

1. CHAPTER 1: EXECUTIVE SUMMARY

Study objectives

- 1.1 The Department for Transport (DfT) commissioned a study into ways to address capacity constraints at the Dartford-Thurrock River Crossing.
- 1.2 The Study had the following objectives:
 - To advise the DfT about the future requirement for crossing capacity across the lower Thames over 30 years to 2037. This should include an initial evaluation of what role other modes (e.g. light / heavy rail, bus) might play in any plans for new capacity, leading to agreed options for evaluation. The study should look at demand and the consequential impacts (environmental and economic) of meeting that demand with new infrastructure.
 - To investigate what may be done to improve traffic flow through the existing Dartford Crossing in the short to medium term, known as 'making better use' of the Crossing. This work should take into account existing Highways Agency plans for the Crossing and the motorway network in the immediate vicinity.
 - To make best use of available traffic models to help understand the nature of current demand at the Crossing, the likely evolution of that demand and the impact that various options might have.
- 1.3 The Study fulfils the above objectives by reviewing previous reports and appraisals that have been carried out at the Dartford Crossing over the last 15 years. Where appropriate, this information has been assimilated and brought up to date, while recommendations have been made for further work where necessary. The output from this Study is designed to inform any future investigatory work on potential interventions for making better use of the existing Crossing and where necessary, options to provide additional future crossing capacity.

Existing Crossing and charging arrangements

- 1.4 The existing A282 Dartford Crossing comprises the Queen Elizabeth II Bridge, which provides four southbound lanes, while two tunnels under the Thames provide a four-lane northbound facility. It is located on the eastern edge of the M25 orbital motorway, between Junction 31 to the north and Junction 1 to the south. The tunnels were opened in 1963 and 1980, while the Queen Elizabeth II Bridge opened in 1991. The Crossing is tolled in both directions via a plaza located to the south of the Thames. There are 13 toll booths in the southbound direction and 14 in the northbound direction.
- 1.5 The charges changed on 15th November 2008, alongside the introduction of a Local Resident Scheme that offers a discounted toll charge to residents of the area. In an effort to encourage traffic to avoid peak hour travel over the Crossing, there is now no charge for all vehicles using the Crossing between the hours of 22.00 and 06.00. This is designed to provide an incentive, in particular for heavy goods vehicles (HGVs), to travel outside the busy peak periods during the day.
- 1.6 At present, the toll at the Dartford Crossing can be paid in two forms, either by cash or electronically via DART-Tag (backed up by direct debit). Figures released by the Highways Agency and Le Crossing indicate that prior to the introduction of the Local Resident Scheme, just 13% of cars use DART-Tags. Although Dart-Tag is available to everyone and provides the user with a reduced toll, the uptake has remained low, although there are early

indications that the November 2008 changes to the charging regime have led to a noticeable increase in the use of the DART-Tag system.

Policy alignment

- 1.7 Following the publication of the “New Deal for Transport” in 1998, the Orbit multi-modal study was carried out to develop a transport strategy for the London area. The Orbit study identified a programme of improvements for the M25 widening and recommended that further consideration should be given to a new Lower Thames Crossing. The response to the study by the Secretary of State in 2003 confirmed that he had asked the Highways Agency and Strategic Rail Authority to examine the case for a Lower Thames Crossing that would relieve the eastern section of the M25 and the Dartford Crossing, while contributing to the development of the Thames Gateway.
- 1.8 The planning, economic, regional and national transport issues in the vicinity of the existing Dartford Crossing are inextricably linked to the relevant Regional Spatial Strategies (RSS) and the emerging Local Development Frameworks (LDF).
- 1.9 The East of England Plan, published in May 2008, covers the period to 2021 but sets a vision, objectives and core strategy for the longer term. This RSS has been informed by and responds to the relationships between the East of England, adjacent regions and the rest of Europe. One of the key inter-regional linkages identified by the South East Region is the cross-Thames linkages between Essex Thames Gateway and Kent Thames Gateway, which share similar regeneration and infrastructure issues.
- 1.10 The Secretary of State’s comments in relation to Chapter 8 of the draft South East Plan, which has passed through the Examination in Public process, deals with Management and Investment Proposals. Of relevance here, the “A2/A282/M2 corridor (including Thames Crossing options)” is specifically identified as one of the “priority transport links likely to come under increasing transport pressure as a result of underlying traffic growth and the development strategy of the RSS, and where further work should be focussed to identify the interventions needed”.
- 1.11 In addition, revised Policy KTG12 of the South East Plan identifies that:
- “The efficient functioning of the Kent Thames Gateway depends on reliable east-west and public transport routes, and the growth already planned depends entirely on their timely improvement. Efficient north-south movement by public transport and by road will be of increasing importance even with the existing level of planned growth. Regional and international traffic will be affected by the congestion on the transport networks serving development in the Growth Area. Therefore, there are regional and national reasons to improve transport capacity.*
- While the Lower Thames crossing would form an inter-regional route it would have important implications for the local economy of the sub-region and would support the planned growth in north Kent.”*
- 1.12 The Secretary of State’s comments on the South East Plan go on to recommend a study of Thames Crossing options as one of the key transport themes to be taken forward.

Outline of Study approach

1.13 The key elements of the study approach are set out below:

Transport modelling: For the purposes of this Study, a review was carried out of the available models to identify those that would be best suited to the initial assessment required for this Study. The outputs from this work have been used in the assessment of the base case, future year and the preliminary assessment of improvement options for the Dartford Crossing. It is important to note that none of the available existing traffic models fully meet the analytical requirements of the Study brief. In particular, there are no models able to provide forecast assessments to 2037 in the study area, although several are able to forecast to 2030 or 2031. Best use has therefore been made of the available models for this Study. Based on experience gained in using the selected models for this work, one of the outputs of this Study (Appendix 4A) is a specification for the data collection and traffic modelling methodology that will address the more detailed requirements of any later phase of work.

Assessment of current and likely future performance of the Dartford Crossing: The Dartford River Crossing Study relies upon the accuracy and availability of existing data only, as no new data collection has been undertaken specifically as part of the scope of work. Several prior studies of the Dartford Crossing have been undertaken and this Study has concentrated on updating or substantiating available information and past conclusions to confirm their ongoing validity. This analysis, reported in Chapter 5, uses data provided from Le Crossing, the Dartford Crossing operators and the Highways Agency's database HATRIS. This has enabled the current performance of the Dartford Crossing to be assessed, providing a clear understanding of the current issues. From this, the modelling tools outlined above have been used to estimate the likely future scenario, should nothing be done to enhance the existing cross-river facilities in the Lower Thames area between now and 2031.

Rail provision: Previous studies have looked at the need for improved rail connectivity in the vicinity of the Dartford Crossing and concluded that current facilities are adequate. This Study reviews the current operation of the rail infrastructure for both passengers and freight, and considers the need for further improvements.

Making better use of the existing Crossing: Previous studies have been carried out to identify measures to improve the operation of the existing Crossing. These have generally focused on small scale measures and are relatively recent. This Study includes a review of the previous work and how it has been developed, as well as a wider consideration of measures used elsewhere. Issues for consideration include improved toll plaza operation using the latest intelligent transport systems, measures to reduce weaving and turbulence and a review of smaller low cost interventions. The recent completion of network enhancements, for example the M25 Junction 1b-3 improvement, opens up new options in this regard, which have been taken into account as part of this element of the Study.

Engagement with stakeholders: In order to ensure a full understanding of the current and emerging issues associated with the Crossing, the stakeholder engagement process for this Study enabled the identification of up-to-date problems, issues, constraints and opportunities. In this case, engagement was carried out by undertaking informal meetings with the majority of the key

regional and local authorities and delivery bodies; non-governmental organisations were not directly consulted within this Study. From the engagement process, it was possible to gain an understanding of the aspirations of the stakeholders in terms of improving transport opportunities in the Thames Gateway and specifically in terms of cross-Thames crossing capacity. In turn, discussions were held to establish how these would assist in delivering the large amount of development through the RSS and LDF processes in the regions adjacent to the Crossing.

Preliminary design of new possible Crossing options: Using information from a variety of sources, a series of potential route corridors have been identified that might serve as future new routes for improvements in cross-Thames capacity. Each option has been assessed against the DfT's five goals, as defined in the new "Delivering a Sustainable Transport System" (DaSTS, November 2008).

Understanding the Problem: Road

- 1.14 While no new data collection has been undertaken for this Study, it makes best use of various data sources, including observed traffic data, modelled traffic data, historic information and census data. In addition, site visits and detailed discussions have been undertaken with a wide range of stakeholders.

Traffic flow trends

- 1.15 The Dartford Crossing experiences high levels of flow and congestion on a daily basis, with typical traffic flows in the order of 145,000 to 150,000 vehicles per day, split fairly evenly by direction. According to the detailed Le Crossing data, total flows over the Crossing have actually reduced slightly in recent years, while HGV flows have increased. This reduction in flows may reflect a variety of factors occurring at and near to the Crossing, possibly including increasing network congestion elsewhere. It is important to note that data to clarify recent trends in movements over the Crossing over time is not yet available. Demand is influenced by the cost of travel and as congestion worsens, the cost this imposes on travel is reflected in individual decisions, which may include a change of mode or destination, or possibly the decision not to travel at all.
- 1.16 Flows exhibit very low seasonality through the year and weekday flows show little variation, although weekend flows are a little lower than weekday equivalents.
- 1.17 The Crossing does not have a 'typical' daily flow pattern, as there is no pronounced morning or evening peak. Instead, observed traffic flows over the Crossing are constantly high, with flows of around 5,000 passenger car units (PCUs) per hour in each direction. Maximum flows are 5,500 PCUs, occurring at around 17:00-18:00 each day.
- 1.18 In terms of delay, recent DfT analysis has concluded that the section of the network that includes the Dartford Crossing experiences the third highest level of delay nationwide. A typical four lane section of UK motorway could support a maximum flow at or above 7,000 vehicles per hour in each direction while experiencing little variation in average speeds. Typically, speeds would tend to stay above 90kph (55mph). The speed/flow relationships at the Crossing show that it does not offer this level of service, as journey times show a great deal of variability and delay when flows exceed just 4,000 vehicles per hour, even though four lanes are available in each direction. This indicates that due to the infrastructure currently in place at the Crossing, it is not able to cope efficiently with the flow volumes that are passing in either direction for the majority of daytime hours. This level of variability is shown to be more prominent in the northbound direction than southbound.

- 1.19 In overall terms, the Crossing starts to offer a significantly reduced level of service (characterised as vehicles using the Crossing which experience more than nine minutes of additional delay) once flows exceed 3,000 vehicles per hour. This level of service and associated delay is experienced by almost half of users in either direction throughout the day. Clear peaks in journey time delay are found in the afternoon peak period. Variability in observed journey time delays is typically low, with the exception of Fridays, suggesting that journey times and associated delays are relatively predictable at given times of the day throughout the week.
- 1.20 The level of delay outlined above is likely to be considered more significant by those making shorter journeys, as the delay represents a relatively large proportion of their total journey time.
- 1.21 In terms of layout issues, the existing Crossing is subject to numerous constraints that affect all users. The network to each side of the Crossing is complex, with closely spaced junctions that encourage weaving over relatively short distances. In a northbound direction, this issue is exacerbated by the fact that the east tunnel has a greater height than the west tunnel, which means that high vehicles must utilise the east tunnel and associated toll booths, regardless of their final destination. Additional weaving is encouraged as restrictions are in place to the north end of the west tunnel to prevent traffic from exiting at M25 Junction 31, meaning that vehicles who wish to exit towards Lakeside (for example) must use the east tunnel.
- 1.22 The operation of the Crossing is also affected by the need for articulated and other heavy vehicles carrying restricted goods to wait for an escort through the tunnels. As these vehicles are escorted through the tunnels, traffic is held at the northbound tolls, creating delays for all other users.
- 1.23 Assimilating all of the above findings, it is apparent that the Crossing is operating or beyond at its effective capacity for much of the day. This finding, coupled with the operational and layout issues outlined above, suggests that further examination of the existing layout is warranted as part of any future analysis.

Accidents and incidents

- 1.24 Turning to incidents and accidents, the injury accident rate associated with the bridges, tunnels, toll plazas and approaches within the vicinity of the Crossing is twice the national average for a route of this type at present.
- 1.25 The incidents occurring at the Dartford Crossing are caused by a wide range of complex, inter-related factors, rather than a single, defined issue. Incidents in close proximity to the Crossing, particularly at junctions 30, 31, 1a and 1b also impact on the performance of the Crossing. The surrounding road network is complex with little distance between junctions. A significant proportion of accidents are caused by weaving and merging movements. These incidents along with incidents at the Crossing itself add to the everyday delays experienced by users of the Crossing.
- 1.26 It should be noted that the causes of incidents are not necessarily mutually exclusive, but add up to an overall picture where flow breakdown is common, leading to extensive queues and delays. This is exacerbated by the high levels of demand flows in both directions, which mean that the Crossing has little resilience to incidents when they do occur.

National, regional and local role of the Crossing

- 1.27 Considering light vehicles alone (cars and light vans), over 40% of journeys using the Crossing are relatively long distance, travelling more than 80km. The remaining 50% to 60% of light vehicles using the Crossing are travelling between the large conurbations to the north and south of the Crossing (i.e. regional and local trips). In terms of HGV trips, over 30% are either to or from the port of Dover and are travelling particularly long distances, while around half have origins and destinations within the East and South East of England (excluding Dover). The remaining 20% are generally more local HGV trips, taking place over short distances to either side of the Crossing. These figures indicate the importance of the Dartford Crossing in relation to its current role in catering for strategic trips of national and European importance.
- 1.28 The above confirms that the Crossing plays a combined role, catering for a mixture of strategic and more local traffic. This, in turn, has implications for the consideration of any future improvement options.
- 1.29 There is specific evidence, drawn from the Census data, which suggests that interactions between the local authority areas to the north and south of the Thames on either side of the Crossing are lower than would be expected, given the proximity of the areas. This could, in part, be an indication that residents are dissuaded from using the Crossing, probably due to existing daytime congestion levels. Given that forecast housing and employment growth in these locations, which form a core part of the Essex and Thurrock Thames Gateway areas, is high, it can be expected that the demand for travel will continue to increase in these areas over time. The current lack of interaction between the areas to the north and south of the Crossing would be expected to have an increasing local and potentially regional economic consequence in future years, as the catchment area within which residents are willing to search for employment opportunities is restricted. If this additional demand cannot be accommodated, this may lead to knock-on effects on wider economic prosperity in the area as the number and range of opportunities open to Thames Gateway residents remains limited.

Stakeholders' view

- 1.30 The stakeholders' view is that the Crossing is a critical component of the national highway network, although it is one of many problems to be resolved in the Thames Gateway area. Stakeholders also agree that the case for improvement is well established, and are extremely concerned about the consequences of inaction over both the short and longer term. There is a clear view from stakeholders that without a safeguarded route for improvement identified in key policy documents, the scale and pace of growth in the Lower Thames area will make it increasingly difficult to deliver a meaningful improvement scheme in the long term.

Summary: existing conditions at the Dartford Crossing

- 1.31 It is evident that demand for the Crossing exceeds its effective capacity throughout many hours of each day. As a result, almost half of users are provided with a poor level of service at present, including all those who travel in the peak periods. These peak periods have already extended far beyond the 'typical' patterns found elsewhere on the strategic highway network, due to the sustained levels of demand that are greater than the capacity of the Crossing.
- 1.32 In addition, incidents and accidents occur with a significantly greater frequency in the area at and immediately around the Dartford Crossing than would be expected, when compared with other parts of the strategic highway network. When these do occur, the high levels of

demand in both directions mean that the Crossing has little resilience and tends to experience further flow breakdown, worsening the level of service provided to users.

- 1.33 This is a clear indication that there is an existing problem at the Crossing, in terms of capacity and operational performance. The extent to which this would be expected to worsen in future years is confirmed under 'Business as Usual' below.

Cross-river rail provision in the Lower Thames area

- 1.34 This Study has considered the case for the inclusion of rail facilities as part of any new or improved crossing in the Lower Thames area. This was highlighted by stakeholders as a key opportunity for improvement.

- 1.35 The Dartford Crossing provides a road-only link across the Lower Thames at present. Rail passenger and rail freight movements between Kent and Essex, and many other north-south movements, have to cross the Thames and transit London at some point on their journey. At present, there are three such crossings: the Snow Hill tunnel near Blackfriars Bridge, the Chelsea Bridge and the new High Speed 1 tunnel between Ebbsfleet and Purfleet. The only one of these that is suitable for rail freight is the Chelsea Bridge.

Passenger rail provision

- 1.36 Considering passenger services, at present, there are no direct train services between Kent and Essex and other north of London locations. All passengers have to travel into London and then transfer to other London stations for onward connections via London Underground, Docklands Light Railway, or use taxi, bus or walk modes to continue their journeys.

- 1.37 There are, however, several major new passenger rail schemes underway that will deliver upgrades to capacity and service within the study area, as listed below:

- High Speed 1 domestic services (from December 2009) between the Kent Coast and Medway Towns, and St Pancras
- Crossrail (expected in 2017) will provide cross-river services between Abbey Wood and central London
- DLR Woolwich Extension (opened in January 2009) now provides interchange between the North Kent Line and the Docklands Light Railway
- Thameslink (scheduled for completion in 2015) will provide increased cross-river services between North Kent and London

- 1.38 A review of the Strategic Rail Authority's Lower Thames Crossing Study (2004) and the Kent Rail Utilisation Strategy confirms that the principal existing passenger rail demands in the South East are generated by radial commuting patterns into and out of London. In addition, current passenger rail demand between stations in the Thames Gateway area (Medway Towns to the London-Tilbury-Southend Line) is minimal.

- 1.39 Further, the total travel volumes between north Kent/Medway Towns and areas of south Essex are fairly low, meaning that there is unlikely to be any significant demand for rail travel between these groups of stations, even assuming that a direct rail service was provided (i.e. there is minimal latent demand). As a result, there is unlikely to be any significant "generated" demand leading to modal shift to rail resulting from the provision of a direct rail passenger service between these groups of stations.

Rail freight provision

- 1.40 Turning to rail freight, growth forecasts to 2031 were obtained from the Great Britain Freight Model. These indicate that rail freight growth in the south east of England up to 2031 is likely to be focused at three locations: the route between the Channel Tunnel and the West Coast Main Line via Maidstone and Swanley; the route between the London-Tilbury-Shouthend Line and the West Coast Main Line (largely due to growth at the London Gateway development), and on the route between the Great Eastern Main Line and the West Coast Main Line (due to planned growth at the Port of Felixstowe and the new deep-sea container port at Bathside Bay (Harwich). It is notable that minimal growth (compared with 2006) is forecast for freight train operations on the North Kent Line.
- 1.41 Any new crossing in the Lower Thames area that incorporated heavy railway infrastructure would provide an additional railway crossing option over the Thames, which at first view would seem to be beneficial. However, on closer examination, it would only serve movements between the Isle of Grain and Medway Towns areas of Kent and the West Coast Main Line and the Great Western Main Line. The freight forecasts suggest minimal growth to 2031 in these areas, with little scope for modal shift away from road movements.
- 1.42 Further, there is currently spare capacity between the Channel Tunnel and WCML for international freight services (via Maidstone and Swanley), however this is forecast to be absorbed by 2031.
- 1.43 A new rail crossing would not provide additional cross-Thames capacity along the main South East England corridor, where substantial growth is forecast up to 2031. This is because the routes used by freight trains travelling between the Channel Tunnel and the West Coast Main Line (via the Ashford-Swanley and Chatham Mainlines) do not connect with the North Kent Line.
- 1.44 It is acknowledged that there will be rail freight capacity issues by 2031 around much of London. That said, the inclusion of rail freight provision as part of any new Lower Thames Crossing would not appear to address these issues and may even lead to a deterioration in rail congestion at certain points in the network.
- 1.45 Overall, taking into account both passenger and freight provision, the inclusion of rail infrastructure within the scheme is not considered to have a reasonable initial business case. It has therefore been discounted from the final scheme options considered in this Study.

Business as Usual

- 1.46 The Study has considered the likely future year scenario should the current layout at the Dartford Crossing remain unchanged to 2030/2031. There is a significant amount of development planned for the Thames Gateway and surrounding regions, as well as at many of the ports in the South East region in particular. Much of this growth would be expected to increase levels of travel demand at the Dartford Crossing and in the surrounding area, and therefore impact upon its operation. All of the modelling tools used in this Study, as well as other forecasting tools such as TEMPRO, predict that demand for crossing capacity will increase substantially between now and 2030/2031. Given the existing level of service offered by the Crossing, where queues and delays are commonplace and journey time reliability is variable, the Dartford Crossing will be unable to cope with this level of additional demand.
- 1.47 Current analysis shows that there is a shortfall between the housing target growth figures for the Thames Gateway and the development delivery rate, should current build rates prevail



until 2016. Given that the Crossing is already operating at its effective capacity and suffers from widespread congestion and delays, ongoing development growth will contribute to increased demand which cannot be accommodated at the Crossing. This may cause tension between those promoting the growth agenda and those managing infrastructure and network capacities, including those for transport. This, in turn, could lead to further shortfalls in the delivery of growth targets in the Thames Gateway. In terms of future freight flows, there is similar evidence that HGVs wishing to use the Crossing will also increase substantially in future years.

- 1.48 It is therefore reasonable to assume that without cross-Thames capacity enhancements in the Lower Thames area, increased delays resulting from forecast increases in demand within the study area will have several effects. It will not only worsen journey time reliability but will also generate negative economic effects at local, regional and national scales as well as more localised social impacts. In reality, the extent to which trips will choose to divert onto alternative routes or to different destinations, reduce their frequency or choose not to travel at all will increase over time as demand grows. These effects will need further investigation as the existing modelling tools cannot quantify these effects in a sufficiently reliable manner.
- 1.49 As a specific effect, a continuation of ‘business as usual’ is likely to exacerbate the existing effect of the Dartford Crossing as a ‘bottleneck’ on the M25. The existing Crossing is already unable to match the level of service on the remainder of the M25. Given the completed and planned widening schemes on the M25 (e.g. the recently completed M25 J1b-3 widening), this bottleneck effect may limit the realisation of the full benefits of these schemes. In view of this, it is considered likely that wider network benefits would be available if cross-Thames capacity in the Lower Thames area were to be improved. This Study does not have tools available to be able to quantify these effects but this is an aspect that should be explored further, as it will form a key element of any detailed business case for improvement.
- 1.50 An indicative ‘forward look’ analysis to 2030/2031 of the ‘business as usual’ scenario has been undertaken with respect to the five high level government goals identified in ‘*Delivering a Sustainable Transport System*’ (DaSTS, November 2008). In summary, this forward look produced the following results, relative to the existing situation:

| DaSTS GOAL | OVERALL FORWARD LOOK RESULT (compared with existing situation) |
|---|--|
| To support national economic competitiveness and growth, by delivering reliable and efficient transport networks | Moderate Adverse Impact |
| To reduce transport’s emissions of carbon dioxide and other greenhouse gases, with the desired outcome of tackling climate change | Slight Adverse Impact |
| To contribute to better safety security and health and longer life-expectancy by reducing the risk of death, injury or illness arising from transport and by promoting travel modes that are beneficial to health | Slight Adverse Impact |
| To improve quality of life for transport users and non-transport users, and to promote a healthy natural environment | Slight Adverse Impact |
| To promote greater equality of opportunity for all citizens, with the desired outcome of achieving a fairer society | Neutral |

- 1.51 In overview, this forward look at the likely future 'business as usual' scenario shows, relative to the existing situation at the Crossing, a deterioration in performance against the DfT's goals over the period to 2030/2031. As confirmed above, there is clearly an existing problem at the Dartford Crossing that requires resolution. Given the lead-in times required to develop and deliver major infrastructure projects in general terms, the analysis of the 'business as usual' scenario confirms the importance of acting now to identify a suitable proposal that would maintain a more acceptable level of service over the long term, rather than letting the issues and wider impacts worsen over time.

'Making better use' of the Crossing

- 1.52 Several recent studies have focused on the identification of measures to 'make better use' of the existing Dartford Crossing. These have led to statements such as the one below, included in the Highways Agency's study in 2004 entitled "Getting the Most out of the Dartford Crossing":

"The review concluded that the inherent constraints of the existing Dartford Crossing present a key anomaly in the forward-looking M25 strategy. The fundamental incapability of the existing Crossing to match the level of service standards of the remainder of the M25, once improved, is brought into sharp focus."

- 1.53 In general terms, the phrase 'making better use' has, for the purposes of this Study, been interpreted as any improvement that could be delivered broadly within the existing land boundaries on either side of the Crossing, without the need for major infrastructure. These are focused upon the improvement of traffic flow through the existing Dartford Crossing in the short to medium term. It is important to note that numerous attempts have been made to identify 'making better use' schemes over recent years, and to date none have delivered major capacity benefits despite ongoing efforts on the part of the Crossing operator.
- 1.54 The analysis undertaken in this Study has investigated the causes of delays occurring at the Dartford Crossing, and has confirmed that the toll plaza layout is the primary constraint to vehicles wishing to use the Crossing. The northbound tunnels also act as a constraint, but generally the charging booths form, at present, the greater restriction and act to 'meter' northbound flows and so enable the tunnels to operate with reasonable efficiency. In overall terms, the situation is finely balanced and must be taken into account as part of any effort to 'make better use' of the northbound crossing. Travelling southbound, the Queen Elizabeth II Bridge has fewer constraints that affect its available capacity. One key factor affects its operation, which is the current layout of the southbound toll plaza, while a secondary factor is the closely spaced junctions downstream of the toll plaza.
- 1.55 This Study has identified two potential new scenarios that fit into the category of 'making better use', particularly now that the M25 widening scheme to the south of the Dartford Crossing has been completed and the planned changes to the charging regime have been introduced. They each have the potential to generate a small benefit at the Crossing by increasing throughput, while avoiding impacts on safety. The first of these scenarios maintains the two toll plazas but seeks to increase their efficiency using new technology and layouts. This has some potential to generate a small amount of additional capacity, which would have to be carefully balanced against safety concerns that could result. The second scenario removes the southbound tolls and proposes the installation of a larger northbound toll plaza through a redesigned layout, located in such a way that the weaving issues on the approach to the tunnels could be reduced. This is a higher cost alternative but one which would be expected to generate slightly greater benefits, and which could possibly form the

first stage of a much larger improvement option at Dartford. Again, this would have to be carefully considered in the light of safety concerns in either direction.

- 1.56 Both of these scenarios rely upon a greater uptake of the DART-Tag system (or equivalent future electronic toll collection mechanism). It is therefore recommended that the uptake of DART-Tag following the November 2008 changes to the charging regime is closely monitored to determine the feasibility of the above improvement suggestions. Further investigation into the benefits offered by these scenarios is essential, as the difference between success and failure is finely balanced.
- 1.57 For the avoidance of doubt, Scenario 1 has the potential to generate relatively small-scale benefit but cannot be relied upon as a scheme to resolve the overall problems at the Crossing. Scenario 2 is intended to provide a finely balanced solution that increases southbound capacity and northbound toll plaza throughput, while taking care to maintain safe operating levels in terms of tunnel capacity in particular. It is recommended that these scenarios are considered in further detail as part of any further investigatory work.
- 1.58 At best, however, both of these Scenarios are seen more as a short term holding response, which will only create marginal headroom, rather than offering a solution that might be expected to resolve the need for urgent action of a more strategic nature in the Lower Thames area.

Major Option Assessments

- 1.59 Five major options have been assessed as part of this Study. The identification of possible improvement corridors for new cross-Thames capacity came from a combination of previous studies, stakeholder consultation, consideration of other published information and a review of current land use and transport infrastructure.
- 1.60 The five corridors considered in this study are listed below and are shown diagrammatically in Appendix 10A:
- Option A - Additional capacity at the existing Dartford Crossing
 - Option B - Swanscombe Peninsula link A2 to the A1089
 - Option C - East of Gravesend and link to the M20
 - Option D - M2 link to Canvey Island
 - Option E - Isle of Grain link to east of Southend
- 1.61 To identify the main constraints and opportunities in the delivery of these options, assessments were undertaken to identify the potential business case for each one with respect to the five high level government goals identified in '*Delivering a Sustainable Transport System*' (DaSTS, November 2008), shown in the table below. These assessments included analysis as appropriate to this phase of the Study in the following areas:
- Traffic assessment
 - Wider economic benefit assessment
 - Environmental appraisal

- Integration and accessibility assessment
- Stakeholders' views

1.62 In summary, the outcome of this process is shown below, together with indicative cost ranges for each of the major options:

| DaSTS GOAL | Option A Additional capacity at the existing Dartford Crossing | Option B Swanscombe Peninsula link A2 to the A1089 | Option C East of Gravesend and link to the M20 | Option D M2 link to Canvey Island | Option E Isle of Grain link to east of Southend |
|---|---|---|---|--------------------------------------|--|
| To support national economic competitiveness and growth, by delivering reliable and efficient transport networks | Moderate Beneficial Impact | Slight Beneficial Impact | Moderate Beneficial Impact | Slight Beneficial Impact | Slight Beneficial Impact |
| To reduce transport's emissions of carbon dioxide and other greenhouse gases, with the desired outcome of tackling climate change | Slight Adverse Impact | Slight Adverse Impact | Moderate Adverse Impact | Slight Adverse Impact | Slight Adverse Impact |
| To contribute to better safety security and health and longer life-expectancy by reducing the risk of death, injury or illness arising from transport and by promoting travel modes that are beneficial to health | Slight Beneficial Impact | Slight Beneficial Impact | Slight Beneficial Impact | Slight Beneficial Impact | Slight Beneficial Impact |
| To improve quality of life for transport users and non-transport users, and to promote a healthy natural environment | Slight Adverse Impact | Moderate Adverse Impact | Large Adverse Impact | Large Adverse Impact | Likely to be Large Adverse |
| To promote greater equality of opportunity for all citizens, with the desired outcome of achieving a fairer society | Slight Beneficial Impact | Slight Beneficial Impact | Slight Beneficial Impact | Neutral | Neutral |
| Indicative cost ranges | £1-3 billion | £1-3 billion | £2.5-7.5 billion | £3.5-10.5 billion | |

Conclusions and Recommendations

- 1.63 In overview, this Study has concluded that there is an existing problem at the Dartford Crossing that requires resolution through the provision of additional cross-river capacity in the Lower Thames area. The existing Crossing has been operating at its effective capacity for several years and now experiences significant congestion throughout daytime hours, with poor journey time reliability. The latest data shows that for between 40 and 45% of users, a delay of over nine minutes is experienced while using the strategic highway links on the approaches to and over the Crossing. In addition, the safety record is currently poor, with twice as many injury accidents as would be expected. When these do occur, the high levels of demand in both directions mean that the Crossing has little resilience and tends to experience further flow breakdown, worsening the level of service provided to users.
- 1.64 All of the above confirms that there is an existing problem at the Dartford Crossing, in terms of capacity and operational performance.
- 1.65 Forecasts indicate that travel demand is likely to increase in future, but the Crossing will not be able to cater for this uplift. This, in turn, could have both economic and social consequences at various scales. This is particularly significant because the Dartford Crossing lies within the Thames Gateway Growth Area, this does not align with the long-term growth agenda for the area. Without additional cross-river capacity in the Lower Thames area, some opportunities to generate economic and social benefits from the planned growth may not materialise.
- 1.66 For this reason, small scale 'making better use' scenarios and major options have been investigated. The latter have been assessed against the DaSTS goals in order to identify their potential benefits and impacts.
- 1.67 From these assessments, it is considered that the following scenarios and options are worthy of further investigation. It is therefore recommended that they are carried forward into a future study, which would include a more detailed analytical process to develop, appraise and rank the options:
- Making Better Use (Scenario 1): This scenario involves amendments to the toll plaza layout and operation in both directions, designed to generate a small amount of additional capacity. This might have short term benefit at the Crossing, if the fine balance between capacity and safety can be achieved with the proposed modification in place.
 - Making Better Use (Scenario 2): This second 'making better use' scenario is a slightly larger scheme, involving the removal of southbound tolls and the creation of a redesigned northbound toll plaza. Together with specified measures to enhance flow throughput and enhance safety, this scenario would generate marginally more capacity than (1) above and might, if designed appropriately, form an initial stage for the major option A set out below. Again, this represents a short term scheme rather than a long term solution, as the additional capacity generated is likely to be relatively small. The impact on traffic patterns of such a scheme would also have to be considered.
 - Major Option A: This major option would provide additional long-term capacity at Dartford through the delivery of a new crossing while retaining all existing infrastructure (bridge and tunnels). This option would allow the possibility of taking the existing tunnels out of the strategic network and simplifying the network around the crossing. It also offers the shortest and most direct crossing route among the options tested in this Study. It potentially provides linkage to the Fastrack and SERT rapid bus schemes and has relatively low levels of environmental impact.

- Major Option B: Option B provides a new crossing in the vicinity of the Swanscombe peninsula. It would connect the A2 to the south in the vicinity of Dartford to the A1089 to the north in the vicinity of Tilbury Docks. It has been examined in this Study primarily to understand the impact of a solution for local traffic to relieve the existing Dartford Crossing. For the purpose of the assessment, no major connections were included that would link the new crossing to the M25 to the north or the M20 to the south. The committed Eastern Quarry development site acts as a major constraint to Option B. If a route can be designed without an impact on Eastern Quarry, then it is recommended that Option B be carried forward into the next phase of assessment. If not, then it is recommended that the option should be rejected given the importance of Eastern Quarry to the Thames Gateway strategy.
- Major Option C: This option involves the provision of a new crossing to connect the M2 to the M25, located to the east of Gravesend and Thurrock. It would form a major new piece of infrastructure in the national highway network. While this option has considerable environmental impacts, it provides a direct route for longer distance routes using the M25 and M20 and would provide some relief to the existing Dartford Crossing (although this would still be operating with high flows). It has the potential to support regeneration in the Thames Gateway area and could link to the flood relief barrage proposals being brought forward in the area.

Next steps

- 1.68 In order to investigate the short listed options in more detail, it is recommended that a tailored scope of work be developed to guide the ongoing technical, economic and environmental appraisal. It is suggested that the detailed objectives for any such work should be drawn from the problems identified in Chapters 5 and 7 of this Study.
- 1.69 In concluding this Study, the analysis of existing Crossing performance and the forward look assessment leads to the identification of four key issues that should be addressed as part of any solution, as outlined below:
- i. Relieve congestion at the existing Crossing
 - ii. Improve the resilience of the Crossing and approaches to the Crossing (including safety and reduction in incidents)
 - iii. Explore the potential of the options to contribute to wider economic benefits for the Thames Gateway Growth Area.
 - iv. Avoid significant environmentally sensitive areas and committed development
- 1.70 It is recommended that the above key issues should form the basis of any future scheme specific objectives, in addition to an ongoing assessment against the DaSTS goals. The next phase of work will necessarily include specific and detailed traffic modelling. Recommendations for this approach are set out in Appendix 4A, which identifies the likely future modelling requirements that would ensure a fully detailed and robust appraisal of the short listed options, including both the 'making better use' and major scheme options.