

**This paper will be considered in public.**

## 1 Summary

- 1.1 This paper summarises a proposed 15-year plan – Trams 2030 – to deal with growing demand on the London Trams network and support the regeneration of the Croydon Opportunity Area, whilst dealing with reliability pressures in Croydon town centre.

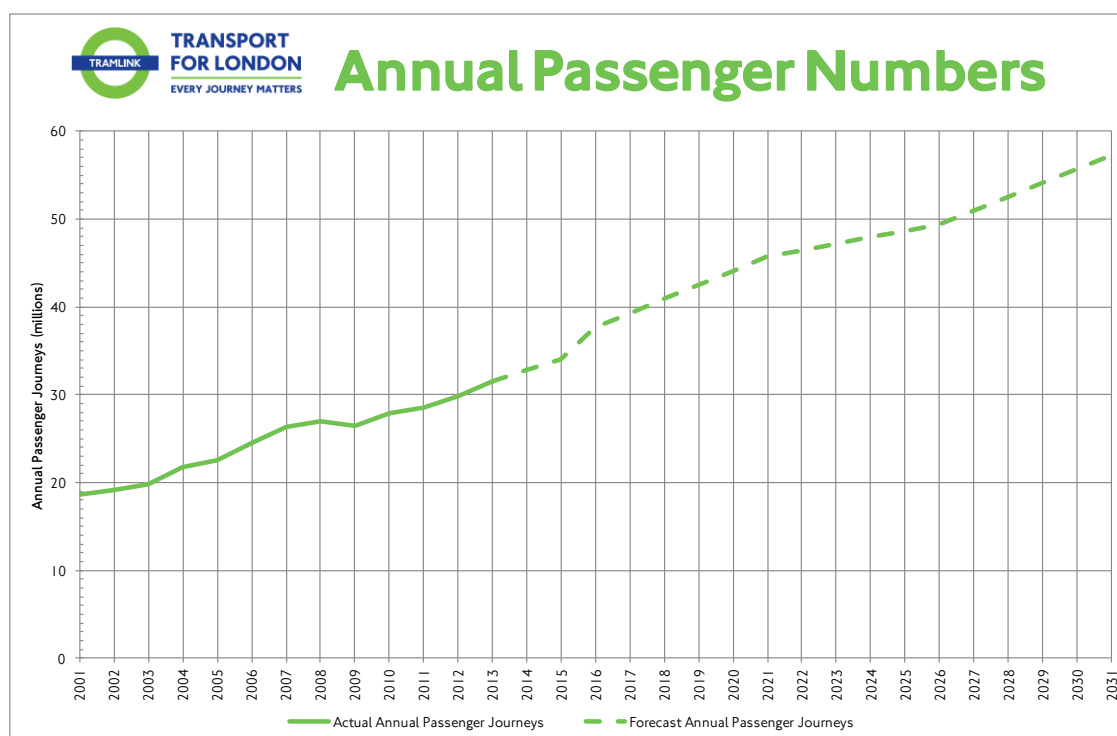
## 2 Recommendation

- 2.1 **The Panel is asked to note the work carried out to date on the Trams 2030 plan.**

## 3 Background and objectives

### Growth in Croydon and on Trams

- 3.1 There has been significant growth on London Trams since its inception, despite relatively small changes in capacity. There were 31 million journeys on Trams in 2013/14. This is expected to continue to grow rapidly with development in Croydon, towards nearly 60 million passengers by 2031.



- 3.2 To accommodate growth, the Wimbledon Line Enhancement Project was developed and is now being delivered. This provides infrastructure and rolling stock to support a 12tph (trams per hour) service from Wimbledon to Croydon – a 50 per cent increase in frequency and capacity.
- 3.3 Since this commitment, growth has accelerated. The Croydon Opportunity Area now includes Westfield-Hammerson shopping centre development, due to open in 2018 - creating 5,000 jobs in 1.5 million square feet of retail space – and proposals for 7,300 new homes in the town centre. Westfield alone accounts for two million extra annual trips on Trams.

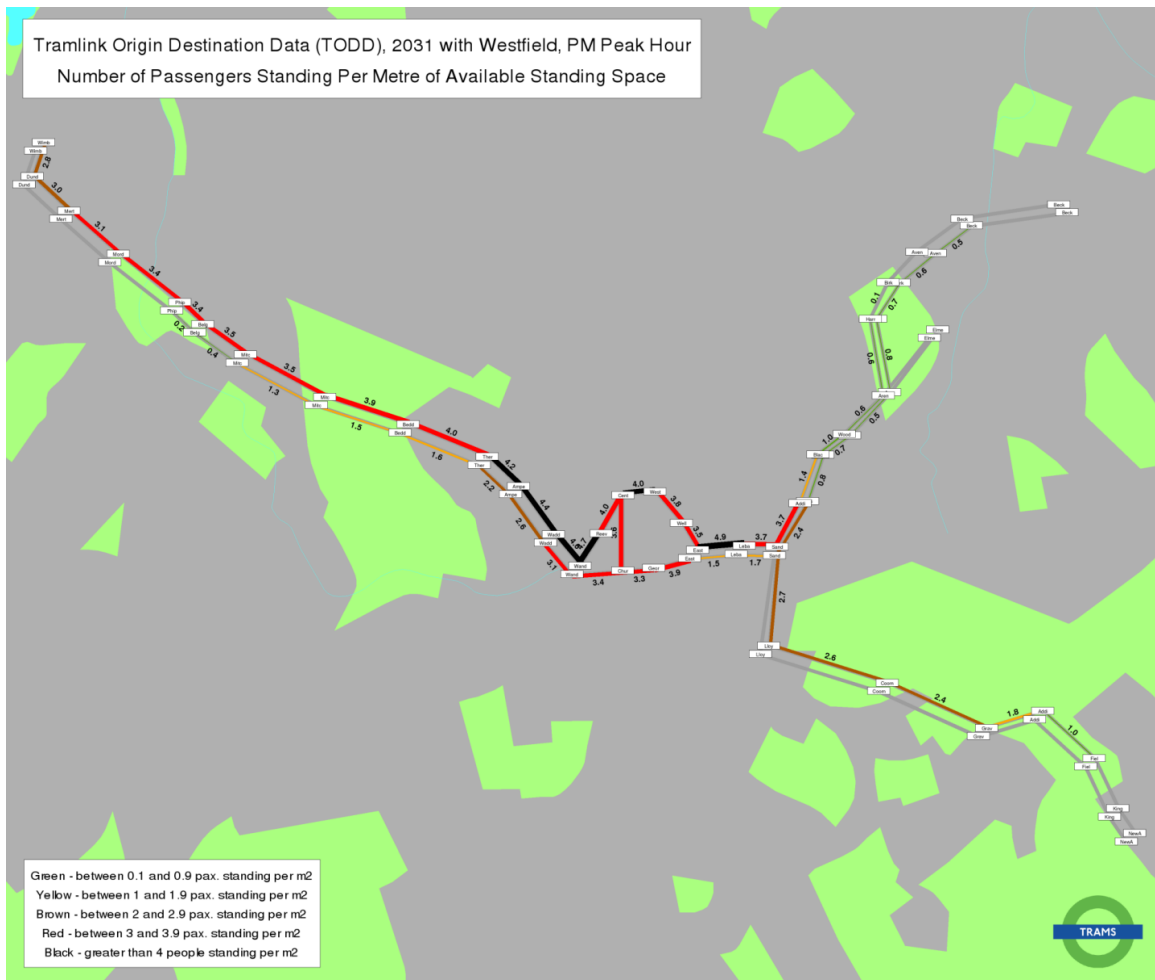
### **Purpose and objectives of Trams 2030**

- 3.4 There is therefore a clear need for a plan to upgrade the Tram network to accommodate this growth. Trams 2030 has been developed to meet this need, allowing us to make the case for additional funding for Trams and to plan investment in a co-ordinated manner across TfL and all our stakeholders.
- 3.5 The objectives of Trams 2030 are to:
- (a) maintain high reliability levels, as good as or better than today's;
  - (b) deliver sufficient capacity to support the growth of Croydon without leaving passengers behind;
  - (c) reduce wait times to meet growing expectations;
  - (d) integrate successfully with a revitalised town centre in Croydon without excessive impact on the quick journey times that make Trams attractive;
  - (e) future-proof for extensions to the network;
  - (f) deliver outstanding levels of customer satisfaction; and
  - (g) cover a greater proportion of operating costs and free up money for investment.

## **4 Key challenges**

### **Crowding and capacity**

- 4.1 With a near-doubling of demand predicted, the biggest pressure on the network is crowding. Forecasts show that without an increase in capacity, passengers will be left behind in the peaks at tramstops across the network.



- 4.2 There is a need for around 66 per cent more capacity on the Wimbledon line (in addition to that currently being provided) and around 36 per cent more capacity on the eastern branches, to avoid leaving passengers behind in the peaks.
- 4.3 There are single track constraints on the network at Wandle Park, Morden Road, the Wimbledon approach, and Beckenham Junction that would need to be dealt with to allow an increase in service. The town centre loop, and its interaction with highway traffic, also poses a major frequency constraint.

**Reliability and journey time**

- 4.4 The main challenge for reliability and journey times is in the town centre. Increasing demand will lengthen dwell times; more highway traffic means greater potential for the tramway to be blocked; and the introduction of new traffic signals and higher pedestrian volumes will increase journey times – particularly if priority for trams – currently absolute – is reduced.
- 4.5 All of these effects will increase tram requirements and operating costs, and reduce capacity in the town centre.

**Efficiency**

- 4.6 Investing in the network will allow more demand to be accommodated and revenue to be generated, but requires upfront funding. Tram fares are currently

the same as bus fares, with a relatively low yield and a requirement for ongoing subsidy.

## **5 Proposed Solutions (The Plan)**

5.1 Many options have been considered to deal with the challenges mentioned above. Some have been ruled out through a sifting and appraisal process.

5.2 The result is a strategy which sets out:

- (a) four key priorities that need addressing to unlock the potential of Trams;
- (b) a series of infrastructure investment packages; and
- (c) six incremental service enhancements (Key Outputs) to accommodate demand growth reliably.

### **Priorities**

#### **(a) Priority 1 is to accommodate the Westfield development.**

5.3 A more resilient timetable will need to be developed, that can accommodate extra journey time for the new pedestrian crossings across Wellesley Road that connect East Croydon to Westfield; and reduce the number of trams operating along the northern part of Wellesley Road, where traffic congestion is expected to be highest.

5.4 This means providing the Dingwall Loop, a new section of tramway between East Croydon and Wellesley Road that allows trams from the east to get close to Westfield but by-passing most town centre congestion.

5.5 Our current proposal is to introduce some timetabling allowance for the new crossings as part of Key Output 0 (12tph to Wimbledon), in late 2015. The full impact of the crossings would then be dealt with at Key Output 1, the introduction of the Dingwall Loop, in 2018.

5.6 The new timetables would involve a slight reduction in the Elmers End service from 8tph to 6tph, with the purpose of enabling a reliable and even-interval service across the network. This could only be avoided through the optional provision of a 2tph “topup” service with an additional tram and second platform at Elmers End, at a total cost of around £11m. Discussions continue as to the business case for and timing of this enhancement.

#### **(b) Priority 2 is to deliver additional stabling.**

5.7 There will be 34 trams in the fleet from 2015 when four additional trams arrive, and this is all that can be accommodated at Therapia Lane without impairing the efficient operation of the depot.

5.8 All future service uplifts therefore depend on additional stabling being provided. Three potential locations for this have been short-listed for further work – an expansion of Therapia Lane itself; Harrington Road; and Elmers End.

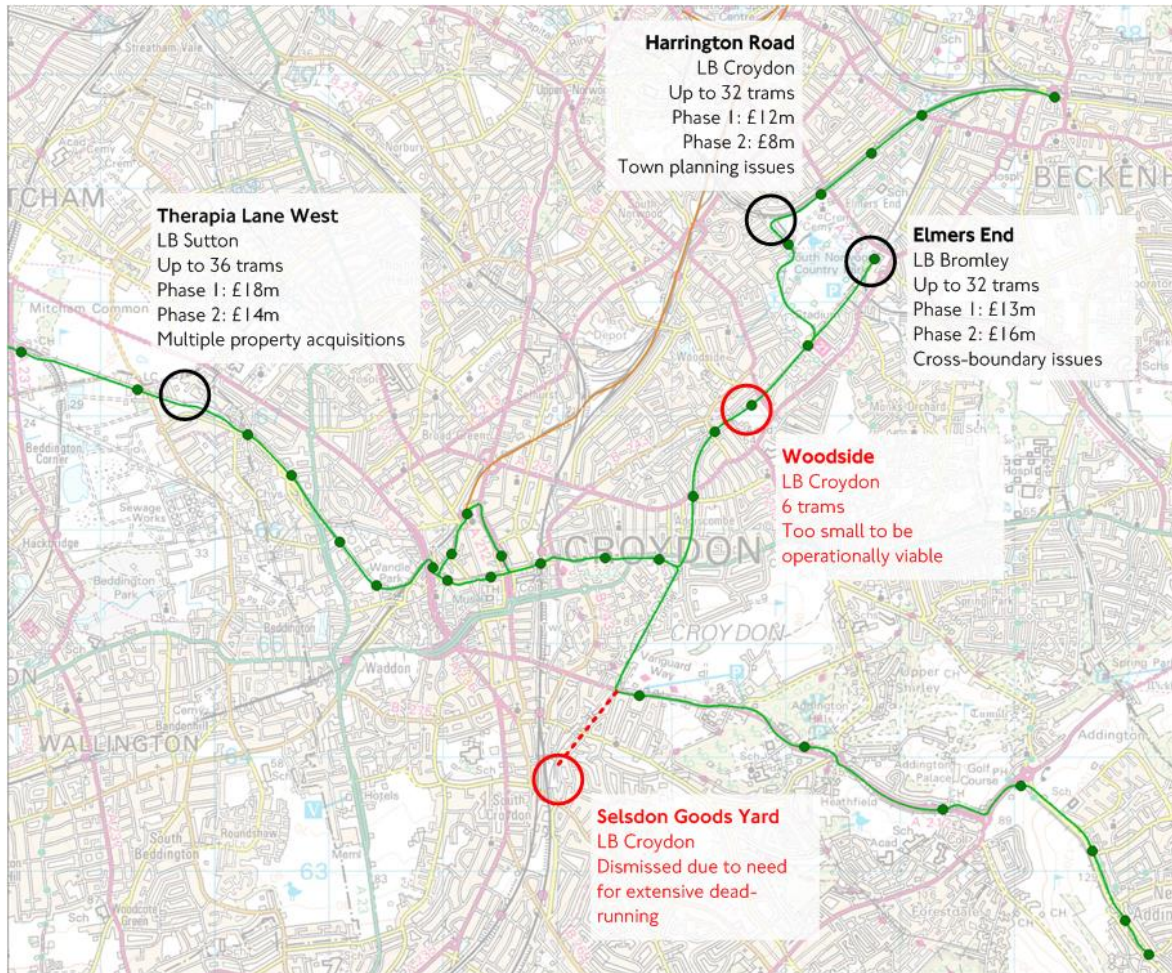


Figure 1: Options for additional stabling. Those in red have been dismissed; those in black have been shortlisted.

**(c) Priority 3 is to increase capacity on the western approach to Croydon.**

5.9 This has two implications: firstly, the single-track flyover of the railway at Wandle Park must be doubled; and secondly, a destination in central Croydon must be found for extra trams without increasing frequency between West Croydon and Wellesley Road.

5.10 Work is underway to identify options for doubling the flyover at Wandle Park.

5.11 The most likely solution for a destination in central Croydon is to introduce a new turnback or loop near Reeves Corner. A turnback would be cheaper and less intrusive, but would require passengers to walk further to the key town centre destinations. A loop would be more expensive, but would allow passengers to reach a new stop close to the Centrale

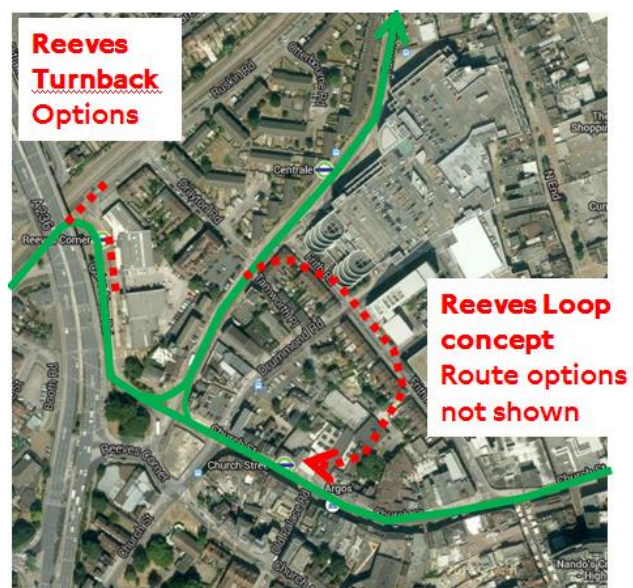


Figure 2: Turnback options for additional services from the Wimbledon branch

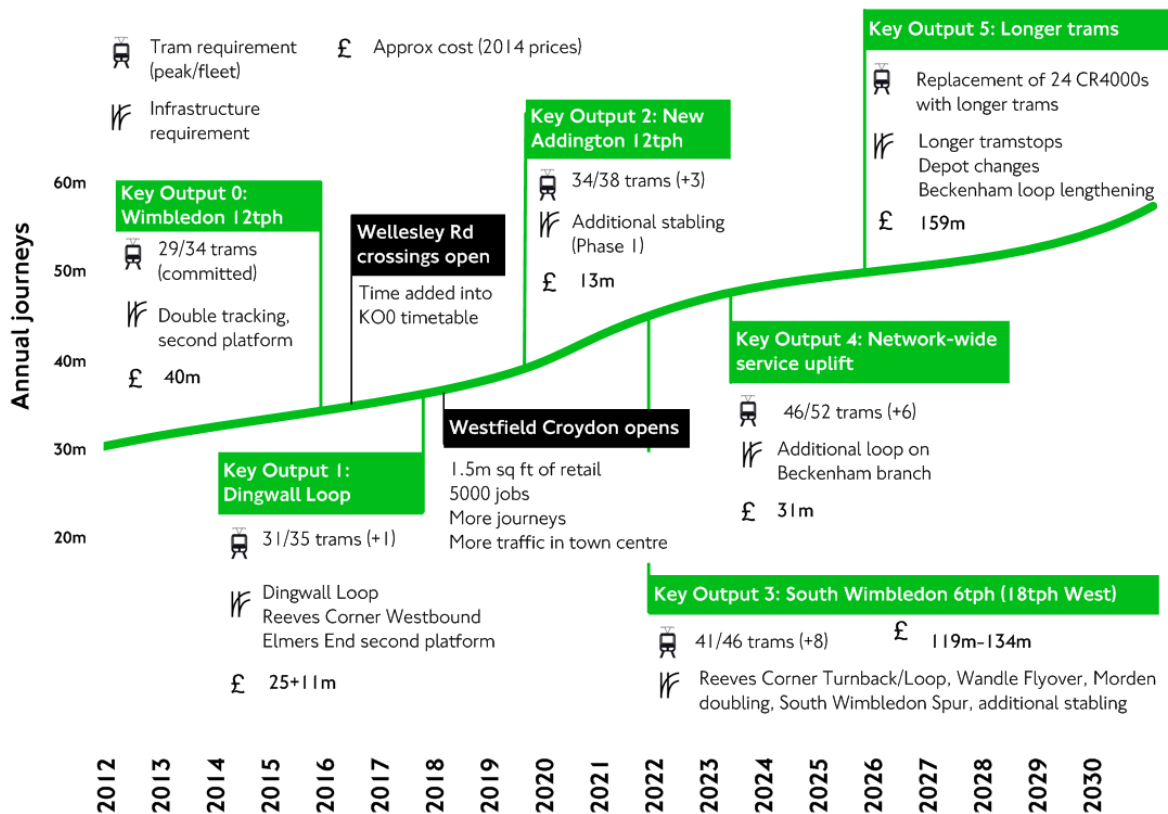
centre.

**(d) Priority 4 is to enable the future operation of longer trams.**

- 5.12 There is a limit to how much capacity can be provided through frequency – this is most acute on the Wimbledon branch, where at Wimbledon station itself, frequency will be limited even with the extra platform now being provided, because of the single-track approach. In addition, trams running across the town centre will be very crowded with limited scope for frequency enhancements.
- 5.13 The natural solution is therefore longer trams. Further work is needed to determine whether this would involve longer vehicles, or coupling vehicles of the same length together for two-car operation. Either option implies challenging work to lengthen tramstops and alter stabling facilities; and would probably be linked to replacement of the Bombardier CR4000 fleet which will be life-expired in the mid-2020s.
- 5.14 There will be a need to decide on this solution much earlier than it is needed (in the late 2020s), as it drives the rolling stock strategy for Trams. To avoid having three different tram fleets in operation on the network, it would be desirable to have one type of tram that fulfils the CR4000 replacement, the additional trams needed for earlier frequency enhancements, and longer tram operation.

**Service strategy (Key Outputs)**

5.15 The following diagram summarises the Key Outputs and their approximate introduction dates.



- 5.16 Key Output 0 delivers a 12tph service to Wimbledon (a 50 per cent increase) and is already committed. Recent timetable work suggests that a full timetable recast is needed to achieve the full benefits of the Wimbledon works and allow even interval services to operate. Funding is already committed.
- 5.17 Key Output 1 puts the Dingwall Loop into operation, transferring some town centre services onto it to avoid highway pressures between West Croydon and Wellesley Road. There is an option to add an extra tram to retain today's frequencies to Elmers End. Funding is largely committed, other than the Elmers End option.
- 5.18 Key Output 2 delivers 12tph to New Addington (a 50 per cent increase) and triggers the need for additional stabling to accommodate the extra trams required.
- 5.19 Key Output 3 is a major intervention, unlocking various capacity constraints to provide a new 6tph South Wimbledon to Croydon service, increasing capacity on most of the Wimbledon branch by a further 50 per cent and providing new connectivity between Trams and London Underground services.
- 5.20 Key Output 4 further exploits this new infrastructure to uplift frequencies across the network by 25 per cent, with major wait time benefits.
- 5.21 Finally, Key Output 5 involves the introduction of longer trams on Wimbledon services, and would require tramstop lengthening and depot works as well as potentially being linked to replacement of the CR4000 fleet.
- 5.22 More detailed descriptions of the Key Outputs and the costs of infrastructure works are included in Appendix 1 (Summary table) and Appendix 2 (Service diagrams).

### **Accommodating future extensions**

- 5.23 Trams 2030 has considered how to accommodate the proposed extensions to Sutton and Crystal Palace.
- 5.24 In the case of Sutton, the South Wimbledon spur – provided for Key Output 3 – would be the natural terminus for future Sutton services. Sufficient capacity would exist through Morden Road for an 8-min interval service between South Wimbledon and Sutton.
- 5.25 Crystal Palace is more difficult to accommodate, as the 30tph service through East Croydon proposed at Key Output 4 is probably the limit of what can be achieved. An additional eastern branch would therefore involve reallocating services from one or several of the other branches to Crystal Palace.
- 5.26 Alternatively, capacity would need to be reserved for a 6tph service – meaning that Key Output 4 would not be possible and there would be a need to move directly to longer trams to provide capacity instead. This has an opportunity cost, as the social benefits and revenue of the increased frequencies across the network in Key Output 4 are much higher than they would be for longer trams.

## **6 Conclusions**

- 6.1 Implementing this plan in full would deliver considerably improvements to passengers and underpin growth aspirations for Croydon. Compared to 2016, there would be:
- (a) 88 per cent more frequency and capacity on the New Addington branch;
  - (b) 88 per cent increase in frequency and up to an 180 per cent increase in capacity on the Wimbledon branch;
  - (c) 25 per cent more frequency and 88 per cent more capacity on the Beckenham branch;
  - (d) 41 per cent more capacity on the Elmers End branch;
  - (e) reduced frequencies in central Croydon but the same level of capacity, with new tramstops at Lansdowne Road and near Centrale to bring passengers closer to their destinations;
  - (f) today's high levels of reliability;
  - (g) wait times of no more than 10 minutes anywhere across the network, with the majority of passengers waiting no more than four minutes;
  - (h) a new tram fleet to replace the CR4000s, with ambience and capacity benefits.

## **7 Next steps**

- 7.1 Further work is needed to develop certain aspects of the plan, in particular:
- (a) Feasibility for Wandle Flyover and Reeves Corner options;
  - (b) Stabling strategy, including further investigation of shortlisted sites;
  - (c) Feasibility for longer tram operation; and
  - (d) Rolling stock strategy.
- 7.2 Ongoing engagement will be required with stakeholders, particularly the London Borough of Croydon but also the London Borough of Bromley, Sutton and Merton.

## **8 Costs and funding**

- 8.1 The only funding currently available is for Key Output 0 (Wimbledon 12tph), which is funded in the business plan for which the necessary infrastructure is already under construction and will be available by 2015.
- 8.2 Key Output 1 is partially funded. The £23.8m cost of Dingwall Loop is funded. It is a joint partnership with Westfield and £15m Section 106 funds are committed through planning consent. TfL will provide the balance of £8.8m. The Elmers End extra tram is not funded.



- 8.3 If this strategy is endorsed, then the infrastructure projects needed would be put forward to the next Business Planning Round in 2015. Part of this could involve examining the opportunity for changes to the Tram fares structure and revenue to provide funding towards the capital investment.
- 8.4 Funding would also be sought from third parties – notably through Croydon’s Community Infrastructure Levy, but potentially also through direct government funding.
- 8.5 London Borough of Croydon also have aspirations to fund infrastructure improvements – including transport alongside utilities and social infrastructure – by delivering an Enterprise Zone and/or Housing Zone for Croydon, allowing future business rates or other tax receipts to be used towards designated improvements, including Trams projects.

**List of appendices to this report:**

Appendix 1: Summary table of Key Outputs and their costs and infrastructure requirements

Appendix 2: Service pattern diagrams

**List of Background Papers:**

None

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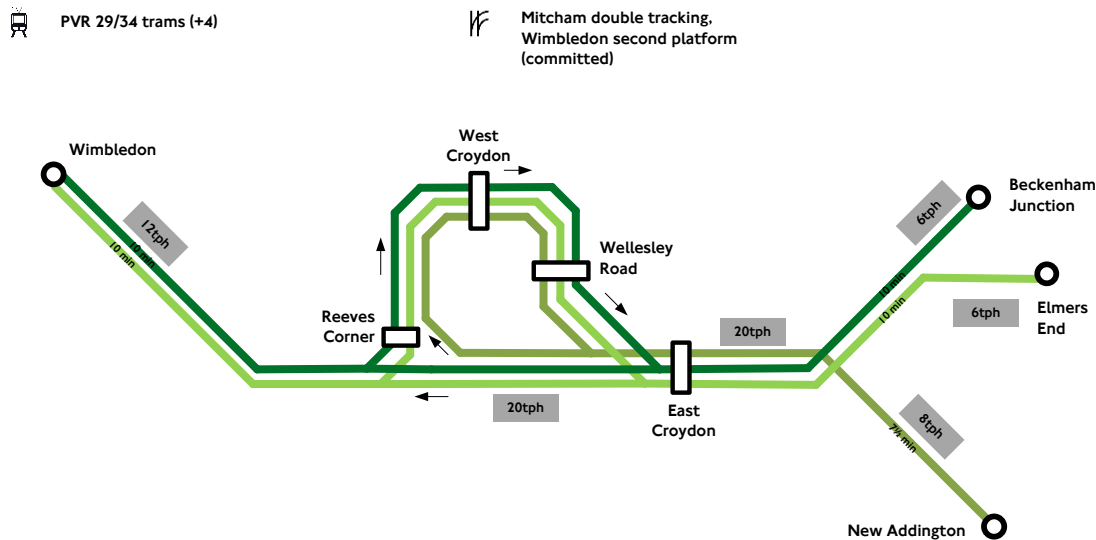
**Appendix 1 - Summary table of Key Outputs and their costs and infrastructure requirements**

Key output		Infrastructure	Trams in fleet	Cost £m
0	Wimbledon 12tph	Mitcham double tracking Wimbledon second platform	34	40
1	Dingwall Loop	Dingwall Loop Reeves Corner Westbound Elmers End second platform Additional stabling	35	36
2	New Addington 12tph	Additional stabling	38	13
3	South Wimbledon – Croydon 6tph	Reeves Corner turnback/loop Wandle flyover doubling Morden Road – Phipps Bridge doubling South Wimbledon spur Additional stabling	46	119-134
4	Network wide service uplift	Additional passing loop on Beckenham Branch	52	31
5	Longer Trams across central Croydon	Longer tramstops Depot changes Beckenham loop lengthening	80 if two car trams added or 52 if 24 x CR4000s replaced with longer trams	159

## Appendix 2 – Service pattern diagrams

### Key Output 0: Wimbledon 12tph

Key Output 0: Service recast for even headway 12tph to Wimbledon



This Key Output uses the committed four additional trams, double tracking at Mitcham and second platform at Wimbledon to deliver a 12tph service on that branch.

To avoid bunching of trams on the branches, the Wimbledon service would operate to Beckenham Junction and Elmers End rather than New Addington. This has a significant benefit in evening-out headways between Arena and Croydon – whilst the current timetable has gaps of between two and eight minutes, the new timetable would be even five minute intervals. In addition, demand for through services from these branches is 20 per cent higher than from the New Addington branch.

The net benefit of the more reliable, even-interval service is large, but there is a small, localised disbenefit at Elmers End, where service reduces from 8tph (uneven) to 6tph (even).

It would be possible to avoid this disbenefit by acquiring an extra tram and building a second platform at Elmers End, to allow an “overlay” service of 2tph from Elmers End to the town centre loop to operate in the peaks. However, this additional tram could only be accommodated temporarily at Therapia Lane as there is no stabling space left in the depot – a commitment would be needed to additional stabling.

## Key Output 1: Dingwall Loop

The Dingwall Loop allows services through the critical section between West Croydon and Wellesley Road to be reduced to avoid highway congestion. The key question is then, how many town centre loop services should be diverted to the new loop.

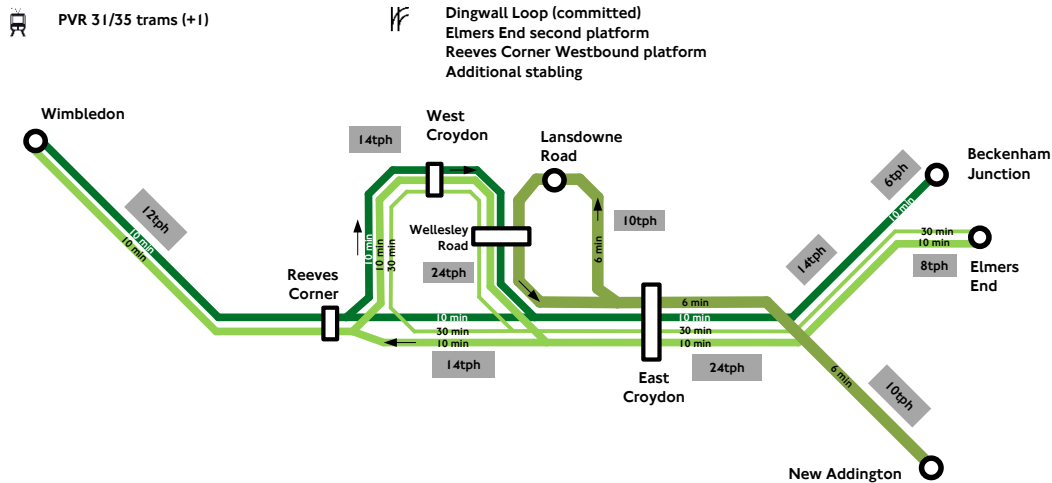
In Option A, all New Addington – town centre services are diverted. This leaves a minimal (and optional) 2tph Elmers End – town centre service using the curve at Church Street, but allows the New Addington service to increase to 10tph.

In Option B, the New Addington service is kept at 8tph, with trams alternating between the Dingwall Loop (4tph) and the town centre loop (4tph, +2tph from Elmers End).

Option A is more beneficial for highway congestion, but Option B has a net benefit for tram passengers (as there are more passengers in the town centre than on the New Addington branch).

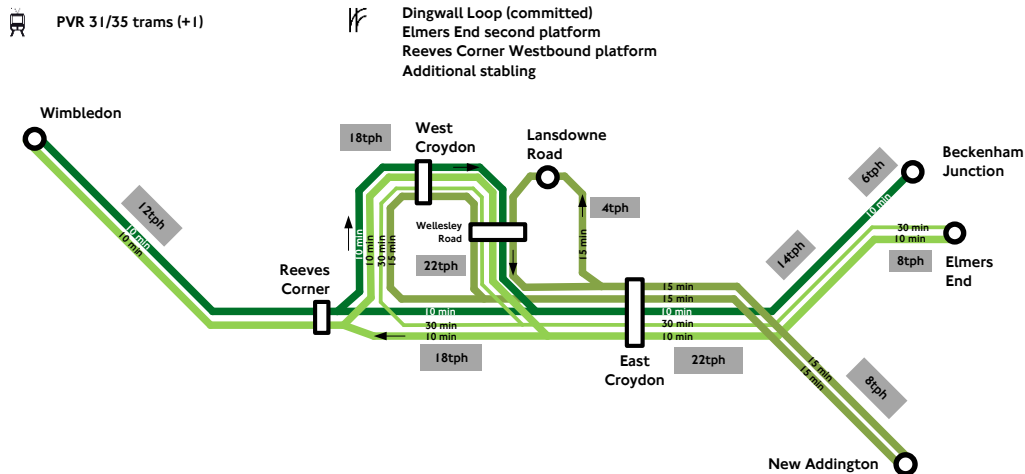
### Key Output 1: Dingwall Loop service recast

Option A: 10tph New Addington, all to Dingwall




### Key Output 1: Dingwall Loop service recast

Option B: 8tph New Addington, higher Town Centre Loop frequency



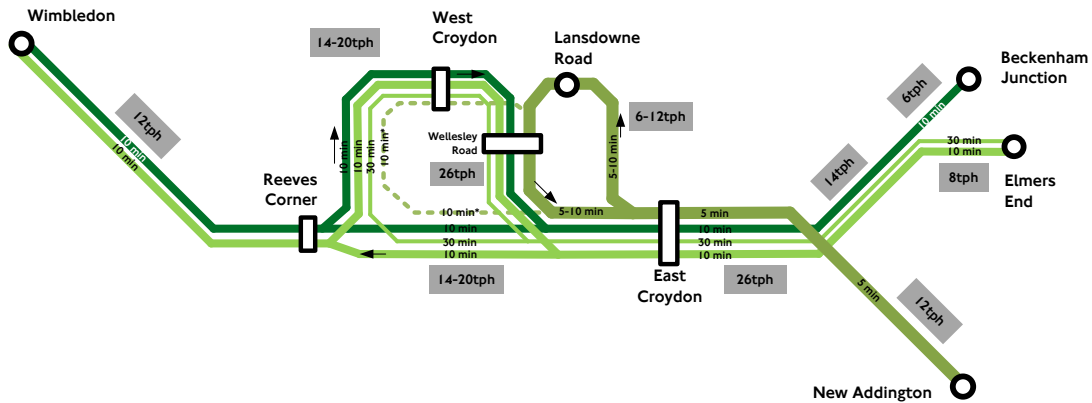
## Key Output 2: 12tph to New Addington

### Key Output 2: New Addington 12tph

 PVR 34/38 trams (+3)

 Additional stabling

\* Town Centre Loop extra service option

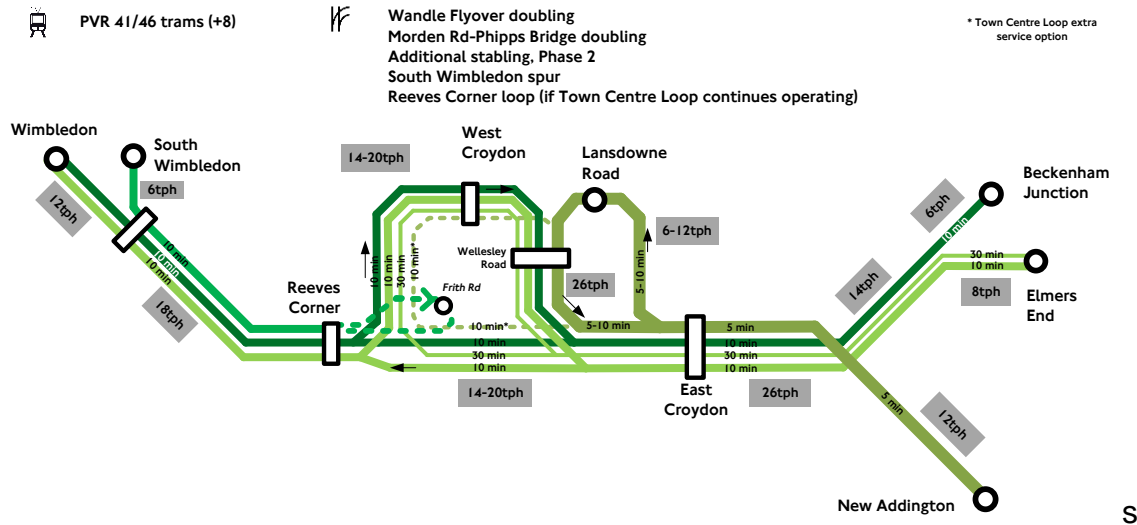


At this stage, New Addington services rise from 10tph to 12tph, purely by providing three additional trams. This triggers the need for additional stabling/depot facilities (alongside the optional extra tram for the 2tph Elmers End overlay service).

There is the option of either running all of these 12tph round the Dingwall Loop (better for tram reliability, highway congestion) or alternating them between the Town Centre Loop and Dingwall Loop (better for crowding and connectivity).

## Key Output 3: 6tph South Wimbledon-Croydon

### Key Output 3: South Wimbledon - Croydon



Additional capacity is needed on the Wimbledon line, particularly at the eastern end where trams are at their most crowded.

Wimbledon cannot support more than 15tph due to the single-track approach, so the first option for increasing capacity is to overlay a new 6tph service between Croydon and Morden Road initially – extending 800 metres to South Wimbledon station later once further funding is available and Transport and Works Act powers can be sought.

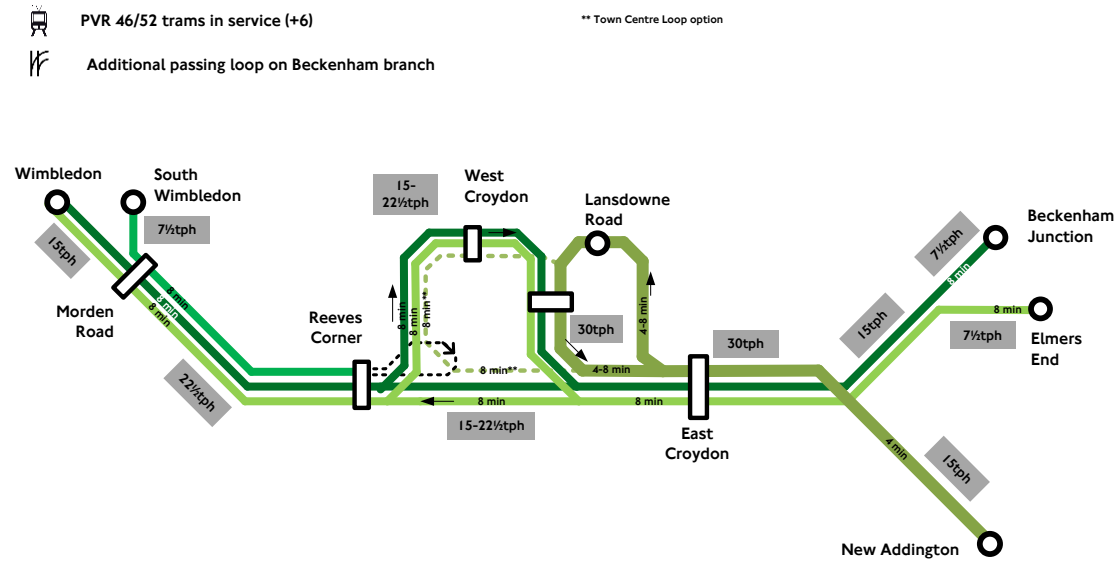
This provides new connectivity between the Northern line and Trams.

In the town centre, there are two options for where to take this 6tph service:

- a) Break the 6tph New Addington-Town Centre Loop service and run it through to South Wimbledon
- b) Leave the 6tph New Addington-Town Centre Loop service and build a new turnback loop for the South Wimbledon trams, mirroring Dingwall, with a new tramstop close to the Centrale centre (e.g. on Frith Road)

## Key Output 4: 25 per cent more frequency across the network

### Key Output 4: Network-wide service uplift



The network service cycle speeds up from 10 minutes to eight minutes, resulting in 25 per cent more capacity.

Minor enhancements on the Beckenham branch are needed, along with the second platform at Elmers End.


This Key Output also triggers the need for Phase 2 of the Stabling Plan.


However, the service plan also requires two minute headways through the new Wellesley Road/Lansdowne Road junction off the Dingwall Loop – which may be difficult to accommodate.

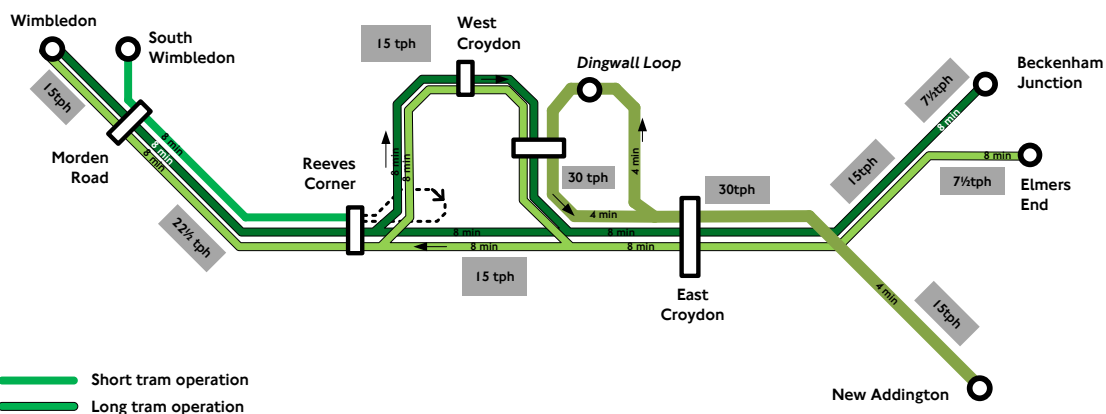
It may not be possible to accommodate the town centre loop service at this stage as with it, frequency through West Croydon would rise to 22 1/2 tph, with knock-on impacts for highway congestion.

## Key Output 5: Longer trams across central Croydon

### Key Output 5: Cross-Croydon capacity

 EITHER: 72/80 trams in service (+28) if 2-car  
OR: Replacement of 24 CR4000 trams with 26 longer trams (PVR 48/54)

 Two-car/longer tram operation including:  
Additional/replacement trams & Depot works  
Tramstop lengthening Wimbledon-Beckenham & Elmers  
Loop lengthening on Beckenham branch



Delivering additional frequency in the town centre or on the Wimbledon branch is unlikely to be feasible, nor compatible with the Sutton Extension.

The most straightforward option for more capacity is therefore to replace the 24 CR4000 trams (assumed to be at least 25 years old by this point) with a longer and slightly larger (26) fleet. There could be scope for 30 to 50 per cent more capacity.

An alternative would be to operate similar length vehicles, but couple some of them to allow two car operation.

These trams or consists would operate primarily on Wimbledon to Beckenham/Elmers End services.

Significant changes would be needed to tramstops, maintenance facilities and stabling; and passing loops on the Beckenham branch would need to be lengthened.