Kent County Council

TUNBRIDGE WELLS

Bus Feasibility Technical Note

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WSP

Kings Orchard
1 Queen Street
Bristol
BS2 0HQ

Phone: +44 117 930 6200

WSP.com

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Signature				
Checked by	Jodie McCann	Jodie McCann		
Signature				
Authorised by	Mike Holmes	Mike Holmes		
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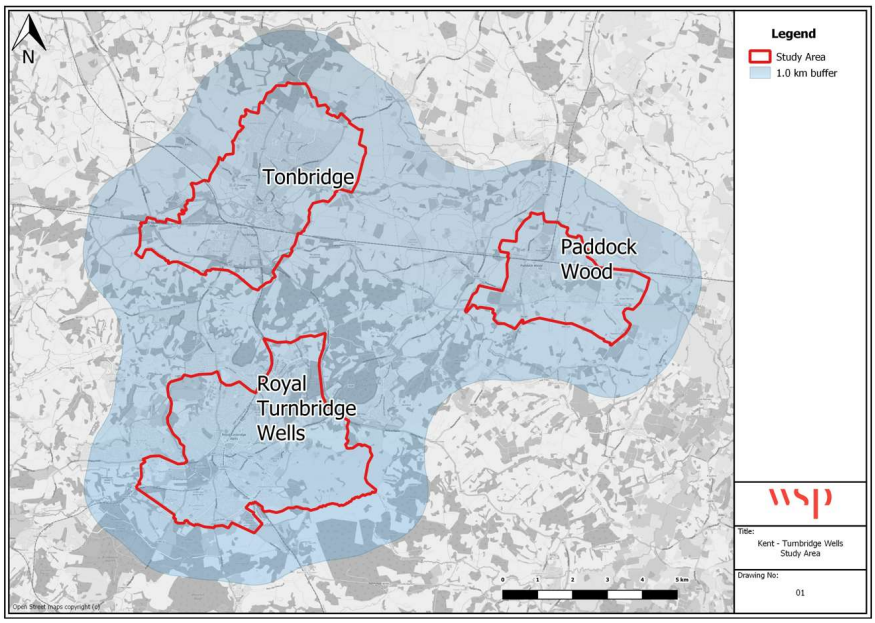
1 INTRODUCTION

1.1.1. WSP has been commissioned by Kent County Council (KCC) and Tunbridge Wells Borough Council (TWBC) to examine the current local bus network operating across the TWBC area and understand how the current local bus network and any subsequent changes to routes, supporting infrastructure, and service levels may support the planned population expansion brought about by the adoption of the Tunbridge Wells Borough Local Plan (2020-2038).

1.1.2. While also seeking to identify opportunities for Bus Rapid Transit (BRT) or 'BRT-light' services in the borough the study has specifically focused on three corridors between (and as shown in Figure 1-1 below):

- Paddock Wood – proposed Tudeley Garden Village – Tonbridge Town Centre
- Royal Tunbridge Wells town centre and Paddock Wood (via the A264)
- Royal Tunbridge Wells town centre and Tonbridge town centre (via the A26)

Figure 1-1 – Tunbridge Wells Bus Feasibility Study Area



1.1.3. The study considers the following aspects of network delivery that may be enhanced through development expansion across the TWBC area:

- Journey time improvements through prioritisation of buses, provision of new routes, and higher frequencies
- Integration with other modes particularly sustainable options such as rail, cycling, and walking
- Improved BRT style passenger facilities through examination of best practice in BRT delivery
- Costing for proposed infrastructure and bus service network improvements
- Overview of financial viability (considering journey time and resource requirements) and revenue generation (including sensitivity testing to demonstrate the impact of frequency and mode share changes on demand and revenue).

2 STRATEGIC BACKGROUND

2.1 STRATEGIC BACKGROUND – SUMMARY

2.1.1. Sustainable travel modes, both bus/public transport and active travel sit at the heart of the 15-year strategic plan as set out by TWBC. Up to 50% of residents remain within the study area daily, of which 40%-45% are of working age, meaning options to increase use of local sustainable travel modes are very important to reduce high levels of congestion and improve air quality both within town centres and on the local highway network.

2.1.2. However, several reports reviewed during this work have highlighted current bus service provision to both be limited in attracting more patronage and insufficient to meet the future demands/needs of proposed developments.

2.1.3. The average distance to work across the borough is 19.9km (higher than county, regional and national levels). The current mode share of bus for travelling to work is low at only 2% (under county, regional and national levels) and reflects this predominantly low frequency network which is in operation between town pairings. Only the Tonbridge- Royal Tunbridge Wells corridor supports a 15-minute service frequency but is subject to significant peak time congestion due to the current highway layout and capacity limitations.

2.1.4. The local area enjoys good rail provision with services focusing on wider access to Central London and the South Coast. However, bus use for travel to/from the local rail stations is c.3%, again attributed to the low levels of bus service frequency and shorter operational span throughout the day (0700-1900 for most services).

2.1.5. From the recent Bus Service Improvement Plan (BSIP) consultation, more frequent bus services which operate for longer durations, coupled with improved reliability, and supported by better fares, were identified as the three main factors for encouraging greater bus use. Concerning reliability Tonbridge Town Centre to Royal Tunbridge Wells Town Centre was specifically identified as corridors within this study area where patronage levels and general delay to services meant bus priority is desirable.

2.1.6. These findings reflect comments provided by local bus operators who expressed a need for additional services to serve new developments, plus bus priority measures to ensure bus travel is attractive to new residents and helps relieve congestion (current and future) along key routes.

2.1.7. The use of local Park & Ride facilities has received moderate support (54% in favour, 2011 consultation) which could be increased using supporting measures such as changes to car parking charging. This study is now eleven years old, and it is recommended that consultation is updated.

2.1.8. All the above suggests a need to develop priority bus corridors between the main towns, the demand for which would be further underpinned by the c.13% of residents who travel 2km or less to work and would therefore be very likely to switch to public transport given a suitable offer.

2.1.9. These needs are reflected in future aspirations which include development of three high quality, rapid bus/transport links between Paddock Wood, Royal Tunbridge Wells and Tonbridge. To support potential use of these corridors, a range of additional measures are planned to include integration with active travel modes, increased use of demand responsive transport (DRT) services, and the application of Mobility as a Service (MaaS) techniques.

2.1.10. Furthermore, new development sites - predominantly in Paddock Wood and including East Capel (c.3,900 homes) and the new Tudeley Garden Village (c.1,900 homes) - have been designed around the concept of walkable neighbourhoods and to position public transport at the centrepiece of each development.

2.1.11. Walk distances from new housing to public transport stops should ideally be no further than 400m[1]. To maximise the potential of a sustainability-focussed approach, public transport services must be high frequency, high quality, and reliable to ensure permanent mode shift from private car use.

2.1.12. Whilst Tudeley Garden Village will be designed to promote and assist sustainable lifestyles, reducing the need to use private car for local and long-distance trips, its proximity to the A21 (a three-minute drive) has been flagged as a key consideration and presents potential limitation for promoting successful modal shift measures, particularly amongst millennial generations who are more used to car use and ownership. General demand for forecasted external trips departing Tudeley Garden Village is approximately 2:1 between Tonbridge (Westbound) and Paddock Wood (Eastbound), which should be reflected in future bus service planning and scheduling.

2.1.13. However, capturing general perceptions and travel habits of the younger generations, who are more aligned to non-car modes and use of future technological opportunities, lends strength to the new service proposals incorporating DRT, BRT (Fastrack), MaaS and smart ticketing.

2.1.14. Finally, the use of active travel modes to access/egress the local bus network is an opportunity to widen the reach of local services beyond the 'traditional' 400m threshold, but this needs to be reflected within both bus and walking/cycling related policies and related strategies.

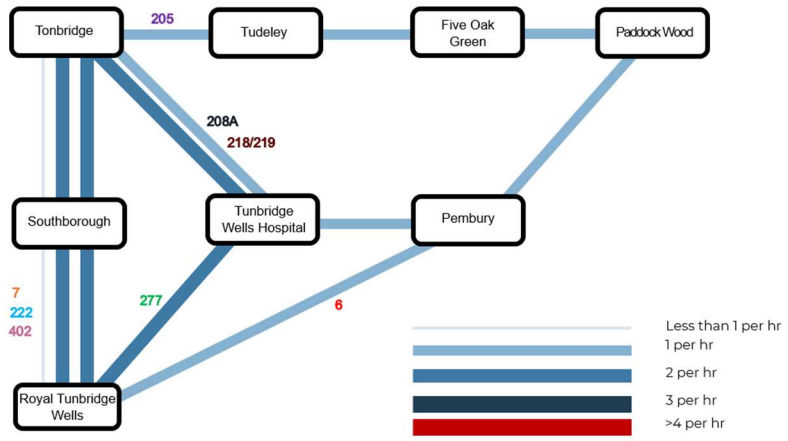
[1] Buses in Urban Developments - Chartered Institution of Highways and Transportation (CIHT)

3 BASELINE PUBLIC TRANSPORT NETWORK

3.1 LOCAL BUS NETWORK

3.1.1. The study area currently supports a network of commercial trunk services at varying frequencies along the main highway corridors including the A21, A26, A228, and A264 in addition to a small number of town circular services operating at high frequencies as shown in Figure 3-1.

Figure 3-1 - Baseline bus network service frequency



3.1.2. The bus network across the region operates daily over standard period (typically ranging from 0700 to 2000) with some school day only services, and Monday to Friday only services which serve the corridors except during weekends and public holidays.

3.1.3. The major travel generators for these routes are Tunbridge Wells Hospital and Maidstone Hospital, Mascalls Academy Grounds in Paddock Wood, Trinity School and Knole Academy (Sevenoaks), Tunbridge Wells Boys' Grammar School, and schools within Tonbridge.

3.1.4. The largest local bus service operator in the area is Arriva Kent and Surrey who operate services 6, 7, 218, 219, 277, and 402 in addition to Royal Tunbridge Wells town services. Additional operators within the study area, or on its fringes, include Autocar (notably route 205 between Tonbridge and Paddock Wood), Nu-Venture, Go Coach Hire, and Metrobus.

3.1.5. Services between Tonbridge and Royal Tunbridge Wells operate to a coordinated headway of 15-minutes. However, whilst 40 trips each way operate across a 15-hour period (Monday-Friday) between Tonbridge and Pembury (A21 corridor) these are uncoordinated but do represent the opportunity to provide a coordinated 20-minute headway.

3.1.6. Together, all services combine to create a reasonably dense network, particularly on the A21 and A26 corridors that support existing levels of residential occupation, housing stock, and retail and commercial opportunities. Furthermore, these service corridors fall across areas where significant new development is planned (Tudeley, c2,500 homes between Paddock Wood and Tonbridge, and Paddock Wood (including East Capel) with c3,500 homes planned on the town's fringes).

3.1.7. The local bus network has been forced to adapt to the challenges presented by the Covid-19 Pandemic. However, it is now recovering with use in most passenger groups at 80%-90% of pre-pandemic levels. Use by older age groups and English National Concessionary Travel Scheme (ENCTS) pass holders has been slower to recover at just 50%-60% of pre-pandemic levels.

3.1.8. Whilst these rates of return to the bus network and the increased use of homeworking by younger and middle age-groups has limited the overall levels of use (and potential growth on some corridors), new developments which will attract a wide range of age-groups and which are developed with embedded sustainability and priority for public and shared transport modes will have the potential to revitalise and increase the overall use of the bus and wider public transport network (e.g., rail). This will be where service levels are high enough and the services provided are reliable enough to ensure a step change in the passenger experience, repeat use, and ongoing loyalty.

3.1.9. Whilst it is acknowledged that the bus market has been experiencing significant challenges following the Covid-19 pandemic, and that some services are under review at present, the imperative for reducing carbon emissions remains and sustainable public transport as well as active travel opportunities need to be prioritised in response. It is therefore important that the vision for improved bus services the TWBC area is not lost especially given the funding that will be provided through the Strategic Sites at Tudeley Garden Village and Paddock Wood (including East Capel). It is anticipated that there will continue to be innovation in bus service provision and both TWBC and KCC are committed to undertaking further work with bus operators to deliver sustainable services to support the proposed growth in the Local Plan.

3.1.10. With the potential for developments to stimulate further frequency increases (up to every 15-minutes in step with housing build out rates) in Tudeley Garden Village and Paddock Wood (including East Capel), there is a foundation within the current local bus network that would support high frequency operation across nearly all the identified corridors, except Paddock Wood to Royal Tunbridge Wells.

3.1.11. This network growth will be needed to support the additional housing developments being proposed and different services scenarios have been modelled with the outputs summarised later in this study. Furthermore, dependent on the current stage of each development there is potential to embed sustainable travel at an early stage through development focused Travel Plans which can be informed by the work conducted within this study (or updated where Travel Plans already exist).

3.1.12. The Paddock Wood to Royal Tunbridge Wells corridor has seen service cutbacks which sit juxtaposed to the remainder of the study area network. These have been caused by the more rural nature of the route taken along the A228 and A264 and have occurred even though there is no parallel rail corridor on the alignment between these two principal towns (unlike the A26 and B2017 corridors).

3.1.13. Three services operate across this corridor. Arriva Kent and Surrey's service 6 runs hourly from Maidstone to Royal Tunbridge Wells via Paddock Wood and Pembury (including Tunbridge Wells Hospital) and follows slower local roads (e.g., B2160) to ensure smaller communities remain on the service. In addition, the 6X runs fast along the A228 from Paddock Wood to Tunbridge Wells Hospital (every 45 minutes) and extends back to Maidstone Hospital with the service being supported by the NHS Trust. Between Tunbridge Wells Hospital and the town centre bus 277 (Arriva) provides a 30-minute frequency but this operates via local housing areas and has a slow journey time of 32 minutes.

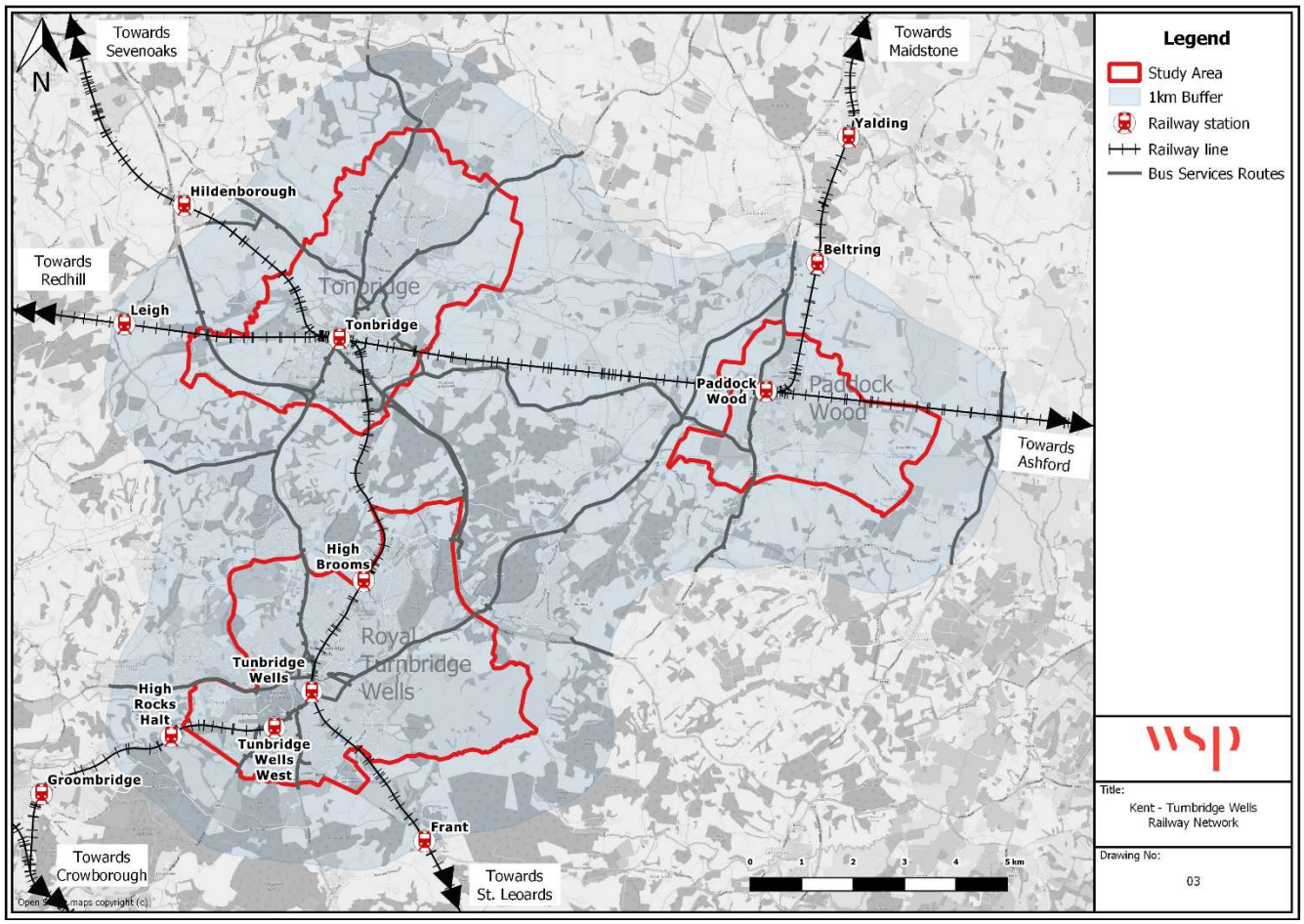
3.1.14. Providing viable higher frequencies on the Paddock Wood to Royal Tunbridge Wells corridor will be challenging but could be supported with cross-over between those services provided through Tudeley Garden Village and further supported by the substantial housing being provided in Paddock Wood with a potential new market seeking, local work, leisure, and social opportunities in Royal Tunbridge Wells and who will consider the bus if journey times, and fares were minimised.

3.2 LOCAL AND NATIONAL RAIL NETWORK

3.2.1. Complementing the local bus network, the rail network operates across two rail alignments through the study area (as shown in Figure 3-2):

- The mainline running through Tonbridge and Paddock Wood
- The mainline running through Tonbridge and Royal Tunbridge Wells

Figure 3-2 - Rail Alignments within the study area



3.2.2. With direct rail services to London mainline stations as well as Ashford (International) for Eurostar connections to continental Europe, the study area attracts a high number of resident commuters who use rail services to access employment and education facilities further afield across Kent and in central London.

3.2.3. Working and travel patterns have been dramatically altered following the Covid-19 Pandemic and post-pandemic rail services on some lines in Kent are not seeing more than 40% (September 2021) of pre-pandemic levels at peak travel times. However, there remain a high number of rail services through the study area and recover to 60-80% of pre-pandemic levels are now expected.

3.2.4. Table 3-1 summarises the current peak hour frequency of rail services on each main route alignment.

Table 3-1 - Mainline rail services (peak hour) frequencies within the study area

Station	Route ID	Route	Weekday Peak Hr Frequency	Saturday Peak Hr Frequency	Sunday Peak Hr Frequency
Tonbridge	1	London, Tonbridge, & Ashford (Int'l) to Canterbury West, Folkestone, Dover, Ramsgate, Margate	4	2	1
Tonbridge	3b	Strood to Maidstone West, Paddock Wood, and Tonbridge	2	1	1
Tonbridge	4	London and Sevenoaks to Tonbridge, Royal Tunbridge Wells, Battle and Hastings	6	5	3
Royal Tunbridge Wells	4	London and Sevenoaks to Tonbridge, Royal Tunbridge Wells, Battle and Hastings	4	3	2
Paddock Wood	1	London, Tonbridge, & Ashford (Int'l) to Canterbury West, Folkestone, Dover, Ramsgate, Margate	4	2	1
Paddock Wood	3b	Strood to Maidstone West, Paddock Wood, and Tonbridge	2	1	1

3.2.5. The rail network's main role is for travel out of (and returning to) the study area. However, rail services also provide a local travel function with rail stations additionally located at High Brooms (north of Royal Tunbridge Wells town centre) and south / south west of Royal Tunbridge Wells at Royal Tunbridge Wells West and High Rocks Halt respectively.

3.2.6. The rail route which parallels bus services between Tonbridge and Royal Tunbridge Wells operates at half the frequency of bus services but completes the end-to-end journey in less than half the bus running time (including a stop at High Brooms).

3.2.7. Similarly, the direct services from Tonbridge to Paddock Wood combined to provide three trains per hour (using an uneven headway) and have a journey time which is only 25% of the current end-to-end journey time on bus service 205.

3.2.8. Rail fares between Tonbridge and Royal Tunbridge Wells are £4.60 single (£4.80 to £5.50 return) and compares favourably with a day ticket (when used once each way) between the two locations by bus (current costs £5.40 'Adult Day' unlimited travel) and less favourably if the bus is used for multiple trips. With its speed advantage rail could be a preferable mode to bus at current fare levels for a return trip as access to rail stations in each location is central and equitable to the bus and journey times are significantly lower. Bus would compete more effectively with lower journey times.

3.2.9. However, as a mode within the study area, rail seems to perform a different role than local bus services with rail offering regional and national travel and being predominantly used to access central London. While rail offers local travel opportunities, local bus has a more appealing offer to residents with stops closer to residential locations as demonstrated by the continued viability of a commercial 15-minute frequency bus corridor at comparable fares to local rail services.

3.3 OTHER SUPPORTING MODES

3.3.1. Regarding supporting modes, there are several local taxi firms operating from principal towns across the study area, providing ad-hoc journey opportunities for bespoke travel needs and often at times outside of the core local bus network hours of coverage.

3.3.2. The taxi market does potentially compete with the local bus network but may not be a direct substitute for many that would use the bus, and therefore is most likely instead to fulfil trips that are either not catered for by the local bus network or are undertaken by residents who would not consider the current bus network as a viable alternative mode in any event.

3.3.3. Several taxi ranks are located across the study area at traditional locations within each town and major trip attractor (e.g., railway stations and hospitals) with a low level of conflict being observed between the taxi market and local bus network.

3.3.4. Additional supporting modes are those that focus on active travel, in particular walking and cycling. TWBC has a strong progressive policy regarding the provision and maintenance of cycle lanes across the borough area with several core routes seeing road space being made available to cycles using a combination of 'with traffic' and 'segregated' cycle lanes where space permits.

3.3.5. As noted earlier, TWBC is into the second phase of its Local Cycling and Walking Infrastructure Plan (LCWIP) and this outlines a significant increase in the cycle network with increases in localised cycle lanes in the three principal towns within the study area alongside plans for an interurban network of cycle links using a mix of main road and quiet-lane alignments between each town pairing.

3.3.6. However, no single source cycle map showing the current cycle network can be located to understand any planned integration between other modes (e.g., bus) and no mention is given to cycle integration with the local public transport network in current documents.

3.3.7. It is recommended that the policy of continued inclusion of cycle lanes into bus priority measures is continued with offline cycle lanes and improved walking routes included in any new bus priority features as space allows.

3.4 LOCAL HIGHWAY NETWORK

3.4.1. The study area is defined by four main highway routes; the A26 between Tonbridge and Royal Tunbridge Wells; the A21 between Tonbridge and Pembury; the A228 between Paddock Wood and Pembury; and the A264 between Pembury and Royal Tunbridge Wells. A network of B and C roads complete the local highway network and include the B2017 linking Tonbridge to Paddock Wood (and the East Capel area) via Tudeley.

3.4.2. Significant assessment relating to the capacity and flow rate of traffic across the highway network within the study area is not within the scope of this report. However, later sections within this report focus on the impact of traffic delays on bus movements across the network and show the widths of all A and B roads within the study area to demonstrate where new bus priority measures (e.g., bus lanes) may be accommodated.

3.4.3. However, for the purposes of completeness it can be concluded that main bus services make extensive use of the A26 and B2017 with lesser use made of the A21 and A264. Therefore, there is potential to consider these lesser used roads as part of a BRT approach to the local bus network as journey times may be lowered more significantly, though at the expense of serving smaller communities that may lie away from the main road alignments (e.g., Matfield).

4 BUS PRIORITY IMPROVEMENTS

4.1.1. Each corridor in the study area has been reviewed considering different factors:

- Existing and potential bus priority infrastructure
- Highway width analysis
- Analyse Bus Open Data service (ABODs)

4.1.2. A series of potential interventions and areas of further investigation have been put forward, as summarised in Table 4-2 and detailed in **Appendix A**.

4.1.3. To estimate the total journey time savings that could result along each corridor, assumptions regarding the performance of various bus priority measures have been used. Table 4-1 lists a simplified total of interventions along each corridor and the likely journey times savings per bus trip that could be expected as a minimum.

Table 4-1 – Time savings resulting from infrastructure interventions along the corridors considered

Corridor	Approximate length of bus lanes of bus gates proposed	Number of prioritised junctions proposed	Total potential time savings (per journey)
Tonbridge – Paddock Wood	1250m	4	145 sec
Paddock Wood – Pembury	1450m	3	140 sec
Pembury – Royal Tunbridge Wells	2800m	4	285 sec
Royal Tunbridge Wells – Tonbridge	1200m	4	140 sec
Tonbridge – Pembury via Hospital	650m	3	88 sec

Table 4-2 – Proposed bus priority interventions

Schedule Reference	Location	Description
1A.	Tonbridge Rail Station	Potential for further priority bus access measures following currently completed works at the station
1B.	A2014, between A26 and Goldsmith	Sufficient highway width to provide bus lane in one direction (approx. 450m) with consideration of addition cycle measures
1C.	Vauxhall Roundabout	Provide priority at junction either by bus lanes bypassing the roundabout or by introducing MVOA lights
1D.	A26, between Vauxhall Roundabout and Somerhill Roundabout	Sufficient highway width to provide bus lanes in both directions (approx. 800m)
1E.	A228/B2017 junction	Provide priority at junction either by bus lanes bypassing the roundabout or by introducing MOVA lights
1F.	B2017/B2160 junction	Provide priority at junction by introducing MOVA traffic lights
1G.	Paddock Wood Rail Station	Potential to explore traffic management options around the train station to provide bus priority and increase integration between different modes.
2A.	Kipping's Cross Roundabout and Henwood Green Road/A21 junction	Provide priority at junctions by providing MOVA lights or bypassing the junctions
2B.	A21 between Kipping's Cross Roundabout and Hastings Road	Sufficient highway width to provide bus lanes in both direction (approx. 950m). Potential to explore off-carriageway alignment
2C.	Hastings Road, between Canterbury Road and Henwood Green Road	Sufficient highway width to provide bus lanes in one direction (approx. 500m).
2D.	Pembury, along Lower Green Road, Romford Road and Henwood Green Road	Potential to investigate other traffic management interventions, such as one-way systems where these include speed management controls.

Schedule Reference	Location	Description
3A.	A228/Tonbridge Road junction, Pembury	Provide priority at junction by introducing MOVA lights.
3B.	Pembury Road overpass roundabouts	Providing priority at junctions by introducing through-abouts or allowing buses to bypass the junction
3C.	Pembury Road overpass and between Pembury Road overpass and Tonbridge Road	Sufficient highway width to provide bus lanes in both directions, linking to priority at junctions (approx..450m)
3D.	Pembury Road, between Oakley School and Pembury Road overpass roundabout	Sufficient width to provide bus lanes in one direction initially and then in both directions on approach to the roundabout (approx. 300m)
3E.	Pembury Road, between Blackhurst Lane and Oakley School	Area needing further investigation
3F.	A264, between B2249 (Calverley Park Gardens) and Blackhurst Lane	Potential westbound bus lane (approx. 1200m)
3G.	B2249 (Calverley Park Gardens)	Potential westbound bus lane with one lane of eastbound general traffic (approx. 450m)
3H.	B2249 (Calverley Park Gardens) /A264 junction	Provide priority at junction by introducing MOVA lights
3I.	Calverley Road and Monson Road	Potential to introduce timed bus gate or one way bus/general traffic system. (approx. 400m)
3J.	A264, between Crescent Road and Pembury Road	Potential to provide bus priority eastbound by introducing additional traffic restrictions. Dependant on expected eastbound traffic on B2249.
4A.	A264/Mount Pleasant Road junction	Provide junction priority by introducing MOVA system.
4B.	Mount Pleasant Road between Monson Road and Goods Station Road	Existing 9-18 bus gate

Schedule Reference	Location	Description
4C.	Grosvenor Road between Goods Station Road and A26	Potential to extend bus gate (approx. 250m)
4D. & 4E.	A26	Existing bus lanes along the A26
4F.	A26, between Holden Park Road and Speldhurst Road	Provide priority at junctions by introducing set back MOVA lights and bus lanes (approx. 150m)
4G.	A26, between Quarry Hill Road/A26 junction and Mabledon services	Sufficient width to provide southbound bus lane (approx. 800m), with MOVA priority at junctions.
5A.	Tonbridge Road / A21 junction	Provide priority at junction by introducing set back MOVA lights and bus lane on approach (approx. 250m)
5B.	Tonbridge Road, between hospital approach and A228/Tonbridge Road junction	Sufficient width to provide southbound bus lane (approx. 750m), linking to priority junction with MOVA system (see 3A above)

4.1.4. In addition to the time savings listed in Table 4-1, current bus timetables and assumed speeds have also been considered, together with the ABODs data.

4.1.5. Due to the high-level nature of data analysis at this stage, the potential journey time savings are set conservatively. This is summarised in Table 4-3. All the time savings presented below need to be verified by detailed modelling at a later stage.

Table 4-3 – Assumed Journey Time (JT) and speed improvements

Section	Current Timetabled JT (across end to end corridor)	Average Speed Based on timetabled JTs	Suggested improved JT	Resulting improved speed	% JT Improvement (across end to end corridor
Tonbridge – Paddock Wood	24 minutes	20.3 mph	20 minutes	24.4 mph	17%
Paddock Wood – Pembury (Direct)	14-18 minutes (17 minutes)	16.7-21.4 mph	14 minutes	21.4 mph	18%
Pembury – Royal Tunbridge Wells	20-30 minutes (24 minutes)	5.5-8.3 mph	20 minutes	8.3 mph	17%
Royal Tunbridge Wells - Tonbridge	23-40 minutes (28 minutes)	8 – 13.9 mph	21 minutes	15.9 mph	25%
Tonbridge – TW Hospital	14-21 minutes (16 minutes)	21.6-31.3 mph	12 minutes	31.3 mph	25%

4.1.6. Table 4-3 demonstrates the with the proposed mix of bus lane and priority junction improvements implemented across the network where there is capacity, a cumulative time saving effect can be achieved across each corridor which can be translated into journey time savings for each bus trip.

4.1.7. Journey time improvements on the Tonbridge to Paddock Wood corridor are more conservative than those outlined in the Tunbridge Wells Fastrack Study. If the higher journey time improvements can be realised under the Fastrack scenario, then there is potential to incrementally increase service frequencies with lower and more efficient use of bus resources.

4.1.8. The significant bus lane measures being developed by KCC and additionally within this study for the Pembury to Royal Tunbridge Wells (A264) section are likely to have a significant effect on journey time savings in peak periods.

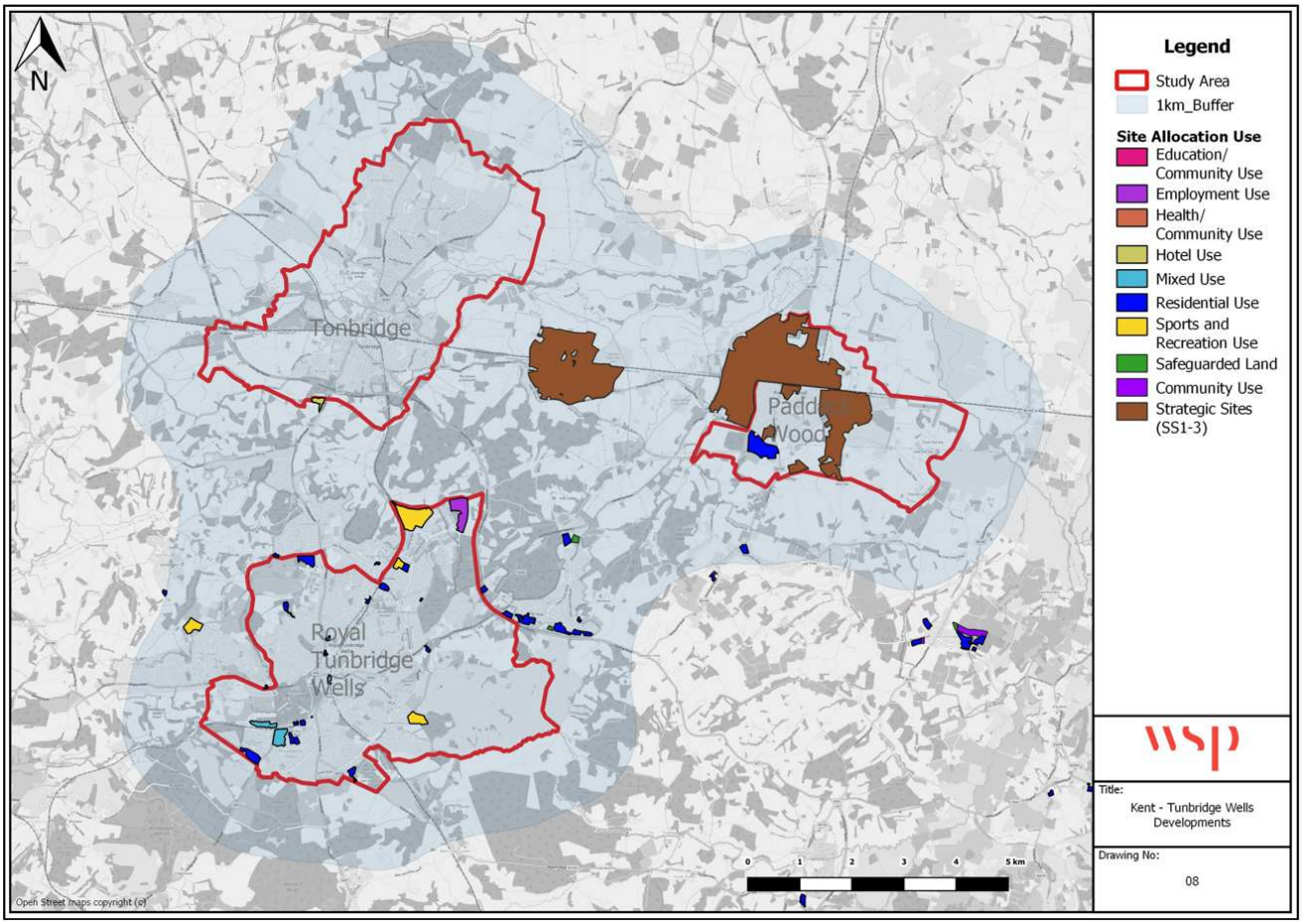
4.1.9. Lower journey time improvements are predicted for the Paddock Wood to Pembury and Royal Tunbridge Wells to Tonbridge sections. The former may benefit from the proposed Cols Hill relief road and linked junction improvements and further off-highway measures could also be considered as a separate feasibility study. The latter corridor is heavily built-up and most viable locations for bus priority measures are either already exploited or now proposed within this study.

5 DEVELOPMENT DEMAND

5.1 DEVELOPMENT OVERVIEW

5.1.1. Figure 5-1 highlights the development areas planned across the study area. Each development falls under one of ten categories of development type with most land parcels being allocated to residential development across the study area (either specifically or as part of Strategic Sites).

Figure 5-1 Development locations by type across the study area



5.1.2. Each identified area of development will create an element of additional demand on both the strategic road network (SRN) and supporting local roads as well as the local public transport network (bus and rail) and the active travel network of cycle and walking routes.

5.1.3. Critical to the levels of additional demand that will be created are the size of each development, its location (proximity) to the SRN and public transport networks, the build-out rates of each development and the approaches to integrate sustainable levels of public and shared transport modes in preference to access for private cars.

5.1.4. The approach that has been adopted for this study has been to evaluate each development and its potential effect on demand for each main corridor within the study area. These are as follows:

- (A) Tonbridge – Paddock Wood (including Tudeley Garden Village)
- (B) Paddock Wood – Pembury (including areas around Tunbridge Wells Hospital)
- (C) Pembury – Royal Tunbridge Wells
- (D) Royal Tunbridge Wells – Tonbridge
- (E) Tonbridge – Pembury (via A21)

5.1.5. Demand for travel between Paddock Wood and Royal Tunbridge Wells and for Tudeley Garden Village to Royal Tunbridge Wells can be derived by combining corridors B / C or corridors A to C.

5.1.6. Table 5-1 outlines by corridor the planned total for local housing development based in housing trajectory information supplied by TWBC. This is given for the base year of 2022/23 and then at five-year intervals to 2037/38 (the last year of information profiled by TWBC). The year-by-year data will be used when generating the likely demand profile for increased public transport (bus) services across the study area.

Table 5-1 Total Housing Development (dwellings) by study area corridor

Corridor	2022/23 (Base)	2027/28	2032/33	2037/38
Tonbridge – Paddock Wood	0	1,483	3,733	5,773
Paddock Wood – Pembury	62	1,234	2,919	4,080
Pembury – Royal Tunbridge Wells	16	675	1,065	1,594
Royal Tunbridge Wells – Tonbridge	-2	558	887	1,271
Tonbridge - Pembury	18	143	328	349

Totals per year not given as some development is counted twice due to overlapping corridor origin / destination pairs

5.1.7. Using the build out information for each corridor, modelling of improved local bus service options that increase frequency across the network to minimum BRT (and BRT-light) standards has been undertaken. This has applied three different mode share scenarios to the network based on 5%, 10% and 15% mode share by bus throughout the development phasing.

5.1.8. The lower 5% figure is based on more recent estimates stated within the Tudeley Garden Village Public Transport Strategy (2019), with these differing from earlier work and estimates that placed a combined bus/rail mode share as high as 17%. The range of mode share options reflects the significant effect that a BRT system (or a BRT-light system) can have on passenger demand levels with the mode seen as being a step-change over traditional bus services and therefore more attractive to potential users who may not choose conventional bus. As the lower 5% figure for mode

share (2019) was based on an upgraded traditional bus service, it is likely that if the same service was delivered using BRT characteristics, then a higher mode share of c10% may be achieved.

5.2 AVERAGE BUS FARES WITHIN THE STUDY AREA

5.2.1. Using work undertaken in 2019 through the Tudeley Village Public Transport Study the average adult bus fare used for modelling the potential revenue brought in through new development, and hence a mode share increase for bus, was £2.63. This was based in taking the average of; an adult single ticket; the cost of an adult single ticket from a return ticket; and an adult weekly saver ticket.

5.2.2. Using current fare information for adult day, adult 'duo' day, adult 3-day bundle, adult 12-day bundle and an adult week ticket for 2022 we have found an average adult fare of c£2.25. Given that this average is only based on ticket products available both online and from the driver and does not include walk-up single and return fare analysis it is reasonable to retain the 2019 average fare figure of £2.63 but add two annual inflationary increases to provide a proxy for 2022 prices.

5.2.3. Based on a RPI increase figure of 2.1% for 2020 and 2.9% for 2021 the assumed average adult fare for modelling purposes has been set at £2.76.

5.3 ADDITIONAL FUNDING THROUGH S106 DEVELOPER CONTRIBUTIONS

5.3.1. While most developments across the study area are small in nature and do not attract significant (or any) required developer contributions to the local transport network through s106 payments, two proposed developments designated as Strategic Sites do provide potential funding towards enhanced public transport provision.

5.3.2. The significant level of housing development planned around the urban fringes of Paddock Wood and in East Capel with a planned housing increase of c3,900 houses is likely to attract a developer contribution of £3 million for bus service improvements.

5.3.3. Similarly, the Tudeley Garden Village development of c2,000 houses (revised down from earlier estimates of c2,500 in 2018) is likely to attract developer contributions through s106 totalling £1.5 million.

5.3.4. Both s106 contributions are to be spread across a five-year period and with profiling across this period provide a potential total funding allowance of c£900,000 p.a. towards public transport, and more specifically local bus service improvements linked to the developments.

5.3.5. It is recommended that, if not already in place, a robust Travel Plan is needed for inclusion with each development across the TWBC area that ties into the aspirations within the study and the wider sustainable transport network across Kent.

5.3.6. This annual figure across a five-year period will be reflected upon through the modelling results and shown as a contribution to off-set costs of operation (after modelled revenue) during the first five years of service operation to ensure a high level of service, commensurate with the growing population of each development, from day one.

6 BUS RAPID TRANSIT CHARACTERISTICS

6.1 BRT BEST PRACTICE SUMMARY

6.1.1. Following a review of the Institute for Transportation and Development Policy (ITDP) and Bus Rapid Transit UK (BRTuk) approaches to BRT system evaluation, and a focus on how the scoring system has been adapted to the more unique circumstances found across the country by BRTuk, the characteristics of a typical BRT system can be seen to cover six broad principles.

6.1.2. These tenets define a BRT system and should be considered in the planning stage for any BRT or BRT-light approach. A system seeking to ramp up to BRT categorisation in the future should work towards instilling each tenet, at least as a foundation, in its formative years and as a minimum ensuring that 'Basic BRT' characteristics are embedded into the planning and delivery of a new scheme.

6.1.3. In summary, the six tenets are:

- Basic BRT characteristics that include as a minimum the segregation of buses from traffic (physical or nominal), junction treatment features as these will have positive impacts on journey time performance and passenger accessibility (level-boarding) – often referred to as 'tram style priority'.
- Service planning which should be closely related to end-to-end demand and route segment demand, the latter forming the ideal location for services to converge as these will enhance the operational performance of the BRT system and will justify higher service frequencies.
- Infrastructure attributes that considers the physical features of the system in their broadest sense and include the vehicles (focusing on emissions), station locations (focusing on wider access) and busway quality (focusing on the construction and materials used for the busway itself).
- Station design and the 'station-bus' interface (from a passenger perspective) that focus on the features relating to the passenger experience of the BRT system and the physical infrastructure at stops/stations to enable maximum accessibility.
- Quality of Service criteria which ensure a BRT system has a unique identity, setting it apart from traditional bus services while ensuring it can engage and attract passengers in high volume.
- Integration and Access which focuses on the interaction of BRT with other modes such as other bus services, rail and light rail, walking, cycling and other supporting active travel mode in addition to elements of BRT that ensure the system is seen as universally accessible.

6.1.4. These tenets define a BRT system and should be considered in the planning stage for any BRT or BRT-light approach. A system seeking to ramp up to BRT categorisation in the future should work towards instilling each tenet, at least as a foundation, in its formative years and as a minimum ensuring that 'Basic BRT' characteristics are embedded into the planning and delivery of a new scheme.

7 BUS IMPROVEMENTS – OPTION GENERATION

7.1 OVERVIEW AND METHODOLOGY

7.1.1. In developing options for a new service pattern, the following objectives were considered:

- Ensuring that the key destinations along the three corridors are connected directly
- Ensuring that the combined frequency along each corridor is brought up to a BRT (or BRT-light) level with the aim of a 'turn-up-and-ride' passenger experience in the medium to long-term
- Ensuring interchange opportunities are considered and enabled in a legible way at designated hubs

7.1.2. Drawing on the summarised information for basic level BRT characteristics and considering the current local bus service network within the study area, this study has developed an initial set of network enhancement scenarios which would be supported by uplifts in local housing levels and consequent higher demand for sustainable travel modes.

7.1.3. Using the baseline network, the options build on the observed 15-minute headway already in operation between Tonbridge and Royal Tunbridge Wells and seek to formalise the high number of buses serving the A21 corridor between Tonbridge and Pembury which already have the potential to provide a 20-minute bus service frequency across a 15-hour period (Monday-Friday as a minimum) if coordinated.

7.1.4. Whilst the existing corridor between Paddock Wood and Royal Tunbridge Wells via Pembury does see significantly lower levels of frequency with route 6 operating only hourly, the options proposed in this section look to increase frequency levels on this corridor up to every 15-minutes. Between Paddock Wood and Pembury this will be supported through bus use from the substantive developments proposed in the Paddock Wood and Tudeley areas whilst the frequency increase between Pembury and Royal Tunbridge Wells will replicate that already achieved through local bus service 277 but will instead use a direct alignment on the A264 and the proposed bus priority improvements outlined. Direct services between Tonbridge, Tudeley Garden Village, Paddock Wood, and Royal Tunbridge Wells are proposed through the study.

7.1.5. Each option proposes different applications for the existing local bus service network. For example, in some options existing services form part of the solution whereas in others, existing services are curtailed at the edge of the study area and new services provide a connection and operate on a bespoke study area network.

7.1.6. All options outlined are in their formative stages and have not been discussed in detail with key stakeholders. It is proposed that these options provide an initial basis for a 15-minute network between all principal towns within the study area and form a long-list for cost purposes. The next stages will be a shortlisting of proposed options together with a workshop to fine-tune the proposals and understand the staging that would be needed through intervening years to bring the baseline network up to a 15-minute or better service on each corridor in step with development build-out rates (likely between 2022/23 and 2037/38).

7.1.7. Initially four options are proposed and shown in **Appendix B**. These are not exhaustive and any future workshop exercises may generate further options (or iterations of existing options) that can be modelled for their performance and cost.

7.2 OPTION SUMMARY

7.2.1. To provide a summary of each option that has been proposed and analysed, the following details provide a brief over view for each option.

- **Option 1** retains all existing bus services between Tonbridge and Royal Tunbridge Wells to ensure a minimum coordinated 15-minute frequency corridor is achieved. The existing 205 service is increased to run every 15 minutes using two coordinated alignments, one between Tonbridge and Paddock Wood and the other running from Tonbridge via Paddock Wood to Pembury and Tunbridge Wells Hospital. Route 6 would be increased to every 30-minutes between Royal Tunbridge Wells, Pembury, and Paddock Wood and routes 218/219 would start at Tonbridge but extend to Royal Tunbridge Wells via Tunbridge Wells Hospital. This would provide a coordinated 15-minute frequency between each principal town, rail station and hospital with a 15-minute frequency between Pembury and Royal Tunbridge Wells and a mix of coordinated direct (30-minutes) and connectional (30-minutes) services between Paddock Wood and Royal Tunbridge Wells with Pembury as a connection point for some journeys.
- **Option 2** retains all existing bus services between Tonbridge and Royal Tunbridge Wells to ensure a minimum coordinated 15-minute frequency corridor is achieved. The existing 205 service is increased to run every 15 minutes using two coordinated alignments, one between Tonbridge and Paddock Wood and the other running from Tonbridge via Paddock Wood and Pembury to Tunbridge Wells Hospital and Royal Tunbridge Wells town centre. Route 6 would terminate at Paddock Wood and not run in the study area and routes 218/219 would start at Tonbridge but extend to Royal Tunbridge Wells via Tunbridge Wells Hospital. This would provide a coordinated 15-minute frequency between Tonbridge and Paddock Wood, Tonbridge and Royal Tunbridge Wells, and Pembury and Royal Tunbridge Wells but would keep Paddock Wood to Pembury as every 30-minutes.
- **Option 3** sees services 7 and 402 terminate at Tonbridge and replaced by a blue circular line operating every 30-minutes each way (Tonbridge / Royal Tunbridge Wells / Pembury / Hospital / Tonbridge) and a black line running every 30-minutes between Tonbridge / Royal Tunbridge Wells / Pembury / Paddock Wood. The existing 205 service is increased to run every 15 minutes using two coordinated alignments, one between Tonbridge and Paddock Wood and the other running from Tonbridge via Paddock Wood to Pembury. Route 6 would terminate at Paddock Wood and not run in the study area and routes 218/219 would start at Tonbridge and run via the Hospital to Pembury. This would provide a coordinated 15-minute frequency between each principal town, rail station and hospital.
- **Option 4** sees service 402 terminate at Tonbridge but route 7 remain as now and run between Tonbridge and Royal Tunbridge Wells in parallel with a new blue circular line operating every 30-minutes each way (Tonbridge / Royal Tunbridge Wells / Pembury / Hospital / Tonbridge) and a black line running every 30-minutes between Tonbridge / Royal Tunbridge Wells / Pembury / Paddock Wood. The existing 205 service would be replaced by a 30-minute red line two-way circular service running Tonbridge / Paddock Wood / Pembury / Hospital / Tonbridge coordinated with a pink line running every 30-minutes Tonbridge / Paddock Wood / Pembury / Hospital / Royal Tunbridge Wells. Route 6 would terminate at Paddock Wood and not run in the study area and routes 218/219 would be replaced by the combination of red and pink lines. This would provide a coordinated 15-minute frequency between each town, rail station and hospital.

7.3 OPTIONS ASSESSMENT

7.3.1. To assess the developed options, a range of criteria are considered below to enable comparison between different service arrangements. The criteria below are not expected to individually eliminate any options, but to build together an overall picture of how options perform that can then inform the selection of a shortlist.

7.4 INTERCHANGES REQUIRED

7.4.1. Firstly, the range of direct available services in the network are analysed. Table 7-1 outlines the results of this analysis. Overall, the difference between options is minimal, with one interchange required between Tunbridge Wells Hospital and Paddock Wood in Option 3.

Table 7-1 – Interchange requirements between selected trip generators for baseline network and long-listed options

Current Network	Tonbridge	Paddock Wood	Pembury	RTW Hospital	Royal Tunbridge Wells
Tonbridge					
Paddock Wood	direct				
Pembury	interchange	direct			
TW Hospital	direct	direct	direct		
Royal Tunbridge Wells	direct	direct	direct	direct	
Option 1	Tonbridge	Paddock Wood	Pembury	RTW Hospital	Royal Tunbridge Wells
Tonbridge					
Paddock Wood	direct				
Pembury	direct	direct			
TW Hospital	direct	direct	direct		
Royal Tunbridge Wells	direct	direct	direct	direct	
Option 2	Tonbridge	Paddock Wood	Pembury	RTW Hospital	Royal Tunbridge Wells
Tonbridge					
Paddock Wood	direct				
Pembury	direct	direct			
TW Hospital	direct	direct	direct		
Royal Tunbridge Wells	direct	direct	direct	direct	
Option 3	Tonbridge	Paddock Wood	Pembury	RTW Hospital	Royal Tunbridge Wells
Tonbridge					
Paddock Wood	direct				
Pembury	direct	direct			
TW Hospital	direct	interchange	direct		
Royal Tunbridge Wells	direct	direct	direct	direct	
Option 4	Tonbridge	Paddock Wood	Pembury	RTW Hospital	Royal Tunbridge Wells
Tonbridge					
Paddock Wood	direct				
Pembury	direct	direct			
TW Hospital	direct	direct	direct		
Royal Tunbridge Wells	direct	direct	direct	direct	

7.5 FREQUENCY OF DIRECT SERVICES BETWEEN DESTINATIONS

7.5.1. Building on the previous criteria, the headway of the direct services available between the trip generators is shown in Table 7-2. This shows the headway of the direct services only, except for Option 3 between Royal Tunbridge Wells and Paddock Wood, where no direct service is available and the given headway reflects the fact that every 15 minutes a service options will be available, with an interchange in Pembury.

7.5.2. All options developed lead to a significant improvement to the baseline network level of service. With Options 3 and 4 performing the best overall, with eight out of ten possible trips being served every 15 minutes.

Table 7-2 – Headway of available direct services between trip generators for baseline network and long-listed options

Current	Tonbridge	Paddock Wood	Pembury	RTW Hospital	Royal Tunbridge Wells
Tonbridge					
Paddock Wood	60				
Pembury	60	60			
TW Hospital	20	60	60		
Royal Tunbridge Wells	15	60	60	30	
Option 1	Tonbridge	Paddock Wood	Pembury	RTW Hospital	Royal Tunbridge Wells
Tonbridge					
Paddock Wood	15				
Pembury	30	15			
TW Hospital	20	15	15		
Royal Tunbridge Wells	15	30	15	30	
Option 2	Tonbridge	Paddock Wood	Pembury	RTW Hospital	Royal Tunbridge Wells
Tonbridge					
Paddock Wood	15				
Pembury	30	30			
TW Hospital	20	30	15		
Royal Tunbridge Wells	15	30	15	30	
Option 3	Tonbridge	Paddock Wood	Pembury	RTW Hospital	Royal Tunbridge Wells
Tonbridge					
Paddock Wood	15				
Pembury	15	15			
TW Hospital	15	15	15		
Royal Tunbridge Wells	15	30	15	30	
Option 4	Tonbridge	Paddock Wood	Pembury	RTW Hospital	Royal Tunbridge Wells
Tonbridge					
Paddock Wood	15				
Pembury	15	15			
TW Hospital	15	15	15		
Royal Tunbridge Wells	15	30	15	30	

7.6 HIGH-LEVEL PVR REQUIRED

7.6.1. A high-level Peak Vehicle Requirement (PVR) exercise has been undertaken, using available timetable journey times to calculate the full network PVR for each proposed option.

7.6.2. The final recommendation for a new operational arrangement will be supported by a range of priority measures to improve the journey times and reliability of BRT services. This means that the resulting journey time savings will have an impact on the PVR for each network.

7.6.3. Table 7-3 outlines the resulting PVR for each option compared to the current network. Option 2 performs best, with only four additional vehicles required when additional bus priority measures are considered (and only an additional six PVR with no new bus priority measures).

Table 7-3 – Full network PVRs for baseline network and proposed options

Option	Full Network PVR required	Difference from baseline
Current Network	19	-
Option 1	29	+10
Option 1+	25	+6
Option 2	27	+8
Option 2+	23	+4
Option 3	31	+12
Option 3+	28	+9
Option 4	30	+11
Option 4+	25	+6

Each '+' option shows PVR when new bus priority measures are considered

7.7 OPTIONS ASSESSMENT SUMMARY

7.7.1. Table 7-4 summarises options on a RAG scale (Red=1 point, Amber = 2 points, Green = 3 points).

Table 7-4 – Summary of long-list assessment criteria

Criteria	Option 1	Option 2	Option 3	Option 4
Interchange required				
Headway of direct service				
PVR				
Phasing				
Overall Score	10	10	8	9

8 OPTIONS AND UNITISED COSTS

8.1.1. This section provides high level unitised costs for the bus priority measures proposed through Section 4 and the local bus service network improvements (to bring services to a minimum BRT / BRT-light level) in Section 7.

8.1.2. At this stage all costs should be considered as approximate and subject to further feasibility work where required and pending any further workshop exercise to develop options into a more detailed approach.

8.1.3. The costs used for bus priority measures (CAPEX) are based on the higher end of any cost ranges (e.g., per metre costs for bus lane implementation) and it is assumed for this study that operational costs remain static for the local bus service network in future years even though these are likely to be subject to cost uplifts over time due to changes in fuel, staff, and overhead costs (+ or -).

8.1.4. The costs for OPEX and Revenue have been generated using WSP's in house operational cost model (for OPEX), with Revenue being shown only for that additional to existing bus service revenue as created by the planned development expansion across the TWBC area and applied to each corridor as outlined later in this section.

8.1.5. The model used to develop the relationship between future development phasing and revenue generation is WSP's Public Transport ASSessment model (PTASS). This provides a spreadsheet-based demand and revenue forecast for any service proposals and for this study has been additionally linked to WSP's operational cost model to generate the following results discussed.

8.1.6. It is recommended that following this study an options sifting exercise leading to a shortlisting workshop takes place.

8.2 CAPITAL COST ASSESSMENT FOR PRIORITY MEASURES (CAPEX)

8.2.1. The following assumptions based on experience and evidence from similar projects have been used to generate high-level costs for the meterage of proposed bus lane and the implantation of AVL / MOVA systems at each identified junction:

- The assumed high-level cost per metre for bus lane installation can range from £1,500 to £3,000 dependent on the complexities of the bus lane installation including any movement of services, realignment of kerb lines, changes to pedestrian crossings, movements of other highway traffic and removal of existing landscaping. For the purposes of this study a cost of £2,250 (the median figure for this range) has been applied per metre to bus lane interventions.
- The cost per junction to apply AVL / MOVA technology is assumed as £35,500. This cost assumes a four-arm junction, the necessary on-site hardware and software, a limited level of ducting and in-road sensors to detect oncoming buses in addition to telematics to communicate to on-board bus equipment.

8.2.2. Table 8-1 applies these costs to the bus priority measures proposed for each corridor, and as detailed earlier in Section 4. It should be noted that where bus lane meterage is noted in Table 4-2 this is for a single direction and, therefore, any bus priority measure that includes a two-way section of bus lane will have the noted meterage doubled to cover the two-way aspect of the improvement.

Table 8-1 – CAPEX estimates for bus priority interventions along the corridors considered

Study Area Corridor	Approx. one-way length of bus lanes / gates proposed (metres)	No. of signalised priority junctions proposed (e.g., AVL / MOVA) (Absolute number)	Estimated corridor cost based on CAPEX assumptions (£)
Tonbridge – Paddock Wood	2,050	4	4,754,000
Paddock Wood – Pembury	2,400	3	5,506,500
Pembury – Royal Tunbridge Wells	3,550	4	8,129,500
Royal Tunbridge Wells – Tonbridge	1,350	4	3,179,500
Tonbridge – Pembury / Hosp	1,000	3	2,356,500
Totals	10,350	18	23,926,500

8.2.3. Table 8-2 brings together the potential CAPEX outlay and the likely journey time savings per bus trip across the corridor. This does not attempt to show a cost per minute saving as the time saved would be on every journey operated through the bus priority improvements and based on a typical day from 0600 to 2359 and at a very high level of assumed frequency (15-minutes) the daily number of bus trips benefiting from the improvements could be as high as 144 trips per day in total across both directions of each corridor.

Table 8-2 CAPEX estimates and potential journey time improvements

Study Area Corridor	CAPEX	JT Saving / trip	Daily JT Saving (based on 144 trips)
Tonbridge – Paddock Wood	4,754,000	4 minutes	576 minutes
Paddock Wood – Pembury	5,506,500	3 minutes	432 minutes
Pembury – Royal Tunbridge Wells	8,129,500	4 minutes	576 minutes
Royal Tunbridge Wells – Tonbridge	3,179,500	7 minutes	1,008 minutes
Tonbridge – Pembury (via Hosp)	2,356,500	4 minutes	576 minutes

8.3 OPERATIONAL COST ESTIMATES (OPEX)

8.3.1. Operational costs (OPEX) has been estimated using WSP's operational cost model. Using inputs for round trip time, estimated speed, period of day (0600 to 2359), service frequency and vehicle type as well as including 10% trip time for layover and a 5% profit margin, an annual cost per vehicle has been estimated.

8.3.2. These estimates have been based on each local bus service network option outlined in Section 7 and are based on a 2022/23 base year.

8.3.3. Each option (excluding the baseline network scenario) has been run twice; once based on the current road network and level of existing bus priorities; and once with all proposed bus priorities and consequent journey time savings included in the modelling work.

8.3.4. Table 8-3 summarises the total annual cost of each optional network with and without all proposed bus priorities being included in the modelling. The peak vehicle requirement (PVR) for each option is also included and average costs per bus are shown and are deemed in line with expectation for a bus operating across an 18-hour day as currently modelled (an industry wide proxy of £150,000 p.a. for a 12-hour day is commonly used).

Table 8-3 OPEX estimates for the current baseline network and each proposed option

Scenario	Cost per Year (£)	Total PVR	Ave. cost per bus per Year
Baseline	**4,508,960**	**19**	**237,314**
Option 1	6,866,714	29	236,783
Option 1 (with all bus priorities)	6,246,626	25	249,865
Option 2	6,393,209	27	236,786
Option 2 (with all bus priorities)	5,773,121	23	251,005
Option 3	7,345,549	31	236,953
Option 3 (with all bus priorities)	6,880,483	28	245,732
Option 4	7,154,992	30	238,500
Option 4 (with all bus priorities)	6,379,882	25	255,195

8.3.5. It is notable that in each case the option with all proposed bus priority measures shows a decrease in PVR and consequently operational cost. However, all options and scenarios see PVR increase significantly over the baseline estimates with Options 2 and 4 (with bus priorities) showing the closest PVR and largest decrease with the application of bus priorities respectively.

8.3.6. It should be noted that all cost estimates (including the baseline scenario) are modelled based on an 18-hour day (0600 to 2359) and across a seven-day period. This is to ensure that the current baseline can be compared on a level playing field with all proposed options and for the baseline scenario this does overestimate the real-life operational situation.

8.4 REVENUE ESTIMATES DUE TO DEVELOPMENT LEVELS

8.4.1. The modelling process has included an estimation of the additional revenue that may potentially be stimulated by new development (housing) taking place across the TWBC area between the base year of 2022/23 and the final model year of 2037/38.

8.4.2. For this process WSP has used its in-house PTASS model to simulate the likely revenue generated across the full period (2022/23 to 2037/38) linked to development build-out rates, three levels of potential bus mode share, and a validated average fare of £2.76.

8.4.3. We have applied the housing development information supplied by TWBC on a corridor-by-corridor basis to ensure that we capture the correct developments for each network link, and overall, for each proposed network option (including the baseline scenario). The demand forecasting does not include destinations for the estimated demand as this information is not available at this stage.

8.4.4. It is important to note that the revenue estimates outlined are those due to the new development only and caused as a factor of estimated mode share for bus, average fare, and build-out rate per year. Any revenue already accrued by the current local bus service network is assumed to remain and change year by year along standard industry lines. This will be considered in 8.5 below.

8.4.5. Section 5 has already provided a summary of the assumed development build-out levels on each corridor that has now been applied through the PTASS model in greater year to year detail to ensure that the annual and cumulative revenue generation figures can be understood before setting these against OPEX for each network option proposed.

8.4.6. Table 8-4 below summarises the estimated revenue that will be accrued by each network option, again shown with and without all proposed bus priority measures, across the same periods as used in Section 5 earlier.

8.4.7. The table also shows revenue based on three mode share scenarios: 5%, 10%, and 15%. Whilst the Tudeley Garden Village Transport Strategy (2019) proposes a revised 5% mode share for bus, this is based on an upgrade of the existing traditional bus service with no other quality enhancements – as such 5% is seen as reasonable albeit a little conservative. However, were the route (and others across the network) improved to the base level BRT standards acknowledged as required for a service or network to be recognised as a BRT by BRTuk then it is reasonable to assume that mode share of 10% as a minimum may be seen across the network with this potentially rising as high as 15% where further quality features embedded and frequencies further improved over time.

8.4.8. The resultant Table 8-4 therefore provides a do little, do something, do more (or a low, medium and high) set of results that are seen as guiding future strategy and policy making in this area.

Table 8-4 Annual fare revenue accrued through housing development for each scenario

Scenario	Mode Share	2022/23 (£)	2027/28 (£)	2032/33 (£)	2037/38 (£)
Baseline	5%	20,905	1,056,821	2,259,293	3,257,944
	10%	41,809	2,113,642	4,518,585	6,515,888
	15%	62,714	3,170,463	6,777,878	9,773,833
Option 1	5%	68,622	2,358,817	5,197,987	7,386,154
	10%	137,244	4,717,634	10,395,973	14,772,316
	15%	205,865	7,076,451	15,593,960	22,158,474
Option 1+	5%	68,622	2,358,817	5,197,987	7,386,154
	10%	137,244	4,717,634	10,395,973	14,772,316
	15%	205,865	7,076,451	15,593,960	22,158,474
Option 2	5%	28,630	1,579,664	3,452,221	5,011,208
	10%	57,261	3,159,329	6,904,442	10,022,416
	15%	85,891	4,738,993	10,356,663	15,033,624
Option 2+	5%	28,630	1,579,664	3,452,221	5,011,208
	10%	57,261	3,159,329	6,904,442	10,022,416
	15%	85,891	4,738,993	10,356,663	15,033,624
Option 3	5%	29,085	1,452,873	3,250,673	4,722,406
	10%	58,169	2,905,746	6,501,346	9,444,812
	15%	87,254	4,358,619	9,752,019	14,167,217
Option 3+	5%	29,085	1,452,873	3,250,673	4,722,406
	10%	58,169	2,905,746	6,501,346	9,444,812
	15%	87,254	4,358,619	9,752,019	14,167,217
Option 4	5%	46,808	1,892,552	4,190,019	6,017,585
	10%	93,616	3,785,105	8,380,838	12,035,170
	15%	140,425	5,677,657	12,570,057	18,052,755
Option 4+	5%	46,808	1,892,552	4,190,019	6,017,585
	10%	93,616	3,785,105	8,380,838	12,035,170
	15%	140,425	5,677,657	12,570,057	18,052,755

8.5 OPEX VS REVENUE

8.5.1. This section considers how new revenue delivered through development expansion may help to support or make the commercial case for each network scenario over a 15-year period.

8.5.2. The information for the baseline network cost in Table 8-3 estimates a current cost of operation, assuming an 18-hour day of c£4.5 million and the utilisation of 19 PVR. If this can be considered as the baseline then any revenue already accrued by the network will either ensure profitable commercial services (e.g., Arriva Kent and Surrey services 7 and 402) and a break-even point for any KCC supported services considered within the baseline (those services shown in Figure 3-1).

8.5.3. On this basis, any network improvement will build on the current baseline and, as such, any additional costs and PVR incurred would be the difference between the baseline and the proposed option. It is these additional costs that have been set against the proposed revenue generated by development expansions across the TWBC area to consider how viable each option may be and how long each one may require revenue support for at each mode share level.

8.5.4. Table 8-5 outlines the cost differences that should be set against revenue estimates for each option once the baseline costs and PVR are removed.

Table 8-5 Additional cost and PVR for each proposed option over existing baseline figures

Scenario	Cost per year (£)	Total PVR	Cost Difference (£)	PVR Difference
Baseline	**4,508,960**	**19**	**0**	**0**
Option 1	6,866,714	29	2,357,754	10
Option 1 (with all bus priorities)	6,246,626	25	1,737,666	6
Option 2	6,393,209	27	1,884,249	8
Option 2 (with all bus priorities)	5,773,121	23	1,264,161	4
Option 3	7,345,549	31	2,836,589	12
Option 3 (with all bus priorities)	6,880,483	28	2,371,523	9
Option 4	7,154,992	30	2,646,032	11
Option 4 (with all bus priorities)	6,379,882	25	1,870,922	6

8.5.5. The cost difference for each proposed option, with and without the application of full bus priorities are set against the potential new revenue generated by development expansion across the TWBC area at three different mode share levels in Table 8-6.

Table 8-6 Summary of OPEX vs Revenue through housing development per scenario

Scenario	Mode Share	2022/23 (£)	2027/28 (£)	2032/33 (£)	2037/38 (£)
Option 1 OPEX	All	2,357,754	2,357,754	2,357,754	2,357,754
Option 1 Revenue	5%	68,622	2,358,817	5,197,987	7,386,154
	10%	137,244	4,717,634	10,395,973	14,772,316
	15%	205,865	7,076,451	15,593,960	22,158,474
Option 1+ OPEX	All	1,737,666	1,737,666	1,737,666	1,737,666
Option 1+	5%	68,622	2,358,817	5,197,987	7,386,154
	10%	137,244	4,717,634	10,395,973	14,772,316
	15%	205,865	7,076,451	15,593,960	22,158,474
Option2 OPEX	All	1,884,249	1,884,249	1,884,249	1,884,249
Option 2	5%	28,630	1,579,664	3,452,221	5,011,208
	10%	57,261	3,159,329	6,904,442	10,022,416
	15%	85,891	4,738,993	10,356,663	15,033,624
Option 2+ OPEX	All	1,264,161	1,264,161	1,264,161	1,264,161
Option 2+	5%	28,630	1,579,664	3,452,221	5,011,208
	10%	57,261	3,159,329	6,904,442	10,022,416
	15%	85,891	4,738,993	10,356,663	15,033,624
Option 3 OPEX	All	2,836,589	2,836,589	2,836,589	2,836,589
Option 3	5%	29,085	1,452,873	3,250,673	4,722,406
	10%	58,169	2,905,746	6,501,346	9,444,812
	15%	87,254	4,358,619	9,752,019	14,167,217
Option 3+ OPEX	All	2,371,523	2,371,523	2,371,523	2,371,523
Option 3+	5%	29,085	1,452,873	3,250,673	4,722,406
	10%	58,169	2,905,746	6,501,346	9,444,812
	15%	87,254	4,358,619	9,752,019	14,167,217
Option 4 OPEX	All	2,646,032	2,646,032	2,646,032	2,646,032
Option 4	5%	46,808	1,892,552	4,190,019	6,017,585
	10%	93,616	3,785,105	8,380,838	12,035,170
	15%	140,425	5,677,657	12,570,057	18,052,755
Option 4+ OPEX	All	1,870,922	1,870,922	1,870,922	1,870,922
Option 4+	5%	46,808	1,892,552	4,190,019	6,017,585
	10%	93,616	3,785,105	8,380,838	12,035,170
	15%	140,425	5,677,657	12,570,057	18,052,755

8.5.6. Table 8-6 demonstrates that at 10% and 15% mode share for bus all options become self-sustainable between 2022/23 and the first review period in 2027/28.

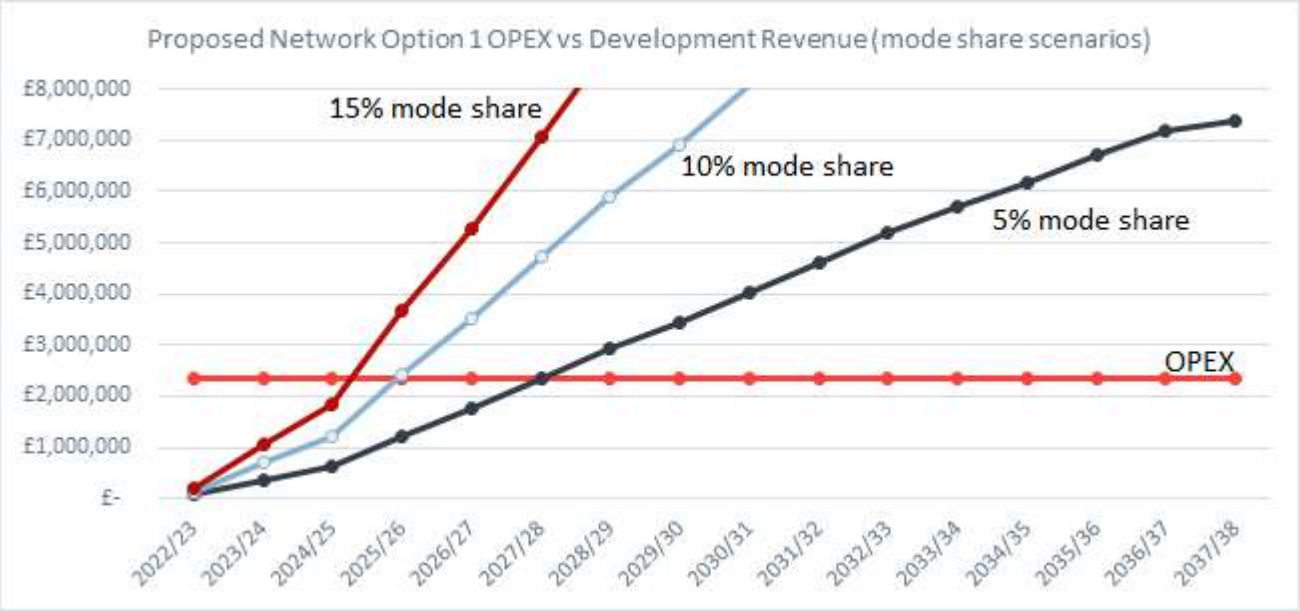
8.5.7. At the 5% mode share as assumed in the Tudeley Garden Village transport strategy, only options 1, 1+, 2+, and 4+ become self-sustainable within the first five years. All other options need up to ten years to reach sustainability. With all '+' options requiring the full level of proposed bus priority at a CAPEX spend of c£24 million and a likely delivery period of three to five years from feasibility to opening it is unlikely that any '+' scenario would be sustainable before 2027/28.

8.5.8. This leaves option 1 with the potential to become self-sustaining at a 15-minute frequency level across all corridors between 2022/23 and 2027/28 across a daily operational period of 0600-2359. This is based on the planned developments (particularly those at Tudeley Garden Village and Paddock Wood) coming forward as currently profiled by TWBC.

8.5.9. The proposed CAPEX spend on bus priorities would make the operation of the option 1 network more attractive to passengers due to lower journey times but does not appear to be critical to the option's sustainability in the short-term.

8.5.10. Figure 8-1 shows the 5% mode share output (black) set against 10% mode share (blue) and 15% mode share (red) set over the static OPEX estimate for the operation of option 1 showing the break-even points for all mode share scenarios across the 15-year period. This also assumes that revenue accrued by the baseline network is retained.

Figure 8-1 OPEX vs Revenue for 5%, 10%, and 15% mode share scenarios for option 1



8.5.11. Based on the yearly data, option 1 would require decreasing levels of support from 2022/23 to the break-even year of 2027/28 at a 5% mode share. This will total c£7.8m over five years and assumes static OPEX costs which, are likely to show an upward trend through the period leading the potential of a later break-even year and a higher 5+ year support figure.

8.5.12. Earlier movement to sustainability shown by higher mode share scenarios are a counterbalance to the argument in 8.5.11. Should a BRT or BRT-light system attract higher mode share figures the likely OPEX increases may still enable option 1 to break even by 2027/28 (e.g., within five years) as the higher revenues accrued through a greater mode share may offset likely OPEX increases.

9 SUMMARY AND NEXT STEPS

9.1 SUMMARY POINTS

9.1.1. This Technical Note is a summary of the full Tunbridge Wells Bus Feasibility Study which outlines in greater detail several summarised elements within this Technical Note.

9.1.2. The analysis of the local bus network has been conducted within the study area boundaries agreed with KCC and TWBC and has focused on bringing services across main corridors linking Tonbridge, Paddock Wood and Royal Tunbridge Wells up to a potential BRT (or BRT-light) service level.

9.1.3. Several strategic policies support improvements to local bus services within the study area and the planned development expansion across the TWBC area will support increases in local bus services, themselves required to ensure new residents have sustainable mode options for local travel and access to rail interchanges throughout the study area.

9.1.4. The local bus network is defined as reasonably dense with a good level of commercially viable service on two of the three corridors. Tonbridge / Royal Tunbridge Wells performs at the strongest level whilst services between Paddock Wood and Royal Tunbridge Wells remain infrequent.

9.1.5. The study area has excellent rail connections to London and the South Coast from three main stations and connections to these stations is a critical driver for growth of the local bus network and will be supported by the planned development coming forward across the next 15-years.

9.1.6. The minimum criteria to deliver BRT have been considered and options for an upgraded local bus network with minimum frequencies on core links of 15-minutes summarised. These have been supplemented by analysis of potential new bus priority measures with a package of improvements combining to provide over 3,000 minutes of journey time savings per day (based on a 15-minute bus frequency / 18-hours per day) at a cost of c£24 million.

9.1.7. Four initial network improvement options have been considered and scored based on criteria focusing on interchange, headway, PVR, and phasing. Option 1 scored equally with Option 2 for these criteria ahead of a high-level unitised cost model being applied and linked to housing build-out rates across the study area.

9.1.8. All proposed network options (together with improvements due to proposed bus priority measures) were modelled using WSP's in-house operational cost and PTASS models (the latter linking development demand to mode share and likely bus revenue). Modelling concluded that option 1 provided the best opportunity for improved services to become sustainable after a five-year period.

9.1.9. However, the likely support cost of c£7.8 million within this period is more than the £4.5 million available over the same period from developer contributions. To aid this, OPEX costs have been set at their highest level (based on a daily 15-minute frequency from 0600-2359) and therefore, OPEX may be lowered by lowering frequency at lower demand periods and days in early years.

9.1.10. Further, the funding available through developer contributions is not CAPEX focused and it is unknown at this stage what funding there is to support the potential £24 million CAPEX figure identified for new bus priority measures, though some funding is identified in the IDP.

9.1.11. Through the modelling work there is an opportunity to understand the cost of each service within each option allowing KCC and TWBC to choose which corridors to upgrade in a phased approach.

9.1.12. The study concludes that the proposed level of development across the TWBC area, and at the Strategic Sites of Tudeley Garden Village and Paddock Wood (including East Capel), will support significant expansion of the local bus service network across all corridors within the study area.

9.1.13. It is considered that the level of development planned within the TWBC area will require significant expansion of the bus service network to provide additional capacity to serve the demands created by new development and to deliver an attractive, viable, and sustainable alternative to private car use in line with current KCC policy on sustainable travel strategies.

9.1.14. The study undertaken, albeit at a high level initially, demonstrates that there are credible and viable options for public transport available within the TWBC area and that these will support the developments coming forward across the 2022/23 to 2037/38 period.

9.1.15. The application of new bus priorities measures will ensure that local bus service improvements move to a higher level of quality and meet those criteria required to be recognised as a BRT system in the medium to long term, replicating the considerable success that KCC has had through is Fastrack BRT system in other areas of the County.

9.1.16. A high frequency local bus network, embedded from day one, has the potential to lower private car use across the study area (in particular from new developments such as those at Paddock Wood, East Capel, and Tudeley Garden Village), build on the reasonably dense local bus network already in existence, improve significantly key links between principal towns and provide much higher levels of access to local employment, social and leisure activities for existing and new residents whilst providing an equivalent frequency connection to local rail services which will ensure high levels of multimodal integration and significant mode switch to bus/rail modes.

9.2 NEXT STEPS

9.2.1. The next steps are identified as:

- Issue the full feasibility study report to KCC and TWBC for their consideration
- Outline a process to formerly shortlist likely new bus priority measures and bus network improvement options through a group workshop approach and establish how preferred options can be built-in to future Local Transport Plans and future strategy documents
- Work up detailed feasibility reports for each corridor with respect to bus priority measures and considering walking and cycling improvements.
- Engage further with KCC, TWBC, and local bus operators to define in more detail the process to achieve local bus network improvements that meet basic requirements for BRT operation, and which can be phased to keep in step with development build-out rates
- Regarding the above point – work with stakeholders to establish the likely phasing of any preferred option for bus priorities and a revised bus network to ensure that each are introduced at the ‘key tipping point’ that is often found at each development regarding initial occupation and the requirement for sustainable services to prevent habitual use of private modes being established
- Understand the current position with Transport Plans for each development across the TWBC area and work closely with all stakeholders (including developers) to establish a robust framework for Travel Plans linked to each development, and as an overarching strategy for the area to link together all sustainable modes

GLOSSARY OF TERMS

This page provides a brief glossary of technical terms that have been used within the Technical Note.

Term	Explanation
BRT	Bus Rapid Transit – high frequency, often segregated buses - closer in many ways to a tram but faster and cheaper to deliver and more flexible.
BRT Light	Bus Rapid Transit with less infrastructure and less segregation – lower cost and sees a network / route take some BRT concepts to increase service quality.
Section 106 (s106)	Developer funded mitigations (often public transport) to make developments more acceptable in planning terms.
Headway	Frequency is defined in terms of vehicles per hour (e.g., 6 buses per hour), whereas headway is in terms of the time between vehicles (e.g., a bus every 10 minutes).
Frequency	
MaaS	Mobility as a Service integrates various forms of transport and transport-related services into a single, comprehensive, and on-demand mobility service. MaaS offers end-users the added value of accessing mobility through a single application and a single payment channel
PVR	Peak Vehicle Requirement – the maximum number of buses (vehicles) required to operate a service at it's busiest (peak) point. The PVR may only be high for short periods of the day when more buses are needed to deliver the same service due to congestion causing slower trip times for example.
SRN	The strategic road network (SRN) is the biggest and most important piece of road infrastructure in the country. It comprises 4,300 miles of motorways and major A roads.
Traffic Impact Study	A Traffic Impact Study (TIS) studies and documents the likely traffic impacts that any new development may have on public health, safety, and welfare. It is a required part of the planning process of large schemes.
BSIP	Bus Service Improvement Plan – a requirement through Government's National Bus Strategy (March 2021). Every Local Transport Authority (LTA) must have a BSIP in place and link this to an Enhanced Partnership Plan and Scheme. The BSIP sets out the LTAs long term vision for local bus services in their area.
Fastrack	The operational name for BRT systems in Kent.
Park & Ride	A mode of public transport that requires a car park located outside of a main town / city to be connected by a local public transport service, often at very regular intervals and branded as separate to the local public transport system.
E-Ticketing	An electronic ticket is a method of payment and payment validation in electronic (paperless) format. It is increasingly being used across many markets.
LCWIP	Local Cycling and Walking Infrastructure Plan – these are required by all LTAs.

Coordinated Services	Local bus services are deemed as coordinated when an attempt is made to form an even headway between two or more bus services running along the same road. This has the effect of growing demand and works best when common ticketing is allowed across all services.
Interworked Services	This is an operational process that may see a vehicle work on different routes through the day by moving from one service to another at a common terminus.
Supported Service	Commonly this is a service that is not profitable (commercially viable) and therefore needs financial support, often from the LTA but sometimes from other sources, e.g., s106 funding.
Commercial Service	This is a service operated by a local bus company for profit and therefore requires no additional financial support. The local bus operator has complete control over fares, timetable, vehicles, and marketing.
Trunk Service	This is a term commonly used to describe a bus service operating as an integral part of the local bus network and linking two or more main locations. It is trunk because it is a vital link and is likely to have a high frequency level.
ABODS	Analyse Bus Open Data Service is an open database created by the Department for Transport (DfT) to allow data relating to local bus service performance and vehicle location to be shared.
LTN 1/20 Guidance	Guidance for LTAs on designing high quality, safe cycle infrastructure – this, amongst other things, sets minimum measurements for infrastructure.
AVL	Automated Vehicle Location systems such as that provided by MOVA enable buses to be located using GPS tracking. These systems enable real time passenger transport information to function and more recently assist ticket systems with creating the right fare. Data is also used to feed Apps.

Appendix A

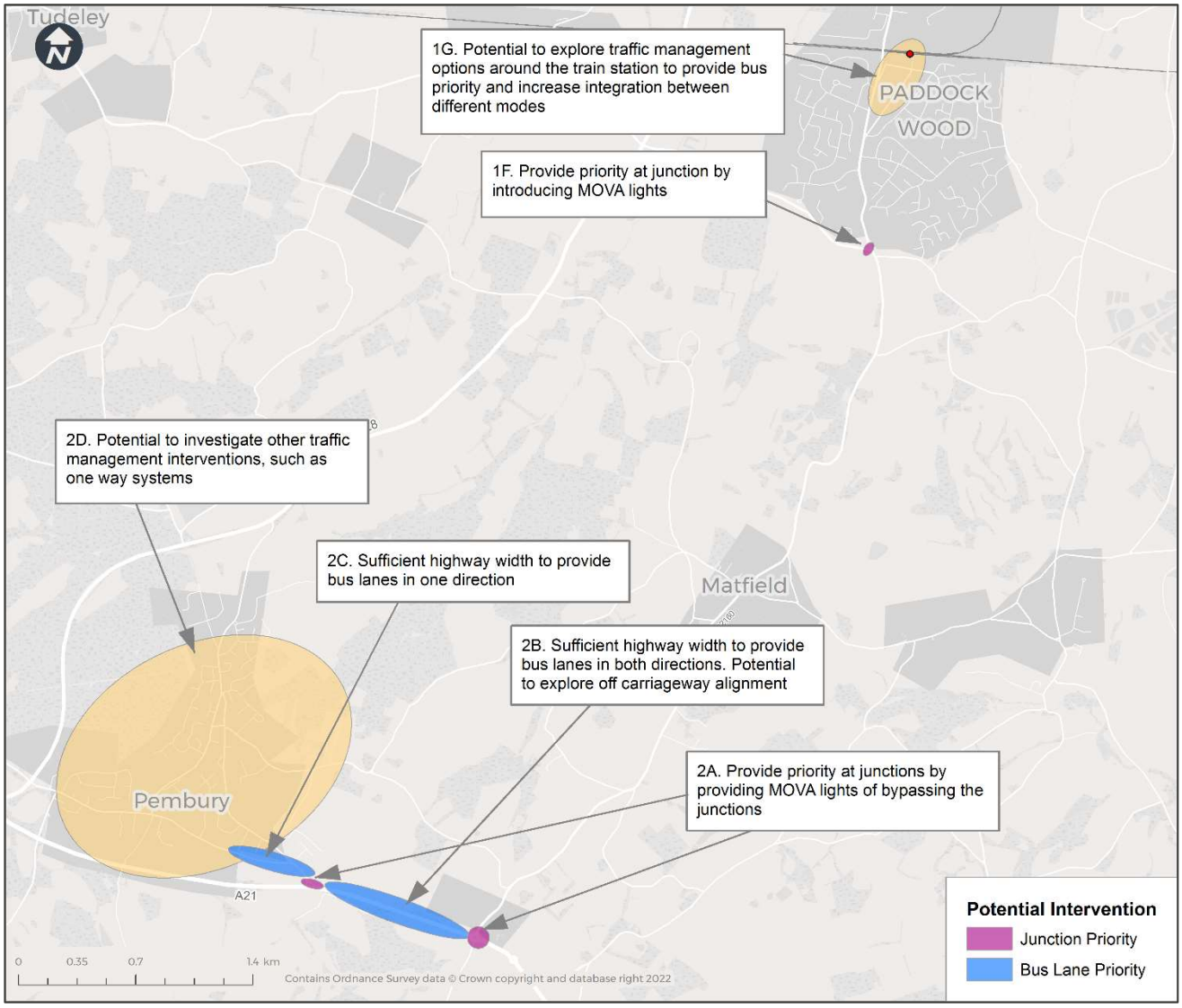
PROPOSED BUS PRIORITY MEASURES

TONBRIDGE TO PADDOCK WOOD CORRIDOR

Potential bus priority interventions between Tonbridge and Paddock Wood

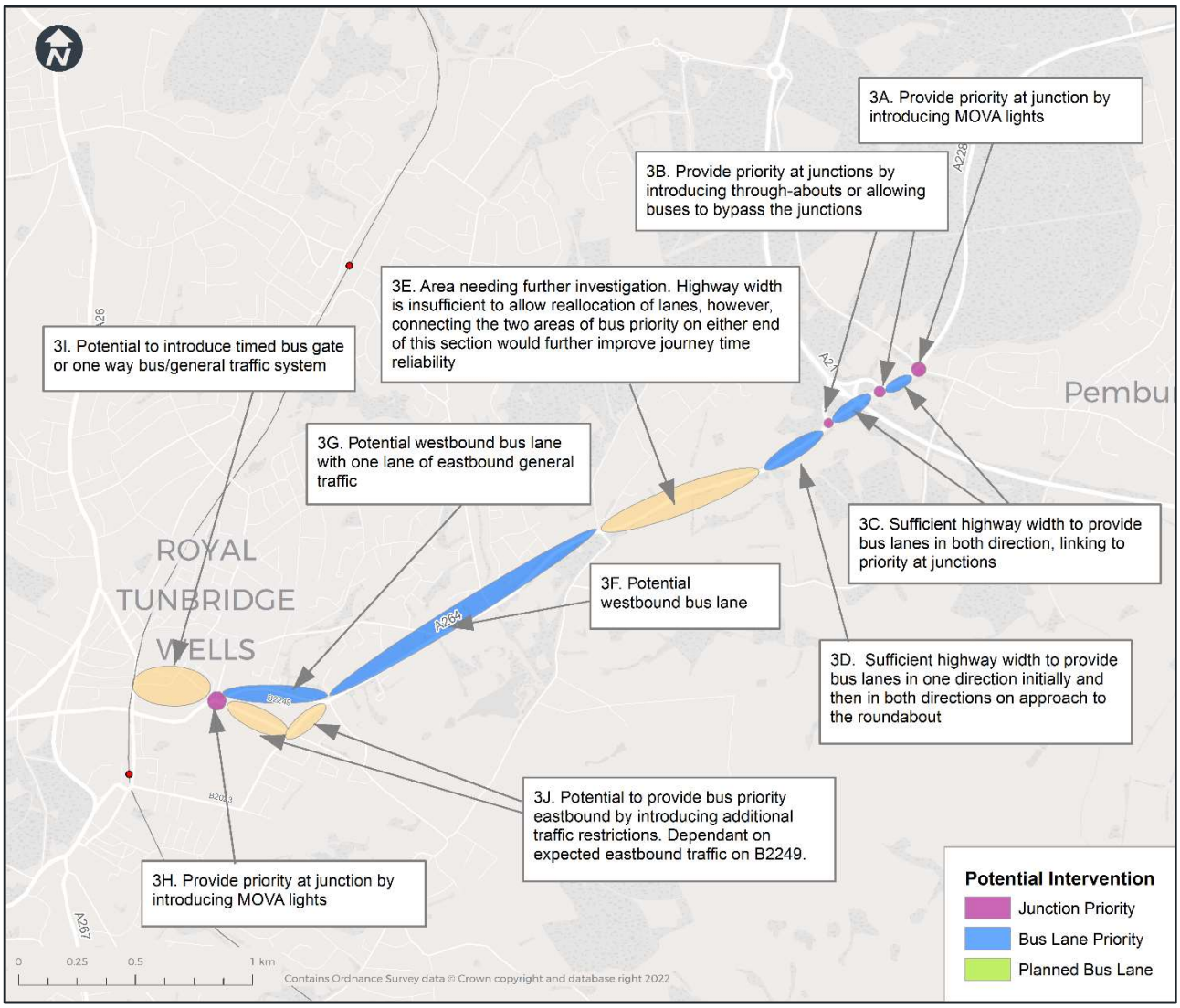
PADDOCK WOOD TO PEMBURY

Potential bus priority interventions between Paddock Wood and Pembury



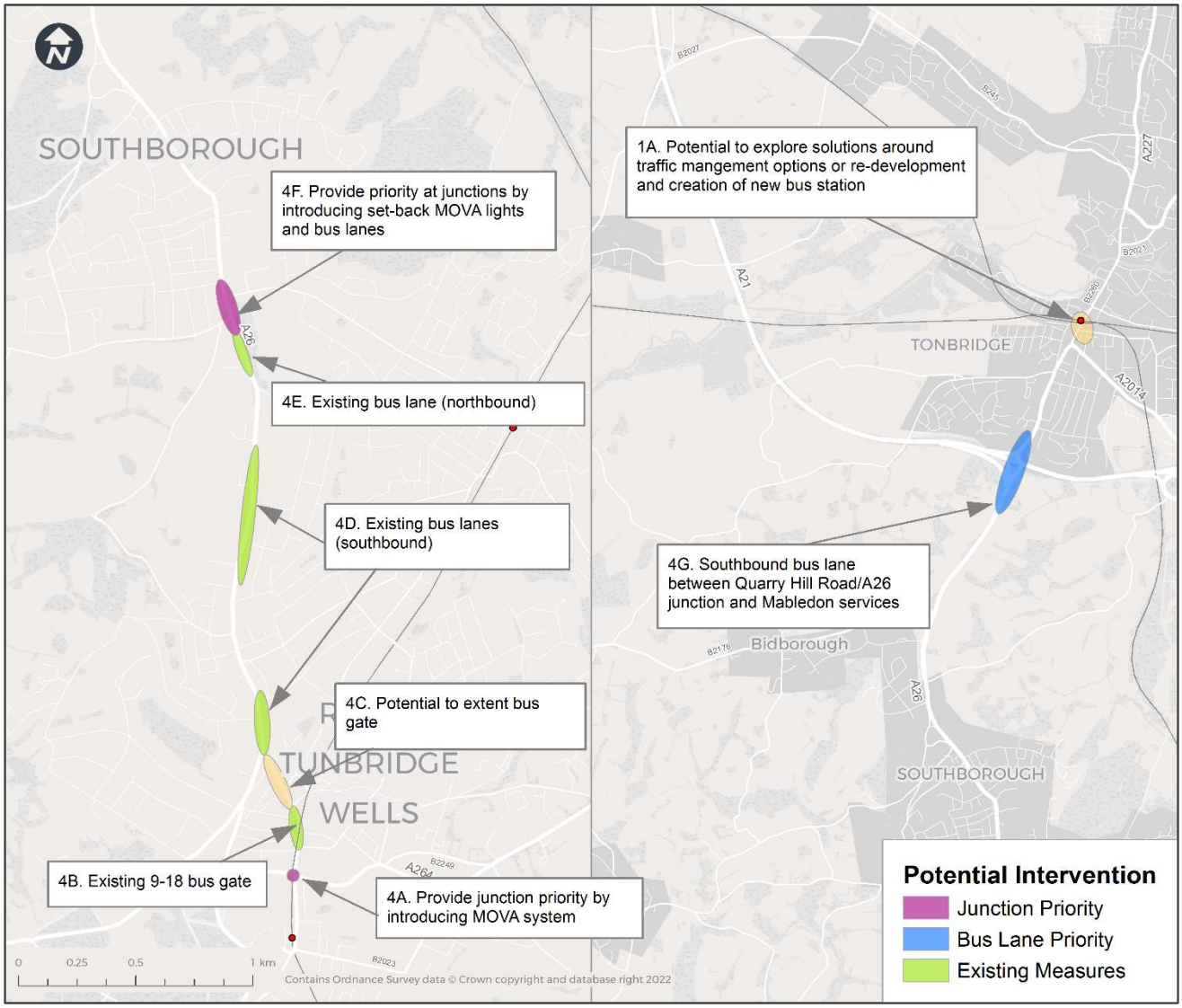
PEMBURY TO ROYAL TUNBRIDGE WELLS

Potential bus priority interventions between Royal Tunbridge Wells and Pembury



ROYAL TUNBRIDGE WELLS TO TONBRIDGE

Proposed bus priority interventions from Royal Tunbridge Wells to Tonbridge



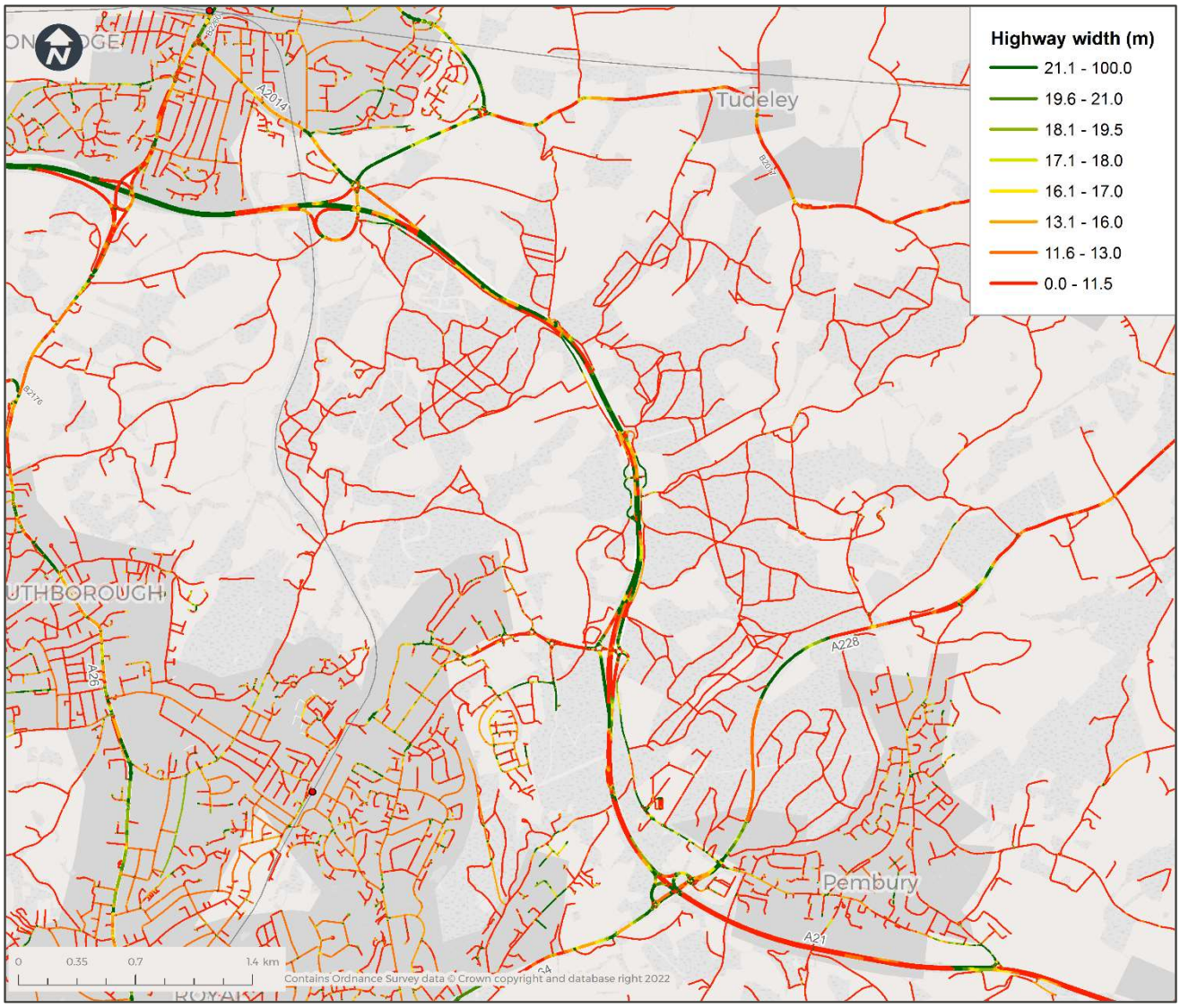
TONBRIDGE TO PEMBURY VIA ROYAL TUNBRIDGE WELLS HOSPITAL

One of the key trip generators in the study area is Tunbridge Wells Hospital, which is currently served by bus routes from Royal Tunbridge Wells, Tonbridge, and Pembury. **Error! Reference source not found.** shows the typical traffic conditions between Tonbridge and Pembury. The key areas of congestions match those discussed in the previous sections (0 and 0) and would be improved by interventions 1A, 1 B and 3A.

The signal crossing just before the junction between A21 and Tonbridge Road can also be modified and expanded to include priority for buses entering the junction, supplemented by a bus lane on approach (intervention 5A).

Additionally, **Error! Reference source not found.** indicates there is sufficient highway width capacity to reallocate space to bus priority along Tonbridge Road between the off-traffic cycle lane and the Tonbridge Road/A228 junction (intervention 5B).

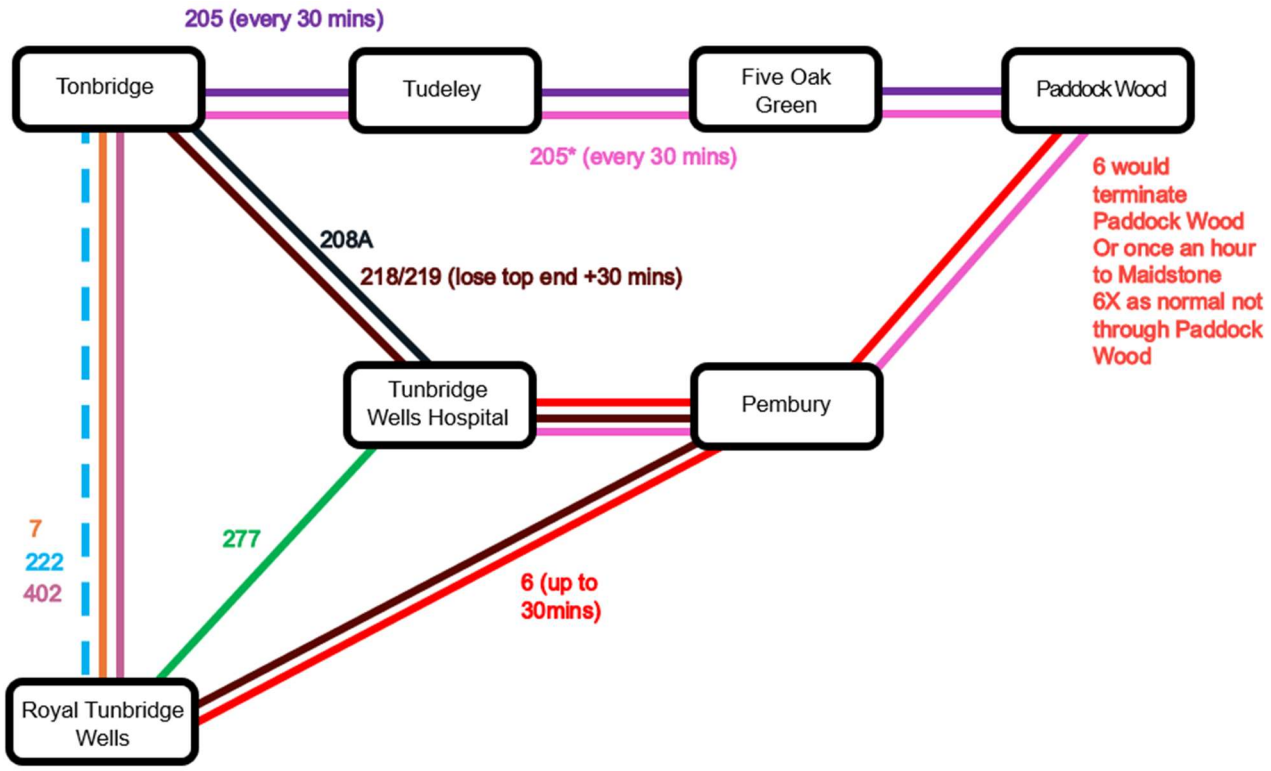
Highway widths between Tonbridge and Pembury



Appendix B

PROPOSED NETWORK OPTIONS

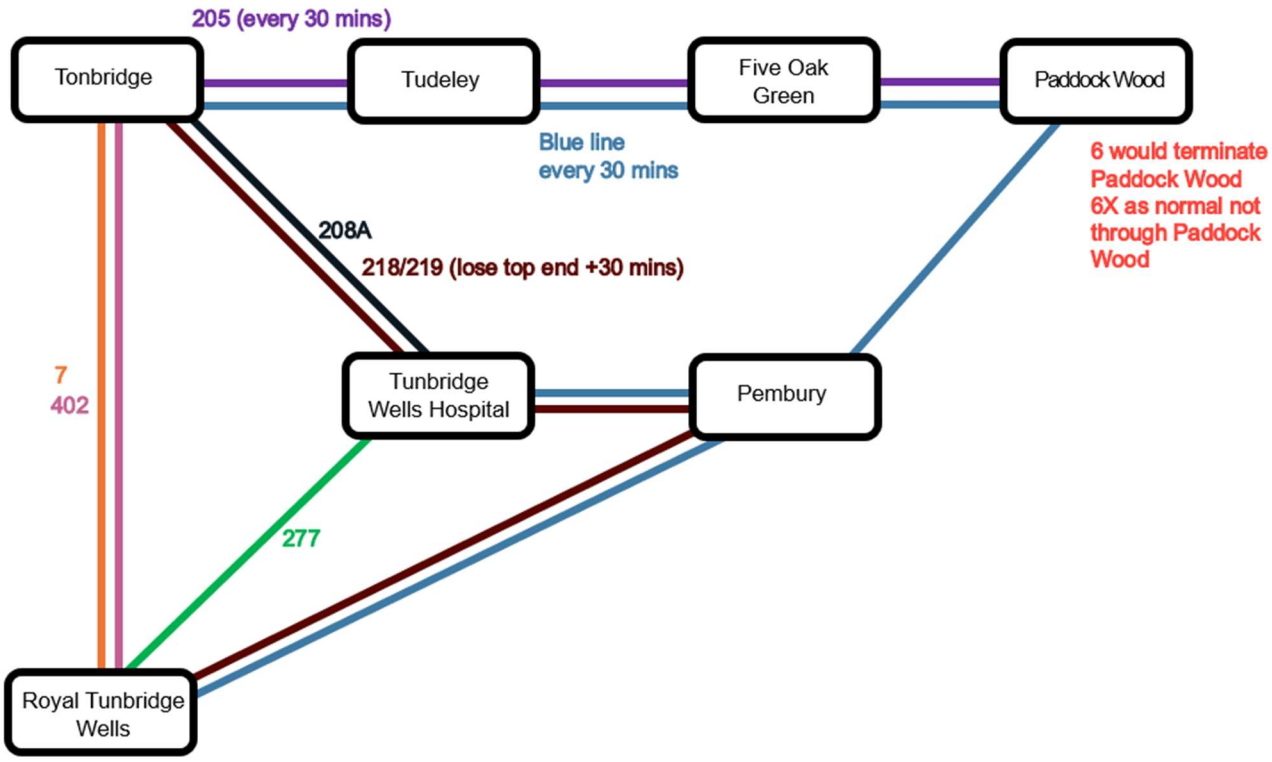
OPTION 1



Option 1 changes to services from baseline network

Service	Changes
7, 222, 402, 277, 208A, 6X	Remain unchanged
6	Increased frequency to twice an hour between Royal Tunbridge Wells and Paddock Wood. Every other service would continue to Maidstone.
218/219	Increased frequency to twice an hour. Does not serve local loop in North Tonbridge, and continues instead along the same route as service no. 6 to Royal Tunbridge Wells via Pembury
205	Increased frequency to twice an hour, with every other service continuing along the same route as service no. 6 to Tunbridge Wells Hospital via Pembury.

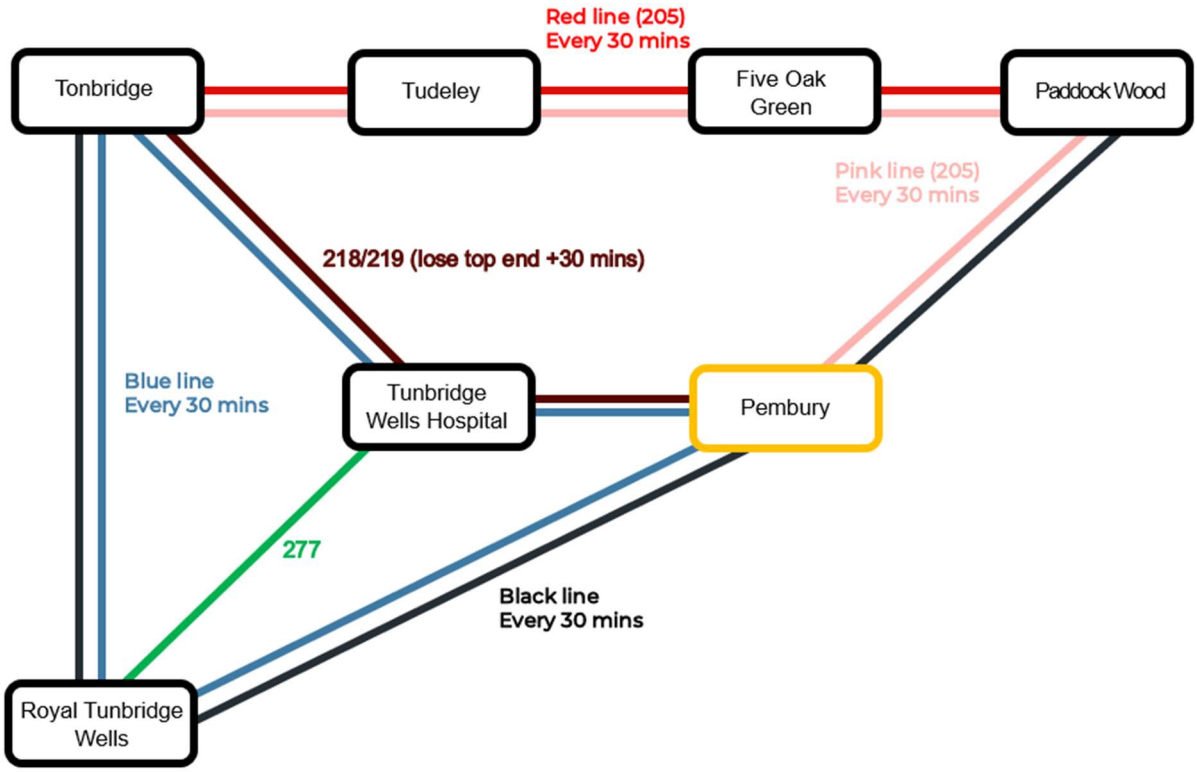
OPTION 2



Option 2 changes to services from baseline network

Service	Changes
7, 222, 402, 277, 208A, 6X	Remain unchanged
6	Would operate only between Paddock Wood and Maidstone.
218/219	Increased frequency to twice an hour. Does not serve local loop in Tonbridge, and continues instead along the same route as service no. 6 to Royal Tunbridge Wells via Pembury
205	Increased frequency to twice an hour.
Blue	New service between Royal Tunbridge Wells, Tunbridge Wells Hospital, Pembury, Paddock Wood, Tonbridge, following the same routes as 6 and 205. Operating every 30 mins.

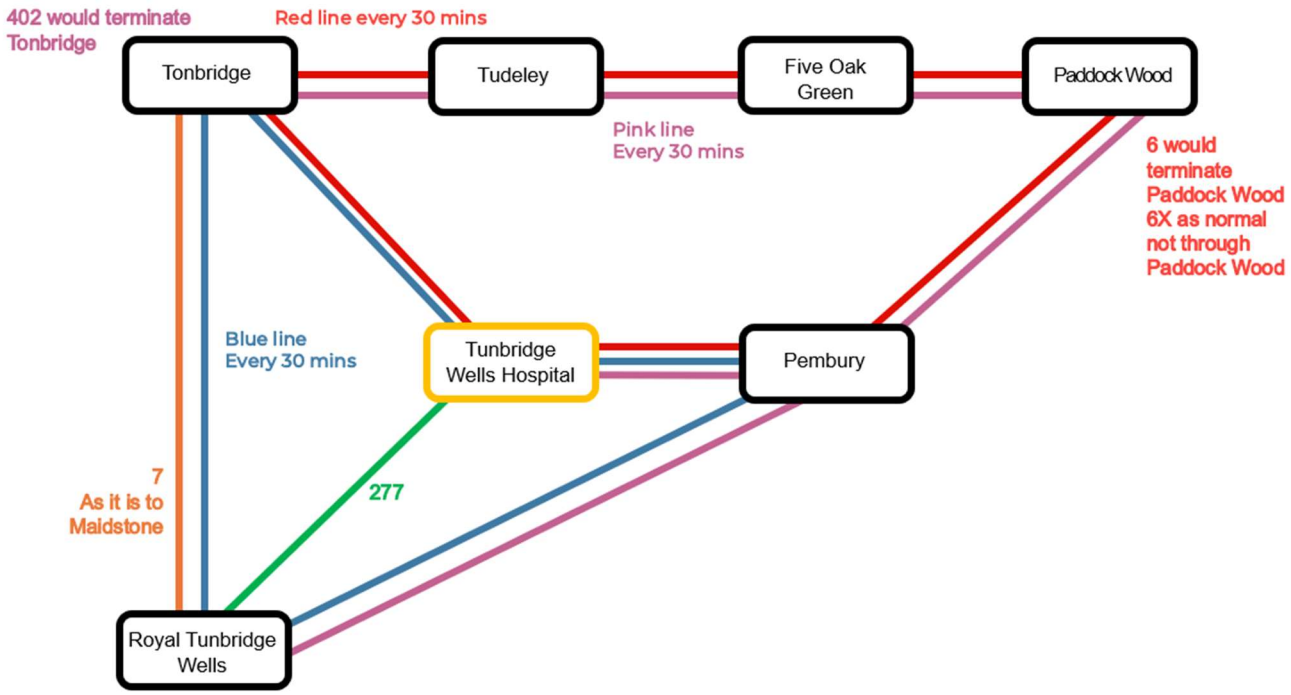
OPTION 3



Option 3 changes to services from baseline network

Service	Changes
222, 277, 208A, 6X	Remain unchanged
7,402	Now terminate in Tonbridge
6	Would operate only between Paddock Wood and Maidstone.
218/219	Retained frequency at twice an hour. Does not serve local loop in Tonbridge
205	Increased frequency to twice an hour. Every other service continues to Pembury
Blue	New loop service between Royal Tunbridge Wells, Pembury, Tunbridge Wells Hospital, and Tonbridge. Operating every 30 mins.
Black	New service between Tonbridge, Royal Tunbridge Wells, Pembury, and Paddock Wood

OPTION 4



Option 4 changes to services from baseline network

Service	Changes
7, 222, 277,6X, 208A	Remain unchanged
402	Not terminates at Tonbridge, operating only between Sevenoaks and Tonbridge
6	Would operate only between Paddock Wood and Maidstone.
218/219, 205	Replaced by service below
Red	Loop service operating every 30 minutes between Tonbridge, Paddock Wood, Pembury, Tunbridge Wells Hospital
Blue	Loop service operating every 30 minutes between Tonbridge, RTW Hospital, Pembury, Royal Tunbridge Wells
Pink	Service operating every 30 minutes between Tonbridge, Paddock Wood, Pembury, RTW Hospital, Pembury

Kings Orchard
1 Queen Street
Bristol
BS2 0HQ

wsp.com