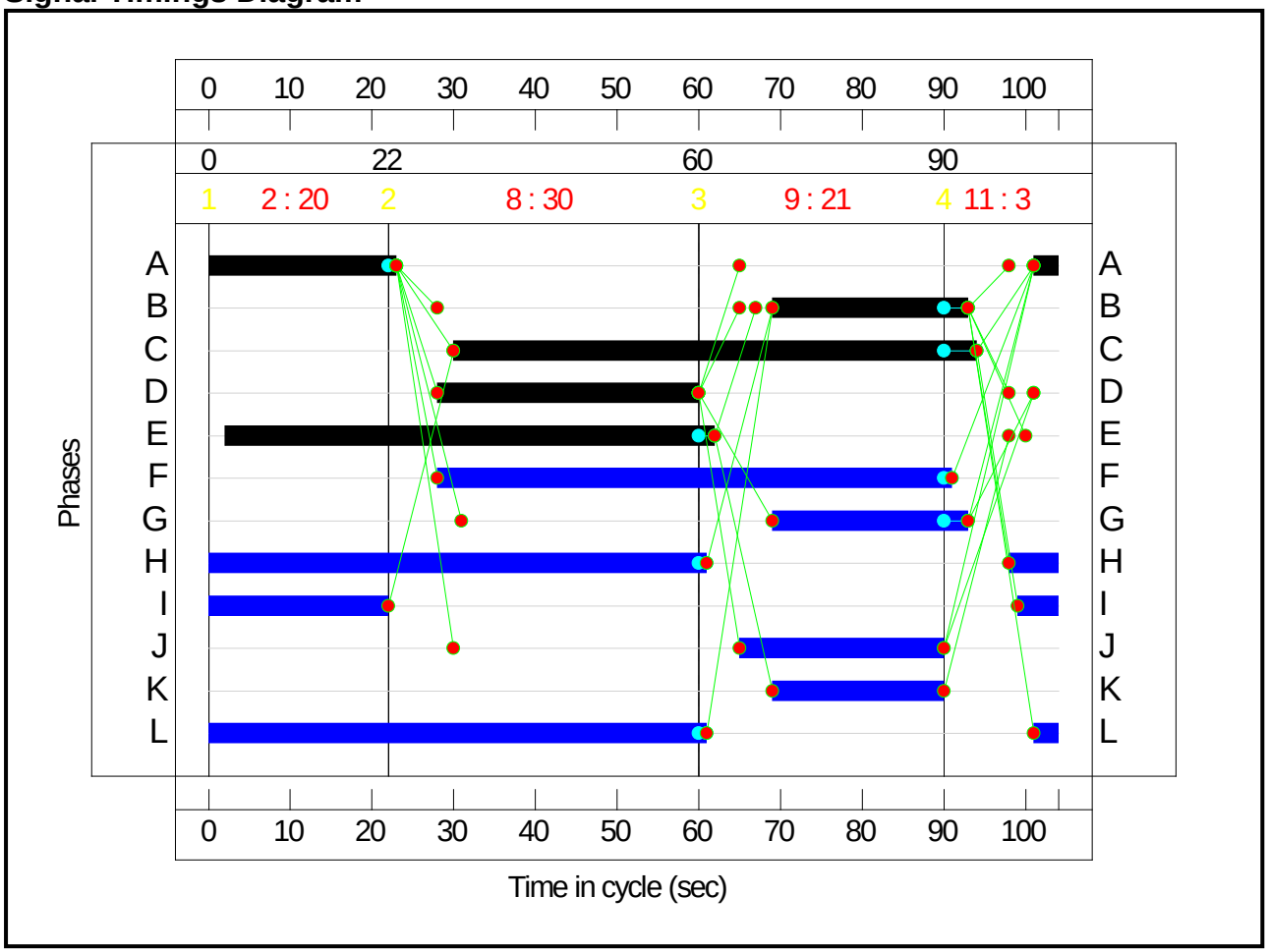
Terminating Phase \ Starting Phase	A	B	C	D	E	F	G	H	I	J	K	L
A		5	7	5	-	5	8	-	-	7	-	-
B	5		-	5	7	-	-	5	-	-	-	8
C	7	-		-	-	-	-	-	5	-	-	-
D	5	5	-		-	-	9	-	-	5	-	-
E	-	5	-	-		-	-	-	-	-	7	-
F	10	-	-	-	-		-	-	-	-	-	-
G	8	-	-	8	-	-		-	-	-	-	-
H	-	8	-	-	-	-	-		-	-	-	-
I	-	-	8	-	-	-	-	-		-	-	-
J	11	-	-	11	-	-	-	-	-		-	-
K	-	-	-	-	8	-	-	-	-	-		-
L	-	8	-	-	-	-	-	-	-	-	-	

Traffic Flows, Desired

Desired Flow :

Origin \ Destination	A	B	C	Tot.
A	0	913	424	1337
B	820	0	317	1137
C	356	377	0	733
Tot.	1176	1290	741	3207

Signal Timings Diagram



Network Results

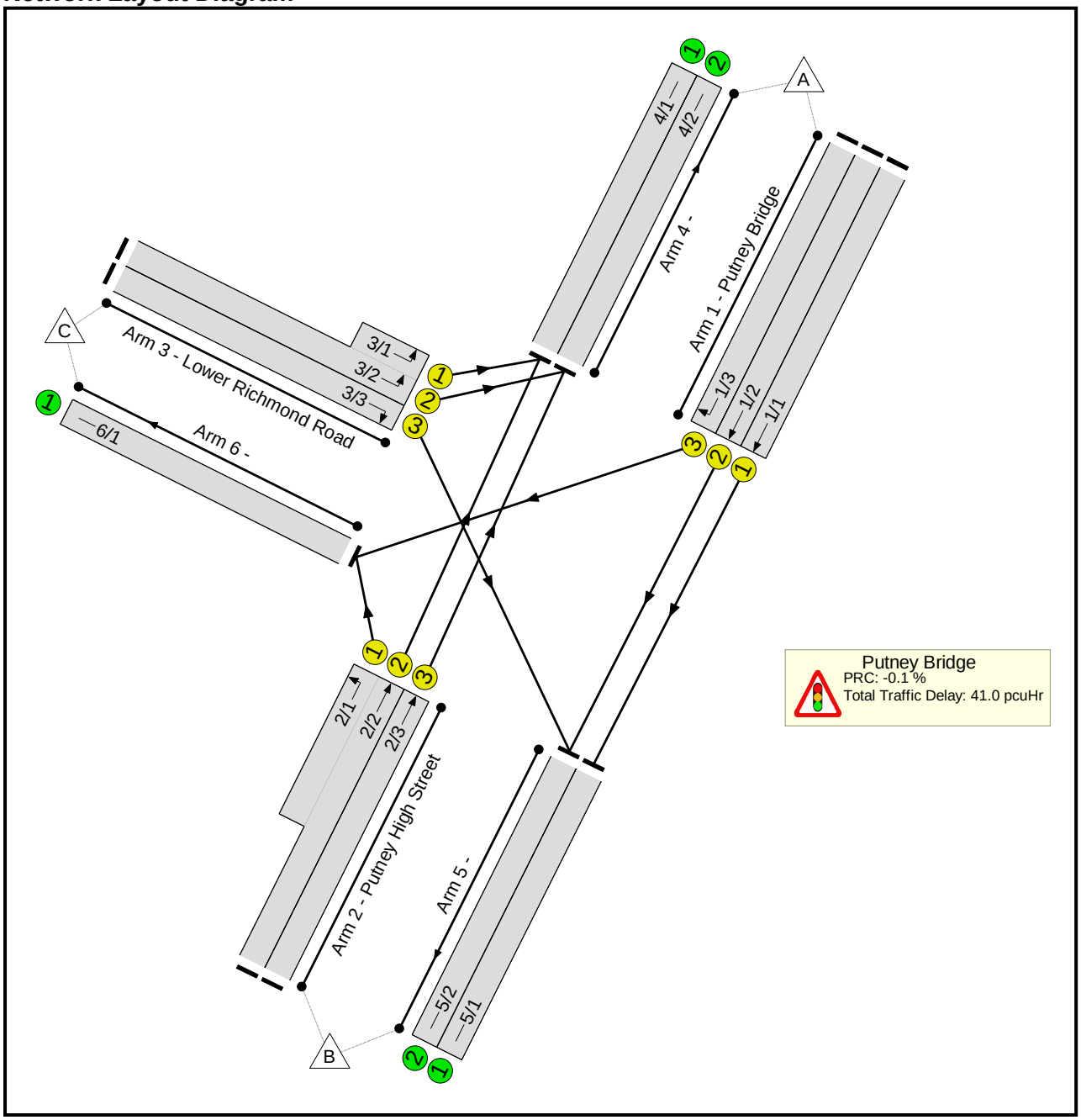
Item	Lane Description	Lane Type	Full Phase	Total Green (s)	Deg Sat (%)	Arriving (pcu)	Leaving (pcu)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
1/1	Putney Bridge Ahead	U	E	60	17.3%	197	197	11.8	2.7
1/2	Putney Bridge Ahead	U	E	60	90.4%	716	716	40.3	22.3
1/3	Putney Bridge Right	U	D	32	90.6%	424	424	68.5	15.7
2/2+2/1	Putney High Street Ahead Left	U	A	26	91.4%	687	687	59.8	15.6
2/3	Putney High Street Ahead	U	A	26	86.5%	450	450	60.3	15.3
3/2+3/1	Lower Richmond Road Left	U	C	64	28.8%	356	356	10.2	2.4
3/3	Lower Richmond Road Right	U	B	24	89.2%	377	377	72.3	14.0

C1 PRC for Signalled Lanes (%): -1.6 Total Delay for Signalled Lanes
PRC Over All Lanes (%): -1.6 Total Delay Over All Lanes

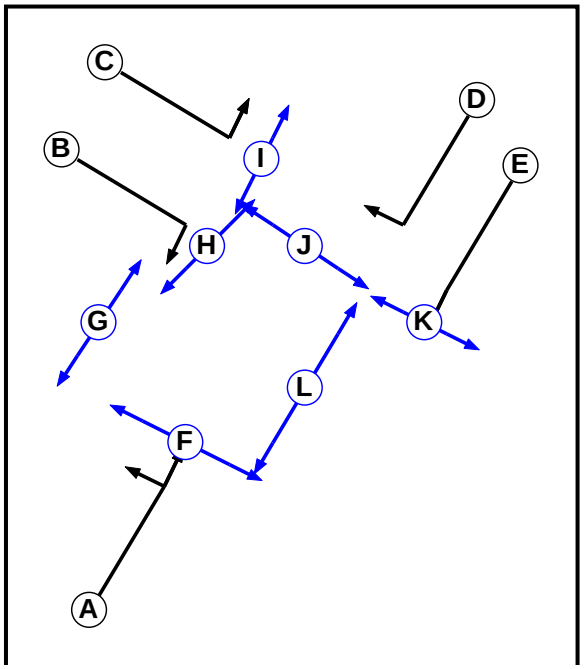
C.5 Construction development case results, AM peak hour

Putney Bridge/Putney High Street/Lower Richmond Road Junction existing signalised layout

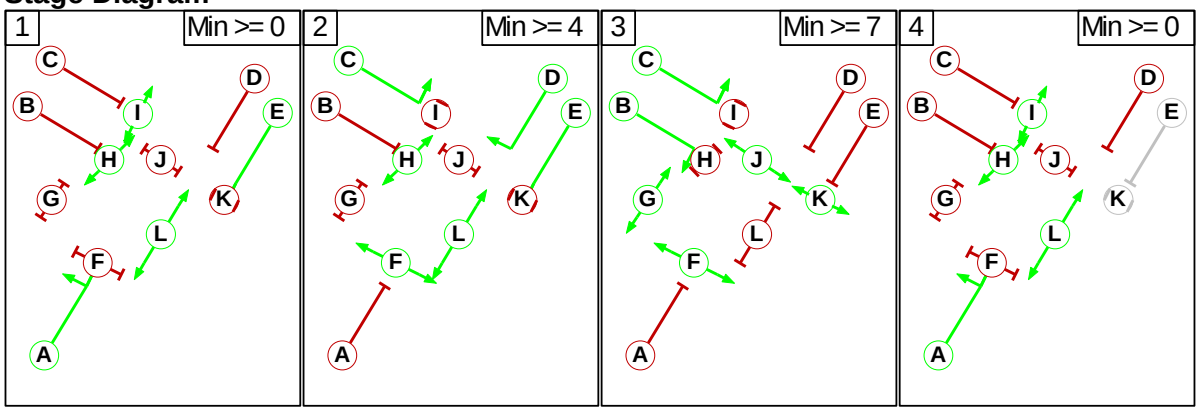
Network Layout Diagram



Phase Diagram



Stage Diagram



Phases in Stage

Stage No.	Phases in Stage
1	A E H I L
2	C D E F H L
3	B C F G J K
4	A H I L

Phase Intergreens Matrix

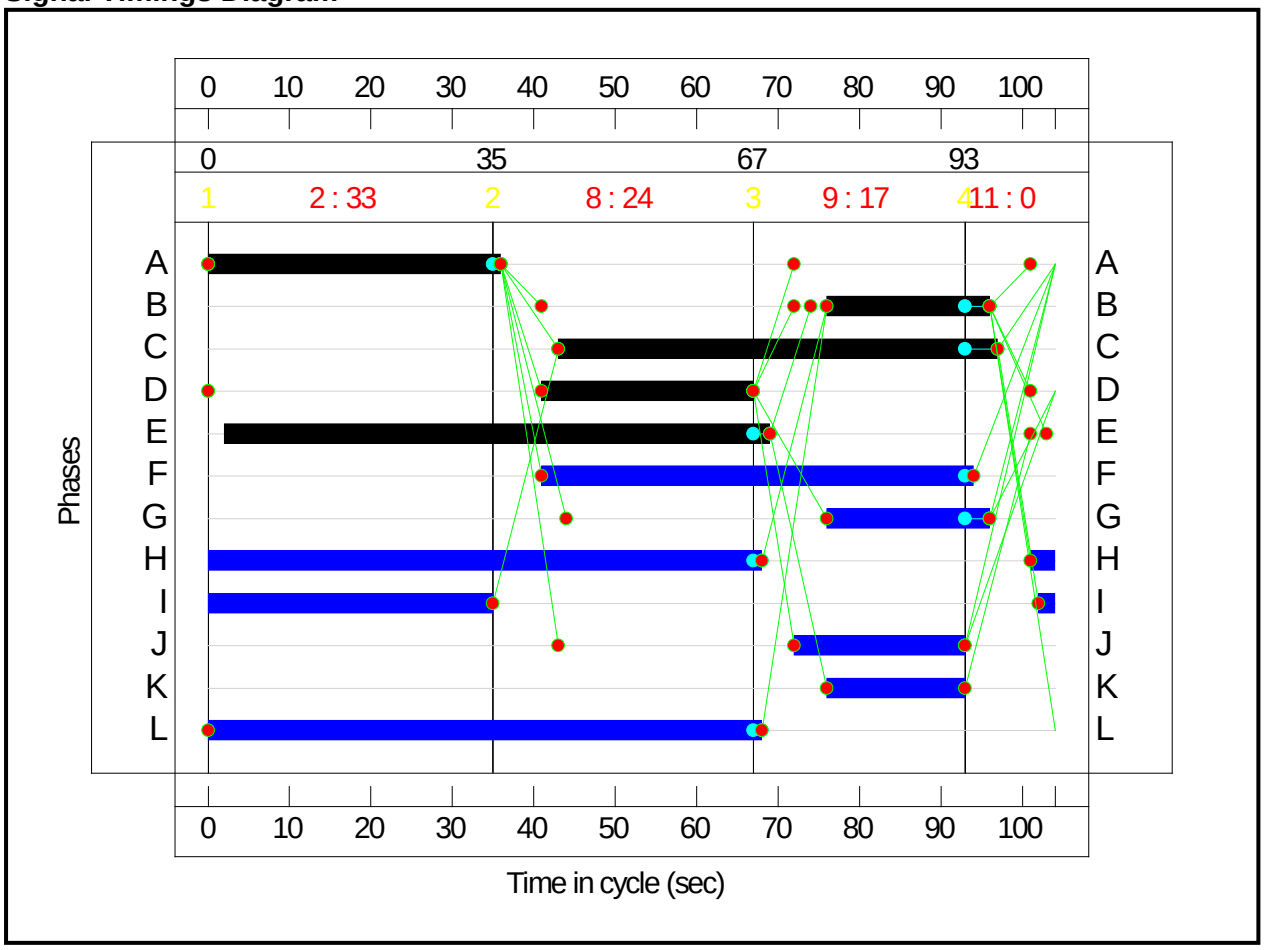
		Starting Phase											
		A	B	C	D	E	F	G	H	I	J	K	L
Terminating Phase	A		5	7	5	-	5	8	-	-	7	-	-
	B	5		-	5	7	-	-	5	-	-	-	8
	C	7	-		-	-	-	-	-	5	-	-	-
	D	5	5	-		-	-	9	-	-	5	-	-
	E	-	5	-	-		-	-	-	-	-	7	-
	F	10	-	-	-	-		-	-	-	-	-	-
	G	8	-	-	8	-	-		-	-	-	-	-
	H	-	8	-	-	-	-	-		-	-	-	-
	I	-	-	8	-	-	-	-	-		-	-	-
	J	11	-	-	11	-	-	-	-	-		-	-
	K	-	-	-	-	8	-	-	-	-	-		-
	L	-	8	-	-	-	-	-	-	-	-	-	

Traffic Flows, Desired

Desired Flow :

		Destination			
		A	B	C	Tot.
Origin	A	0	860	337	1197
	B	1096	0	285	1381
	C	739	309	0	1048
	Tot.	1835	1169	622	3626

Signal Timings Diagram



Network Results

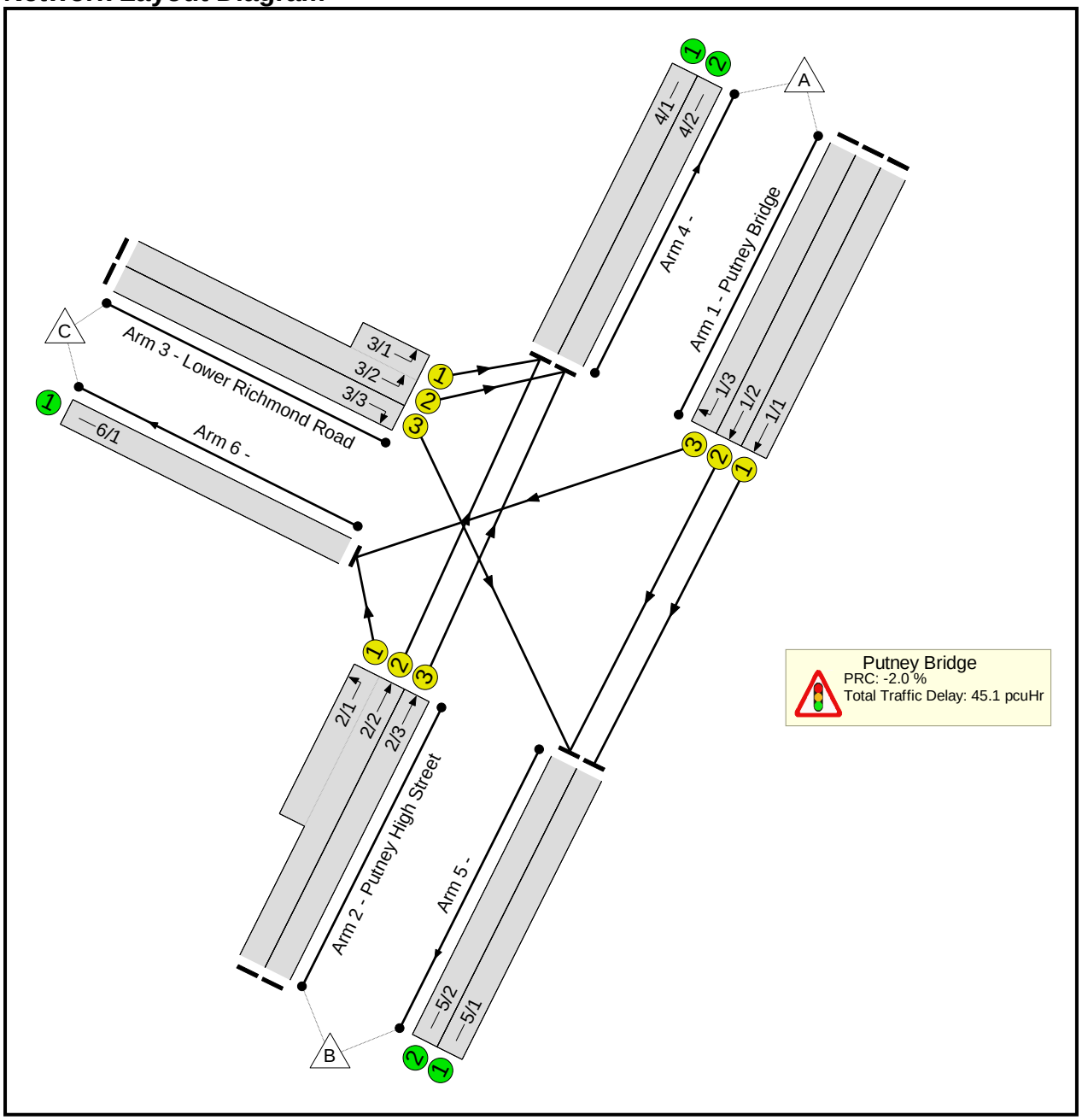
Item	Lane Description	Lane Type	Full Phase	Total Green (s)	Deg Sat (%)	Arriving (pcu)	Leaving (pcu)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
1/1	Putney Bridge Ahead	U	E	67	12.4%	158	158	8.4	1.8
1/2	Putney Bridge Ahead	U	E	67	79.5%	702	702	22.7	16.3
1/3	Putney Bridge Right	U	D	26	88.0%	337	337	71.3	12.5
2/2+2/1	Putney High Street Ahead Left	U	A	36	90.1%	762	762	48.2	18.9
2/3	Putney High Street Ahead	U	A	36	86.8%	619	619	49.1	19.6
3/2+3/1	Lower Richmond Road Left	U	C	54	70.5%	739	739	21.7	12.9
3/3	Lower Richmond Road Right	U	B	20	87.0%	309	309	74.8	11.6

C1 PRC for Signalled Lanes (%): -0.1 Total Delay for Signalled Lanes
PRC Over All Lanes (%): -0.1 Total Delay Over All Lanes

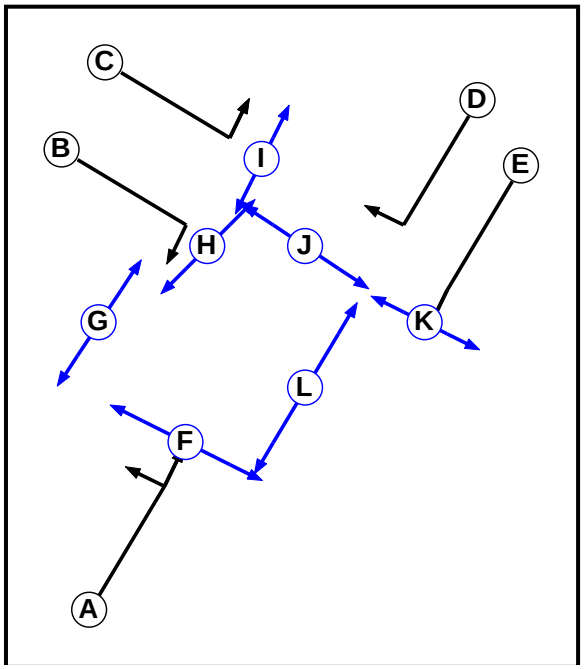
C.6 Construction development case results, PM peak hour

Putney Bridge/Putney High Street/Lower Richmond Road Junction existing signalised layout

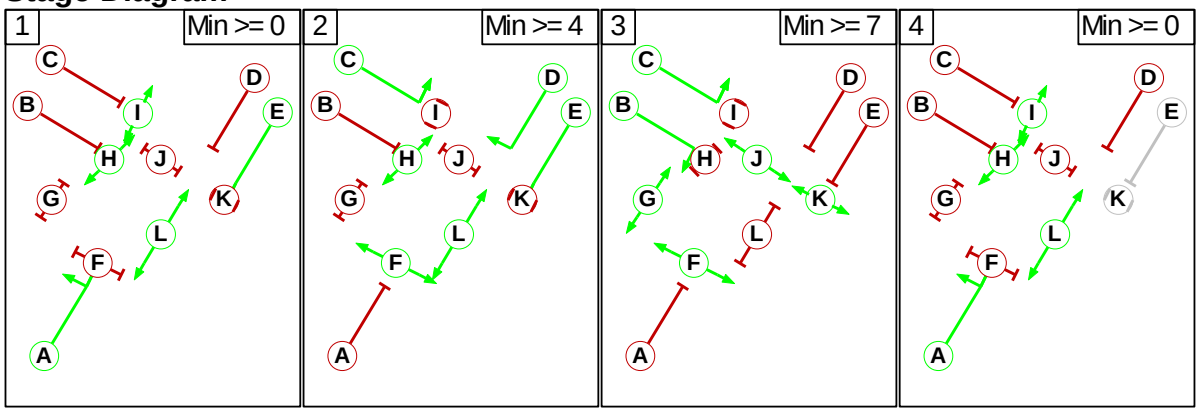
Network Layout Diagram



Phase Diagram



Stage Diagram



Phases in Stage

Stage No.	Phases in Stage
1	A E H I L
2	C D E F H L
3	B C F G J K
4	A H I L

Phase Intergreens Matrix

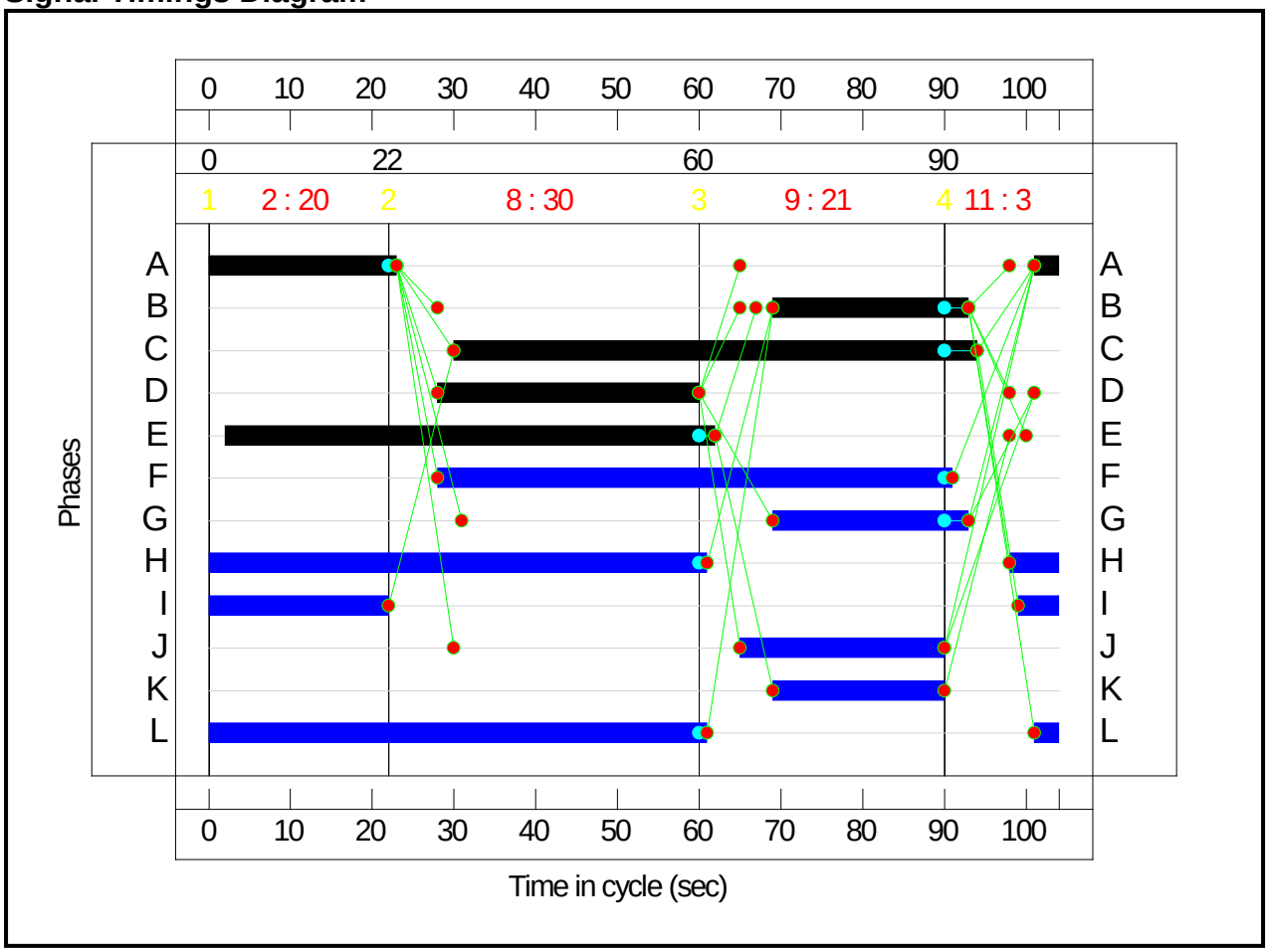
Terminating Phase \ Starting Phase	A	B	C	D	E	F	G	H	I	J	K	L
A		5	7	5	-	5	8	-	-	7	-	-
B	5		-	5	7	-	-	5	-	-	-	8
C	7	-		-	-	-	-	-	5	-	-	-
D	5	5	-		-	-	9	-	-	5	-	-
E	-	5	-	-		-	-	-	-	-	7	-
F	10	-	-	-	-		-	-	-	-	-	-
G	8	-	-	8	-	-		-	-	-	-	-
H	-	8	-	-	-	-	-		-	-	-	-
I	-	-	8	-	-	-	-	-		-	-	-
J	11	-	-	11	-	-	-	-	-		-	-
K	-	-	-	-	8	-	-	-	-	-		-
L	-	8	-	-	-	-	-	-	-	-	-	

Traffic Flows, Desired

Desired Flow :

Origin \ Destination	A	B	C	Tot.
A	0	913	424	1337
B	820	0	323	1143
C	356	384	0	740
Tot.	1176	1297	747	3220

Signal Timings Diagram



Network Results

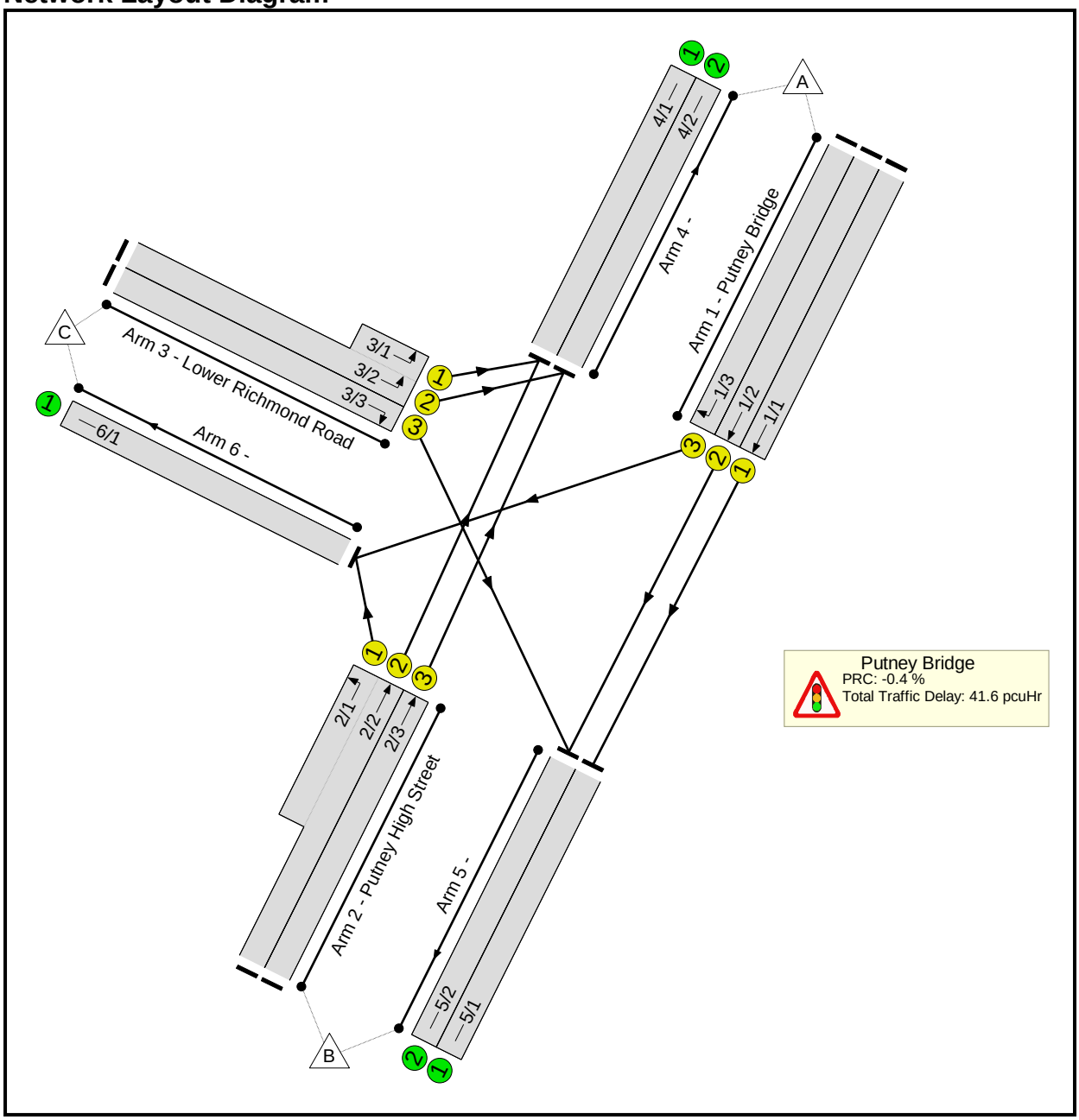
Item	Lane Description	Lane Type	Full Phase	Total Green (s)	Deg Sat (%)	Arriving (pcu)	Leaving (pcu)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
1/1	Putney Bridge Ahead	U	E	60	17.3%	197	197	11.8	2.7
1/2	Putney Bridge Ahead	U	E	60	90.4%	716	716	40.3	22.3
1/3	Putney Bridge Right	U	D	32	90.6%	424	424	68.5	15.7
2/2+2/1	Putney High Street Ahead Left	U	A	26	91.8%	694	694	60.7	16.0
2/3	Putney High Street Ahead	U	A	26	86.3%	449	449	60.0	15.3
3/2+3/1	Lower Richmond Road Left	U	C	64	28.8%	356	356	10.2	2.4
3/3	Lower Richmond Road Right	U	B	24	90.9%	384	384	76.9	14.9

C1 PRC for Signalled Lanes (%): -2.0 Total Delay for Signalled Lanes
PRC Over All Lanes (%): -2.0 Total Delay Over All Lanes

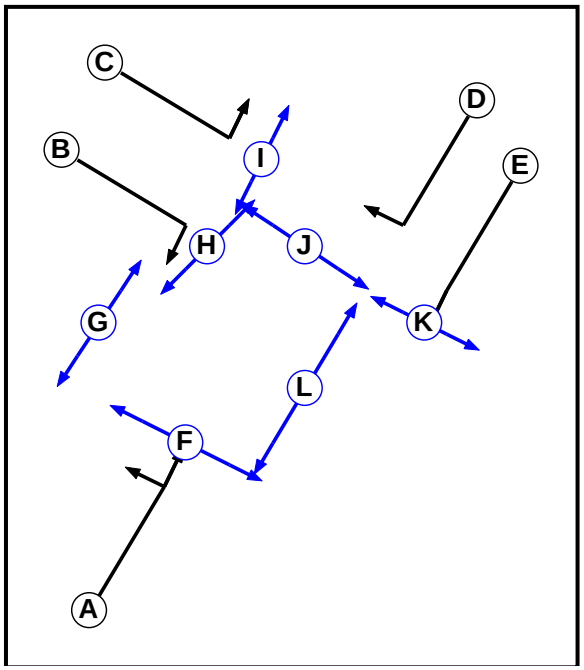
C.7 Construction development case results, 'all by road' sensitivity test, AM peak hour

Putney Bridge/Putney High Street/Lower Richmond Road Junction existing signalised layout

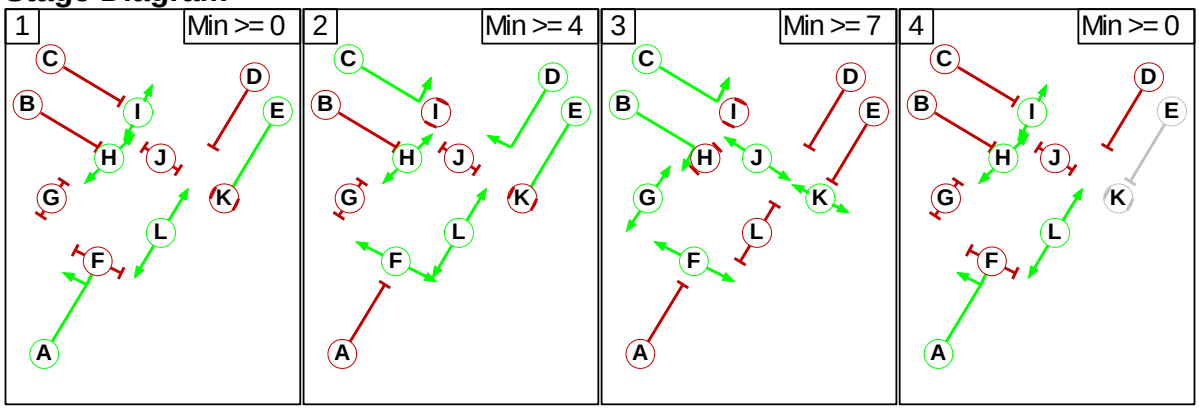
Network Layout Diagram



Phase Diagram



Stage Diagram



Phases in Stage

Stage No.	Phases in Stage
1	A E H I L
2	C D E F H L
3	B C F G J K
4	A H I L

Phase Intergreens Matrix

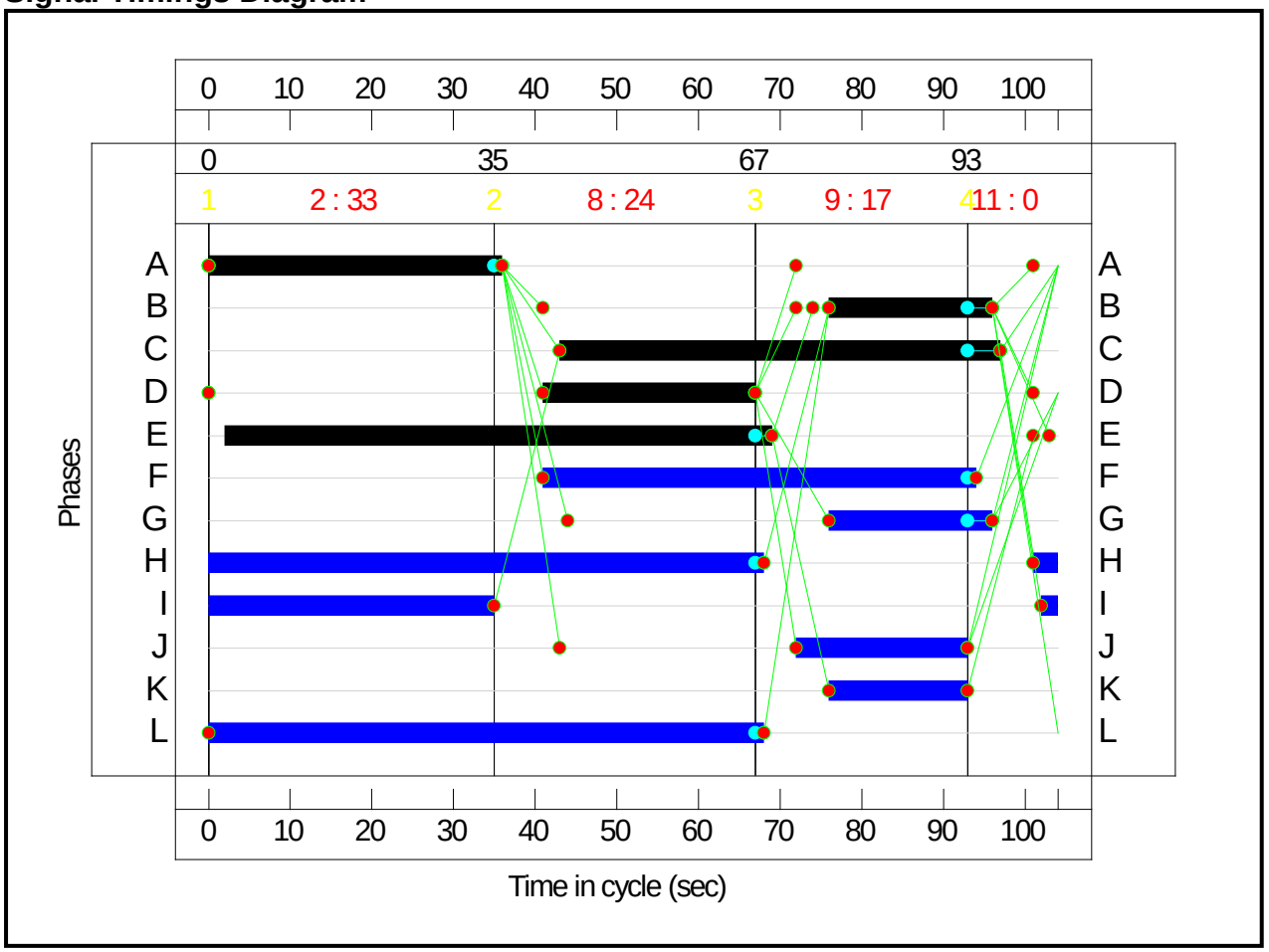
Terminating Phase \ Starting Phase	A	B	C	D	E	F	G	H	I	J	K	L
A		5	7	5	-	5	8	-	-	7	-	-
B	5		-	5	7	-	-	5	-	-	-	8
C	7	-		-	-	-	-	-	5	-	-	-
D	5	5	-		-	-	9	-	-	5	-	-
E	-	5	-	-		-	-	-	-	-	7	-
F	10	-	-	-	-		-	-	-	-	-	-
G	8	-	-	8	-	-		-	-	-	-	-
H	-	8	-	-	-	-	-		-	-	-	-
I	-	-	8	-	-	-	-	-		-	-	-
J	11	-	-	11	-	-	-	-	-		-	-
K	-	-	-	-	8	-	-	-	-	-		-
L	-	8	-	-	-	-	-	-	-	-	-	

Traffic Flows, Desired

Desired Flow :

Origin \ Destination	A	B	C	Tot.
A	0	860	337	1197
B	1096	0	290	1386
C	739	315	0	1054
Tot.	1835	1175	627	3637

Signal Timings Diagram



Network Results

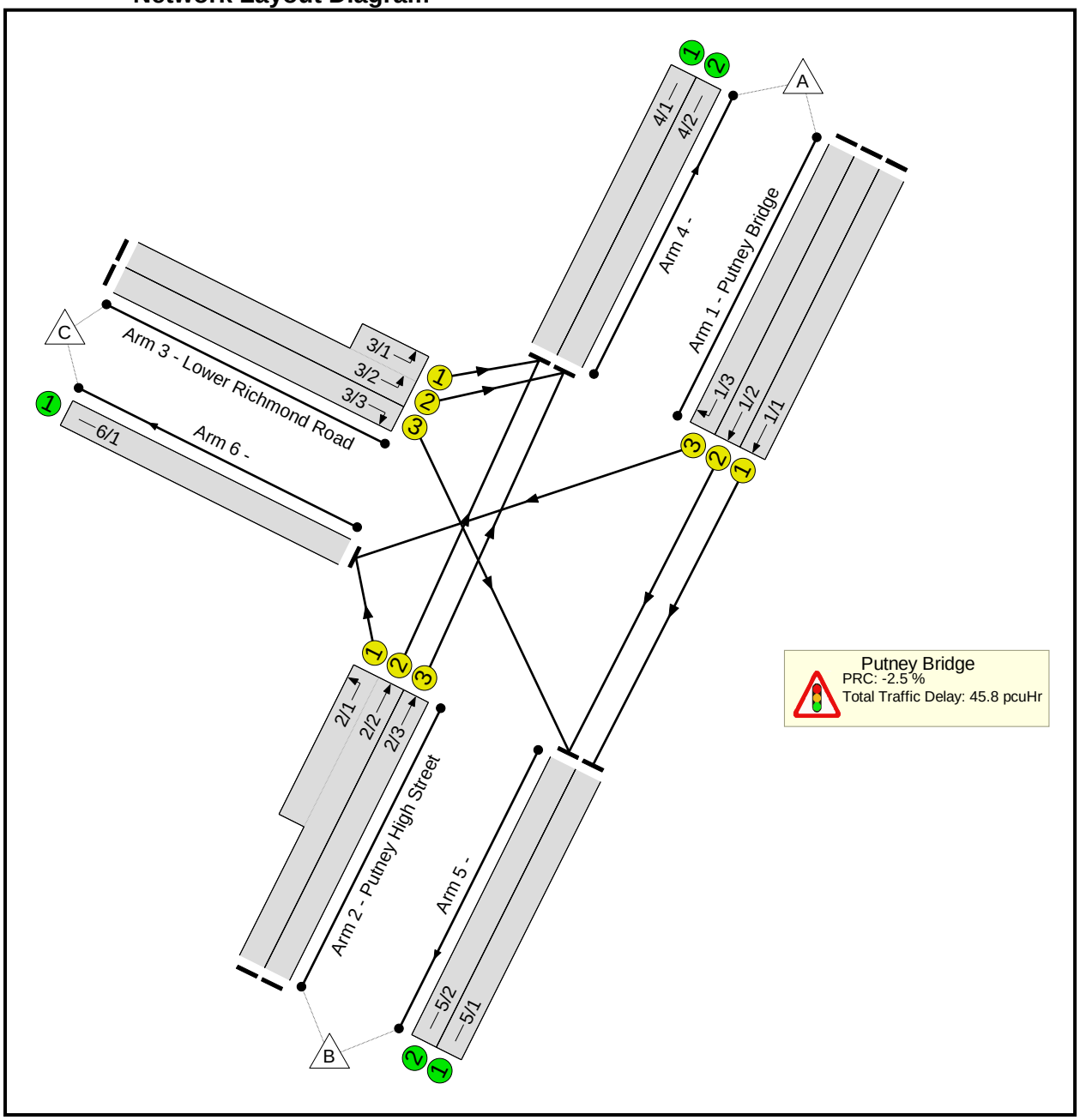
Item	Lane Description	Lane Type	Full Phase	Total Green (s)	Deg Sat (%)	Arriving (pcu)	Leaving (pcu)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
1/1	Putney Bridge Ahead	U	E	67	12.4%	158	158	8.4	1.8
1/2	Putney Bridge Ahead	U	E	67	79.5%	702	702	22.7	16.3
1/3	Putney Bridge Right	U	D	26	88.0%	337	337	71.3	12.5
2/2+2/1	Putney High Street Ahead Left	U	A	36	90.3%	767	767	48.6	19.0
2/3	Putney High Street Ahead	U	A	36	86.8%	619	619	49.1	19.6
3/2+3/1	Lower Richmond Road Left	U	C	54	70.5%	739	739	21.7	12.9
3/3	Lower Richmond Road Right	U	B	20	88.7%	315	315	78.9	12.2

C1 PRC for Signalled Lanes (%): -0.4 Total Delay for Signalled Lanes
PRC Over All Lanes (%): -0.4 Total Delay Over All Lanes

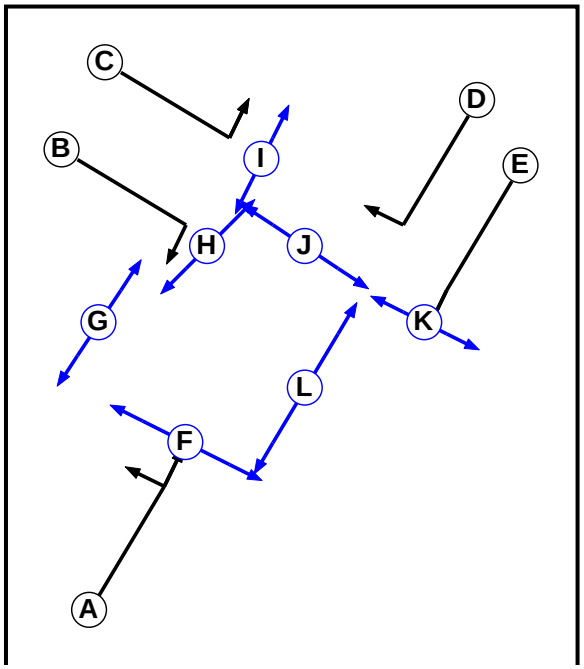
C.8 Construction development case results, 'all by road' sensitivity test, PM peak hour

Putney Bridge/Putney High Street/Lower Richmond Road Junction existing signalised layout

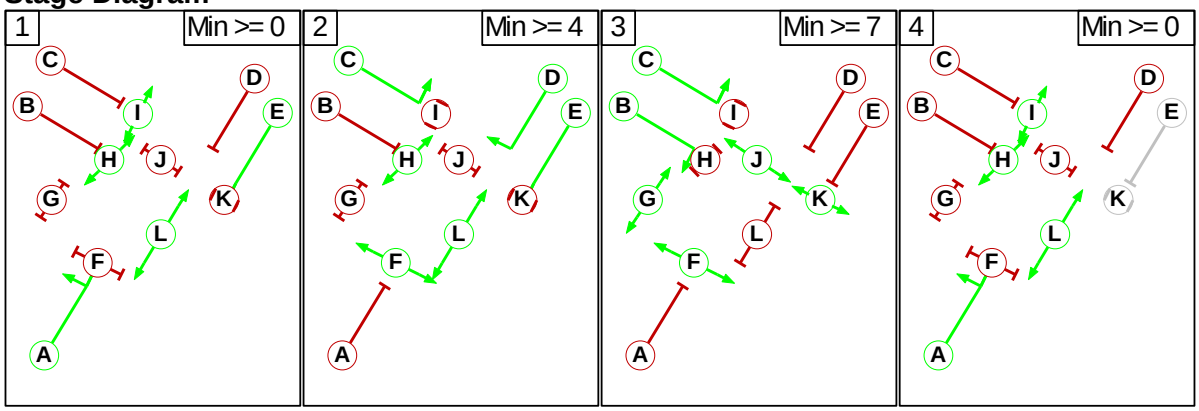
Network Layout Diagram



Phase Diagram



Stage Diagram



Phases in Stage

Stage No.	Phases in Stage
1	A E H I L
2	C D E F H L
3	B C F G J K
4	A H I L

Phase Intergreens Matrix

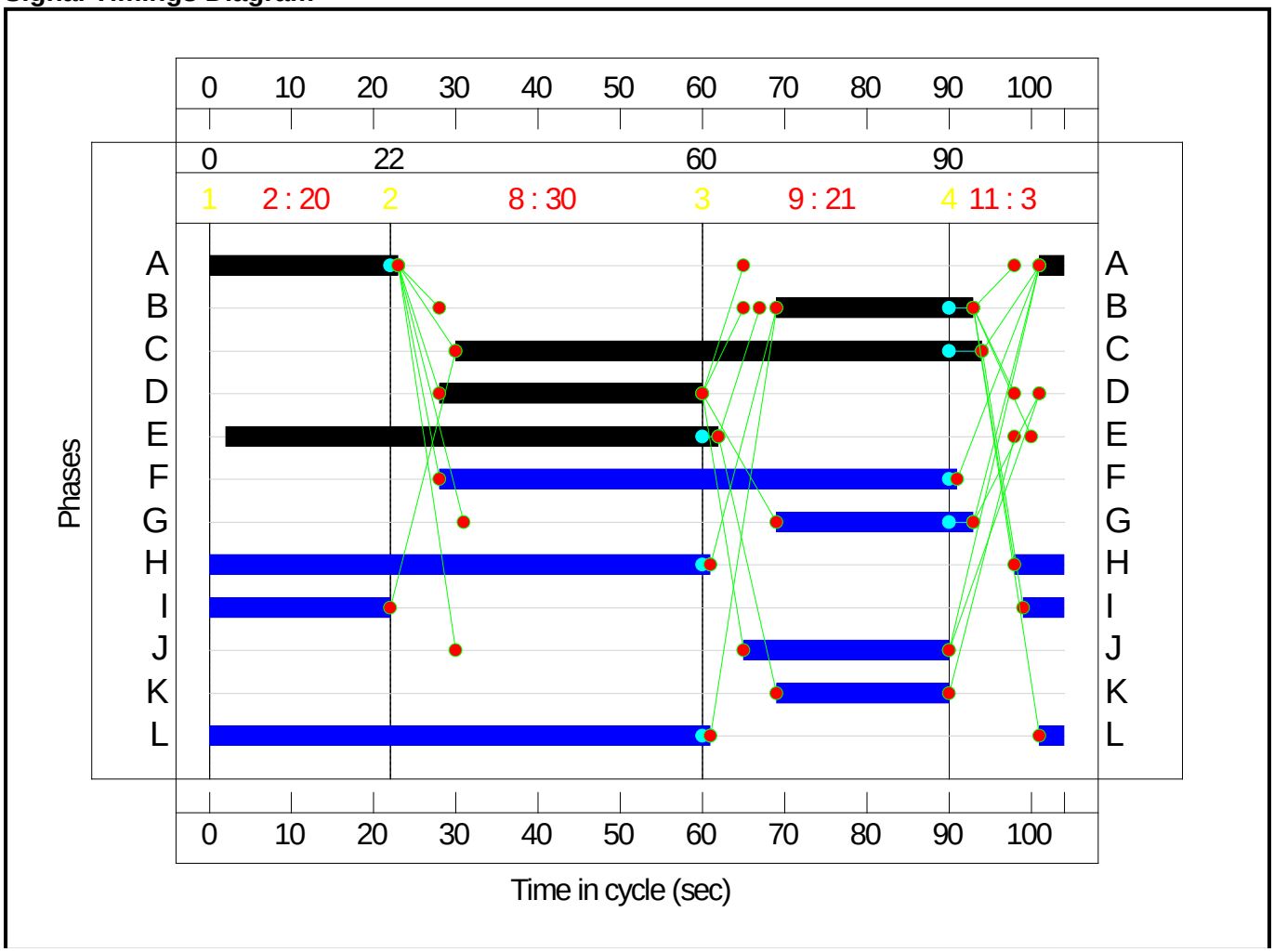
Terminating Phase \ Starting Phase	A	B	C	D	E	F	G	H	I	J	K	L
A		5	7	5	-	5	8	-	-	7	-	-
B	5		-	5	7	-	-	5	-	-	-	8
C	7	-		-	-	-	-	-	5	-	-	-
D	5	5	-		-	-	9	-	-	5	-	-
E	-	5	-	-		-	-	-	-	-	7	-
F	10	-	-	-	-		-	-	-	-	-	-
G	8	-	-	8	-	-		-	-	-	-	-
H	-	8	-	-	-	-	-		-	-	-	-
I	-	-	8	-	-	-	-	-		-	-	-
J	11	-	-	11	-	-	-	-	-		-	-
K	-	-	-	-	8	-	-	-	-	-		-
L	-	8	-	-	-	-	-	-	-	-	-	

Traffic Flows, Desired

Desired Flow :

Origin \ Destination	A	B	C	Tot.
A	0	913	424	1337
B	820	0	329	1149
C	356	390	0	746
Tot.	1176	1303	753	3232

Signal Timings Diagram



Network Results

Item	Lane Description	Lane Type	Full Phase	Total Green (s)	Deg Sat (%)	Arriving (pcu)	Leaving (pcu)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
1/1	Putney Bridge Ahead	U	E	60	17.3%	197	197	11.8	2.7
1/2	Putney Bridge Ahead	U	E	60	90.4%	716	716	40.3	22.3
1/3	Putney Bridge Right	U	D	32	90.6%	424	424	68.5	15.7
2/2+2/1	Putney High Street Ahead Left	U	A	26	91.8%	699	699	60.5	16.0
2/3	Putney High Street Ahead	U	A	26	86.5%	450	450	60.3	15.3
3/2+3/1	Lower Richmond Road Left	U	C	64	28.8%	356	356	10.2	2.4
3/3	Lower Richmond Road Right	U	B	24	92.3%	390	390	81.5	15.6

C1 PRC for Signalled Lanes (%): -2.5 Total Delay for Signalled Lanes
PRC Over All Lanes (%): -2.5 Total Delay Over All Lanes

C.9 Construction base case results, AM peak hour

Lower Richmond Road/Embankment Junction existing priority layout

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Include In Report	Use Specific Demand Set(s)	Specific Demand Set(s)	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
Existing Layout	ARCADY		✓				100.000	100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Traffic Profile Type	Model Start Time (HH:mm)	Model Finish Time (HH:mm)	Model Time Period Length (min)	Time Segment Length (min)	Results For Central Hour Only	Single Time Segment Only	Locked	Run Automatically	Use Relationship	Relationship
Base Case, AM	Base Case	AM		Varies by Arm	08:00	09:00	60	15				✓		

Junction Network

Junctions

Name	Junction Type	Major Road Direction	Arm Order	Do Geometric Delay	Junction Delay (s)	Junction LOS
untitled	T-Junction	Two-way	A,B,C		5.94	A

Junction Network Options

Driving Side	Lighting	Road Surface
Left	Normal/unknown	(Mini-roundabouts only)

Arms

Arms

Arm	Name	Description	Arm Type
A	Lower Richmond Rd (East)		Major
B	Embankment		Minor
C	Lower Richmond Rd (West)		Major

Major Arm Geometry

Arm	Width of carriageway (m)	Has kerbed central reserve	Width of kerbed central reserve (m)	Has right turn bay	Width For Right Turn (m)	Visibility For Right Turn (m)	Blocks?	Blocking Queue (PCU)
C	10.50		0.00		2.20	100.00	✓	0.00

Geometries for Arm C are measured opposite Arm B. Geometries for Arm A (if relevant) are measured opposite Arm D.

Minor Arm Geometry

Arm	Minor Arm Type	Lane Width (m)	Lane Width (Left) (m)	Lane Width (Right) (m)	Width at give-way (m)	Width at 5m (m)	Width at 10m (m)	Width at 15m (m)	Width at 20m (m)	Estimate Flare Length	Flare Length (PCU)	Visibility To Left (m)	Visibility To Right (m)
B	One lane	2.50										25	20

Pedestrian Crossings

Arm	Crossing Type
A	None
B	None
C	None

Slope / Intercept / Capacity

Priority Intersection Slopes and Intercepts

Junction	Stream	Intercept (Veh/hr)	Slope for A-B	Slope for A-C	Slope for C-A	Slope for C-B
1	B-A	470.725	0.069	0.174	0.110	0.249

1	B-C	604.664	0.075	0.188	-	-
1	C-B	631.874	0.197	0.197	-	-

The slopes and intercepts shown above do NOT include any corrections or adjustments.
Streams may be combined, in which case capacity will be adjusted.
Values are shown for the first time segment only; they may differ for subsequent time segments.

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)	Total Queueing Delay (Veh-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (Veh-min/min)	Inclusive Total Queueing Delay (Veh-min)	Inclusive Average Queueing Delay (s)
B-AC	0.00	0.00	0.00	A	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C-AB	0.28	5.94	1.08	A	233.83	233.83	64.06	16.44	1.07	64.10	16.45
C-A	-	-	-	-	456.17	456.17	-	-	-	-	-
A-B	-	-	-	-	3.00	3.00	-	-	-	-	-
A-C	-	-	-	-	1364.00	1364.00	-	-	-	-	-

C.10 Construction base case results, PM peak hour

Lower Richmond Road/Embankment Junction existing priority layout

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Include In Report	Use Specific Demand Set(s)	Specific Demand Set(s)	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
Existing Layout	ARCADY		✓				100.000	100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Traffic Profile Type	Model Start Time (HH:mm)	Model Finish Time (HH:mm)	Model Time Period Length (min)	Time Segment Length (min)	Results For Central Hour Only	Single Time Segment Only	Locked	Run Automatically	Use Relationship	Relationship
Base Case, PM	Base Case	PM		Varies by Arm	17:00	18:00	60	15				✓		

Junction Network

Junctions

Name	Junction Type	Major Road Direction	Arm Order	Do Geometric Delay	Junction Delay (s)	Junction LOS
untitled	T-Junction	Two-way	A,B,C		4.02	A

Junction Network Options

Driving Side	Lighting	Road Surface
Left	Normal/unknown	(Mini-roundabouts only)

Arms

Arms

Arm	Name	Description	Arm Type
A	Lower Richmond Rd (East)		Major

B	Embankment		Minor
C	Lower Richmond Rd (West)		Major

Major Arm Geometry

Arm	Width of carriageway (m)	Has kerbed central reserve	Width of kerbed central reserve (m)	Has right turn bay	Width For Right Turn (m)	Visibility For Right Turn (m)	Blocks?	Blocking Queue (PCU)
C	10.50		0.00		2.20	100.00	✓	0.00

Geometries for Arm C are measured opposite Arm B. Geometries for Arm A (if relevant) are measured opposite Arm D.

Minor Arm Geometry

Arm	Minor Arm Type	Lane Width (m)	Lane Width (Left) (m)	Lane Width (Right) (m)	Width at give-way (m)	Width at 5m (m)	Width at 10m (m)	Width at 15m (m)	Width at 20m (m)	Estimate Flare Length	Flare Length (PCU)	Visibility To Left (m)	Visibility To Right (m)
B	One lane	2.50										25	20

Pedestrian Crossings

Arm	Crossing Type
A	None
B	None
C	None

Slope / Intercept / Capacity

Priority Intersection Slopes and Intercepts

Junction	Stream	Intercept (Veh/hr)	Slope for A-B	Slope for A-C	Slope for C-A	Slope for C-B
1	B-A	470.725	0.069	0.174	0.110	0.249
1	B-C	604.664	0.075	0.188	-	-
1	C-B	631.874	0.197	0.197	-	-

The slopes and intercepts shown above do NOT include any corrections or adjustments.

Streams may be combined, in which case capacity will be adjusted.

Values are shown for the first time segment only; they may differ for subsequent time segments.

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)	Total Queueing Delay (Veh-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (Veh-min/min)	Inclusive Total Queueing Delay (Veh-min)	Inclusive Average Queueing Delay (s)
B-AC	0.00	0.00	0.00	A	0.00	0.00	0.00	0.00	0.00	0.00	9999999999.00
C-AB	0.19	4.02	0.66	A	216.41	216.41	39.18	10.86	0.65	39.19	10.87
C-A	-	-	-	-	725.59	725.59	-	-	-	-	-
A-B	-	-	-	-	4.00	4.00	-	-	-	-	-
A-C	-	-	-	-	763.00	763.00	-	-	-	-	-

C.11 Construction development case results, AM peak hour

Lower Richmond Road/Embankment Junction priority layout

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Include In Report	Use Specific Demand Set(s)	Specific Demand Set(s)	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
Existing Layout	ARCADY		✓				100.000	100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Traffic Profile Type	Model Start Time (HH:mm)	Model Finish Time (HH:mm)	Model Time Period Length (min)	Time Segment Length (min)	Results For Central Hour Only	Single Time Segment Only	Locked	Run Automatically	Use Relationship	Relationship
Dev Case Core, AM	Dev Case Core	AM		Varies by Arm	08:00	09:00	60	15				✓		

Junction Network

Junctions

Name	Junction Type	Major Road Direction	Arm Order	Do Geometric Delay	Junction Delay (s)	Junction LOS
untitled	T-Junction	Two-way	A,B,C		6.47	A

Junction Network Options

Driving Side	Lighting	Road Surface
Left	Normal/unknown	(Mini-roundabouts only)

Arms

Arms

Arm	Name	Description	Arm Type
A	Lower Richmond Rd (East)		Major
B	Embankment		Minor
C	Lower Richmond Rd (West)		Major

Major Arm Geometry

Arm	Width of carriageway (m)	Has kerbed central reserve	Width of kerbed central reserve (m)	Has right turn bay	Width For Right Turn (m)	Visibility For Right Turn (m)	Blocks?	Blocking Queue (PCU)
C	10.50		0.00		2.20	100.00	✓	0.00

Geometries for Arm C are measured opposite Arm B. Geometries for Arm A (if relevant) are measured opposite Arm D.

Minor Arm Geometry

Arm	Minor Arm Type	Lane Width (m)	Lane Width (Left) (m)	Lane Width (Right) (m)	Width at give-way (m)	Width at 5m (m)	Width at 10m (m)	Width at 15m (m)	Width at 20m (m)	Estimate Flare Length	Flare Length (PCU)	Visibility To Left (m)	Visibility To Right (m)
B	One lane	2.50										25	20

Pedestrian Crossings

Arm	Crossing Type
A	None
B	None
C	None

Slope / Intercept / Capacity

Priority Intersection Slopes and Intercepts

Junction	Stream	Intercept (Veh/hr)	Slope for A-B	Slope for A-C	Slope for C-A	Slope for C-B
1	B-A	470.725	0.069	0.174	0.110	0.249
1	B-C	604.664	0.075	0.188	-	-
1	C-B	631.874	0.197	0.197	-	-

The slopes and intercepts shown above do NOT include any corrections or adjustments.

Streams may be combined, in which case capacity will be adjusted.

Values are shown for the first time segment only; they may differ for subsequent time segments.

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)	Total Queueing Delay (Veh-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (Veh-min/min)	Inclusive Total Queueing Delay (Veh-min)	Inclusive Average Queueing Delay (s)
B-AC	0.02	16.11	0.02	C	4.00	4.00	1.05	15.71	0.02	1.05	15.71
C-AB	0.31	6.27	1.24	A	262.57	262.57	73.37	16.76	1.22	73.42	16.78
C-A	-	-	-	-	432.43	432.43	-	-	-	-	-
A-B	-	-	-	-	3.00	3.00	-	-	-	-	-
A-C	-	-	-	-	1364.00	1364.00	-	-	-	-	-

C.12 Construction development case results, PM peak hour

Lower Richmond Road/Embankment Junction priority layout

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Include In Report	Use Specific Demand Set(s)	Specific Demand Set(s)	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
Existing Layout	ARCADY		✓				100.000	100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Traffic Profile Type	Model Start Time (HH:mm)	Model Finish Time (HH:mm)	Model Time Period Length (min)	Time Segment Length (min)	Results For Central Hour Only	Single Time Segment Only	Locked	Run Automatically	Use Relationship	Relationship
Dev Case Core, PM	Dev Case Core	PM		Varies by Arm	17:00	18:00	60	15				✓		

Junction Network

Junctions

Name	Junction Type	Major Road Direction	Arm Order	Do Geometric Delay	Junction Delay (s)	Junction LOS
untitled	T-Junction	Two-way	A,B,C		4.38	A

Junction Network Options

Driving Side	Lighting	Road Surface
Left	Normal/unknown	(Mini-roundabouts only)

Arms

Arms

Arm	Name	Description	Arm Type

A	Lower Richmond Rd (East)		Major
B	Embankment		Minor
C	Lower Richmond Rd (West)		Major

Major Arm Geometry

Arm	Width of carriageway (m)	Has kerbed central reserve	Width of kerbed central reserve (m)	Has right turn bay	Width For Right Turn (m)	Visibility For Right Turn (m)	Blocks?	Blocking Queue (PCU)
C	10.50		0.00		2.20	100.00	✓	0.00

Geometries for Arm C are measured opposite Arm B. Geometries for Arm A (if relevant) are measured opposite Arm D.

Minor Arm Geometry

Arm	Minor Arm Type	Lane Width (m)	Lane Width (Left) (m)	Lane Width (Right) (m)	Width at give-way (m)	Width at 5m (m)	Width at 10m (m)	Width at 15m (m)	Width at 20m (m)	Estimate Flare Length	Flare Length (PCU)	Visibility To Left (m)	Visibility To Right (m)
B	One lane	2.50										25	20

Pedestrian Crossings

Arm	Crossing Type
A	None
B	None
C	None

Slope / Intercept / Capacity

Priority Intersection Slopes and Intercepts

Junction	Stream	Intercept (Veh/hr)	Slope for A-B	Slope for A-C	Slope for C-A	Slope for C-B
1	B-A	470.725	0.069	0.174	0.110	0.249
1	B-C	604.664	0.075	0.188	-	-
1	C-B	631.874	0.197	0.197	-	-

The slopes and intercepts shown above do NOT include any corrections or adjustments.

Streams may be combined, in which case capacity will be adjusted.

Values are shown for the first time segment only; they may differ for subsequent time segments.

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)	Total Queueing Delay (Veh-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (Veh-min/min)	Inclusive Total Queueing Delay (Veh-min)	Inclusive Average Queueing Delay (s)
B-AC	0.02	11.20	0.02	B	5.00	5.00	0.92	11.01	0.02	0.92	11.01
C-AB	0.22	4.19	0.83	A	242.62	242.62	49.37	12.21	0.82	49.38	12.21
C-A	-	-	-	-	703.38	703.38	-	-	-	-	-
A-B	-	-	-	-	4.00	4.00	-	-	-	-	-
A-C	-	-	-	-	763.00	763.00	-	-	-	-	-

C.13 Construction development case results, 'all by road' sensitivity test, AM peak hour

Lower Richmond Road/Embankment Junction priority layout

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Include In Report	Use Specific Demand Set(s)	Specific Demand Set(s)	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
Existing Layout	ARCADY		✓				100.000	100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Traffic Profile Type	Model Start Time (HH:mm)	Model Finish Time (HH:mm)	Model Time Period Length (min)	Time Segment Length (min)	Results For Central Hour Only	Single Time Segment Only	Locked	Run Automatically	Use Relationship	Relationship
Dev Case Sen, AM	Dev Case Sen	AM		Varies by Arm	08:00	09:00	60	15				✓		

Junction Network

Junctions

Name	Junction Type	Major Road Direction	Arm Order	Do Geometric Delay	Junction Delay (s)	Junction LOS

untitled	T-Junction	Two-way	A,B,C		7.05	A

Junction Network Options

Driving Side	Lighting	Road Surface
Left	Normal/unknown	(Mini-roundabouts only)

Arms

Arms

Arm	Name	Description	Arm Type
A	Lower Richmond Rd (East)		Major
B	Embankment		Minor
C	Lower Richmond Rd (West)		Major

Major Arm Geometry

Arm	Width of carriageway (m)	Has kerbed central reserve	Width of kerbed central reserve (m)	Has right turn bay	Width For Right Turn (m)	Visibility For Right Turn (m)	Blocks?	Blocking Queue (PCU)
C	10.50		0.00		2.20	100.00	✓	0.00

Geometries for Arm C are measured opposite Arm B. Geometries for Arm A (if relevant) are measured opposite Arm D.

Minor Arm Geometry

Arm	Minor	Lane	Lane Width	Lane Width	Width at	Width at	Width at	Width at	Width at	Estimate Flare	Flare Length	Visibility To	Visibility To

	Arm Type	Width (m)	(Left) (m)	(Right) (m)	give-way (m)	5m (m)	10m (m)	15m (m)	20m (m)	Length	(PCU)	Left (m)	Right (m)
B	One lane	2.50										25	20

Pedestrian Crossings

Arm	Crossing Type
A	None
B	None
C	None

Slope / Intercept / Capacity

Priority Intersection Slopes and Intercepts

Junction	Stream	Intercept (Veh/hr)	Slope for A-B	Slope for A-C	Slope for C-A	Slope for C-B
1	B-A	470.725	0.069	0.174	0.110	0.249
1	B-C	604.664	0.075	0.188	-	-
1	C-B	631.874	0.197	0.197	-	-

The slopes and intercepts shown above do NOT include any corrections or adjustments.

Streams may be combined, in which case capacity will be adjusted.

Values are shown for the first time segment only; they may differ for subsequent time segments.

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)	Total Queueing Delay (Veh-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (Veh-min/min)	Inclusive Total Queueing Delay (Veh-min)	Inclusive Average Queueing Delay (s)
B-AC	0.04	18.76	0.04	C	7.00	7.00	2.13	18.23	0.04	2.13	18.23
C-AB	0.34	6.59	1.37	A	282.33	282.33	80.98	17.21	1.35	81.05	17.22
C-A	-	-	-	-	415.67	415.67	-	-	-	-	-
A-B	-	-	-	-	3.00	3.00	-	-	-	-	-
A-C	-	-	-	-	1364.00	1364.00	-	-	-	-	-

C.14 Construction development case results, 'all by road' sensitivity test, PM peak hour

Lower Richmond Road/Embankment Junction priority layout

Data Errors and Warnings

No errors or warnings

Analysis Set Details

Name	Roundabout Capacity Model	Description	Include In Report	Use Specific Demand Set(s)	Specific Demand Set(s)	Locked	Network Flow Scaling Factor (%)	Network Capacity Scaling Factor (%)	Reason For Scaling Factors
Existing Layout	ARCADY		✓				100.000	100.000	

Demand Set Details

Name	Scenario Name	Time Period Name	Description	Traffic Profile Type	Model Start Time (HH:mm)	Model Finish Time (HH:mm)	Model Time Period Length (min)	Time Segment Length (min)	Results For Central Hour Only	Single Time Segment Only	Locked	Run Automatically	Use Relationship	Relationship
Dev Case Sen, PM	Dev Case Sen	PM		Varies by Arm	17:00	18:00	60	15				✓		

Junction Network

Junctions

Name	Junction Type	Major Road Direction	Arm Order	Do Geometric Delay	Junction Delay (s)	Junction LOS
untitled	T-Junction	Two-way	A,B,C		4.76	A

Junction Network Options

Driving Side	Lighting	Road Surface
Left	Normal/unknown	(Mini-roundabouts only)

Arms

Arms

Arm	Name	Description	Arm Type
A	Lower Richmond Rd (East)		Major
B	Embankment		Minor
C	Lower Richmond Rd (West)		Major

Major Arm Geometry

Arm	Width of carriageway (m)	Has kerbed central reserve	Width of kerbed central reserve (m)	Has right turn bay	Width For Right Turn (m)	Visibility For Right Turn (m)	Blocks?	Blocking Queue (PCU)
C	10.50		0.00		2.20	100.00	✓	0.00

Geometries for Arm C are measured opposite Arm B. Geometries for Arm A (if relevant) are measured opposite Arm D.

Minor Arm Geometry

Arm	Minor Arm Type	Lane Width (m)	Lane Width (Left) (m)	Lane Width (Right) (m)	Width at give-way (m)	Width at 5m (m)	Width at 10m (m)	Width at 15m (m)	Width at 20m (m)	Estimate Flare Length	Flare Length (PCU)	Visibility To Left (m)	Visibility To Right (m)
B	One lane	2.50										25	20

Pedestrian Crossings

Arm	Crossing Type
A	None
B	None
C	None

Slope / Intercept / Capacity

Priority Intersection Slopes and Intercepts

Junction	Stream	Intercept (Veh/hr)	Slope for A-B	Slope for A-C	Slope for C-A	Slope for C-B
1	B-A	470.725	0.069	0.174	0.110	0.249
1	B-C	604.664	0.075	0.188	-	-

1	C-B	631.874	0.197	0.197	-	-

The slopes and intercepts shown above do NOT include any corrections or adjustments.

Streams may be combined, in which case capacity will be adjusted.

Values are shown for the first time segment only; they may differ for subsequent time segments.

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (Veh)	Max LOS	Average Demand (Veh/hr)	Total Junction Arrivals (Veh)	Total Queueing Delay (Veh-min)	Average Queueing Delay (s)	Rate Of Queueing Delay (Veh-min/min)	Inclusive Total Queueing Delay (Veh-min)	Inclusive Average Queueing Delay (s)
B-AC	0.03	13.17	0.03	B	8.00	8.00	1.72	12.89	0.03	1.72	12.89
C-AB	0.24	4.37	0.95	A	267.42	267.42	56.29	12.63	0.94	56.31	12.64
C-A	-	-	-	-	681.58	681.58	-	-	-	-	-
A-B	-	-	-	-	4.00	4.00	-	-	-	-	-
A-C	-	-	-	-	763.00	763.00	-	-	-	-	-

Appendix D – Accident analysis

D.1 Existing Highway Safety Analysis

D.1.1 Details of road traffic accidents within the vicinity of the site have been obtained from Transport for London (TfL) and have been reviewed to determine whether there are particular issues or trends on the local highway network.

D.1.2 Data on accidents for 5 years until the end of March 2011 has been analysed for the following junctions and the surrounding roads:

- Putney High Street/ Putney Bridge Approach Junction;
- Lower Richmond Road/ Embankment Junction; and
- Lower Richmond Road/ Putney Bridge Approach Junction.

D.1.3 Based on the DfT Design Manual for Roads and Bridges, Volume 13 Economic Assessment of Road Schemes, accidents have been analysed according to the method outlined in this guidance which states that accidents that have occurred within 20m of each junction are associated with that specific junction, and the remaining accidents are grouped to the relevant links.

D.1.4 The area of interest together with the locations of the recorded road traffic accidents are indicated in Table D.1 below. The study area is also graphically represented in Figure 1.1.

D.1.5 A total of 44 road traffic accidents have occurred in the area of interest during the five year period. These have been assessed in this section.

D.1.6 Of these accidents, 35 are classified as slight, nine are classified as serious and none as fatal. Table D.1 below summarises where these accidents occurred, and their level of severity. Accident analysis for the individual junctions and roads sections is discussed below.

Table D.1 Accident severity 2006 to 2011

Location	Slight	Serious	Fatal	Total
Putney High Street	3	1	0	4
Putney High Street/ Putney Bridge Approach Junction	5	2	0	7
Putney High Street/ Putney Bridge Road Junction	1	0	0	1
Putney High Street/ Weimar Street Junction	1	1	0	2
Putney High Street/ Lower Richmond Junction	1	0	0	1
Lower Richmond Road	1	1	0	2
Lower Richmond Road/ Bemish Road Junction	1	0	0	1
Lower Richmond Road/ Biggs Row Junction	2	0	0	2
Lower Richmond Road/ Embankment Junction	4	2	0	6

Location	Slight	Serious	Fatal	Total
Lower Richmond Road/ Ruvigny Gardens Junction	1	0	0	1
Lower Richmond Road/ Putney Bridge Approach Junction	10	0	0	10
Lower Richmond Road/ Putney Bridge Road Junction	2	1	0	3
Lower Richmond Road/ Waterman Street Jn.	1	0	0	1
Lower Richmond Road/ Weiss Road Junction	1	0	0	1
Embankment/ Glendarvon Street Junction	1	1	0	2
Total	**35**	**9**	**0**	**44**

A219 Putney High Street

D.1.7 The A219 Putney High Street runs perpendicular to the site area in a south/north direction and extends towards the A24 Morden Road in the south and the A315 Hammersmith Road in the north. For the stretch of the A219 within the study area, the highway is a three lane dual carriageway inclusive of a bus lane heading in the north-south direction. The junctions involved within this analysis are as follows:

- Putney High Street/ Putney Bridge Approach Junction;
- Putney High Street/ Putney Bridge Road Junction;
- Putney High Street/ Weimar Street Junction;
- Putney High Street/ Lower Richmond Junction;
- Putney Bridge Approach/ Lower Richmond Road Junction; and
- Putney Bridge Road/ Lower Richmond Road Junction.

D.1.8 In total 15 accidents have occurred along Putney High Street and the junctions associated with this stretch of highway. In relation to the severity of these accidents, 11 were slight accidents, predominantly resulting from failure to look properly, carelessness or failure to judge other persons path or speed.

D.1.9 Of the total accidents, 4 were classified as serious. These accidents involved a car and a motorcyclist/ cyclist/ pedestrian or a motorcyclist. One of these accidents occurred at the Putney High Street/ Putney Bridge Approach Junction involved a pedestrian falling down the steps of a bus/coach. The other serious accidents the major contributory factor to them was where one's vision was affected by a parked or stationary vehicle, failure to look properly or road surfacing was poor.

D.1.10 Of the total accidents, three accidents included HGVs and none for MGVs/LGVs. Two of the HGV accidents were rated as slight in severity and one was serious in severity. Also, within these total accidents four involved pedestrians and four involved pedal cycles.

D.1.11 No fatal accident occurred along the A219 Putney High Street in the 5 year period analysed.

B306 Lower Richmond Road

D.1.12 The B306 Lower Richmond Road runs parallel to the site in an east/west direction and extends in the east towards the A219 Putney High Street and to the south-west the A205 Upper Richmond Road. For the stretch of the B306 within the study area, the highway is a dual single-carriageway heading in the south-west direction. The junctions involved within this analysis are as follows:

Lower Richmond Road/ Bemish Road Junction;

Lower Richmond Road/ Biggs Row Junction;

Lower Richmond Road/ Embankment Junction;

Lower Richmond Road/ Ruvigny Gardens Junction;

Lower Richmond Road/ Waterman Street Junction; and

Lower Richmond Road/ Weiss Road Junction;

D.1.13 In total 27 accidents have occurred along Lower Richmond Road and the junctions associated with this stretch of highway. In relation to the severity of these accidents, 23 were slight accidents, predominantly from a failure to look properly and a failure to judge other person's path or speed.

D.1.14 Of the total accidents, 4 were classified as serious. The accidents involved a car and either a car, cyclist or a motorcyclist. One of these accidents occurred at the Lower Richmond Road/ Embankment Junction which involved a pedal cycle turning into the path of a car. The major contributory factor to this serious accident was a failure to look properly and carelessness. The major contributory factor to the other serious accident was a failure to look properly and carelessness.

D.1.15 Of the total accidents, two accidents included HGVs and none for MGVs/LGVs. The two HGV accidents were rated as slight in severity. Also, within these total accidents five involved pedestrians and 13 involved pedal cycles.

D.1.16 No fatal accident occurred along the B306 Lower Richmond Road in the 5 year period analysed.

Embankment

D.1.17 The Embankment road runs parallel to the south of the site boundary in an east/west direction and extends in the east towards the B306 Lower Richmond Road and to the west culminates to a cul-de-sac. For the stretch of the road within the study area, the highway is a dual single-carriageway heading in the east-west direction. This road acts as the access/egress route to the site. The junctions involved within this analysis are as follows:

- Embankment/ Glendarvon Street Junction.

D.1.18 In total 2 accidents have occurred along Embankment and the junctions associated with this stretch of highway. In relation to the severity of these accidents, 1 was a slight accident, and the other was serious in severity.

D.1.19 Of the total accidents, 1 was classified as serious. This accident involved a car and a pedestrian. The pedestrian fell into the side of the moving car.

The major contributory factor to the serious accident was predominantly from impairment to alcohol and other factors.

D.1.20 Of the total accidents, none included HGVs or MGVs/LGVs. Also, within these total accidents two involved pedestrians and none involved pedal cycles.

D.1.21 No fatal accident occurred along Embankment in the 5 year period analysed.

D.2 Summary and conclusion

D.2.1 The largest number of road traffic accidents has occurred at the Putney Bridge Approach junction with Lower Richmond Road; all of which have been classified as slight accidents. The largest number of serious accidents has occurred at the Lower Richmond Road, locations along the Lower Richmond Road where it meets with Embankment junction.

D.2.2 The only significant clustering of accidents in these locations is the junction between Putney Bridge Approach and Lower Richmond Road, where vehicle paths cross. In this case vehicle accidents are evenly spread around the junction indicating that accidents are not due to highway geometry.

D.2.3 In the case of the majority of accidents within the study area, slippery road due to weather and wrong use of pedestrian crossing are the main causes, as well as failure to look properly.

D.2.4 Of the total accidents, five included HGVs and there were none for MGVs/LGVs. Also within the total accidents 11 involved pedestrians and 17 involved pedal cycles.

D.2.5 Overall, the accidents occurred in the area of interest were mainly caused as a result of vehicle/ pedestrian paths crossing or poor turning/ manoeuvring which resulted from not looking properly and reckless driving indicating that the accidents are not due to highway geometry or poor infrastructure.

Appendix E – Road Safety Audit

This page is intentionally blank

Your ref -
Our ref 211146-00/cvl

ARUP

Thames Tideway Tunnel
The Point (7th Floor),
37 North Wharf Road,
Paddington,
London W2 1AF
For the attention of Dermot Scanlon

Central Square
Forth Street
Newcastle upon Tyne
NE1 3PL
United Kingdom

t +44 191 261 6080
f +44 191 261 7879

chris.van-lottum@arup.com-
www.arup.com

12 February 2013

Dear Sirs

Thames Tideway Tunnel
Putney Bridge Foreshore – Stage 1 Road Safety Audit

I have the pleasure of enclosing our Putney Bridge Foreshore – Stage 1 Road Safety Audit report. In addition to the enclosed report the Audit Team noted the following points outwith the remit of the audit. I would be grateful if you would bring these issues to the attention of the Highway Authority, Designer and/or Maintainer as appropriate.

Additional Comments

- Embankment forms part of National Cycle Network Route 4 and the Thames Cycle Route. Any traffic management proposed on these roads should take full account of cycles. Furthermore, delivery drivers should be made aware of the presence of the cycle routes and the likely increased risk of cycle / goods vehicle conflict.

IMG_8361.jpg

- It is not clear from the construction layout whether there is sufficient space within the designated Manoeuvring Zone to turn a 16.5m HGV in order to enter and exit the site in a forward gear.

If you have any further queries regarding this letter or the enclosed report, please do not hesitate to contact me

Yours faithfully

Chris van Lottum
Senior Engineer
Road Safety Audit Team Leader

Enc

cc Phil Longman, Peter Brett Associates
Gavin Wicks, Arup

Thames Tideway Tunnel

Thames Tideway Tunnel – Putney Bridge Foreshore

Stage 1 Road Safety Audit

RSA1.1

Rev A | 12 February 2013

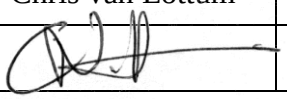
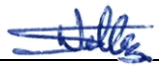
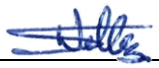
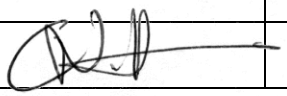
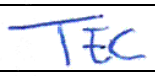
Job number 211146-03

Ove Arup & Partners Ltd
Central Square
Forth Street
Newcastle-upon-Tyne NE1 3PL
United Kingdom
www.arup.com

ARUP

Document Verification

ARUP

Job title		Thames Tideway Tunnel – Putney Bridge Foreshore		**Job number**	211146-03
Document title		Stage 1 Road Safety Audit		**File reference**	
Document ref		RSA1.1			
Revision	**Date**	**Filename**	RP CVL TTT 04 Putney RSA1.1 130212 Rev A.docx		
Issue	9 Jan 2013	**Description**	Issue Document		
			Prepared by	Checked by	Approved by
		Name	Chris van Lottum	Steve Wells	Steve Wells
		Signature			
Rev A	12 Feb 2013	**Filename**	RP CVL TTT 04 Putney RSA1.1 130212 Rev A.docx		
		Description	Revised information received		
			Prepared by	Checked by	Approved by
		Name	Chris van Lottum	Tom Corke	Steve Wells
		Signature			
		Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			
		Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			
				Issue Document Verification with Document	✓

Contents

Page

1 Introduction 1

1.1 Site Description 2
1.2 Scheme Description 2

2 Stage 1 Road Safety Audit 3

2.1 Construction Layout 3
2.2 Permanent Layout 7

3 Road Safety Audit Statement 8

Figures

Figure 1 Location of Recommendations

Appendices

Appendix A
Documents and Drawings

1 Introduction

Arup was appointed by Thames Tideway Tunnel to conduct a Stage 1 Road Safety Audit on proposals to create a construction access and egress for works associated with the Thames Tideway Tunnel at Putney Bridge Foreshore, Embankment in the London Borough of Wandsworth.

The agreed Audit Team consisted of:

- Mr C van Lottum MEng (Hons), MCIHT, MSoRSA
- Mr T Corke BEng (Hons), MSc, CEng, MICE, MCIHT, MSoRSA

The Audit Team visited the site together on Tuesday 4th December 2012; weather conditions at the time of the site visit were bright and cold and the road surface was damp.

A list of information provided to the Audit Team has been included as Appendix A to this Report.

The following information was **not** made available to the Audit Team and as such any specific influence of these details on road user safety has not been considered by this audit:

- Departures from Standard
- Road profiles
- Cross sections
- Drainage
- Landscape
- Public utilities
- Traffic signals
- Traffic signs
- Street lighting
- Road markings
- Road restraint systems

It is understood that no previous road safety audits have been conducted on this scheme.

This audit has been undertaken in accordance with the Terms of Reference set out in TfL Procedure 'Road Safety Audit SQA-0170 – Issue 4'; and the Audit Team members meet the training and experience requirements set out therein. The Audit Team has examined and reported only on the road safety implications of the scheme as presented and has not examined or verified the compliance of the design to any other criteria. However, to clearly explain a problem or recommendation the Audit Team may occasionally refer to design standards without engaging in technical audit.

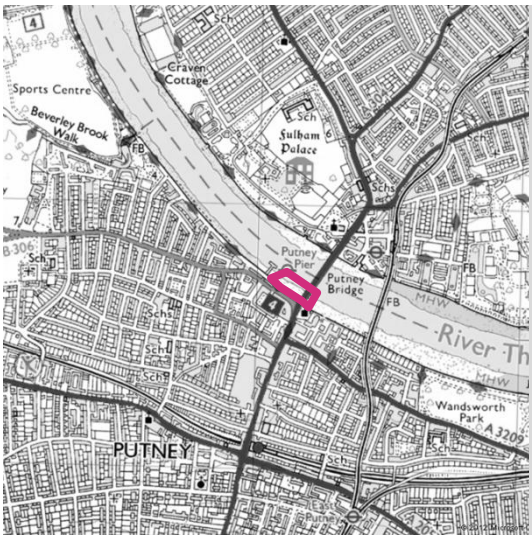
All problems and recommendations identified by this audit are referenced to the design drawings and the locations have been indicated on the attached plan.

Other issues, including safety issues identified during the Audit but excluded from this report by the Terms of Reference, which the Audit Team wishes to draw to the attention of the Audit Project Sponsor are set out in separate correspondence.

Road Safety Audit is based upon a qualitative risk assessment process and there is no measure of the success achieved by any recommendations given herein. Road

Safety Audit cannot guarantee the safe operation of the scheme under consideration in this report as accidents are rare and random events and are largely caused by factors outside the Audit Team's influence, such as driving behaviour and, to a lesser extent, vehicle condition.

1.1 Site Description



Scheme Location

The Putney Bridge Foreshore site is situated to the East of Putney Pier on the south bank of the River Thames; accessed from Embankment and Lower Richmond Road. The B306 Lower Richmond Road joins the A219 Putney High Street at the south end of Putney Bridge in south-west London.

1.2 Scheme Description

During construction, the junction of Embankment and Lower Richmond Road require widening to accommodate construction vehicle movements and the new site access. A short length of the existing one-way operation on the Embankment would be temporarily converted to two-way operation during the construction period. During the construction, some 18m of parking on either side of Embankment would be removed to allow vehicles to reverse into site.

A new permanent access will be required, approximately 10m northeast of the junction between Embankment and Lower Richmond Road. The site would be accessed from Embankment for maintenance visits. In the operational phase, the highway layout and car parking provision would be reinstated to the existing layout.

2 Stage 1 Road Safety Audit

The Recommendations below are numbered as follows:

STAGE . AUDIT NUMBER . RECOMMENDATION NUMBER

2.1 Construction Layout

	Location:	Junction of Embankment with Lower Richmond Road
	Summary:	Existing accident record for delivery route could be exacerbated by construction traffic.
	Description:	There is an existing accident risk relating to vehicles turning on to the Embankment from Lower Richmond Road. The construction necessitates large numbers of HGV turning movements at this junction which may exacerbate the existing problems.
S1.1.1	**Recommendation:**	TM layouts during construction should highlight the likelihood of HGV and plant movements at this location. Delivery drivers and site staff should be made aware of the likely increased risk of turning conflicts, particularly with vulnerable road users through inclusion in the site induction process and construction method statements.

Location: Embankment

Summary: Part suspension of contra-flow cycle lane places cycle at risk of conflict with other vehicles.

Description: There is a contra-flow cycle lane running eastbound on Embankment past the construction site, and a splitter island between the cycle lane and the traffic lane at the junction with Lower Richmond Road. The splitter island would be removed to facilitate large vehicle turning movements.

IMG_8364.jpg

The splitter island protects emerging cyclists from traffic turning into the traffic lane. Its removal would significantly increase the risk of cycle / vehicle conflicts at the junction.

S1.1.2 **Recommendation:** Divert the cycle route via Lower Richmond Way and Thames Place for the duration of the works.

Location: Embankment

Summary: Swept path shows HGV conflict with site hoarding

Description: The swept path analysis for 16.5m articulated and 12.0m rigid HGVs entering the site from Embankment conflicts with the hoarding on both sides of the access.

		Notwithstanding the damage to a vehicle caused by a collision with the gate and hoarding, if the movement cannot be completed without conflict, it will be necessary for HGV drivers to reverse back to complete their manoeuvre placing other road users at risk from a collision as a result of reduced rearward visibility.
S1.1.3	**Recommendation:**	Widen the site entrance to accommodate the movement allowing HGVs to enter the site in a forward direction of movement.

	Location:	Embankment
	Summary:	Large vehicle manoeuvring could conflict with other road users leading to injury.
	Description:	The swept path analysis for 16.5m articulated and 12.0m rigid HGVs entering the site from Embankment shows vehicles driving westbound along Embankment and reversing east and north into the site from Embankment, within a few metres of the junction of Embankment with Lower Richmond Road. Reversing vehicles have limited visibility so there is a much greater chance of conflict between a reversing vehicle and other road users, especially those turning into Embankment from Lower Richmond Road.
S1.1.4	**Recommendation:**	Introduce temporary traffic control across the Embankment and Lower Richmond Road junction throughout the construction phase to stop vehicles turning into the junction and conflicting with construction traffic.

Location: Junction of Embankment with Lower Richmond Road

Summary: Uneven footway surface on temporary right-of-way diversion could lead to pedestrian injuries.

Description: During the construction works, the Thames Path is diverted around the western side of the junction of Embankment with Lower Richmond Road to avoid the site access.

IMG_8376.jpg

IMG_8377.jpg

The footway surface around this junction is in poor condition and could result in slips, trips and falls resulting in pedestrian injuries.

S1.1.5 Recommendation: Ensure the footway on the diversionary route is regulated presenting a uniform walking surface for pedestrians.

2.2 Permanent Layout

	Location:	Embankment
	Summary:	Tight swept path could result in vehicle damage.
	Description:	The swept path analysis for the permanent road layout indicates conflicts between some vehicle types leaving the site, and the parking bays on Embankment at the site egress and at the junction with Thames Place. Swept path conflicts can lead to vehicle damage and could result in injuries for vehicle occupants or pedestrians if footways are over run to avoid a collision.
S1.1.6	**Recommendation:**	Temporary suspension of parking bays on Embankment may be required during maintenance periods so as to ensure unobstructed access.

End of list of problems identified and recommendations offered in this Stage 1 Road Safety Audit

3 Road Safety Audit Statement

I certify that this audit has been carried out in accordance with HD19/03.

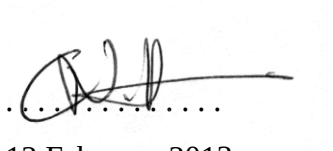
Audit Team Leader

Mr C van Lottum MEng (Hons), MCIHT, MSoRSA

Senior Engineer

Arup

Central Square, Forth Street,
Newcastle upon Tyne, NE1 3PL



12 February 2013

Audit Team Member

Mr T Corke BEng (Hons), MSc, CEng, MICE, MCIHT, MSoRSA

Senior Engineer

Arup

The Arup Campus, Blythe Gate, Blythe Valley Park,
Solihull, B90 8AE

Figures

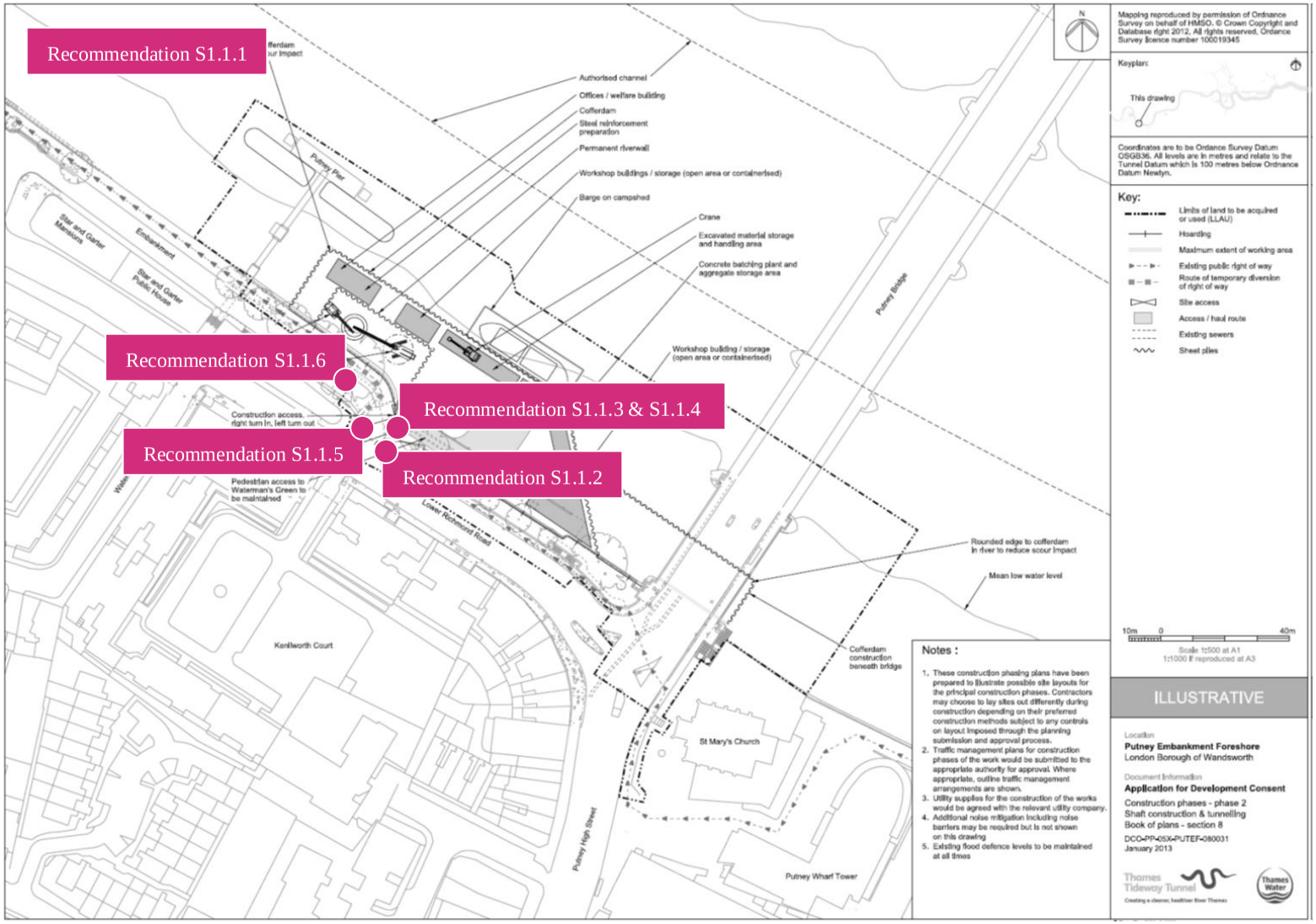


Figure 1 Location of Recommendations

Appendix A

Documents and Drawings

A1 Documents and Drawings

The following documents and drawings were supplied to the Audit Team by the Designer and have been examined in the course of conducting this audit.

A1.1 Documents

Title	Reference	Revision
Road Safety Audit Brief	-	19/12/2012
Road Accident Data	-	-

A1.2 Drawings

Title	Reference	Revision
Transport - site location plan	1PL03-TT-50662	Jan 2013
Transport - construction traffic routes	1PL03-TT-50654	Jan 2013
Transport - accident locations	1PL03-TT-50758	Jan 2013
Construction phases – phase 2 Shaft construction & tunnelling	DCO-PP-05X-PUTEF-080031	Jan 2013
Highway layout during construction (Area 1)	DCO-PP-05X-PUTEF-080040	Jan 2013
Permanent highway layout – Area 1 work	DCO-PP-05X-PUTEF-080043	Jan 2013
Highway layout during construction (Area 1) – Vehicle swept path analysis	DCO-PP-05X-PUTEF-080047	Jan 2013
Permanent highway layout (Area 1) – Vehicle swept path analysis	DCO-PP-05X-PUTEF-080050	Jan 2013

This page is intentionally blank

TECHNICAL NOTE

Peter Brett Associates LLP
16 Brewhouse Yard, Clerkenwell,
London, EC1V 4LJ
T: +44 (0)20 7025 7100
E: london@peterbrett.com

Job Name	**Thames Tideway Tunnel – Putney Bridge Foreshore**	
Job No.	22104	
Note No.	001	
Date	15th February 2013	
Subject	Stage 1 Road Safety Audit – Designer's Response	
Prepared by	L Harney	**Reviewed:** B Kemp

1 Introduction

1.1 Arup was appointed by Thames Water to conduct a Stage 1 Road Safety Audit on proposals to create a construction access and egress for works associated with the Thames Tideway Tunnel at the slipway located on the eastern end of the Embankment to the west of Putney Bridge, in the London Borough of Wandsworth.

1.2 This technical note provides the Designer's Response to the Stage 1 Audit for this site.

2 Stage 1 Road Safety Audit

Construction Layout

2.1 Location: Junction of Embankment with Lower Richmond Road

Summary: Existing accident record for delivery route could be exacerbated by construction traffic.

Description: There is an existing accident risk relating to vehicles turning on to the Embankment from Lower Richmond Road.

The construction necessitates large numbers of HGV turning movements at this junction which may exacerbate the existing problems

S1.1.1 Recommendation: TM layouts during construction should highlight the likelihood of HGV and plant movements at this location. Delivery drivers and site staff should be made aware of the likely increased risk of turning conflicts, particularly with vulnerable road users through inclusion in the site induction process and construction method statements.

Recommendation Accepted – The traffic management layouts will highlight the likelihood of HGV and plant movements at the Putney Bridge Foreshore site. Delivery drivers and site staff will be made aware of the increased risk of turning conflicts as part of the site induction. This will be included in the Code of Construction Practice at Stage 2 (Detailed Design).

2.2 Location: Embankment

Summary: Part suspension of contra-flow cycle lane places cyclists at risk with other vehicles.

Description: There is a contra-flow cycle lane running eastbound on Embankment past the construction site. This would be diverted on to the carriageway at the eastern end of the road and the splitter island between the cycle lane and the traffic lane at the junction with Lower Richmond Road would be removed to facilitate large vehicle turning movements.

The splitter island protects emerging cyclists from traffic turning into the traffic lane. Its removal would significantly increase the risk of cycle / vehicle conflicts at the junction.

S1.1.2 Recommendation: Divert the cycle route via Lower Richmond Way and Thames Place for the duration of the works.

Recommendation Accepted – The option of diverting the cycle route via Lower Richmond Way and Thames Place for the duration of the works will be reviewed at Stage 2 (Detailed Design).

2.3 Location: Embankment

Summary: Swept path shows HGV conflict with site hoarding.

Description: The swept path analysis for 16.5m articulated and 12.0m rigid HGVs entering the site from Embankment conflicts with the hoarding on both sides of the access.

Notwithstanding the damage to a vehicle caused by a collision with the gate and hoarding, if the movement cannot be completed without conflict, it will be necessary for HGV drivers to reverse back to complete their manoeuvre placing other road users at risk from a collision as a result of reduced rearward visibility.

S1.1.3 Recommendation: Widen the site entrance to accommodate the movement allowing HGVs to enter the site in a forward direction of movement.

Recommendation Accepted – Adequate width will be provided at the site access to allow HGVs to enter the site in a forward direction of movement. The exact location of the hoarding will be determined at Stage 2 (Detailed Design)

2.4 Location: Embankment

Summary: Large vehicles manoeuvring could conflict with other road users leading to injury.

Description: The swept path analysis for 16.5m articulated and 12m rigid HGVs entering the site from Embankment shows vehicles driving westbound along Embankment and reversing east and north into the site from Embankment, within a few metres of the junction of Embankment with Lower Richmond Road.

Reversing vehicles have limited visibility so there is a much greater chance of conflict between a reversing vehicle and other road users, especially those turning into Embankment from Lower Richmond Road.

S1.1.4 Recommendation: Introduce temporary traffic control across the Embankment and Lower Richmond Road junction throughout the construction phase to stop vehicles turning into the junction and conflicting with construction traffic.

Recommendation Accepted – The provision of temporary traffic control across the Embankment and Lower Richmond Road will be review at Stage 2 (Detailed Design).

2.5 Location: Junction of Embankment with Lower Richmond Road

Summary: Uneven footway surface on temporary right-of-way diversion could lead to pedestrian injuries.

Description: During the construction works, the Thames Path is diverted around the western side of the junction of Embankment with Lower Richmond Road to avoid the site access.

The footway surface around this junction is in poor condition and could result in slips, trips and falls resulting in pedestrian injuries.

S1.1.5 Recommendation: Ensure the footway on the diversionary route is regulated presenting a uniform walking surface for pedestrians.

Recommendation Accepted – The provision of a uniform walking surface for pedestrians on the diversionary route of the Thames Path will be review at Stage 2 (Detailed Design). A condition survey will be undertaken before commencement of any onsite works to verify the existing condition.

Permanent Layout

2.6 Location: Embankment

Summary: Tight swept path could result in vehicle damage.

Description: The swept path analysis for the permanent road layout indicates conflicts between some vehicle types leaving the site, and the parking bays on Embankment at the site egress and at the junction with Thames Place.

Swept path conflicts can lead to vehicle damage and could result in injuries for vehicles occupants or pedestrians if footways are over run to avoid a collision

S1.1.6 Recommendation: Temporary suspension of parking bays on Embankment may be required during maintenance periods so as to ensure unobstructed access.

Recommendation Accepted – The requirement for temporary parking bay suspensions during maintenance periods will be reviewed at Stage 2 (Detailed Design).

3 Response to Comments provided in addition to the Stage 1 Road Safety Audit

3.1 Additional Comments

Embankment forms part of National Cycle Route 4 and the Thames Cycle Route. Any traffic management proposed on these roads should take full account of cycles. Furthermore, delivery drivers should be made aware of the presence of the cycle routes and the likely increased risk of cycle / goods vehicle conflict.

Comment Response –.Delivery drivers will be made aware of the presence of cyclists on Embankment as part of the site induction. This will be included in the Code of Construction Practice at Stage 2 (Detailed Design).

Additional Comments

It is not clear from the construction layout whether there is sufficient space within the designated Manoeuvring Zone to turn a 16.5m HGV in order to enter and exit the site in a forward gear.

Comment Response – The internal site vehicle manoeuvring zone will be determined at Stage 2 (Detailed Design). An adequate area will be provided to allow HGVs to enter and exit the site in forward gear.

Your ref -
Our ref 211146-00/cvl

ARUP

Central Square
Forth Street
Newcastle upon Tyne
NE1 3PL
United Kingdom

t +44 191 261 6080
f +44 191 261 7879

chris.van-lottum@arup.com-
www.arup.com

Thames Tideway Tunnel
The Point (7th Floor),
37 North Wharf Road,
Paddington,
London W2 1AF
For the attention of Dermot Scanlon

13 February 2013

Dear Sirs

Thames Tideway Tunnel
Putney Embankment Temporary Slipway – Stage 1 Road Safety Audit

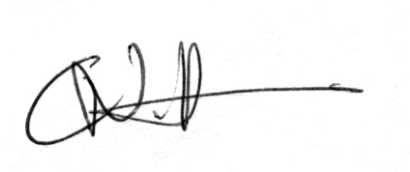
I have the pleasure of enclosing our Putney Embankment Temporary Slipway, Stage 1 Road Safety Audit report. In addition to the enclosed report the Audit Team noted the following point outwith the remit of the audit. I would be grateful if you would bring this issue to the attention of the Highway Authority, Designer and/or Maintainer as appropriate.

Additional Comment

- The proposals show the removal of over 30 on-street parking bays from Embankment and Glendavaron Street. It is likely to result in congestion and frustration for drivers who cannot find somewhere to park. Replacement facilities should be provided during the duration of the construction works.

If you have any further queries regarding this letter or the enclosed report, please do not hesitate to contact me

Yours faithfully



Chris van Lottum
Senior Engineer
Road Safety Audit Team Leader

Enc

cc Phillip Longman, Peter Brett Associates
Gavin Wicks, Arup

Thames Tideway Tunnel

Thames Tideway Tunnel – Putney Embankment Temporary Slipway

Stage 1 Road Safety Audit

RSA1.1a

Rev A | 13 February 2013

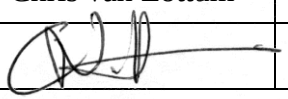
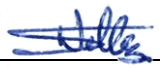
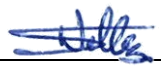
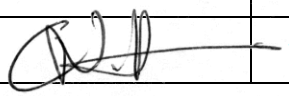
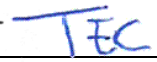
Job number 211146-03

Ove Arup & Partners Ltd
Central Square
Forth Street
Newcastle-upon-Tyne NE1 3PL
United Kingdom
www.arup.com

ARUP

Document Verification

ARUP

Job title		Thames Tideway Tunnel – Putney Embankment Temporary Slipway		**Job number**	211146-03
Document title		Stage 1 Road Safety Audit		**File reference**	
Document ref		RSA1.1a			
Revision	**Date**	**Filename**	RP CVL TTT 04 Putney Slipway RSA1.1 130213 Rev A.docx		
Issue	4 Jan 2013	**Description**	Issue document		
			Prepared by	Checked by	Approved by
		Name	Chris van Lottum	Steve Wells	Steve Wells
		Signature			
Rev A	13 Feb 2013	**Filename**	RP CVL TTT 04 Putney Slipway RSA1.1 130213 Rev A.docx		
		Description	Revised information received		
			Prepared by	Checked by	Approved by
		Name	Chris van Lottum	Tom Corke	Steve Wells
		Signature			
		Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			
		Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			
				Issue Document Verification with Document	✓

Contents

Page

1 Introduction 1

1.1 Site Description 2
1.2 Scheme Description 2

2 Stage 1 Road Safety Audit 3

2.1 Construction Layout 3
2.2 Permanent Layout 5

3 Road Safety Audit Statement 6

Figures

Figure 1 Location of Recommendations

Appendices

Appendix A
Documents and Drawings

1 Introduction

Arup was appointed by Thames Tideway Tunnel to conduct a Stage 1 Road Safety Audit on proposals to create a construction access and egress for works associated with the Thames Tideway Tunnel at Putney Embankment Temporary Slipway, Embankment in the London Borough of Wandsworth.

The agreed Audit Team consisted of:

- Mr C van Lottum MEng (Hons), MCIHT, MSoRSA
- Mr T Corke BEng (Hons), MSc, CEng, MICE, MCIHT, MSoRSA

The Audit Team visited the site together on Tuesday 4th December 2012; weather conditions at the time of the site visit were bright and cold and the road surface was damp.

A list of information provided to the Audit Team has been included as Appendix A to this Report.

The following information was **not** made available to the Audit Team and as such any specific influence of these details on road user safety has not been considered by this audit:

- Departures from Standard
- Road profiles
- Cross sections
- Drainage
- Landscape
- Public utilities
- Traffic signals
- Traffic signs
- Street lighting
- Road markings
- Road restraint systems

It is understood that no previous Road Safety Audits have been conducted on this scheme.

This audit has been undertaken in accordance with the Terms of Reference set out in TfL Procedure 'Road Safety Audit SQA-0170 – Issue 4'; and the Audit Team members meet the training and experience requirements set out therein. The Audit Team has examined and reported only on the road safety implications of the scheme as presented and has not examined or verified the compliance of the design to any other criteria. However, to clearly explain a problem or recommendation, the Audit Team may occasionally refer to design standards without engaging in technical audit.

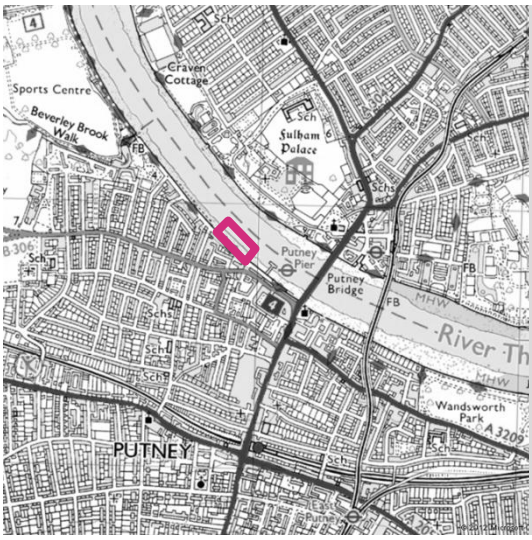
All problems and recommendations identified by this audit are referenced to the design drawings and the locations have been indicated on the attached plan.

Other issues, including safety issues identified during the Audit but excluded from this report by the Terms of Reference, which the Audit Team wishes to draw to the attention of the Audit Project Sponsor, are set out in separate correspondence.

Road Safety Audit is based upon a qualitative risk assessment process and there is no measure of the success achieved by any recommendations given herein. Road

Safety Audit cannot guarantee the safe operation of the scheme under consideration in this report as accidents are rare and random events and are largely caused by factors outside the Audit Team's influence, such as driving behaviour and, to a lesser extent, vehicle condition.

1.1 Site Description



Scheme Location

The Putney Embankment Temporary Slipway site is situated to the west of Putney Pier on the south bank of the River Thames; accessed from Embankment and Lower Richmond Road. The B306 Lower Richmond Road joins the A219 Putney High Street at the south end of Putney Bridge in south-west London.

1.2 Scheme Description

A temporary slipway is required to replace the existing public slipway located adjacent to Putney Bridge which would be closed during the construction works. The works to construct this temporary slipway would last for approximately three months prior to construction commencing on the main site. This temporary slipway would be removed once the original slipway has been reinstated at the end of the construction works.

During construction of the temporary slipway the carriageway of Embankment would be reduced to 5.2m, which would not be sufficient for two-way working. In addition, 30+ parking spaces on Embankment and Glendarvon Street would be suspended during the construction of the slipway.

The Thames Path runs along the riverside footway of Embankment past the Putney Embankment Temporary Slipway site. During the construction of the temporary slipway pedestrians and cycles would be diverted from the northern footway of Embankment onto a protected diversion route within the carriageway across the access to the Putney Embankment Temporary Slipway site.

During the operation of the temporary slipway the Embankment will return to its existing arrangement of accommodating two-way traffic flows and on-street parking. There will be a small section of on-street parking suspended during the operation of the slipway where it joins the Embankment.

2 Stage 1 Road Safety Audit

The Recommendations below are numbered as follows:

STAGE . AUDIT NUMBER . RECOMMENDATION NUMBER

2.1 Construction Layout

	Location:	Glendarvon Street
	Summary:	Tight swept path could result in vehicle damage.
	Description:	The swept path analysis for the construction layout indicates conflicts between some vehicle types approaching the site, and some of the parking bays on Glendarvon Street. Swept path conflicts can lead to vehicle damage and could result in injuries for vehicle occupants or pedestrians if footways are over run to avoid a collision.
S1.1.1	**Recommendation:**	Suspend additional parking bays at either end of Glendarvon Street so as to ensure unobstructed egress can be achieved.

	Location:	Embankment
	Summary:	Angled footway crossing and poor visibility around delivery access point could result in pedestrian conflicts.
	Description:	The entry to the delivery access point at the temporary slipway crosses the diversionary footway route at a shallow angle. Furthermore, the delivery access point is hoarded resulting in limited pedestrian visibility around the obstructions. An intermittent barrier is proposed across the opening to be removed when HGVs require access.

It is not clear how this would be managed during the construction phase. Shallow crossing angles and poor visibility could result in pedestrian conflict with delivery vehicles resulting in pedestrian injuries.

S1.1.2 **Recommendation:** Relocate the pedestrian walkway to the western side of Embankment so as to avoid conflict with delivery access traffic.

Location: Embankment

Summary: Tree adjacent to delivery access point could result in difficulties with loading leading to congestion and conflict.

Description: There is a tree shown part way along the delivery access point for the temporary slipway.

IMG_8385.jpg

Tree branches could prevent the safe loading and unloading of vehicles by HIABs or forklifts in the delivery access point; resulting in spillage of payloads on to the adjacent carriageway.

S1.1.3 **Recommendation:** Remove the tree from footway adjacent to the delivery access point.

	Location:	Junction of Thames Place with Embankment
	Summary:	Lack of storage at junction under traffic management could lead to congestion and conflicts.
	Description:	It is necessary for the Embankment, west of Thames Place, to operate under a single lane flow regime during the construction phase. To the east of Thames Place the road is westbound only; as a result, eastbound traffic must exit via Thames Place.

IMG_8382.jpg

Under a single lane flow regime queues may block back through the Thames Place junction preventing the right turn to Thames Place resulting in gridlock.

S1.1.4	**Recommendation:**	Provide yellow box markings to allow eastbound traffic to clear via Thames Place.

2.2 Permanent Layout

No items have been raised with respect to the Permanent Layout as a result of this audit

End of list of problems identified and recommendations offered in this Stage 1 Road Safety Audit

3 Road Safety Audit Statement

I certify that this audit has been carried out in accordance with HD19/03.

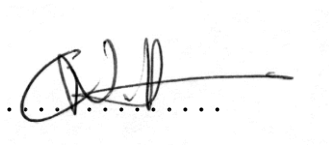
Audit Team Leader

Mr C van Lottum MEng (Hons), MCIHT, MSoRSA

Senior Engineer

Arup

Central Square, Forth Street,
Newcastle upon Tyne, NE1 3PL



13 February 2012

Audit Team Member

Mr T Corke BEng (Hons), MSc, CEng, MICE, MCIHT, MSoRSA

Senior Engineer

Arup

The Arup Campus, Blythe Gate, Blythe Valley Park,
Solihull, B90 8AE

Figures

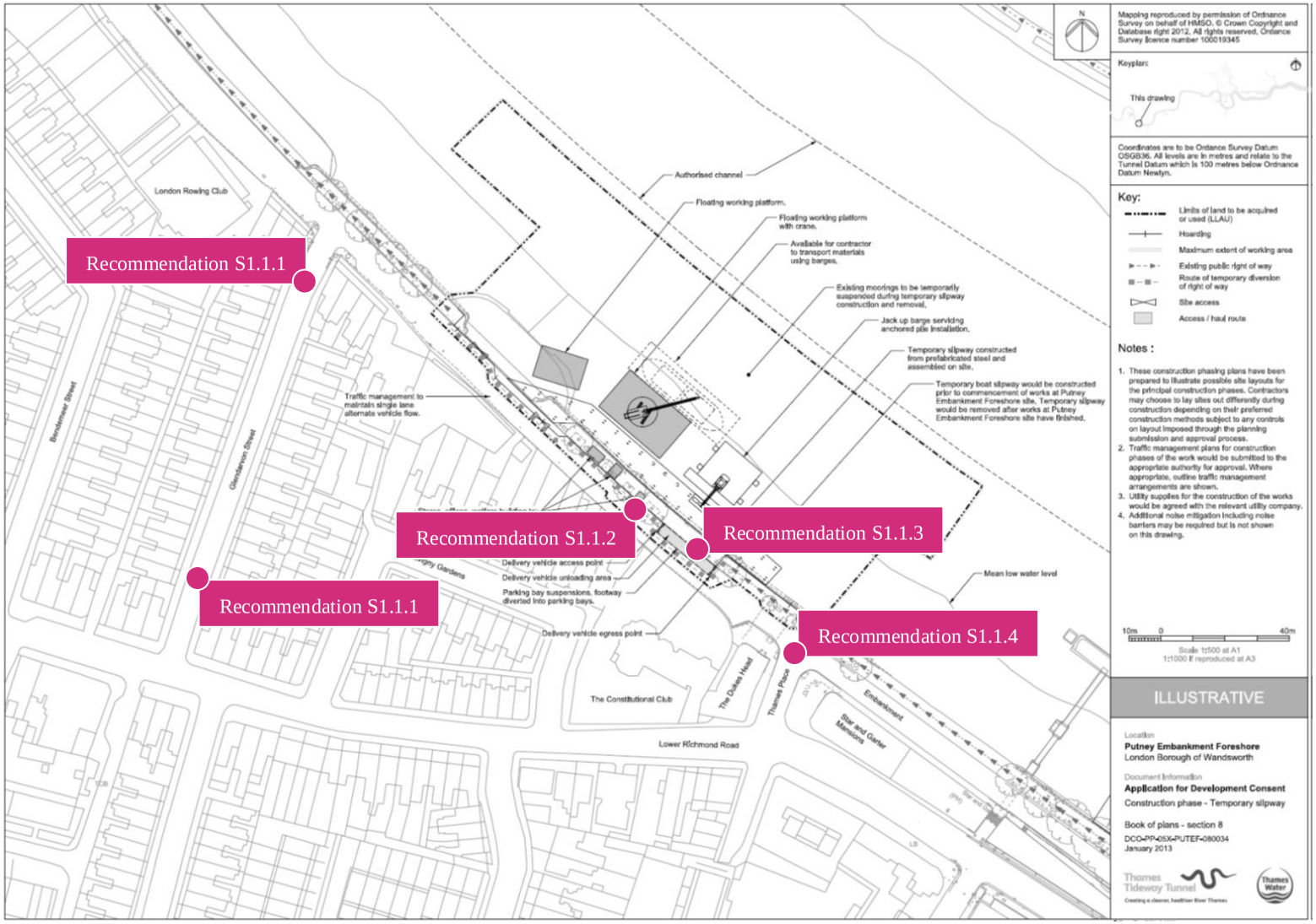


Figure 1 Location of Recommendations

Appendix A

Documents and Drawings

A1 Documents and Drawings

The following documents and drawings were supplied to the Audit Team by the Designer and have been examined in the course of conducting this audit.

A1.1 Documents

Title	Reference	Revision
Road Safety Audit Brief	-	19/12/12

A1.2 Drawings

Title	Reference	Revision
Transport - site location plan	1PL03-TT-50662	Jan 2013
Transport - construction traffic routes	1PL03-TT-50654	Jan 2013
Transport - accident locations	1PL03-TT-50758	Jan 2013
Construction phase - Temporary slipway	DCO-PP-05X-PUTEF-080034	Jan 2013
Highway layout during construction (Area 2)	DCO-PP-05X-PUTEF-080041	Jan 2013
Highway layout during construction (Area 3)	DCO-PP-05X-PUTEF-080042	Jan 2013
Permanent highway layout – Area 2 work	DCO-PP-05X-PUTEF-080044	Jan 2013
Permanent highway layout – Area 3 work	DCO-PP-05X-PUTEF-080045	Jan 2013
Temporary slipway layout (Area 2) – Vehicle swept path analysis	DCO-PP-05X-PUTEF-080046	Jan 2013
Highway layout during construction (Area 2) – Vehicle swept path analysis	DCO-PP-05X-PUTEF-080048	Jan 2013
Highway layout during construction (Area 3) – Vehicle swept path analysis	DCO-PP-05X-PUTEF-080049	Jan 2013

TECHNICAL NOTE

Peter Brett Associates LLP
16 Brewhouse Yard, Clerkenwell,
London, EC1V 4LJ
T: +44 (0)20 7025 7100
E: london@peterbrett.com

Job Name	**Thames Tideway Tunnel – Putney Embankment Temporary Slipway**	
Job No.	22104	
Note No.	001	
Date	15th February 2013	
Subject	Stage 1 Road Safety Audit – Designer's Response	
Prepared by	L Harney	**Reviewed:** B Kemp

1 Introduction

1.1 Arup was appointed by Thames Water to conduct a Stage 1 Road Safety Audit on proposals to create a construction access and egress for works associated with the Thames Tideway Tunnel at the slipway located on the Embankment to the west of Putney Bridge, between Thames Place and Glendarvon Street in the London Borough of Wandsworth.

1.2 This technical note provides the Designer's Response to the Stage 1 Audit for this site.

2 Stage 1 Road Safety Audit

Construction Layout

2.1 Location: Glendarvon Street

Summary: Tight swept path could result in vehicle damage.

Description: The swept path analysis for the construction layout indicates conflicts between some vehicle types approaching the site, and some of the parking bays on Glendarvon Street.

Swept path conflicts can lead to vehicle damage and could result in injuries for vehicle occupants or pedestrians if footways are over run to avoid a collision.

S1.1.1 Recommendation: Suspend additional parking bays at either end of Glendarvon Street so as to ensure unobstructed egress can be achieved.

Recommendation Accepted – The requirement to suspend additional parking on Glendarvon Road will be reviewed at Stage 2 (Detailed Design).

2.2 Location: Embankment

Summary: Angled footway crossing and poor visibility around delivery access point could result in pedestrian conflicts.

Description: The entry to the delivery access point at the temporary slipway crosses the diversionary footway route at a shallow angle. Furthermore, the delivery access point is hoarded resulting in limited pedestrian visibility around the obstructions.

Shallow crossing angles and poor visibility could result in pedestrian conflict with delivery vehicles resulting in pedestrian injuries.

S1.1.2 Recommendation: Relocate the pedestrian walkway to the western side of Embankment so as to avoid conflict with delivery access vehicles.

Recommendation Response – There is no footway in place currently on the western side of the Embankment. The provision of a footpath on this side of the road would require pedestrians to make two additional crossings when approaching on the eastern side of the road and would also route pedestrians in front of a number of vehicular gates to private residences and also the chancellery where large vehicles towing boats frequently require access. The access to the delivery area for this site will be managed to avoid pedestrian conflict.

2.3 Location: Embankment

Summary: Tree adjacent to delivery access point could result in difficulties with loading leading to congestion and conflict.

Description: There is a tree shown part way along the delivery access point for the temporary slipway.

Tree branches could prevent the safe loading and unloading of vehicles by HIABs or forklifts in the delivery access point; resulting in spillages of payloads on to the adjacent carriageway.

S1.1.3 Recommendation: Remove the tree from footway adjacent to the delivery access point.

Recommendation Response – The exact location of the loading bay will be determined at Stage 2 (Detailed Design) and will be in such a position so as to avoid the existing trees within the footway.

2.4 Location: Junction of Thames Place with Embankment

Summary: Lack of storage at junction under traffic management could lead to congestion and conflicts.

Description: It is necessary for the Embankment, west of Thames Place, to operate under a single lane flow regime during the construction phase. To the east of Thames Place the road is westbound only; as a result, eastbound traffic must exit via Thames Place.

Under a single lane flow regime queues may block back through the Thames Place resulting in gridlock.

S1.1.4 Recommendation: Provide yellow box marking to allow eastbound traffic to clear via Thames Place.

Recommendation Accepted – The provision of a yellow box marking will be reviewed at Stage 2 (Detailed Design).

3 Response to Comments provided in addition to the Stage 1 Road Safety Audit

3.1 Additional Comments

The proposals show the removal of over 30 on-street parking bays from Embankment and Glendarvon Street. It is likely to result in congestion and frustration for drivers who cannot find somewhere to park. Replacement facilities should be provided during the duration of the construction works.

Comment Response – Parking surveys were undertaken on the Embankment and the surrounding roads and the results showed that there should be adequate spare capacity within the surrounding area to accommodate the loss of on-street parking.

This page is intentionally blank

Thames Tideway Tunnel
Thames Water Utilities Limited

Application for Development Consent

Application Reference Number: WWO10001

Transport Assessment

Doc Ref: **7.10.04**

Putney Embankment Foreshore

Figures

APFP Regulations 2009: Regulation **5(2)(q)**

Hard copy available in

Box **50** Folder **A**
January 2013

Thames Tideway Tunnel

Creating a cleaner, healthier River Thames

This page is intentionally blank

Thames Tideway Tunnel

Transport Assessment

Section 7: Putney Embankment Foreshore figures

List of contents

Plans	
Transport - existing highway layout	
Transport - highway layout during construction area 1	
Transport - highway layout during construction area 2 - vehicle swept path analysis	
Transport - highway layout during construction area 3	
Transport - permanent highway layout area 1 work	
Transport - permanent highway layout area 2	
Transport - permanent highway layout area 3	
Transport - temporary slipway layout (Area 2) - Vehicle swept path analysis	
Transport - highway layout during construction area 1 - vehicle swept path analysis	
Transport - highway layout during construction area 2 - vehicle swept path analysis (1 of 2)	
Transport - highway layout during construction area 2 - vehicle swept path analysis (2 of 2)	
Transport - permanent highway layout area 1 - vehicle swept path analysis	
Transport assessment figures	
Transport - site location plan	Figure 7.2.1
Transport - construction traffic routes	Figure 7.2.2
Transport - pedestrian and cycle network	Figure 7.4.1
Transport - public transport	Figure 7.4.2
Transport - parking	Figure 7.4.3
Transport - survey locations	Figure 7.4.4
Baseline, Construction and Development case traffic flow (AM peak hour)	Figure 7.4.5
Baseline, Construction and Development case traffic flow (PM peak hour)	Figure 7.4.6
Transport - accident locations	Figure 7.4.7
Transport - pedestrian and cyclist accidents by severity	Figure 7.4.8
Hourly Construction Lorry Movements - Site Year 2 of Construction	Figure 7.5.1

This page is intentionally blank

Plans

This page is intentionally blank

Putney Embankment Foreshore

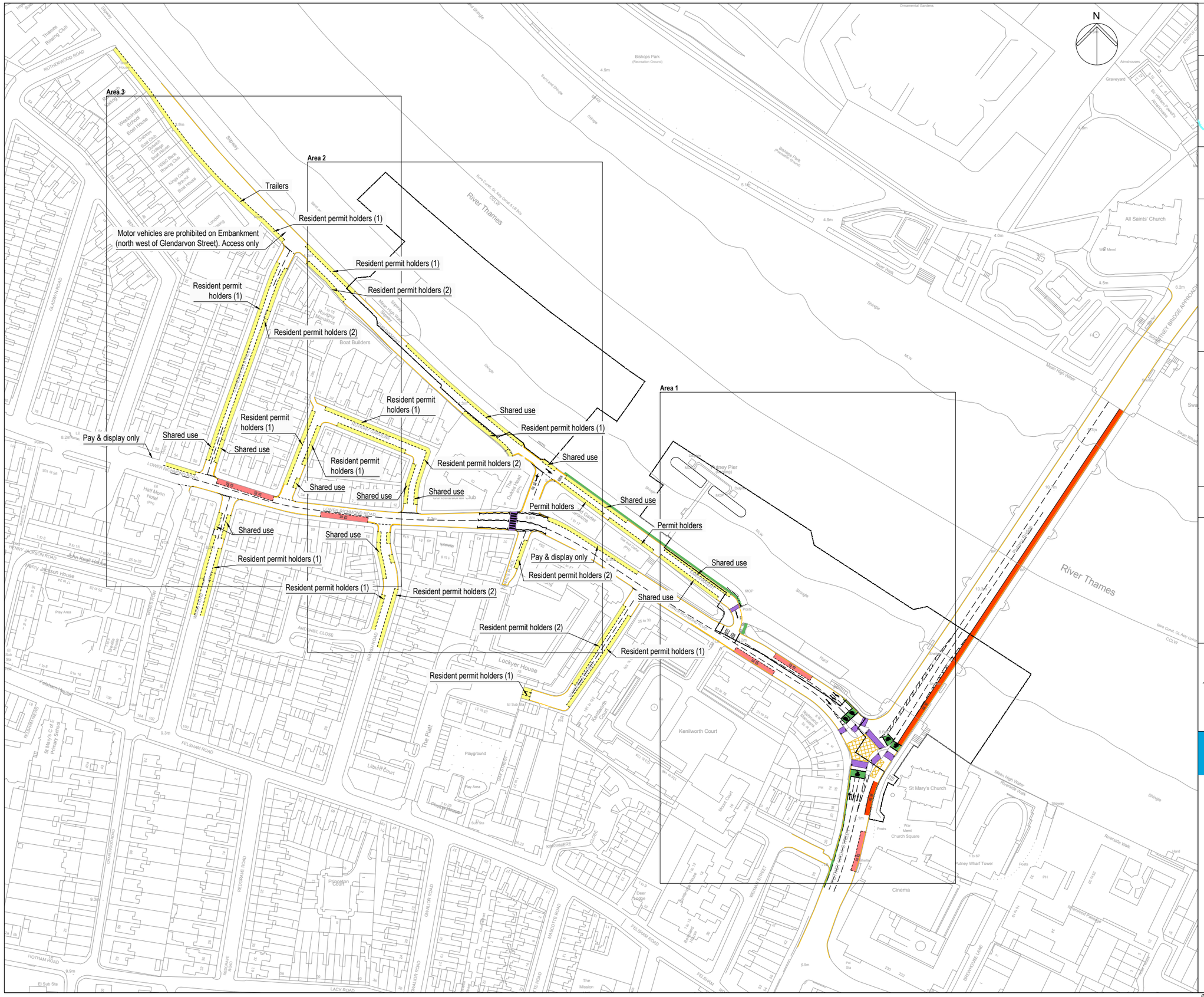
THAMES TIDEWAY TUNNEL - SCHEDULE OF ASSOCIATED HIGHWAY WORKS

Drawing Number	Works Reference	Location	Items of Work	Dates of Implementation
DCO-PP-05X-PUTEF-080040	PWH1X_C01	Embankment / Lower Richmond Road Junction	Widening of junction by settling back the kerb on the eastern side of the Embankment arm. Relocation of tactile paving on the eastern side of the Embankment arm to match realigned kerb. Suspension of cycle path at junction to accommodate kerb realignment. Extension of 'Keep Clear' road marking to accommodate turning circle of HGVs. Implementation of two-way traffic system for construction traffic on the eastern section of the Embankment.	TBC
	PWH1X_C02	Embankment - Access to slipway on the eastern end of the Embankment	Provision of gated construction site access and closure of slipway to public access. Access to Waterman's Green will be maintained.	TBC
	PWH1X_C03	Embankment - North-west of the Embankment/Lower Richmond Road Junction	Suspension of 18 metres of shared use on-street parking on northern side of Embankment and 13 metres of shared on-street parking on southern side of Embankment	TBC
DCO-PP-05X-PUTEF-080041	PWH1X_C04	Lower Richmond Road - Opposite Thames Place	Suspension of 8.6 metres of pay and display on-street parking due to swept path of construction vehicles.	TBC
	PWH1X_C05	Embankment - West of Thames Place / Embankment Junction	Suspension of 32.7 metres of resident permit on-street parking and 4.4metres of motorcycle parking	TBC
	PWH1X_C06	Embankment - West of Thames Place / Embankment Junction	Provision of loading/unloading bay for construction vehicles which will be segregated from pedestrians and live vehicles using fencing.	TBC
	PWH1X_C07	Embankment - West of Thames Place	Suspension of 88.8 metres of shared use on-street parking.	TBC
	PWH1X_C08	Embankment - West of Thames Place	Suspension of public footpath as it falls within the construction site boundary.	TBC
	PWH1X_C09	Embankment - West of Thames Place	Provision of gated site access	TBC
	PWH1X_C10	Embankment - West of Thames Place	Diversion of Thames Path into a 1. 5 metre wide walkway which will be provided in the carriageway due to location of construction site boundary. Pedestrians will be segregated from live traffic using suitable temporary barriers.	TBC
	PWH1X_C11	Embankment - West of Thames Place	Provision of gated construction site access and closure of slipway to public access.	TBC
	PWH1X_C12	Embankment - West of Thames Place	Implementation of priority traffic management system to control the movement of vehicles through the section of Embankment which will be reduced to one-way traffic flow as a result of the construction site boundary.	TBC
	PWH1X_C13	Embankment - East of Glendarvon Street	Suspension of 38.6m of shared use on-street parking on the northern side of Embankment to facilitate the priority traffic management system.	TBC
DCO-PP-05X-PUTEF-080042	PWH1X_C14	Glendarvon Street - Southern End	Suspension of 12.6m of shared use on-street parking on the eastern side of Glendarvon Street.	TBC
	PWH1X_C25	Glendarvon Street - Southern End	Suspension of 15.0m of shared use on-street parking on the western side of Glendarvon Street.	TBC
	PWH1X_C16	Glendarvon Street - Southern End	Change of single yellow line restriction so that loading/unloading is not permitted during the working hours of the site.	TBC
DCO-PP-05X-PUTEF-080043	PWH1X_P01	Embankment / Upper Richmond Road Junction	Reinstatement of 'Keep Clear' road marking to existing location.	TBC
	PWH1X_P02	Embankment / Upper Richmond Road Junction	Reinstatement of diverted cycle path and pedestrian refuge to their existing locations.	TBC
	PWH1X_P03	Embankment - North of the Embankment/Lower Richmond Road Junction	Reinstatement of one-way traffic system for all vehicles on the eastern end of the Embankment except when maintenance vehicles need access to the site.	TBC

Putney Embankment Foreshore

THAMES TIDEWAY TUNNEL - SCHEDULE OF ASSOCIATED HIGHWAY WORKS

Drawing Number	Works Reference	Location	Items of Work	Dates of Implementation
	PWH1X_P04	Embankment - North-west of the Embankment/Lower Richmond Road Junction	Reinstatement of on-street parking on the northern and southern side of the Embankment which was suspended during the construction phase in order to accommodate construction vehicle access. Reinstatement of cycle path on the Embankment northern footpath.	TBC
DCO-PP-05X-PUTEF-080044	PWH1X_P05	Embankment - West of Thames Place	Reinstatement of 32.7 metres of resident permit on-street parking and 4.4metres of motorcycle parking	TBC
	PWH1X_P06	Embankment / Thames Place Junction	Reinstatement of 8.6 metres of shared use on-street parking.	TBC
	PWH1X_P07	Embankment - West of Thames Place / Embankment Junction	Removal of loading/unloading area used by HGVs during the construction phase.	TBC
	PWH1X_P08	Embankment - West of Thames Place	Reinstatement of 88.8 metres of shared use on-street parking.	TBC
	PWH1X_P09	Embankment - Between Thames Place and Glendarvon Street	Reinstatement of footpath which was closed during construction as it formed part of the construction site.	TBC
	PWH1X_P10	Embankment - West of Thames Place	Removal of double yellow lines and reinstatement of single yellow lines.	TBC
	PWH1X_P11	Embankment - Between Thames Place and Glendarvon Street	Removal of priority traffic management system and reopening of full width of carriageway adjacent to slipway access.	TBC
	PWH1X_P12	Embankment - East of Glendarvon Street	Reinstatement of 38.6m of shared use on-street parking which was suspended during the construction phase to facilitate the priority traffic management system.	TBC
	PWH1X_P13	Glendarvon Street - Southern End	Reinstatement of slipway which was closed during temporary slipway construction phase	TBC
DCO-PP-05X-PUTEF-080045	PWH1X_P09	Embankment - Between Thames Place and Glendarvon Street	Reinstatement of footpath which was closed during construction as it formed part of the construction site.	TBC
	PWH1X_P10	Embankment - West of Thames Place	Removal of double yellow lines and reinstatement of single yellow lines.	TBC
	PWH1X_P11	Embankment - Between Thames Place and Glendarvon Street	Removal of priority traffic management system and reopening of full width of carriageway adjacent to slipway access.	TBC
	PWH1X_P12	Embankment - East of Glendarvon Street	Reinstatement of 38.6m of shared use on-street parking which was suspended during the construction phase to facilitate the priority traffic management system.	TBC
	PWH1X_P13	Glendarvon Street - Southern End	Reinstatement of slipway which was closed during temporary slipway construction phase	TBC
	PWH1X_P14	Glendarvon Street - Southern End	Reinstatement of 15.0m of shared use on-street parking on the western side of Glendarvon Street and reinstatement of 12.6m of shared use on-street parking on the eastern side of Glendarvon Street.	TBC
	PWH1X_P15	Glendarvon Street - Southern End	Removal of single yellow line restriction that prohibited loading/unloading during the construction site operating hours.	TBC



Mapping reproduced by permission of Ordnance Survey on behalf of HMSO. © Crown Copyright and Database right 2012. All rights reserved. Ordnance Survey licence number 100019345

Keyplan:

Coordinates are to be Ordnance Survey Datum OSGB36. All levels are in metres and relate to the Tunnel Datum which is 100 metres below Ordnance Datum Newlyn.

Key

Existing

- Parking restrictions
- On street parking
- Bus stop / stand
- Bus lane
- Pedestrian crossing
- Cycle lane / advance stop line
- Bicycle stands
- Bollards

Revised

- Limit of land to be acquired or used (LLAU)

On Street Parking

Shared Use - A1 permit holders or pay & display max stay 4 hrs Mon - Sat 8:30am - 6.30pm

A1 - A1 permit holders only Mon - Sat 8:30am - 6:30pm

Pay & display only - Pay & display only max stay 1 hr Mon - Sat 10:00am - 4:00pm

Residence permit holders (1) - Residence permit holders only at all times

Residence permit holders (2) - Residence permit holders only Mon - Sat 8:30am - 6.30pm

Trailers - Trailers or towing vehicles with trailers only. Mon - Sat 8:30am - 6:30pm

Stage

Existing and construction base case

Standards

- Design Manual for Roads and Bridges, Dft, 1992
- Traffic Signs Regulations & General Directions, Tso, 2002
- Traffic Signs Manual, Dft, 2006
- Manual for Streets, Dft, 2007
- Manual for Streets 2, CIHT, 2010
- Designing for Deliveries, Fta, 1998
- Cycle Infrastructure Design Ltn 2/08, Dft, 2008
- Design of Pedestrian Crossings Ltn 2/95, Dft, 1995
- Guidance on the use of Tactile Paving Surfaces, Dft, 1998
- Accessible Bus Stop Design Guidance, TfL, 2006

10m 0 100m

Scale 1:1000 at A1
1:2000 if reproduced at A3

FOR INFORMATION

Location

Putney Embankment Foreshore
London Borough of Wandsworth

Document Information

Application for Development Consent

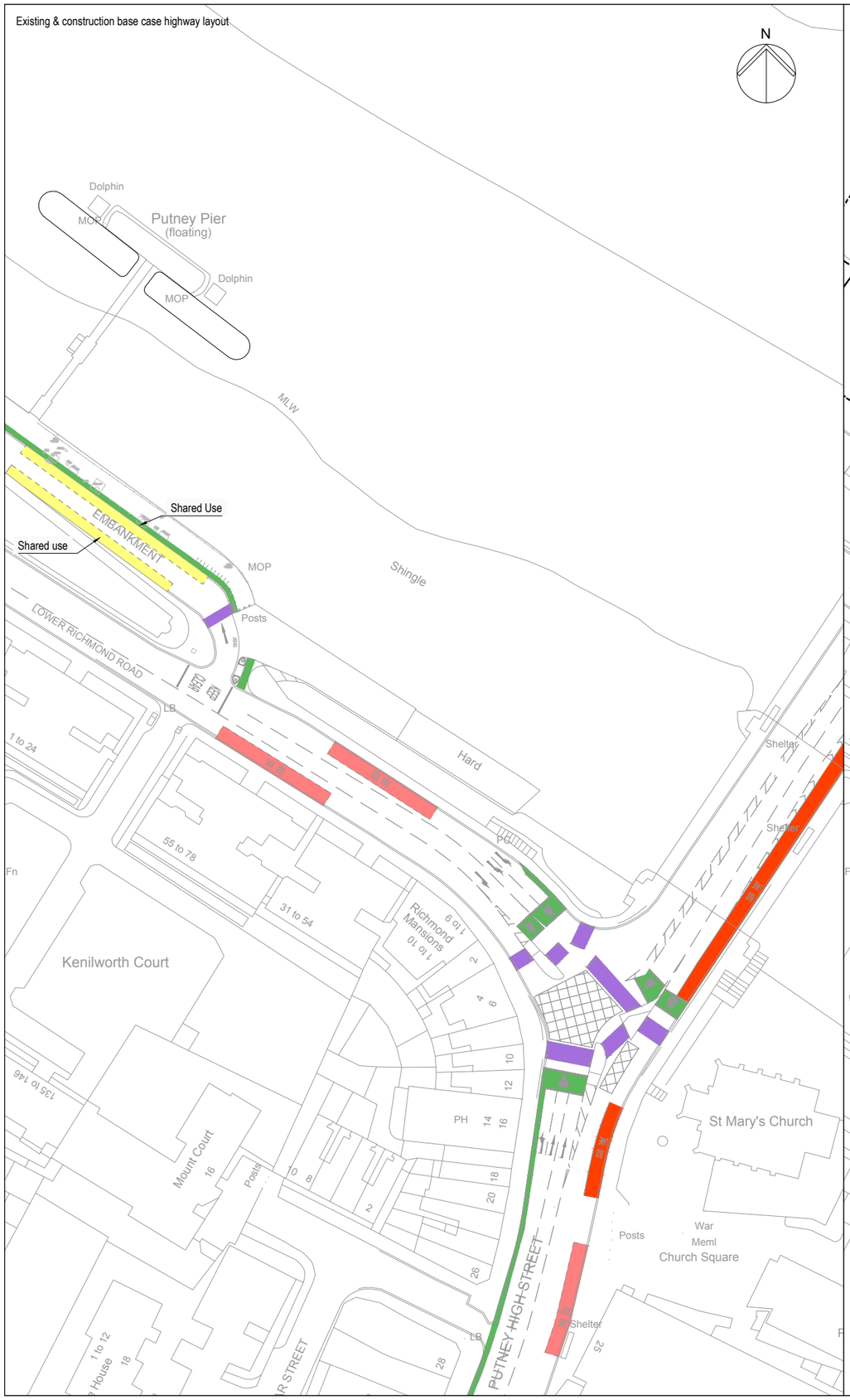
Existing highway layout

DCO-PP-05X-PUTEF-080039
January 2013

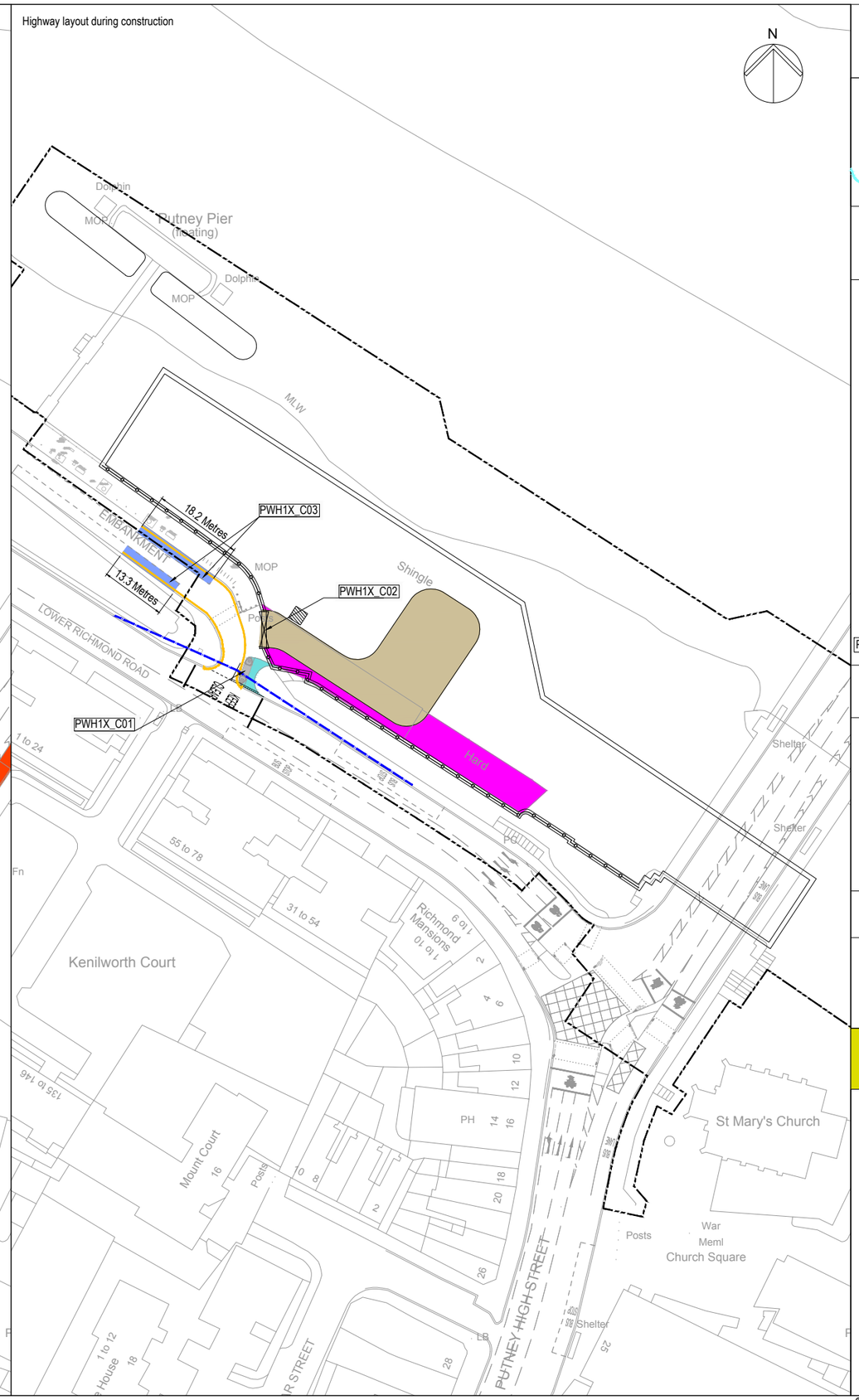
Thames Tideway Tunnel
Creating a cleaner, healthier River Thames

Thames Water

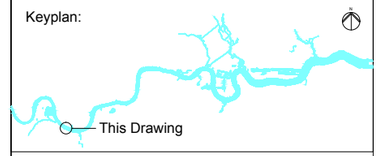
Existing & construction base case highway layout



Highway layout during construction



Keyplan:



Coordinates are to be Ordnance Survey Datum OSGB36. All levels are in metres and relate to the Tunnel Datum which is 100 metres below Ordnance Datum Newlyn.

Key

Existing
- Parking restrictions
- On street parking
- Bus stop / stand
- Bus lane
- Pedestrian crossing
- Cycle lane / advance stop line
- Bicycle Parking
- Bollard

Revised
- Parking restrictions
- Suspension of footway
- Suspension of Slipway
- Suspended on street parking
- Relocated cycle path
- Illustrative on-site manoeuvring zone
- Visibility splay - 2.4m x 43m / 2.4m x 27m (ssd adjust for bonnet length)
- Site hut
- Site hoarding
- Access gate
- Limit of land to be acquired or used (LLAU)
- PWH1X_C00 See schedule of works

On Street Parking

Shared Use - A1 permit holders or pay & display max stay 4 hrs Mon - Sat 8:30am - 6.30pm

Standards
- Design Manual for Roads and Bridges, Dft, 1992
- Traffic Signs Regulations & General Directions, TSO, 2002
- Traffic Signs Manual, Dft, 2006
- Manual for Streets, Dft, 2007
- Manual for Streets 2, CIHT, 2010
- Designing for Deliveries, Fta, 1998
- Cycle Infrastructure Design Ltn 2/08, Dft, 2008
- Design of Pedestrian Crossings Ltn 2/95, Dft, 1995
- Guidance on the use of Tactile Paving Surfaces, Dft, 1998
- Accessible Bus Stop Design Guidance, TfL, 2006

Stage

Phase 1-3

10m 0 40m

Scale 1:500 at A1
1:1000 if reproduced at A3

ILLUSTRATIVE

Location

Putney Embankment Foreshore
London Borough of Wandsworth

Document Information

Application for Development Consent

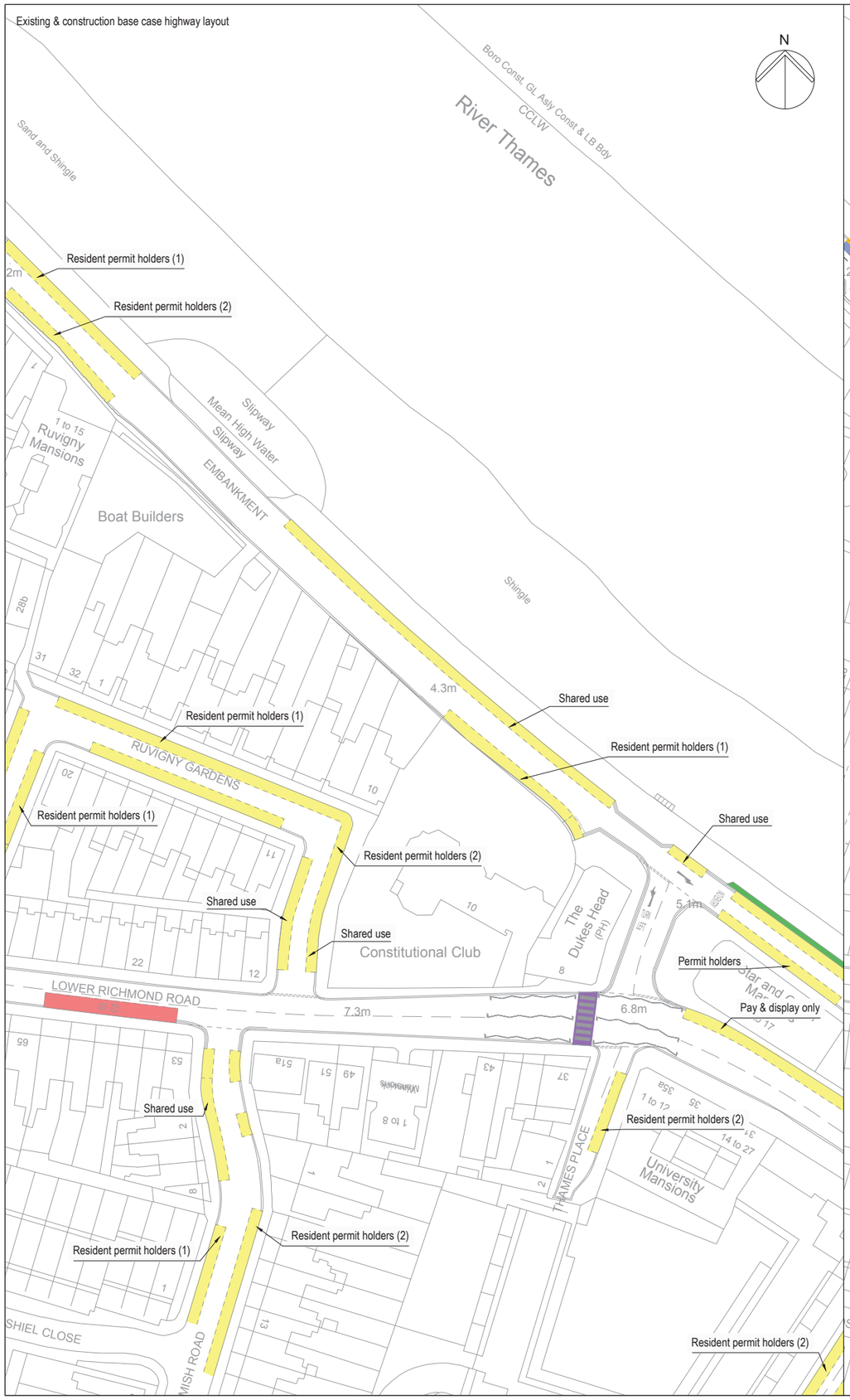
Highway layout during construction (Area 1)

DCO-PP-05X-PUTEF-080040
January 2013

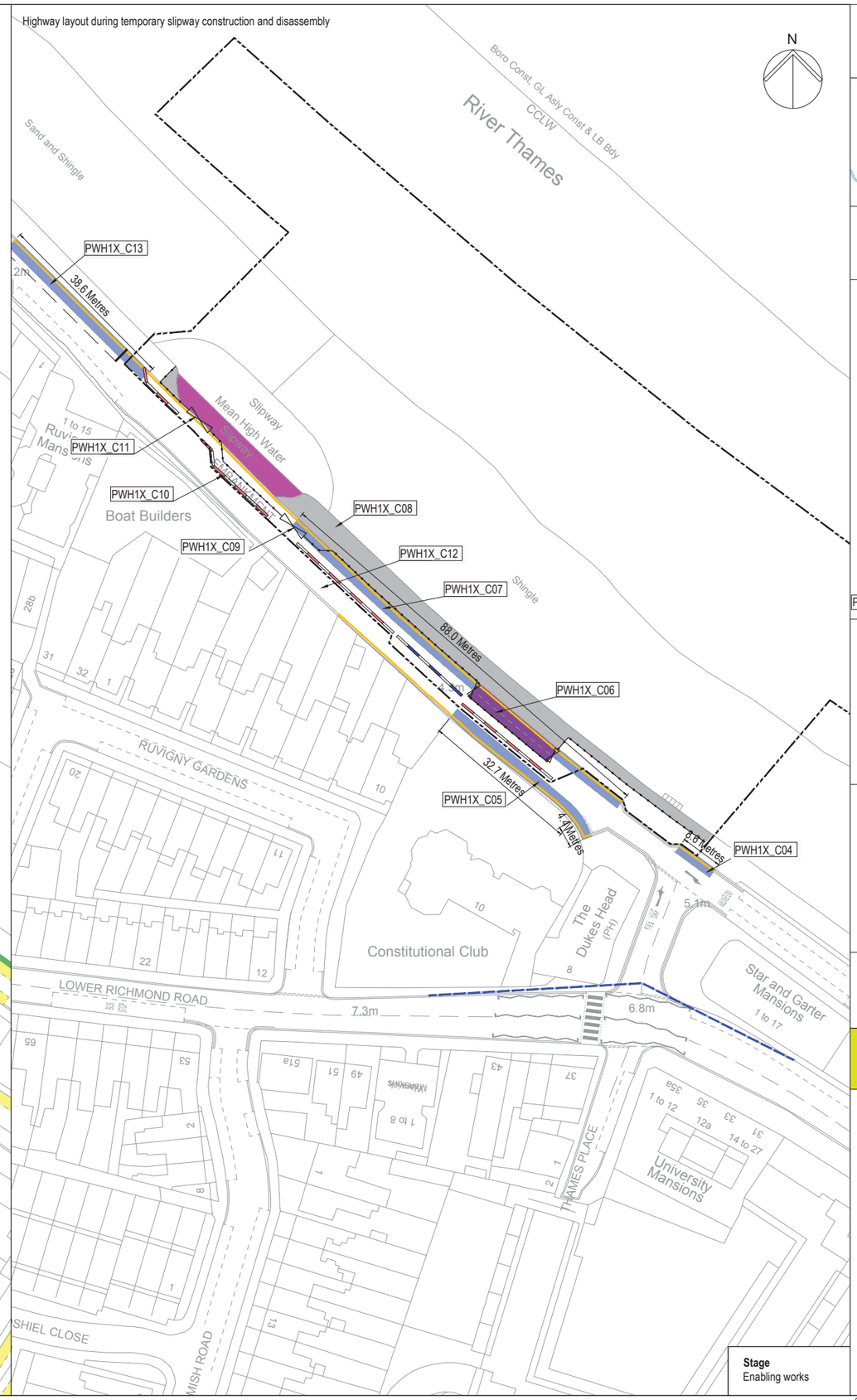
Thames Tideway Tunnel
Creating a cleaner, healthier River Thames

Thames Water

Existing & construction base case highway layout



Highway layout during temporary slipway construction and disassembly



Keyplan:

Coordinates are to be Ordnance Survey Datum OSGB36. All levels are in metres and relate to the Tunnel Datum which is 100 metres below Ordnance Datum Newlyn.

Key

Existing
- Parking restrictions
- On street parking
- Bus stop / stand
- Pedestrian crossing
- Cycle lane / advance stop line

Revised
- Parking restrictions
- Suspension of footway
- Suspension of slipway
- Suspended on street parking
- Intermittent loading area (with associated traffic management)
- Temporary barrier
- Intermittent barrier, to be removed during hgv access
- Site hoarding
- Access gate
- Visibility splay - 2.4m x 43m (ssd adjust for bonnet length)
- Limit of land to be acquired or used (LLAU)
- PWH1X_C00 See schedule of works

On street parking

Shared use - Shared use A1 permit holders or pay & display max stay 4hrs Mon - Sat 8:30am - 6:30pm

Permit holders - A1 permit holders only Mon - Sat 8:30am - 6:30pm

Pay & display - Pay & display only max stay 1 hr Mon - Sat 10:00am - 4:00pm

Residence permit holders (1) - Residents permit holders only at all times

Residents permit holders (2) - Residents permit holders only Mon - Sat 8:30am - 6:30pm

Standards
- Design Manual for Roads and Bridges, Dft, 1992
- Traffic Signs Regulations & General Directions, Tso, 2002
- Traffic Signs Manual, Dft, 2006
- Manual for Streets, Dft, 2007
- Manual for Streets 2, CIHT, 2010
- Designing for Deliveries, Fta, 1998
- Cycle Infrastructure Design Ltn 2/08, Dft, 2008
- Design of Pedestrian Crossings Ltn 2/95, Dft, 1995
- Guidance on the use of Tactile Paving Surfaces, Dft, 1998
- Accessible Bus Stop Design Guidance, TfL, 2006

10m 0 40m

Scale 1:500 at A1
1:1000 if reproduced at A3

ILLUSTRATIVE

Location

Putney Embankment Foreshore
London Borough of Wandsworth

Document Information

Application for Development Consent

Highway layout during construction (Area 2)

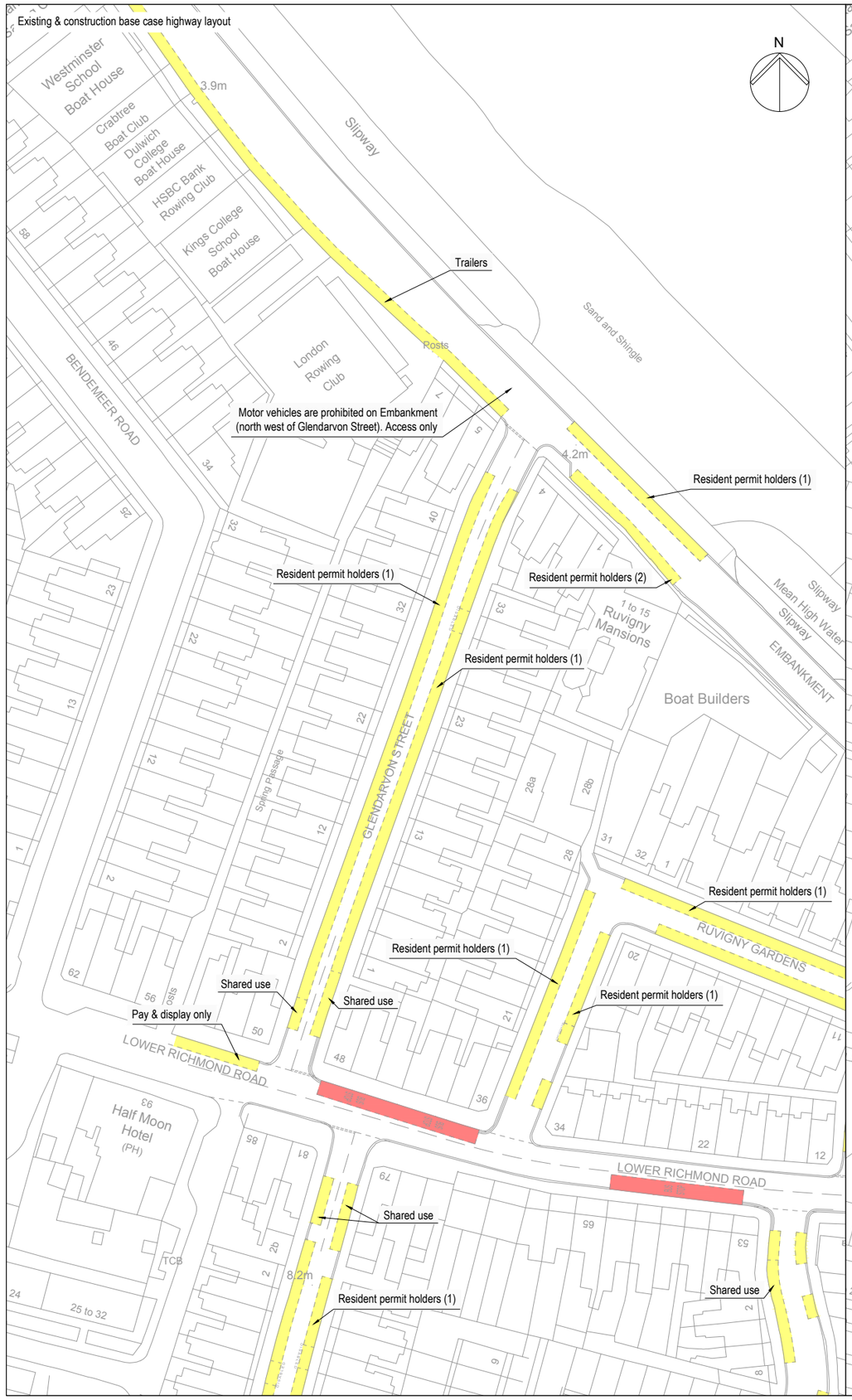
DCO-PP-05X-PUTEF-080041
January 2013

Thames Tideway Tunnel
Creating a cleaner, healthier River Thames

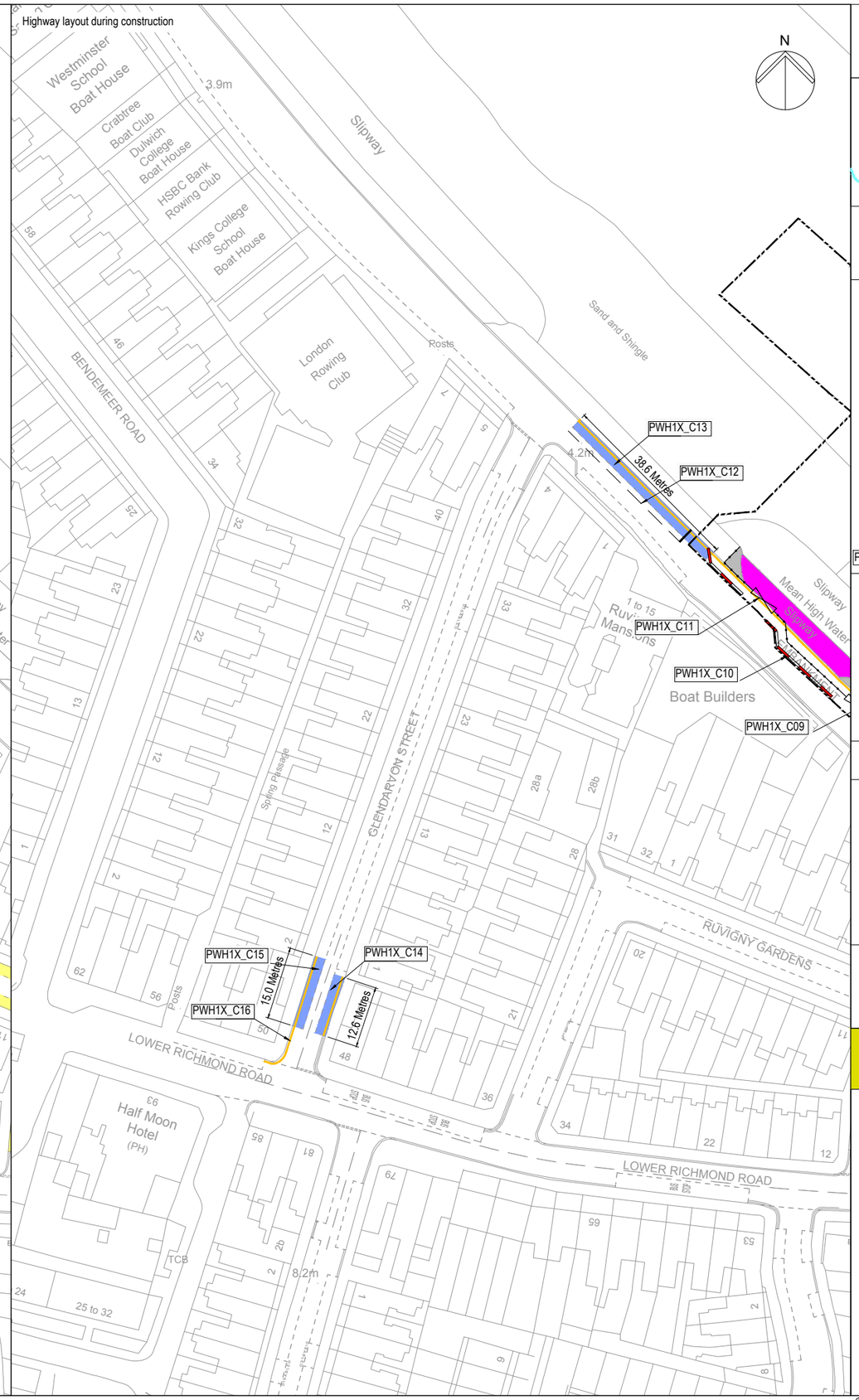
Thames Water

Stage
Enabling works

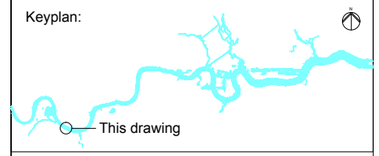
Existing & construction base case highway layout



Highway layout during construction



Keyplan:



Coordinates are to be Ordnance Survey Datum OSGB36. All levels are in metres and relate to the Tunnel Datum which is 100 metres below Ordnance Datum Newlyn.

Key

Existing
- Parking restrictions
- On street parking
- Bus stop / stand

Revised
- Parking restrictions
- Suspension of footway
- Suspension of slipway
- Suspended on street parking
- Illustrative on-site manoeuvring zone
- Temporary barrier
- Visibility splay - 2.4m x 43m (ssd adjust for bonnet length)
- Site hoarding
- Access gate
- Limit of land to be acquired or used (LLAU)
- PWH1X_C00 See schedule of works

On street parking

Shared use - Shared use A1 permit holders or pay & display max stay 4hrs Mon - Sat 8:30am - 6:30pm

Permit holders - A1 permit holders only Mon - Sat 8:30am - 6:30pm

Pay & display - Pay & display only max stay 1 hr Mon - Sat 10:00am - 4:00pm

Residence permit holders (1) - Residents permit holders only at all times

Residents permit holders (2) - Residents permit holders only Mon - Sat 8:30am - 6:30pm

Stage

Enabling works

Standards

- Design Manual for Roads and Bridges, Dft, 1992
- Traffic Signs Regulations & General Directions, Tso, 2002
- Traffic Signs Manual, Dft, 2006
- Manual for Streets, Dft, 2007
- Manual for Streets 2, CIHT, 2010
- Designing for Deliveries, Fta, 1998
- Cycle Infrastructure Design Ltn 2/08, Dft, 2008
- Design of Pedestrian Crossings Ltn 2/95, Dft, 1995
- Guidance on the use of Tactile Paving Surfaces, Dft, 1998
- Accessible Bus Stop Design Guidance, TfL, 2006

10m 0 40m

Scale 1:500 at A1
1:1000 if reproduced at A3

ILLUSTRATIVE

Location

Putney Embankment Foreshore
London Borough of Wandsworth

Document Information

Application for Development Consent

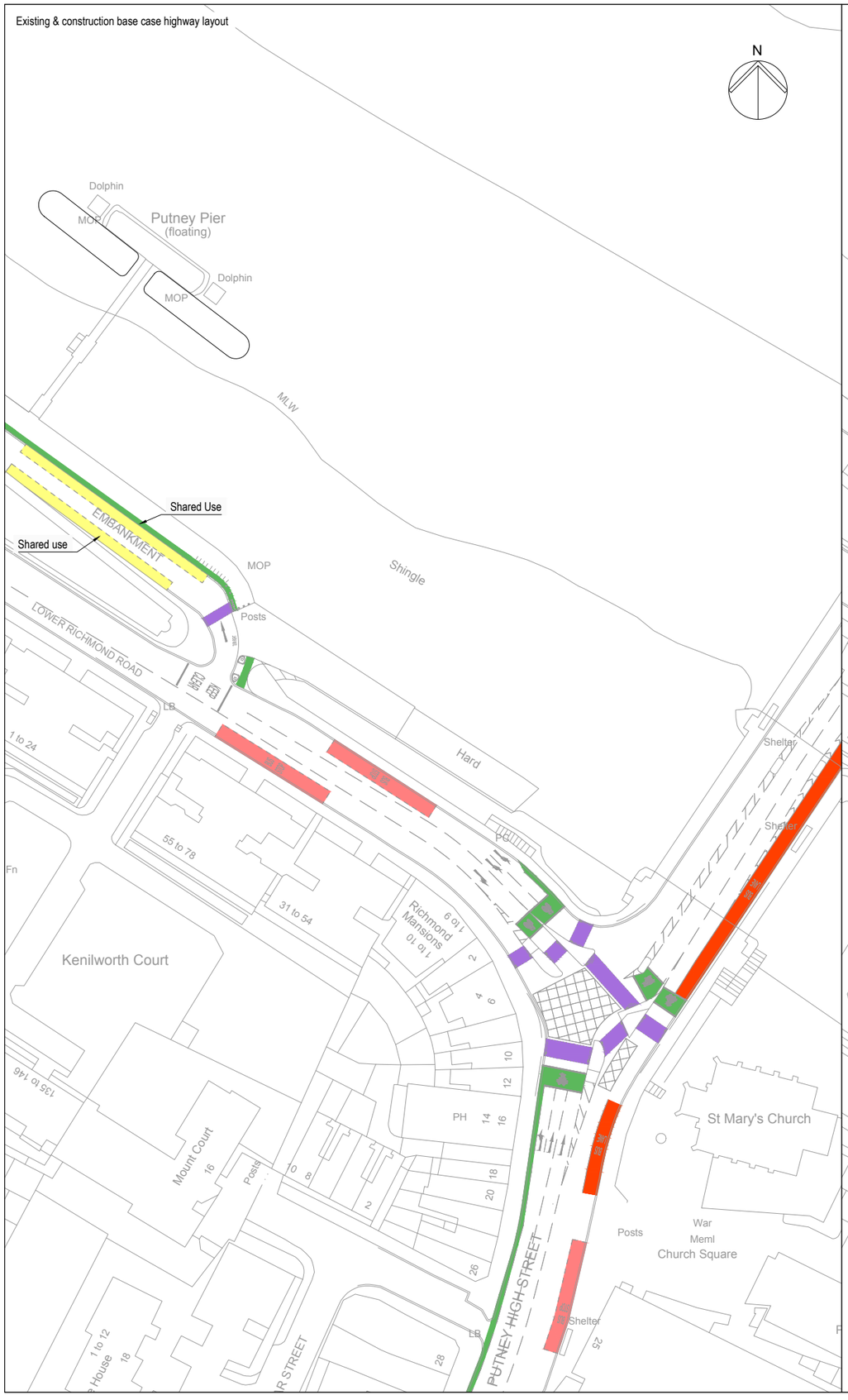
Highway layout during construction (Area 3)

DCO-PP-05X-PUTEF-080042
January 2013

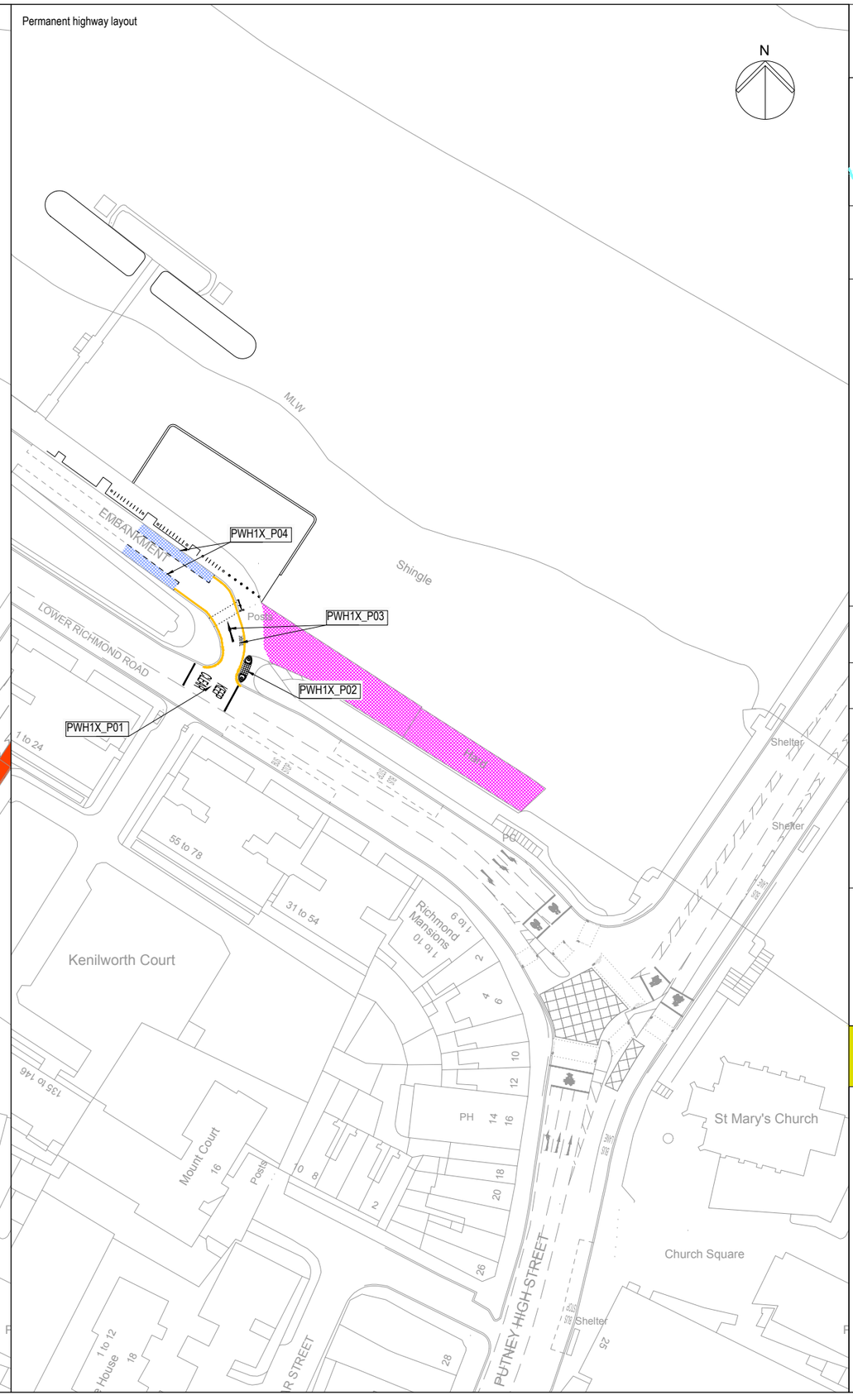
Thames Tideway Tunnel
Creating a cleaner, healthier River Thames

Thames Water

Existing & construction base case highway layout

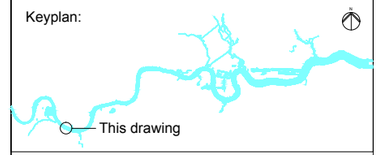


Permanent highway layout



Mapping reproduced by permission of Ordnance Survey on behalf of HMSO. © Crown Copyright and Database right 2012. All rights reserved. Ordnance Survey licence number 100019345

Keyplan:



Coordinates are to be Ordnance Survey Datum OSGB36. All levels are in metres and relate to the Tunnel Datum which is 100 metres below Ordnance Datum Newlyn.

Key

Existing

- Parking restrictions
- On street parking
- Bus stop / stand
- Bus lane
- Pedestrian crossing
- Cycle lane / advance stop line
- Bicycle stand
- Bollard

Revised

- Reinstated parking restriction
- Reinstated footway
- Reinstated slipway
- Reinstated on street parking
- Reinstated bollards
- Proposed removable bollards
- New shoreline wall
- New bicycle parking
- PWH1X_P00 See schedule of works

On street parking

Shared use - A1 permit holders or pay & display max stay 4hrs Mon - Sat 8:30am - 6:30pm

Stage

Permanent phase

Standards

- Design Manual for Roads and Bridges, Dft, 1992
- Traffic Signs Regulations & General Directions, TSO, 2002
- Traffic Signs Manual, Dft, 2006
- Manual for Streets, Dft, 2007
- Manual for Streets 2, CIHT, 2010
- Designing for Deliveries, Fta, 1998
- Cycle Infrastructure Design Ltn 2/08, Dft, 2008
- Design of Pedestrian Crossings Ltn 2/95, Dft, 1995
- Guidance on the use of Tactile Paving Surfaces, Dft, 1998
- Accessible Bus Stop Design Guidance, TfL, 2006

10m 0 40m

Scale 1:500 at A1
1:1000 if reproduced at A3

ILLUSTRATIVE

Location

Putney Embankment Foreshore
London Borough of Wandsworth

Document Information

Application for Development Consent

Permanent highway layout
Area 1 work

DCO-PP-05X-PUTEF-080043
January 2013

Thames Tideway Tunnel
Creating a cleaner, healthier River Thames

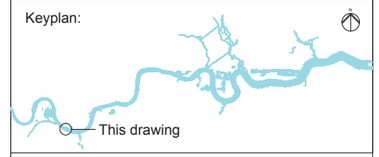
Thames Water

Existing & construction base case highway layout

Permanent highway layout

Mapping reproduced by permission of Ordnance Survey on behalf of HMSO. © Crown Copyright and Database right 2012. All rights reserved. Ordnance Survey licence number 100019345

Keyplan:



Coordinates are to be Ordnance Survey Datum OSGB36. All levels are in metres and relate to the Tunnel Datum which is 100 metres below Ordnance Datum Newlyn.

Key

Existing

- Parking restrictions
- On street parking
- Bus stop / stand
- Pedestrian crossing
- Cycle lane / advance stop line

Revised

- Reinstated parking restrictions
- Reinstated footway
- Reinstated slipway
- Reinstated on street parking
- PWH1X_P00 See schedule of works

On street parking

Shared use - Shared use A1 permit holders or pay & display max stay 4hrs Mon - Sat 8:30am - 6:30pm

Permit holders - A1 permit holders only Mon - Sat 8:30am - 6:30pm

Pay & display - Pay & display only max stay 1 hr Mon - Sat 10:00am - 4:00pm

Residence permit holders (1) - Residents permit holders only at all times

Residents permit holders (2) - Residents permit holders only Mon - Sat 8:30am - 6:30pm

Stage

Permanent phase

Standards

- Design Manual for Roads and Bridges, Dft, 1992
- Traffic Signs Regulations & General Directions, TSO, 2002
- Traffic Signs Manual, Dft, 2006
- Manual for Streets, Dft, 2007
- Manual for Streets 2, CIHT, 2010
- Designing for Deliveries, Fta, 1998
- Cycle Infrastructure Design Ltn 2/08, Dft, 2008
- Design of Pedestrian Crossings Ltn 2/95, Dft, 1995
- Guidance on the use of Tactile Paving Surfaces, Dft, 1998
- Accessible Bus Stop Design Guidance, TfL, 2006

10m 0 40m

Scale 1:500 at A1
1:1000 if reproduced at A3

ILLUSTRATIVE

Location

Putney Embankment Foreshore
London Borough of Wandsworth

Document Information

Application for Development Consent

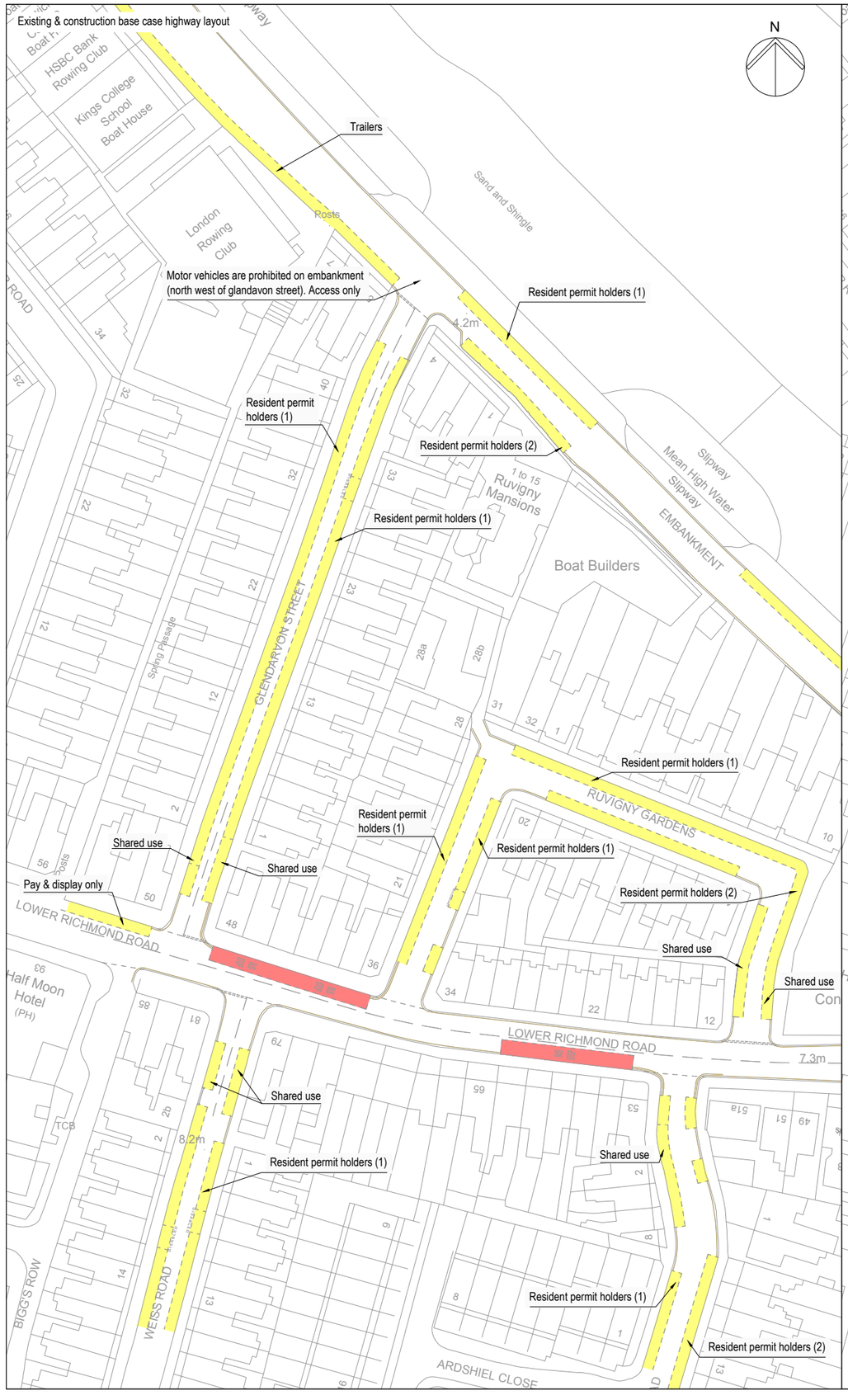
Permanent highway layout
Area 2 work

DCO-PP-05X-PUTEF-080044
January 2013

Thames Tideway Tunnel
Creating a cleaner, healthier River Thames

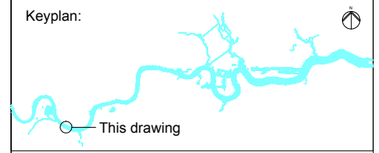
Thames Water

Existing & construction base case highway layout



Permanent highway layout

Keyplan:



Coordinates are to be Ordnance Survey Datum OSGB36. All levels are in metres and relate to the Tunnel Datum which is 100 metres below Ordnance Datum Newlyn.

Key

Existing
- Parking restrictions
- On street parking
- Bus stop / stand

Revised
- Reinstated parking restrictions
- Reinstated footway
- Reinstated slipway
- Reinstated on street parking

PWH1X_P00 See schedule of works

On street parking

Shared use - Shared use A1 permit holders or pay & display max stay 4hrs Mon - Sat 8:30am - 6:30pm

Permit holders - A1 permit holders only Mon - Sat 8:30am - 6:30pm

Pay & display - Pay & display only max stay 1 hr Mon - Sat 10:00am - 4:00pm

Residence permit holders (1) - Residents permit holders only at all times

Residents permit holders (2) - Residents permit holders only Mon - Sat 8:30am - 6:30pm

Stage
Permanent phase

Standards
- Design Manual for Roads and Bridges, Dft, 1992
- Traffic Signs Regulations & General Directions, TSO, 2002
- Traffic Signs Manual, Dft, 2006
- Manual for Streets, Dft, 2007
- Manual for Streets 2, CIHT, 2010
- Designing for Deliveries, Fta, 1998
- Cycle Infrastructure Design Ltn 2/08, Dft, 2008
- Design of Pedestrian Crossings Ltn 2/95, Dft, 1995
- Guidance on the use of Tactile Paving Surfaces, Dft, 1998
- Accessible Bus Stop Design Guidance, TfL, 2006

10m 0 40m

Scale 1:500 at A1
1:1000 if reproduced at A3

ILLUSTRATIVE

Location

Putney Embankment Foreshore
London Borough of Wandsworth

Document Information

Application for Development Consent

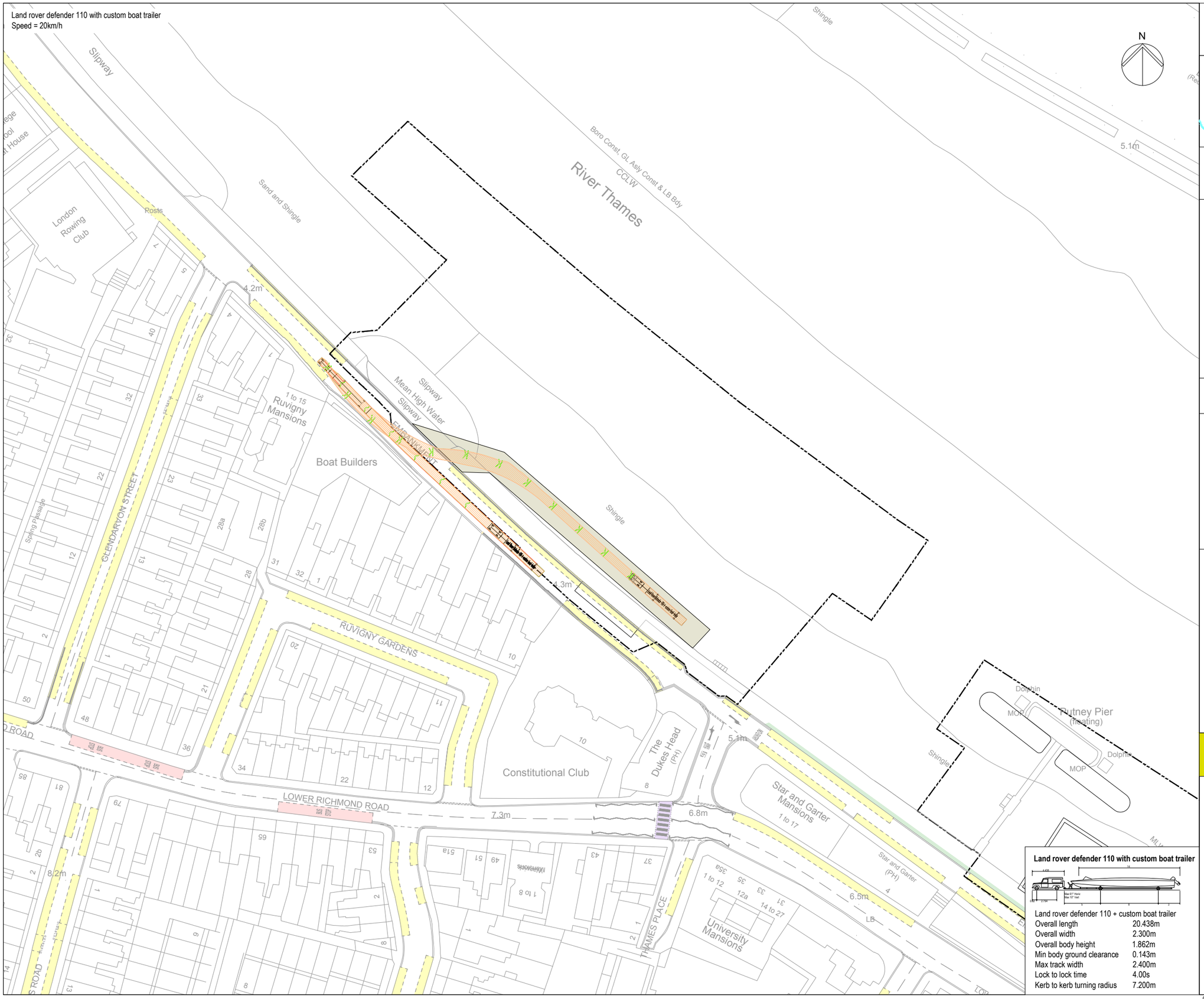
Permanent highway layout
Area 3 work

DCO-PP-05X-PUTEF-080045
January 2013

Thames Tideway Tunnel
Creating a cleaner, healthier River Thames

Thames Water

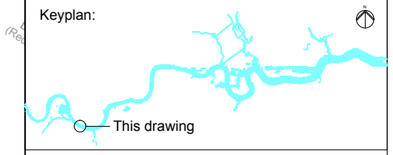
Land rover defender 110 with custom boat trailer
Speed = 20km/h



Land rover defender 110 with custom boat trailer

Land rover defender 110 + custom boat trailer	
Overall length	20.438m
Overall width	2.300m
Overall body height	1.862m
Min body ground clearance	0.143m
Max track width	2.400m
Lock to lock time	4.00s
Kerb to kerb turning radius	7.200m

Keyplan:



Coordinates are to be Ordnance Survey Datum OSGB36. All levels are in metres and relate to the Tunnel Datum which is 100 metres below Ordnance Datum Newlyn.

Key

Existing
- Parking restrictions
- On street parking
- Bus stop / stand
- Pedestrian crossing
- Cycle lane / advance stop line

Revised
- Temporary slipway
- Limit of land to be acquired or used (LLAU)

Vehicle swept path analysis
- Vehicle body outlines
- Vehicle chassis outline
- Vehicle swept path

Stage
Enabling works

Standards
- Design Manual for Roads and Bridges, Dft, 1992
- Traffic Signs Regulations & General Directions, TSO, 2002
- Traffic Signs Manual, Dft, 2006
- Manual for Streets, Dft, 2007
- Manual for Streets 2, CIHT, 2010
- Designing for Deliveries, Fta, 1998
- Cycle Infrastructure Design Ltn 2/08, Dft, 2008
- Design of Pedestrian Crossings Ltn 2/95, Dft, 1995
- Guidance on the use of Tactile Paving Surfaces, Dft, 1998
- Accessible Bus Stop Design Guidance, TfL, 2006

10m 0 40m

Scale 1:500 at A1
1:1000 if reproduced at A3

ILLUSTRATIVE

Location
Putney Embankment Foreshore
London Borough of Wandsworth

Document Information
Application for Development Consent

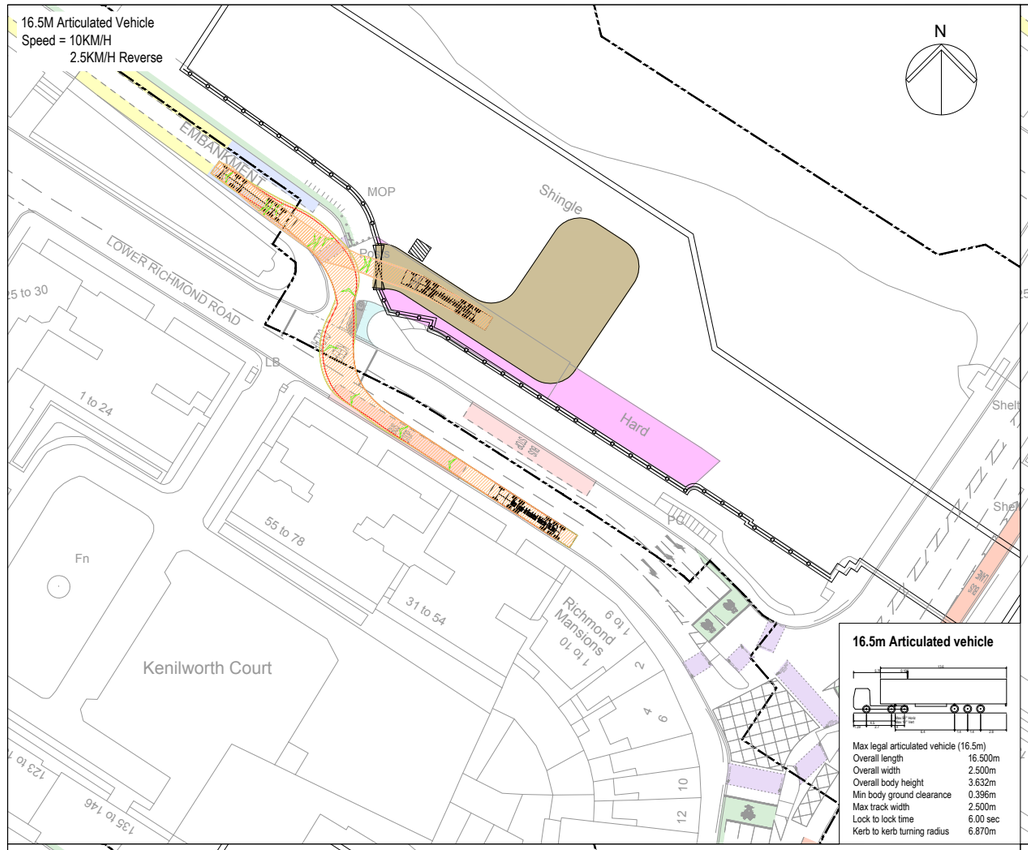
Temporary slipway layout
(Area 2)
Vehicle swept path analysis

DCO-PP-05X-PUTEF-080046
January 2013

Thames Tideway Tunnel
Creating a cleaner, healthier River Thames

Thames Water

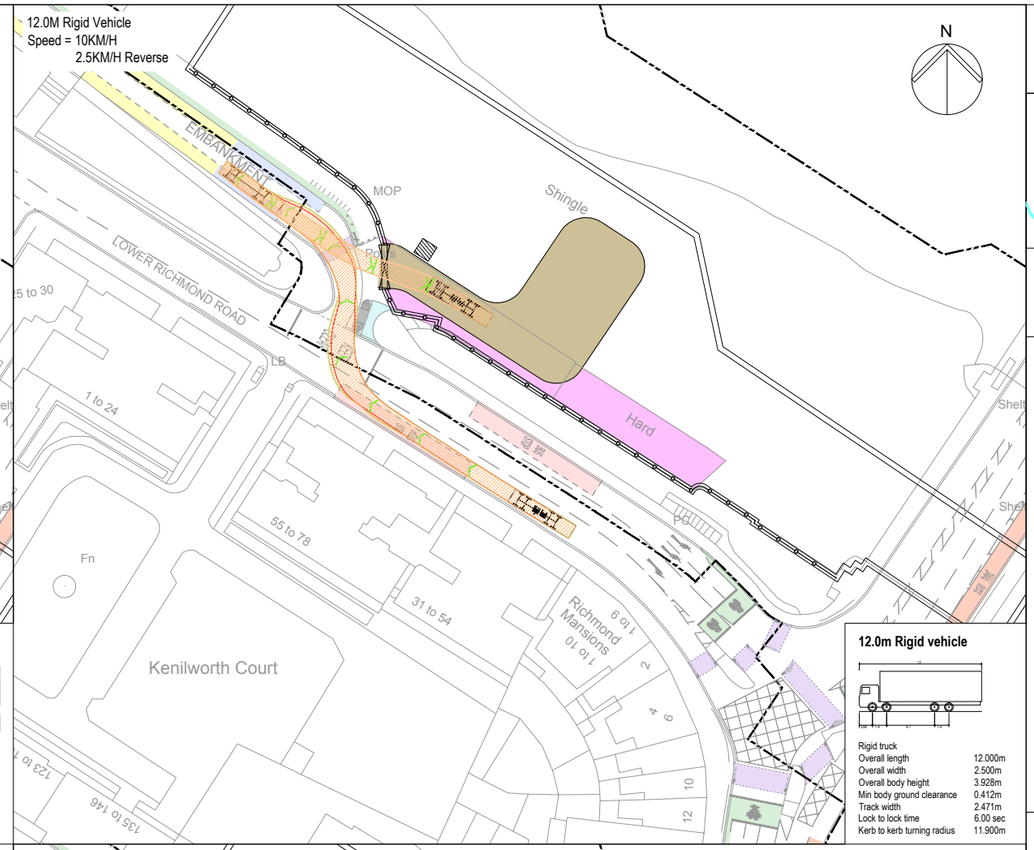
16.5M Articulated Vehicle
Speed = 10KM/H
2.5KM/H Reverse



16.5m Articulated vehicle

Max legal articulated vehicle (16.5m)	
Overall length	16.500m
Overall width	2.500m
Overall body height	3.632m
Min body ground clearance	0.396m
Max track width	2.500m
Lock to lock time	6.00 sec
Kerb to kerb turning radius	6.870m

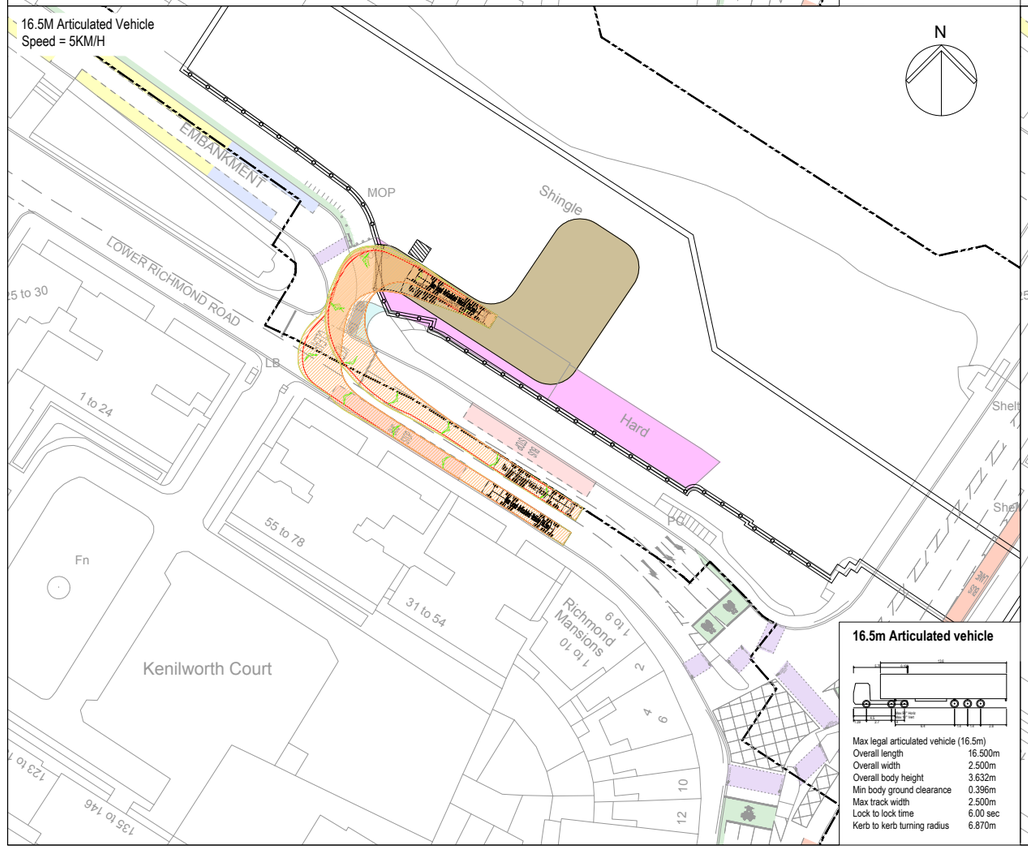
12.0M Rigid Vehicle
Speed = 10KM/H
2.5KM/H Reverse



12.0m Rigid vehicle

Rigid truck	
Overall length	12.000m
Overall width	2.500m
Overall body height	3.928m
Min body ground clearance	0.412m
Track width	2.471m
Lock to lock time	6.00 sec
Kerb to kerb turning radius	11.900m

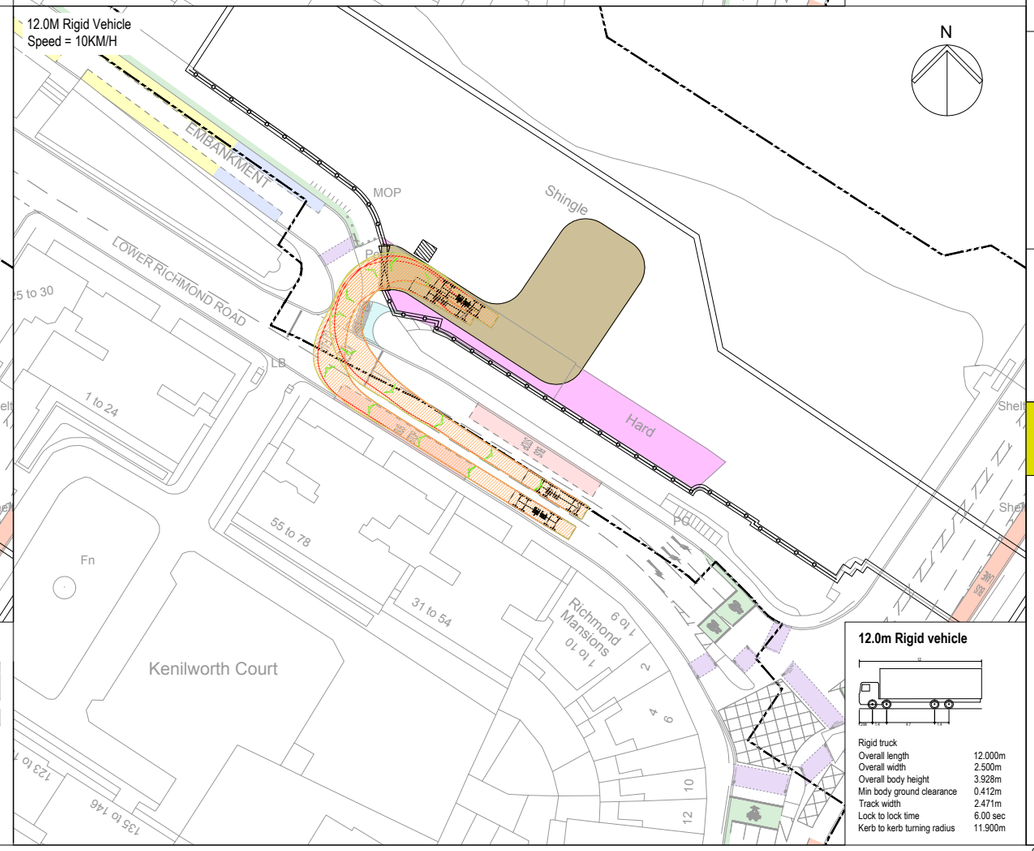
16.5M Articulated Vehicle
Speed = 5KM/H



16.5m Articulated vehicle

Max legal articulated vehicle (16.5m)	
Overall length	16.500m
Overall width	2.500m
Overall body height	3.632m
Min body ground clearance	0.396m
Max track width	2.500m
Lock to lock time	6.00 sec
Kerb to kerb turning radius	6.870m

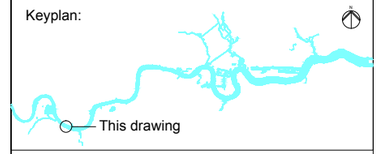
12.0M Rigid Vehicle
Speed = 10KM/H



12.0m Rigid vehicle

Rigid truck	
Overall length	12.000m
Overall width	2.500m
Overall body height	3.928m
Min body ground clearance	0.412m
Track width	2.471m
Lock to lock time	6.00 sec
Kerb to kerb turning radius	11.900m

Keyplan:



Coordinates are to be Ordnance Survey Datum OSGB36. All levels are in metres and relate to the Tunnel Datum which is 100 metres below Ordnance Datum Newlyn.

Key

Existing

- Parking Restrictions
- On street parking
- Bus stop / stand
- Bus lane
- Pedestrian crossing
- Cycle lane / advance stop line
- Bicycle Stands
- Bollards

Revised

- Suspension of footway
- Suspension of Slipway
- Suspended on street parking
- Relocated cycle path
- Illustrative on-site manoeuvring zone
- Site hut
- Site hoarding
- Access gate
- Limit of land to be acquired or used (LLAU)

Vehicle swept path analysis

- Vehicle body outlines
- Vehicle chassis outline
- Vehicle swept path

Stage
Phase 1-3

Standards

- Design Manual for Roads and Bridges, Dft, 1992
- Traffic Signs Regulations & General Directions, Tso, 2002
- Traffic Signs Manual, Dft, 2006
- Manual for Streets, Dft, 2007
- Manual for Streets 2, CIHT, 2010
- Designing for Deliveries, Fta, 1998
- Cycle Infrastructure Design Ltn 2/08, Dft, 2008
- Design of Pedestrian Crossings Ltn 2/95, Dft, 1995
- Guidance on the use of Tactile Paving Surfaces, Dft, 1998
- Accessible Bus Stop Design Guidance, TfL, 2006

10m 0 40m

Scale 1:500 at A1
1:1000 if reproduced at A3

ILLUSTRATIVE

Location
Putney Embankment Foreshore
London Borough of Wandsworth

Document Information
Application for Development Consent

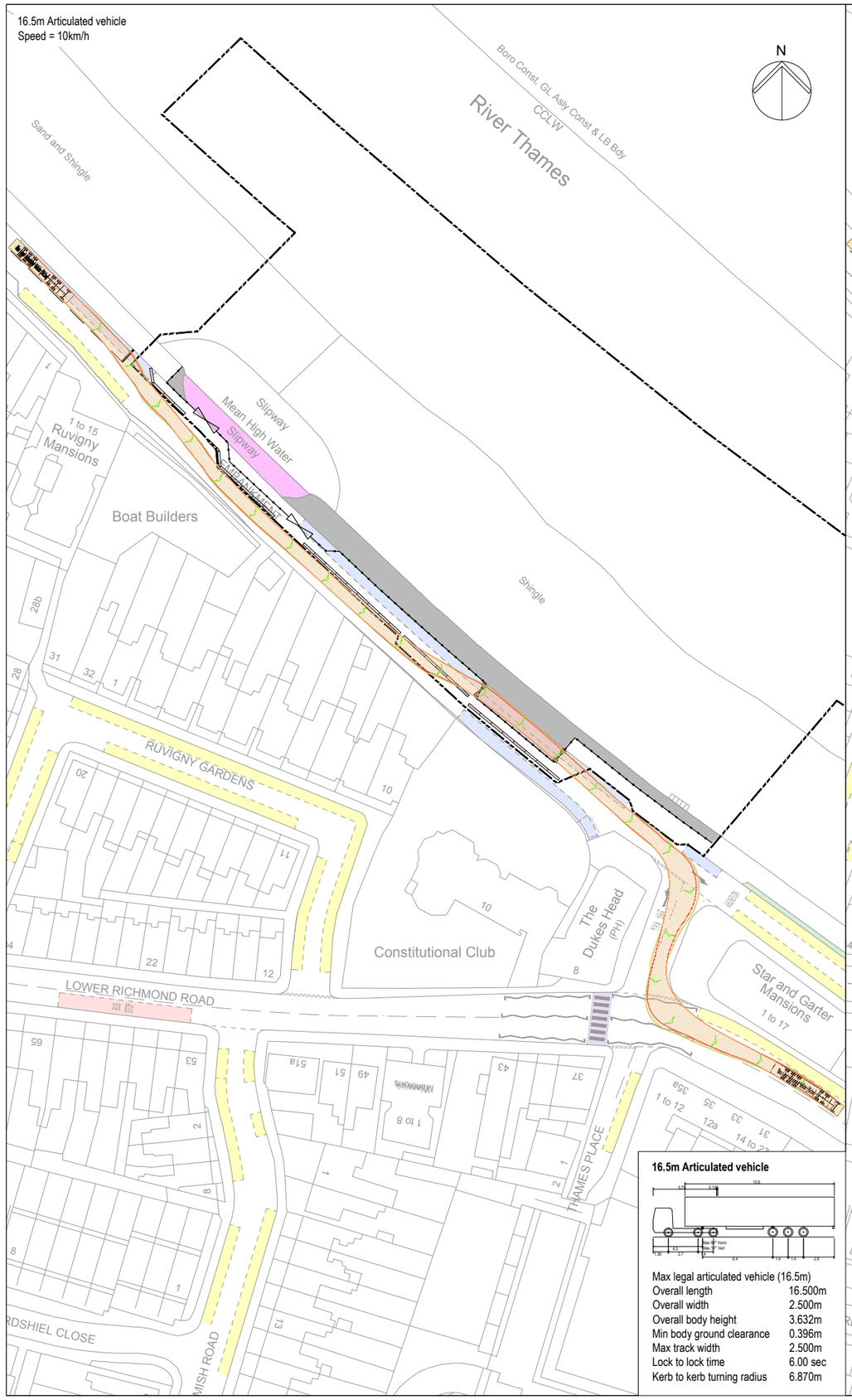
Highway layout during construction
(Area 1)
Vehicle swept path analysis

DCO-PP-05X-PUTEF-080047
January 2013

Thames Tideway Tunnel
Creating a cleaner, healthier River Thames

Thames Water

16.5m Articulated vehicle
Speed = 10km/h



16.5m Articulated vehicle

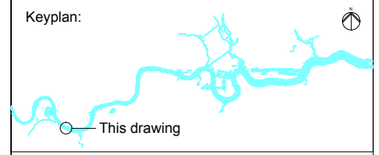
Max legal articulated vehicle (16.5m)	
Overall length	16.500m
Overall width	2.500m
Overall body height	3.632m
Min body ground clearance	0.396m
Max track width	2.500m
Lock to lock time	6.00 sec
Kerb to kerb turning radius	6.870m

12.0m Rigid vehicle
Speed = 10km/h

12.0m Rigid vehicle

Rigid truck	
Overall length	12.000m
Overall width	2.500m
Overall body height	3.928m
Min body ground clearance	0.412m
Track width	2.471m
Lock to lock time	6.00 sec
Kerb to kerb turning radius	11.900m

Keyplan:



Coordinates are to be Ordnance Survey Datum OSGB36. All levels are in metres and relate to the Tunnel Datum which is 100 metres below Ordnance Datum Newlyn.

Key

Existing
- Parking restrictions
- On street parking
- Bus stop / stand
- Pedestrian crossing
- Cycle lane / advance stop line

Revised
- Suspension of footway
- Suspension of slipway
- Suspended on street parking
- Intermittent loading area (with associated traffic management)
- Site hoarding
- Sand filled barrier
- Intermittent barrier, to be removed during hgv access
- Access gate
- Limit of land to be acquired or used (LLAU)

Vehicle swept path analysis
- Vehicle body outlines
- Vehicle chassis outline
- Vehicle swept path

Standards
- Design Manual for Roads and Bridges, Dft, 1992
- Traffic Signs Regulations & General Directions, TSO, 2002
- Traffic Signs Manual, Dft, 2006
- Manual for Streets, Dft, 2007
- Manual for Streets 2, CIHT, 2010
- Designing for Deliveries, Fta, 1998
- Cycle Infrastructure Design Ltn 2/08, Dft, 2008
- Design of Pedestrian Crossings Ltn 2/95, Dft, 1995
- Guidance on the use of Tactile Paving Surfaces, Dft, 1998
- Accessible Bus Stop Design Guidance, TfL, 2006

Stage
Enabling works

10m 0 40m

Scale 1:500 at A1
1:1000 if reproduced at A3

ILLUSTRATIVE

Location

Putney Embankment Foreshore
London Borough of Wandsworth

Document Information

Application for Development Consent

Highway layout during construction (Area 2)
Vehicle swept path analysis

DCO-PP-05X-PUTEF-080048
January 2013

Thames Tideway Tunnel
Creating a cleaner, healthier River Thames

Thames Water

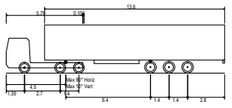
16.5m Articulated vehicle
Speed = 5km/h

12.0m Rigid vehicle
Speed = 5km/h

N

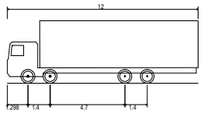
Westminster School Boat House
Crabtree Boat Club
Dulwich College Boat House
HSBC Bank Rowing Club
Kings College School Boat House
London Rowing Club
Slipway
Sand and Shingle
Rosts
BENDEMEER ROAD
GLENAVON STREET
Spring Passage
1 to 15 Ruvigny Mansions
Slipway
Mean High Water
Slipway
Boat Builders
RUVIGNY GARDENS
Posts
LOWER RICHMOND ROAD
Half Moon Hotel (PH)
TCB
25 to 32

16.5m Articulated vehicle



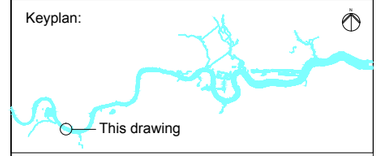
Max legal articulated vehicle (16.5m)	
Overall length	16.500m
Overall width	2.500m
Overall body height	3.632m
Min body ground clearance	0.396m
Max track width	2.500m
Lock to lock time	6.00 sec
Kerb to kerb turning radius	6.870m

12.0m Rigid vehicle



Rigid truck	
Overall length	12.000m
Overall width	2.500m
Overall body height	3.928m
Min body ground clearance	0.412m
Track width	2.471m
Lock to lock time	6.00 sec
Kerb to kerb turning radius	11.900m

Keyplan:



Coordinates are to be Ordnance Survey Datum OSGB36. All levels are in metres and relate to the Tunnel Datum which is 100 metres below Ordnance Datum Newlyn.

Key

Existing
- Parking restriction
- On street parking
- Bus stop / stand

Revised
- Suspension of footway
- Suspension of slipway
- Suspended on street parking
- Site hoarding
- Sand filled barrier
- Access gate
- Limit of land to be acquired or used (LLAU)

Vehicle swept path analysis
- Vehicle body outlines
- Vehicle chassis outline
- Vehicle swept path

Stage
Enabling works

Standards
- Design Manual for Roads and Bridges, Dft, 1992
- Traffic Signs Regulations & General Directions, Tso, 2002
- Traffic Signs Manual, Dft, 2006
- Manual for Streets, Dft, 2007
- Manual for Streets 2, CIHT, 2010
- Designing for Deliveries, Fta, 1998
- Cycle Infrastructure Design Ltn 2/08, Dft, 2008
- Design of Pedestrian Crossings Ltn 2/95, Dft, 1995
- Guidance on the use of Tactile Paving Surfaces, Dft, 1998
- Accessible Bus Stop Design Guidance, TfL, 2006

10m 0 40m

Scale 1:500 at A1
1:1000 if reproduced at A3

ILLUSTRATIVE

Location
Putney Embankment Foreshore
London Borough of Wandsworth

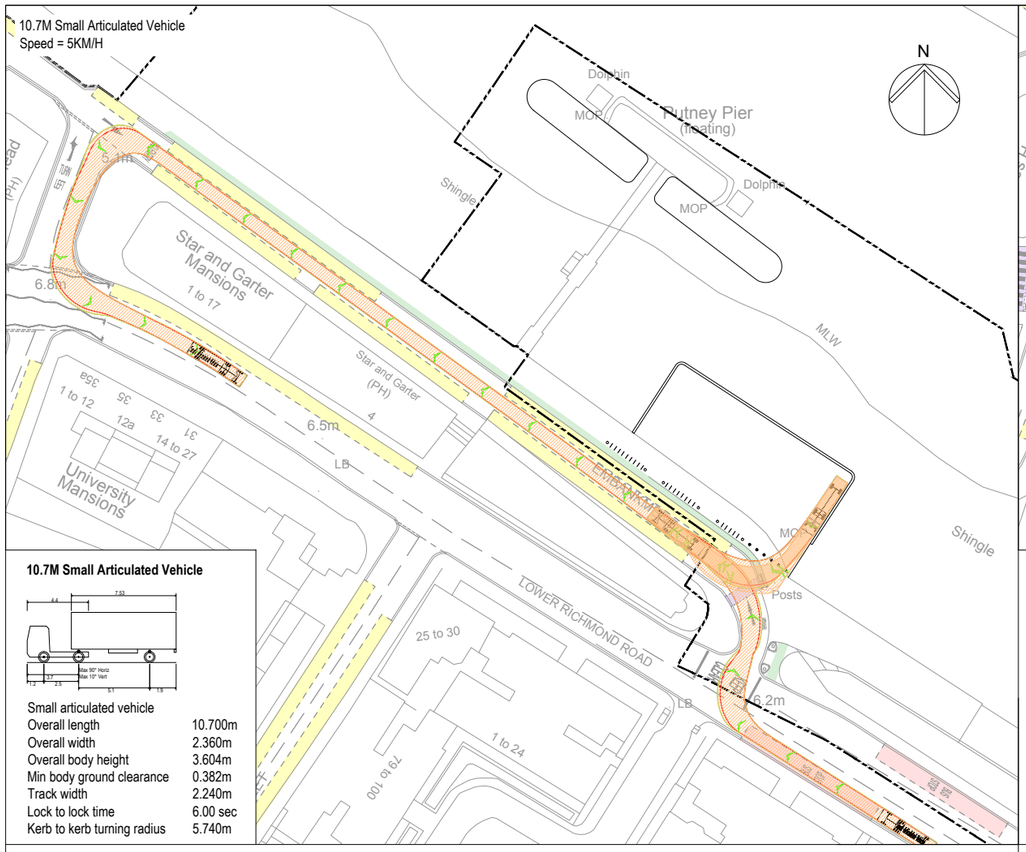
Document Information
Application for Development Consent

Highway layout during construction (Area 3)
Vehicle swept path analysis

DCO-PP-05X-PUTEF-080049
January 2013

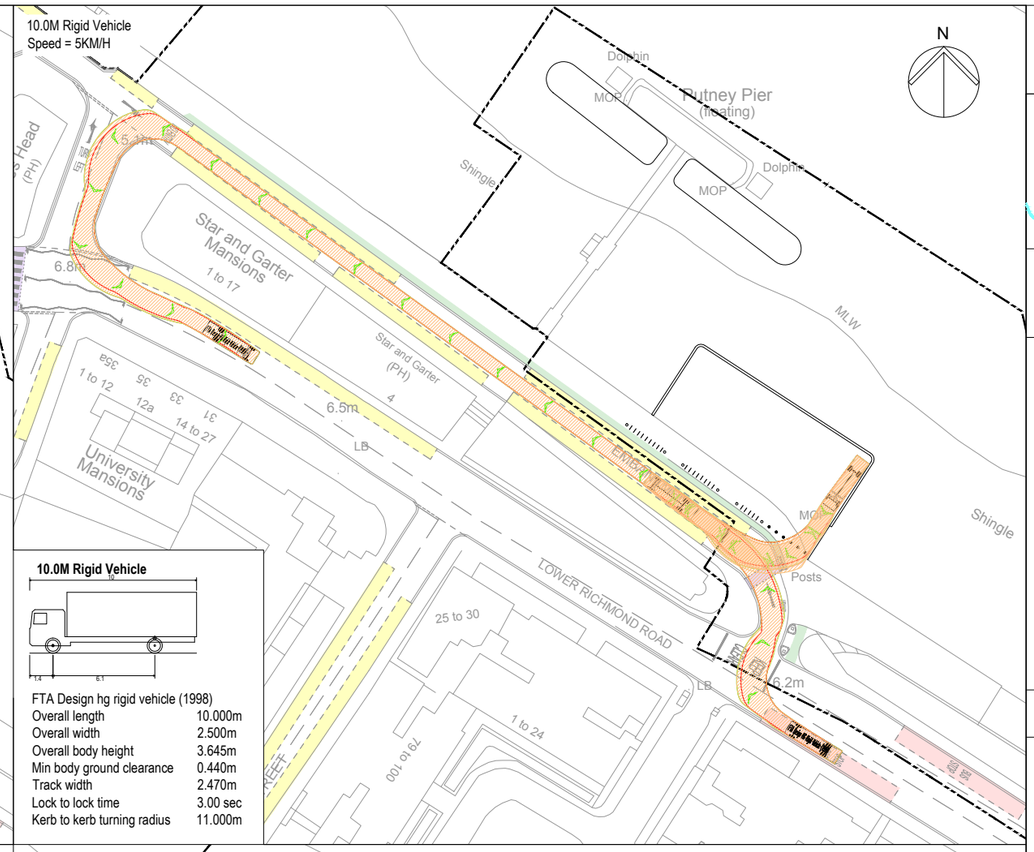
Thames Tideway Tunnel
Creating a cleaner, healthier River Thames

Thames Water



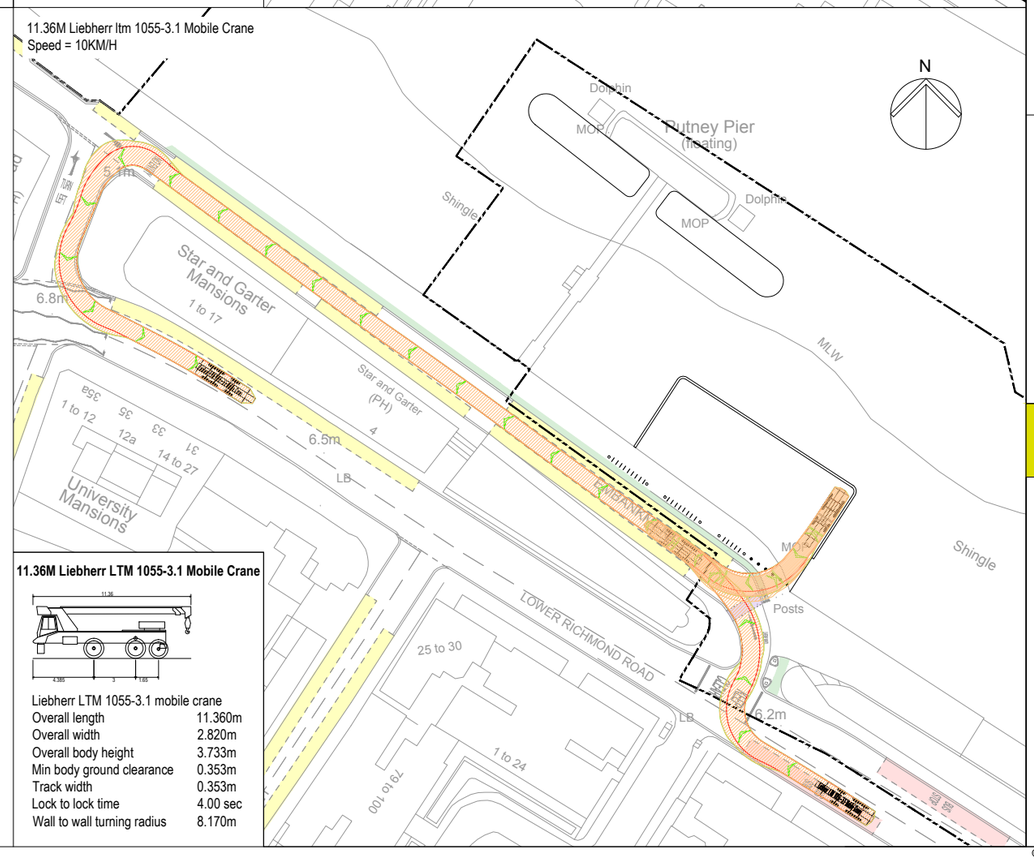
10.7M Small Articulated Vehicle

Small articulated vehicle	
Overall length	10.700m
Overall width	2.360m
Overall body height	3.604m
Min body ground clearance	0.382m
Track width	2.240m
Lock to lock time	6.00 sec
Kerb to kerb turning radius	5.740m



10.0M Rigid Vehicle

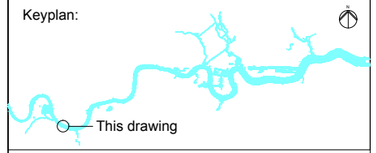
FTA Design hg rigid vehicle (1998)	
Overall length	10.000m
Overall width	2.500m
Overall body height	3.645m
Min body ground clearance	0.440m
Track width	2.470m
Lock to lock time	3.00 sec
Kerb to kerb turning radius	11.000m



11.36M Liebherr LTM 1055-3.1 Mobile Crane

Liebherr LTM 1055-3.1 mobile crane	
Overall length	11.360m
Overall width	2.820m
Overall body height	3.733m
Min body ground clearance	0.353m
Track width	0.353m
Lock to lock time	4.00 sec
Wall to wall turning radius	8.170m

Keyplan:



Coordinates are to be Ordnance Survey Datum OSGB36. All levels are in metres and relate to the Tunnel Datum which is 100 metres below Ordnance Datum Newlyn.

Key

Existing
- Parking Restrictions
- On street parking
- Bus stop / stand
- Pedestrian crossing
- Cycle lane / advance stop line

Revised
- Listed bollards
- Proposed removable bollards
- Bicycle Parking
- New shoreline wall

Vehicle swept path analysis
- Vehicle body outlines
- Vehicle chassis outline
- Vehicle swept path

Stage
Permanent phase

Standards
- Design Manual for Roads and Bridges, Dft, 1992
- Traffic Signs Regulations & General Directions, Tso, 2002
- Traffic Signs Manual, Dft, 2006
- Manual for Streets, Dft, 2007
- Manual for Streets 2, CIHT, 2010
- Designing for Deliveries, Fta, 1998
- Cycle Infrastructure Design Ltn 2/08, Dft, 2008
- Design of Pedestrian Crossings Ltn 2/95, Dft, 1995
- Guidance on the use of Tactile Paving Surfaces, Dft, 1998
- Accessible Bus Stop Design Guidance, TfL, 2006

10m 0 40m

Scale 1:500 at A1
1:1000 if reproduced at A3

ILLUSTRATIVE

Location
Putney Embankment Foreshore
London Borough of Wandsworth

Document Information
Application for Development Consent

Permanent highway layout
(Area 1)
Vehicle swept path analysis

DCO-PP-05X-PUTEF-080050
January 2013

Thames Tideway Tunnel
Creating a cleaner, healthier River Thames

Thames Water

Transport assessment figures

This page is intentionally blank

Keyplan:

Key

- TFL road network
- Strategic road network
- Limits of Land to be Acquired or Used
- Local authority boundary

110 55 0 110 m

Scale 1 : 7,500 at A3

FOR INFORMATION

Location

Putney Embankment Foreshore
London Borough Of Wandsworth

Document Information

Transport Assessment

Transport - site location plan

Figure 7.2.1

1PL03-TT-50662
January 2013

Thames Tideway Tunnel
Creating a cleaner, healthier River Thames

Thames Water

Keyplan:

Key

- Site access
- TFL road network
- Strategic road network
- Primary construction route
- Limits of Land to be Acquired or Used
- Local authority boundary

110 55 0 110 m

Scale 1 : 7,500 at A3

FOR INFORMATION

Location

Putney Embankment Foreshore
London Borough Of Wandsworth

Document Information

Transport Assessment

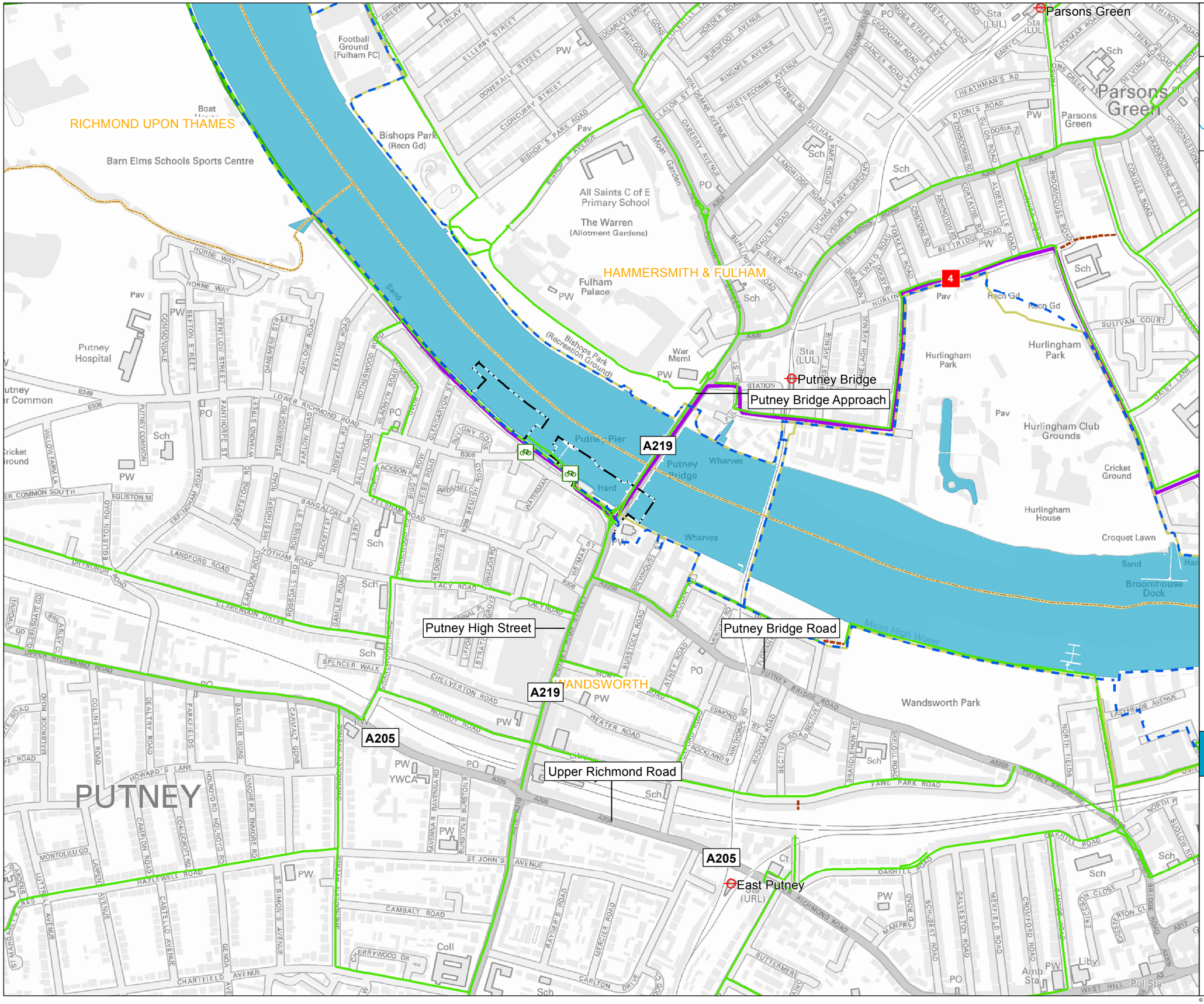
Transport - construction traffic routes

Figure 7.2.2

1PL03-TT-50654
January 2013

Thames Tideway Tunnel
Creating a cleaner, healthier River Thames

Thames Water



Mapping reproduced by permission of Ordnance Survey on behalf of HMSO. © Crown Copyright and Database right 2012. All rights reserved. Ordnance Survey licence number 100019345

Keyplan:

Key

- Cycle Parking
- National rail stations with cycle parking
- Underground stations with cycle parking
- Cycle superhighway (open)
- Cycle superhighway (open 2013)
- Cycle superhighway (open 2015)
- London cycle routes
- Thames path
- London strategic walk network
- Pedestrian routes

National cycle network

Route Type

- Open Traffic Free
- Open on-road
- Limits of Land to be Acquired or Used
- Local authority boundary

110 55 0 110 m

Scale 1 : 7,500 at A3

FOR INFORMATION

Location

Putney Embankment Foreshore
London Borough Of Wandsworth

Document Information

Transport Assessment

Transport - pedestrian and cycle network

Figure 7.4.1

1PL03-TT-50670
January 2013

Thames Tideway Tunnel
Creating a cleaner, healthier River Thames

Thames Water

Keyplan:

Key

- TFL bus stops
- Pier locations
- National rail stations
- London underground stations
- TfL bus routes
- Limits of Land to be Acquired or Used
- Local authority boundary

110 55 0 110 m

Scale 1 : 7,500 at A3

FOR INFORMATION

Location

Putney Embankment Foreshore
London Borough Of Wandsworth

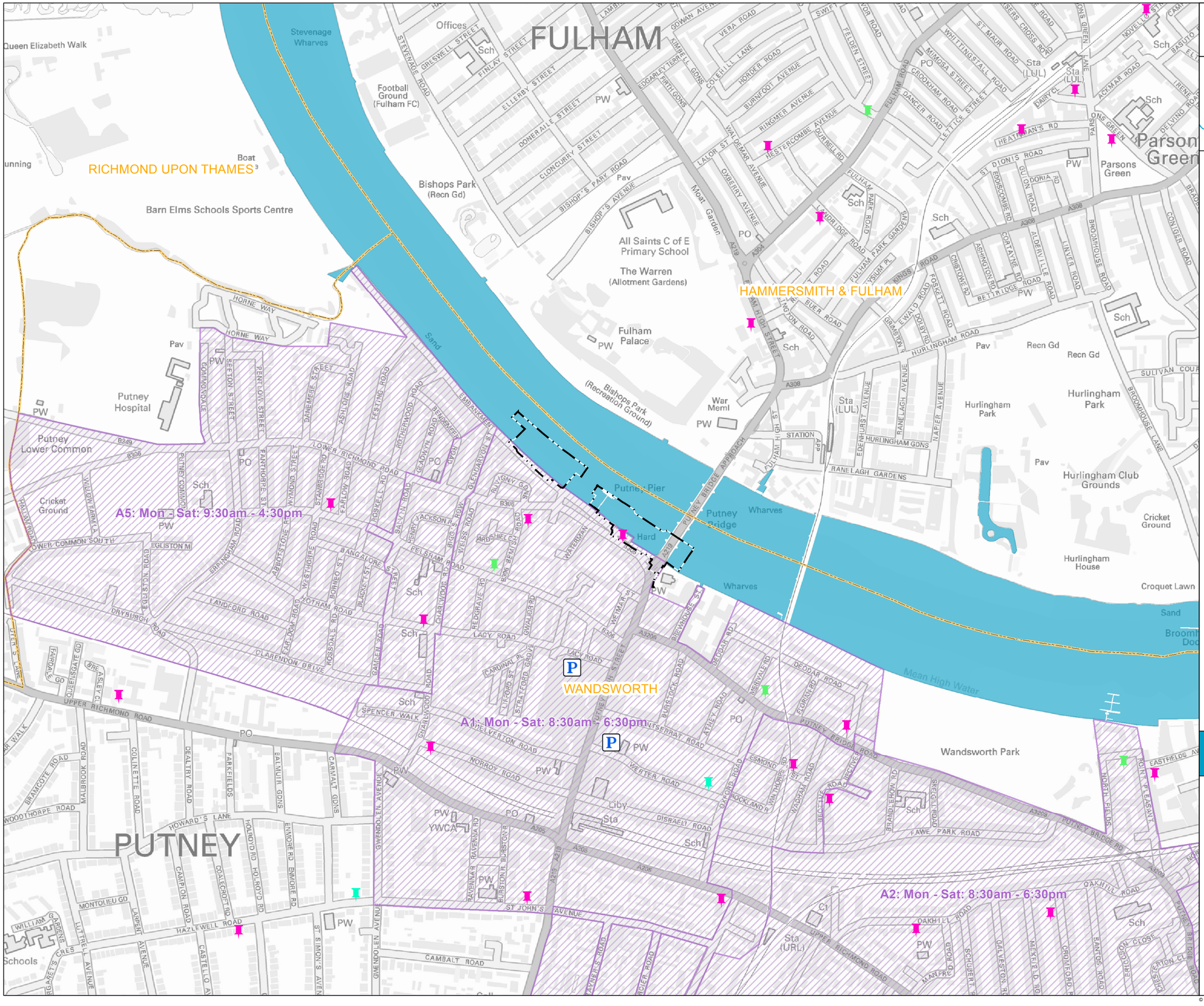
Document Information

Transport Assessment
Transport - public transport

Figure 7.4.2
1PL03-TT-50678
January 2013

Thames Tideway Tunnel
Creating a cleaner, healthier River Thames

Thames Water



Keyplan:

Key

- City Car
- Green Wheels
- Zip Car
- Private car parking
- Controlled Parking Zones and hours of operation
- Limits of Land to be Acquired or Used
- Local authority boundary

110 55 0 110 m

Scale 1 : 7,500 at A3

FOR INFORMATION

Location

Putney Embankment Foreshore
London Borough of Wandsworth

Document Information

Transport Assessment

Transport - parking

Figure 7.4.3

1PL03-TT-50686
January 2013

Thames Tideway Tunnel
Creating a cleaner, healthier River Thames

Thames Water

Keyplan:

Key

- Pedestrian and cycle surveys
- Junction surveys
- Parking surveys
- Limits of Land to be Acquired or Used
- Local authority boundary

60 30 0 60 m

Scale 1 : 4,000 at A3

FOR INFORMATION

Location

Putney Embankment Foreshore
London Borough Of Wandsworth

Document Information

Transport Assessment

Transport - survey locations

Figure 7.4.4

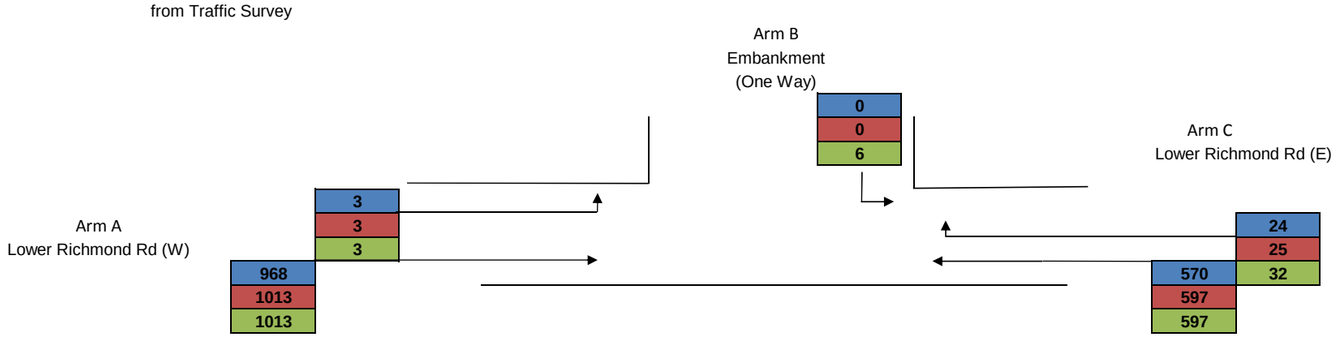
1PL03-TT-50694
January 2013

Thames Tideway Tunnel
Creating a cleaner, healthier River Thames

Thames Water

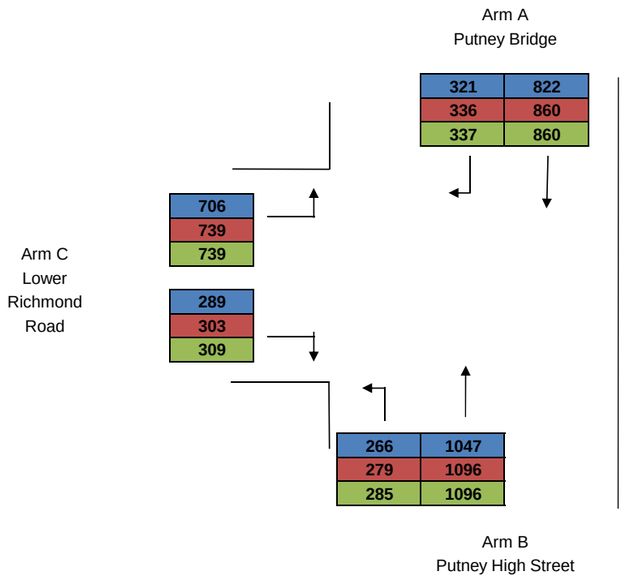
Site: Putney Bridge Foreshore
Borough: Wandsworth
Junction: Lower Richmond Rd/ Embankment
Junction no.: PBA 11

Data: Traffic Flow in PCUs - PM Peak Hour
from Traffic Survey



Site: Putney Bridge
Borough: Wandsworth
Junction: Putney Bridge / Putney High Street / Lower Richmond Road
Junction no.: PBA 47

Data: Traffic Flow in PCUs - PM Peak Hour
from Traffic Survey



FOR INFORMATION

Location
Putney Bridge Foreshore
London Borough of Wandsworth

Document Information
Transport Assessment

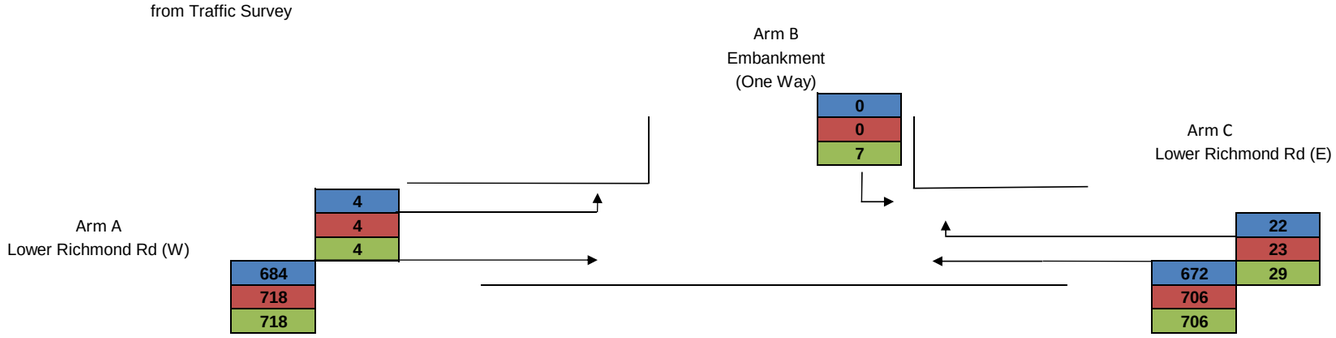
Baseline, Construction and Development case traffic flow (AM peak hour)

Figure 7.4.5
1PL03-TT-50913
January 2013

Thames Tideway Tunnel
Creating a cleaner, healthier River Thames
Thames Water

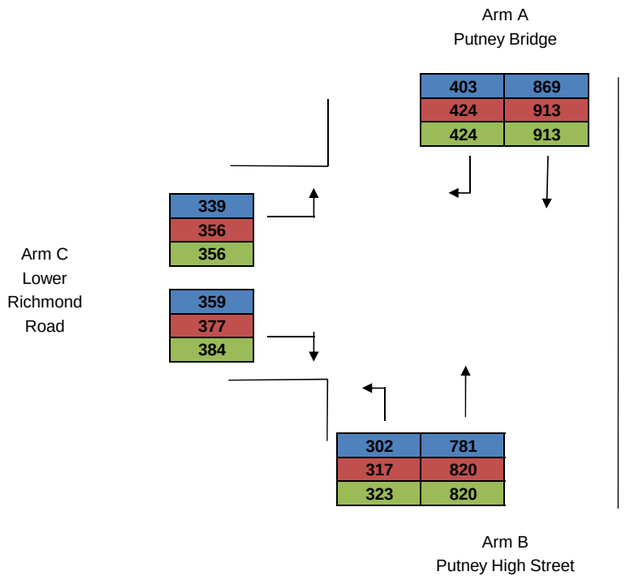
Site: Putney Bridge Foreshore
Borough: Wandsworth
Junction: Lower Richmond Rd/ Embankment
Junction no.: PBA 11

Data: Traffic Flow in PCUs - PM Peak Hour
from Traffic Survey



Site: Putney Bridge
Borough: Wandsworth
Junction: Putney Bridge / Putney High Street / Lower Richmond Road
Junction no.: PBA 47

Data: Traffic Flow in PCUs - PM Peak Hour
from Traffic Survey



Key
- Baseline
- Construction Base
- Development Case

FOR INFORMATION

Location
Putney Bridge Foreshore
London Borough of Wandsworth

Document Information
Transport Assessment

Baseline, Construction and Development case traffic flow (PM peak hour)

Figure 7.4.6
1PL03-TT-50937
January 2013

Thames Tideway Tunnel
Creating a cleaner, healthier River Thames

Thames Water

Keyplan:

Key

- Slight
- Serious
- Limits of Land to be Acquired or Used
- Local authority boundary

110 55 0 110 m

Scale 1 : 7,500 at A3

FOR INFORMATION

Location

Putney Embankment Foreshore
London Borough Of Wandsworth

Document Information

Transport Assessment

Transport - accident locations

Figure 7.4.7

1PL03-TT-50758
January 2013

Thames Tideway Tunnel
Creating a cleaner, healthier River Thames

Thames Water

Keyplan:

Key

Accidents

(Severity, Mode of travel)

- Slight, Pedestrian
- Slight, Pedal Cycle
- Serious, Pedestrian
- Serious, Pedal Cycle
- Limits of Land to be Acquired or Used
- Local authority boundary

110 55 0 110 m

Scale 1 : 7,500 at A3

FOR INFORMATION

Location

Putney Embankment Foreshore
London Borough Of Wandsworth

Document Information

Transport Assessment

Transport - pedestrian and cyclist accidents by severity
Figure 7.4.8

1PL03-TT-50842
January 2013

Thames Tideway Tunnel
Creating a cleaner, healthier River Thames

Thames Water

Barn Elms

Fulham Road

Lower Richmond Road

Putney Embankment Foreshore

Carnwath Road Riverside

Upper Richmond Road

Putney Bridge Road

Dormay Street

Roehampton Lane

Putney Hill

King George's Park

West Hill

Hourly construction lorries arrivals and departures

- Arrivals
- Departures

Hourly construction lorries movements

- 0 - 1
- 1 - 2
- 2 - 3
- 3 - 4
- 4 - 5
- 5 - 6
- 6 - 7
- 7 - 8
- 8 - 9
- 9 - 10
- 10 - 11
- 11 - 12
- 12 - 13
- 13 - 14
- 14 - 15
- > 15

Note: Construction vehicle flows include all Thames Tideway Tunnel sites on this network during this period.

FOR INFORMATION

Location

Putney Embankment Foreshore
London Borough of Wandsworth

Document Information

Transport Assessment
Hourly Construction Lorry Movements - Site Year 2 of Construction

Figure 7.5.1

1PL03-TT-50890

Thames Tideway Tunnel
Creating a cleaner, healthier River Thames

Thames Water

This page is intentionally left blank

This page is intentionally blank

Thames Water Utilities Limited
Clearwater Court, Vastern Road, Reading RG1 8DB

DCO-DT-000-ZZZZZ-071004