TRANSPORT FOR LONDON

RIVER CROSSINGS: SILVERTOWN TUNNEL

SUPPORTING TECHNICAL DOCUMENTATION

TRAFFIC FORECASTING REPORT

Transport for London

October 2014

This report presents the traffic impacts that the Silvertown Tunnel would have on the highway network.

Topics examined include:

- Background traffic growth;
- Changes in traffic and related delay;
- Connectivity;
- Cross river demand;
- Routeing of trips;
- Origins of trips using crossings.

This report is part of a wider suite of documents which outline our approach to traffic, environmental, optioneering and engineering disciplines, amongst others. We would like to know if you have any comments on our approach to this work. To give us your views, please respond to our consultation at www.tfl.gov.uk/silvertown-tunnel

Please note that consultation on the Silvertown Tunnel is running from October – December 2014.

This report (or note) forms part of a suite of documents that support the public consultation for Silvertown Tunnel in Autumn 2014. This document should be read in conjunction with other documents in the suite that provide evidential inputs and/or rely on outputs or findings.

The suite of documents with brief descriptions is listed below:-

- **Silvertown Crossing Assessment of Needs and Options**
  This report sets out in detail, the need for a new river crossing at Silvertown, examines and assesses eight possible crossing options and identifies the preferred option.

- **Outline strategy for user charging at Blackwall and Silvertown Tunnels**
  This note sets out TfL's emerging approach to charging at Blackwall and Silvertown Tunnels.

- **Silvertown Tunnel Traffic Forecasting Report**
  This report presents the traffic impacts that the Silvertown Tunnel would have on the highway network.

- **Silvertown Tunnel Introductory Transport Assessment**
  This report presents the existing transport network and travel demand and assesses the transport impacts of the proposed Silvertown Tunnel.

- **Silvertown Tunnel Outline Business Case, including:**
  - **Economic Assessment Report**
  - **Distributional Impact Appraisal**
  - **Social Impact Assessment**

  Sets out the evidence for intervening in the transport system to address the issues of congestion and road network resilience at the Blackwall Tunnel.

- **Silvertown Tunnel Introductory Environmental Assessment Report**
  This report summarises the environmental work undertaken to date and presents an early indication of the potential impacts of the proposal and the mitigation measures being considered.

- **Silvertown Tunnel Introductory Equalities Impact Assessment Report**
  This report presents an early indication of the potential impacts of the proposal on gender, race and age groups. It also outlines potential mitigation measures to encourage a positive impact.

- **Silvertown Tunnel Introductory Health Impact Assessment Report**
  This report presents an early indication of the potential impacts of the proposal on health and wellbeing. It also outlines potential mitigation measures to encourage a positive impact.

Transport for London

Silvertown Tunnel: Traffic Forecasting Report

Date: October 2014
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Document control

Version Number	Date	Description	Author	Approved
1.0	October 2014	Final draft	SN/NG	RDC

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EXECUTIVE SUMMARY

Introduction

1. This report sets out the latest strategic traffic forecasts for Silvertown Tunnel including user charges at both Blackwall and Silvertown Tunnels.
2. The Silvertown Tunnel is assumed to consist of twin bored tunnels running between Blackwall Tunnel Southern Approach on the Greenwich Peninsula and the Tidal Basin roundabout in the Royal Docks area.
3. For the purposes of this analysis, user charges are assumed to apply at the Dartford rates in the peak direction in the peak period and at half that rate in other modelled time periods/directions. The charge is assumed to increase in line with DfT assumptions in the future.
4. The work uses TfL's London Regional Demand Model (LoRDM) to forecast the demand and traffic impacts. An independent review of the base year LoRDM found that the model was fit for purpose.
5. The report first considers traffic conditions in a 2021 reference case without the Silvertown Tunnel. It then examines the impact of Silvertown Tunnel against this reference case in terms of changes in journey times (connectivity), changes in trip patterns and mode share (re-distribution and mode share) and changes in flows and delays (traffic assignment).

Reference case (2021)

6. The reference case represents 2021, and includes growth in population and employment from the 2009 London Plan. Population is expected to increase more rapidly in east and south east London than in other sub-regions.
7. The reference case also includes committed transport schemes. Public transport connectivity across east and southeast London improves because of planned investment including Crossrail. The Woolwich Ferry is assumed to have been enhanced with 30% additional capacity. The reference case does not include the Silvertown Tunnel.
8. From 2012 to 2021 the proportion of travel by car is expected to fall in Greenwich, Newham and Tower Hamlets, but the growth in population and employment result in an increase in total car trips. (See table below)

Morning peak hour (0800-0900) trips with an origin in Greenwich, Newham and Tower Hamlets

	2012 base trips (and mode share %)		2021 reference case trips (and mode share %)	
	Car	PT	Car	PT
Greenwich	26,200 (61.5%)	16,400 (38.5%)	29,700 (57.7%)	21,700 (42.3%)
Newham	20,000 (49.2%)	20,600 (50.8%)	22,400 (45.5%)	26,900 (54.5%)
Tower Hamlets	13,800 (39.9%)	20,900 (60.1%)	15,600 (37.9%)	25,500 (62.1%)
Sub-total	**60,000 (50.9%)**	**57,900 (49.1%)**	**67,600 (47.7%)**	**74,100 (52.3%)**
East sub-region[1]	**218,800 (56.4%)**	**169,200 (43.6%)**	**236,200 (54.2%)**	**199,300 (45.8%)**

9. This leads to large increases in flows across the strategic road network with increases in journey times and congestion. Flows across the Blackwall Tunnel are expected to change by a smaller amount because of capacity constraints.

Impacts of the Silvertown Tunnel (2021)

Change in connectivity

10. Queues at the Blackwall Tunnel are tidal in nature and therefore the implementation of the Silvertown Tunnel and user charging at the Blackwall and Silvertown Tunnels leads to the greatest journey time savings for northbound traffic in the morning peak and southbound traffic in the evening peak. In the northbound morning peak hour (0800-0900), for example, savings of 22 minutes are forecast from Lewisham to the Royal Docks.

11. This results in the largest connectivity benefits for residents south of the river and businesses north of the river. For example, significant proportion of Greenwich is estimated to see over 400,000 additional jobs accessible within a 45-minute highway travel time.

[1] Barking & Dagenham, Bexley, Greenwich, Lewisham, Hackney, Havering, Newham, Redbridge, Tower Hamlets, Waltham Forest

Trip distribution and mode shift

12. The Silvertown Tunnel is expected to only make a marginal change to mode shares because of the demand management effect of charging the Blackwall and Silvertown Tunnels.

13. The changes in connectivity, however, are expected to result in users changing their travel patterns. This effect is known as trip re-distribution. Work is under way to understand other impacts that could influence demand, such as related land use changes.

14. The forecast increase at Blackwall and Silvertown Tunnels combined is around 1,200 vehicles in the morning peak hour compared to the reference case. Most of this increase comes from the release of previously queued traffic at Blackwall (where delays are almost eliminated) and re-routeing of traffic that previously used other crossings. Re-distribution is likely to account for a small proportion of the increase, in the order of 200 vehicles. Daily (0600-2200) weekday traffic is expected to increase by around 4% northbound and 3% southbound.

15. Trips using the Blackwall and Silvertown Tunnels are mostly local journeys (defined as having at least one end in Tower Hamlets, Newham, Barking and Dagenham, Havering, Lewisham, Greenwich or Bexley). Blackwall Tunnel remains the preferred crossing for many strategic movements, such as the A2 to A12 and A406, and local cross-river movements. Silvertown Tunnel caters for more local trips to the Royal Docks as well as those into the City.

Traffic assignment

16. The increase in capacity provided by Silvertown Tunnel removes a bottleneck for northbound traffic in the morning peak and southbound in the evening peak.

17. Charging both tunnels helps to manage overall traffic levels on the surrounding network.

18. Across the host boroughs delays reduce by around 8% in the morning peak and 7% in the evening peak. Further work is required to look at mitigating increases in delay using more detailed local traffic modelling.

1. Introduction

Scope

1.1. Transport for London is proposing to construct twin bored tunnels under the River Thames between the Greenwich Peninsula and Silvertown ("the Silvertown Tunnel").

1.2. This report sets out the highway traffic forecasts for the proposed project incorporating a new Silvertown Tunnel road crossing and the introduction of user charges at this new crossing and the adjacent Blackwall Tunnel.

1.3. This report forms one of several documents for public consultation commencing in October 2014, and informs several of the supporting documents including the Introductory Transport Assessment. Traffic modelling work is continuing and outputs will be updated for the final Transport Assessment to be completed in spring 2015.

1.4. The traffic forecasting process has been carried out following a standard approach:

- The base year model (2012) has been calibrated to represent observed patterns of travel behaviour (refer to the accompanying Base Year Model Development and Validation Report and Base Year Model Audit for more information);
- Future year reference case models have been developed including background growth in population/employment and other committed developments, but without the Silvertown Tunnel project; and
- Future year models including the Silvertown Tunnel and any relevant sensitivity tests.

Description of traffic models

1.5. Transport for London (TfL) has used the London Regional Demand Model (LoRDM) to forecast the demand and traffic impacts of several options to provide new river crossings in east and southeast London. LoRDM uses population and employment figures (as contained in the Mayor's 2009 London Plan) as well as assumptions from Government on economic growth to predict overall travel demand on both public transport and the highway network. The LoRDM model also estimates highway and public transport network conditions. On the highway side, LoRDM includes TfL's River Crossings Highway Assignment Model (RXHAM) which represents the highway network in detail to determine the strategic routeing of trips between their origins and destinations. It is TfL's position that the LoRDM and RXHAM models are appropriate and robust tools for the purpose of assessing the Silvertown Tunnel project.

1.6. It is recommended practice to present traffic forecasts for the proposed scheme opening year, one intermediate year, and a future design year. In the case of the Blackwall-Silvertown Crossing, the scenarios have been tested using traffic models for 2021 and 2031. The final submission in spring 2015 will also include a 2041 forecast. This report illustrates comparisons between model scenarios using the 2021 model, although the final submission will include a technical forecasting report covering all model years.

1.7. The process of model development and review is ongoing and the forecasting outputs will be updated for the final Transport Assessment in spring 2015. The model development process has included:

- The commissioning of a major traffic counts programme (120 sites) across East and South East London to update the base year highway assignment model; and
- A review of the base year assignment model by an independent consultant (SDG) working on behalf of the local boroughs, which concluded that the model was "fit for the purpose of identifying changes in strategic movements in and around East London should a new crossing be introduced or, for example, if charges for use of existing crossings were to be imposed".

1.8. Once a further enhanced version of the assignment model is available, this will also be reviewed independently, as well as the future year reference case and the performance of the model with regards to modelling potential scenarios.

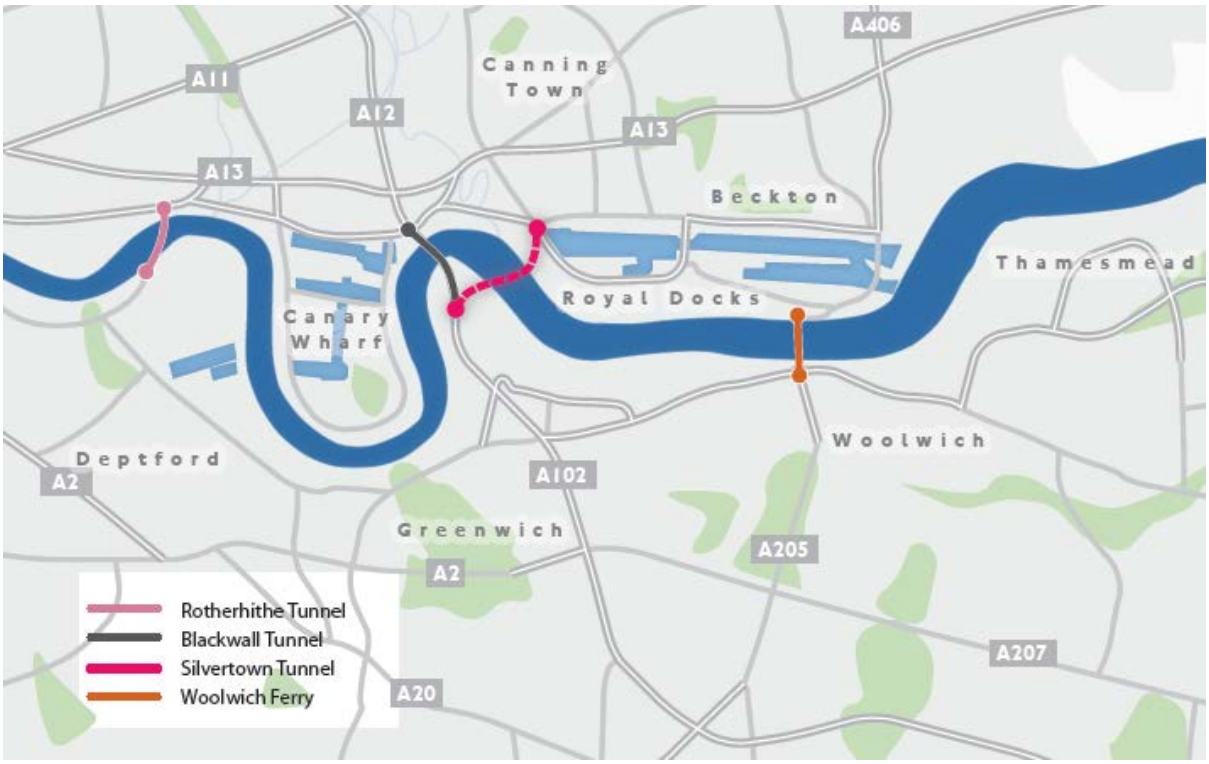
1.9. **It should be noted that LoRDM and RXHAM are strategic transport models and are used to identify broad changes in traffic patterns across the highway network, as well as the magnitude of this change. Local traffic models which will provide a more detailed representation of traffic flows at individual junctions closer to the Blackwall and Silvertown Tunnels are currently being developed by TfL. Also the models do not yet assume any network mitigation measures that might be introduced such as changes to junction capacities or new traffic management measures.**

1.10. Traffic forecasts will be updated if population and employments forecasts as contained in the Mayor's London Plan are revised.

Project description

1.11. The Silvertown Tunnel scheme is made up of twin bored tunnels running between the Blackwall Tunnel Southern Approach on the Greenwich Peninsula to the Tidal Basin roundabout in the Royal Docks area. Figure 1-1 shows a map / image of the proposed tunnel.

Figure 1-1: Overview of Silvertown Tunnel location



1.12. The tunnel scheme forms the central case assessed within this report. The key elements of the central case are:

- Twin tunnels creating a dual two-lane cross-river connection;
- One lane in each direction used by any type of vehicle, the other by buses and goods vehicles only;
- User charging to manage demand for the Blackwall and Silvertown Tunnels and their approach routes; and
- Dimensional standards in the Silvertown Tunnel providing access to all vehicle types including double-decker buses and normal maximum height goods vehicles.

1.13. It is assumed for the purpose of this assessment that the Woolwich Ferry continues to operate, albeit as a new ferry with 30% extra capacity and charges consistent with the Blackwall and Silvertown tunnels[2].

1.14. The rationale for charging the Silvertown and Blackwall Tunnels is set out in the accompanying *Outline strategy for user charging at Blackwall and Silvertown Tunnels*.

[2] For the purpose of traffic modelling, the reason for this assumption is that by 2031 Woolwich Ferry would need to either be upgraded at its existing location or replaced with a new crossing. Other crossings east of Silvertown Tunnel are subject to a separate decision-making process. If the Woolwich Ferry were to be upgraded at its existing location, the modelling assumes that it would be charged to ensure consistency with the Blackwall, Silvertown and Dartford Crossings. The assumption about the existing and potential future capacity of the Woolwich Ferry has little material impact on the forecasts for Silvertown Tunnel.

At this point in time the proposed charging strategy is under development. Therefore the central case model charges do not represent a preferred strategy but instead a reasonable estimate for the purpose of assessing the wider traffic, environmental and other impacts.

1.15. The proposed user charges in the central case traffic model have been defined using the charges paid at the Dartford Crossing as a benchmark. The cash and Dart Tag charges that will be applied to the Dartford Crossing from November 2014 are shown in Table 1.1. The modelled Dartford rate charges take into account the proportion of Dart Tag discount users by vehicle class.

Table 1.1: Dartford charge rates by user class

	Dartford cash charges from November 2014	Dartford Tag charges from November 2014	Modelled Dartford rate charges in 2012 prices
Car	£2.50	£1.33	£1.77
Van	£3.00	£2.19	£2.54
HGV	£6.00	£4.33	£4.38

1.16. It is assumed that these charges will increase over time, broadly in line with inflation and will reflect planned increases as set out by the DfT. For the purposes of TfL's modelling of the impacts of the proposed river crossing the charges in Table 1.2 have been applied at Blackwall, Silvertown and Woolwich Ferry.

Table 1.2: Modelled charge rates by time period and direction

	Northbound	Southbound
Morning peak	Dartford rate	50% Dartford rate
Inter-peak	50% Dartford rate	50% Dartford rate
Evening peak	50% Dartford rate	Dartford rate

1.17. This central case traffic model forms the basis for all of the assessments prepared for the October 2014 consultation. However, further testing of alternative charges is being undertaken to assess the various impacts.

1.18. Traffic forecasts were also prepared for different charging scenarios, including where the Silvertown and Blackwall Tunnels have no user charging, a scenario where the Silvertown Tunnel is charged but the Blackwall Tunnel is not, and a sensitivity test with higher charging in the peak direction. The results of these forecasts are presented in Appendix B of this report.

1.19. It is assumed in the central case forecasts that the Woolwich Ferry will continue to operate in the future, albeit as a new ferry with 30% extra capacity and charges consistent with the Blackwall and Silvertown Tunnels. A separate consultation has recently concluded on proposals for additional river crossings to the east of Silvertown. The results of these models are presented in Appendix C of this report. Also it should be noted that previous analysis undertaken to examine the potential impact of a Lower Thames Crossing as proposed by the DfT would have minimal impact on Blackwall and Silvertown.

Structure of traffic modelling outputs

1.20. TfL has modelled the impact of a number of potential river crossing options for the years 2021 and 2031. The focus is on the weekday morning peak hour (08:00-09:00), however, results are also provided for some indicators for an average one hour period in the inter-peak (from 10:00-16:00), and for the evening peak hour (17:00-18:00).

1.21. This report first presents the expected change between the observed base year (2012) and a future reference case year (2021). The potential opening year for the Silvertown Tunnel is likely to be in the early 2020's. This report subsequently focuses on how the proposed Silvertown Tunnel and charging of the Blackwall and Silvertown Tunnels impacts the highway network. In both cases the report will address the following themes:

a) Connectivity – how journey times change as a result of the new crossing;

b) Distribution and mode shift – how road users change their trip patterns and mode; and

c) Assignment – which routes are used by people in making their journey taking into account the new crossing, and the resulting flows and delays.

This report sets out the latest strategic traffic forecasts for Silvertown Tunnel including user charges at both Blackwall and Silvertown Tunnels.

The Silvertown Tunnel is assumed to consist of twin bored tunnels running between Blackwall Tunnel Southern Approach on the Greenwich Peninsula and the Tidal Basin roundabout in the Royal Docks area.

For the purposes of this analysis, user charges are assumed to apply at the Dartford rates in the peak direction in the peak period and at half that rate in other modelled time periods/directions. The charge is assumed to increase in line with DfT assumptions in the future.

The work uses TfL's London Regional Demand Model (LoRDM) to forecast the demand and traffic impacts. An independent review of the base year LoRDM found that the model was fit for purpose.

The report first considers traffic conditions in a 2021 reference case without the Silvertown Tunnel. It then examines the impact of Silvertown Tunnel against this reference case in terms of changes in journey times (connectivity), changes in trip patterns and mode share (re-distribution and mode share) and changes in flows and delays (traffic assignment).

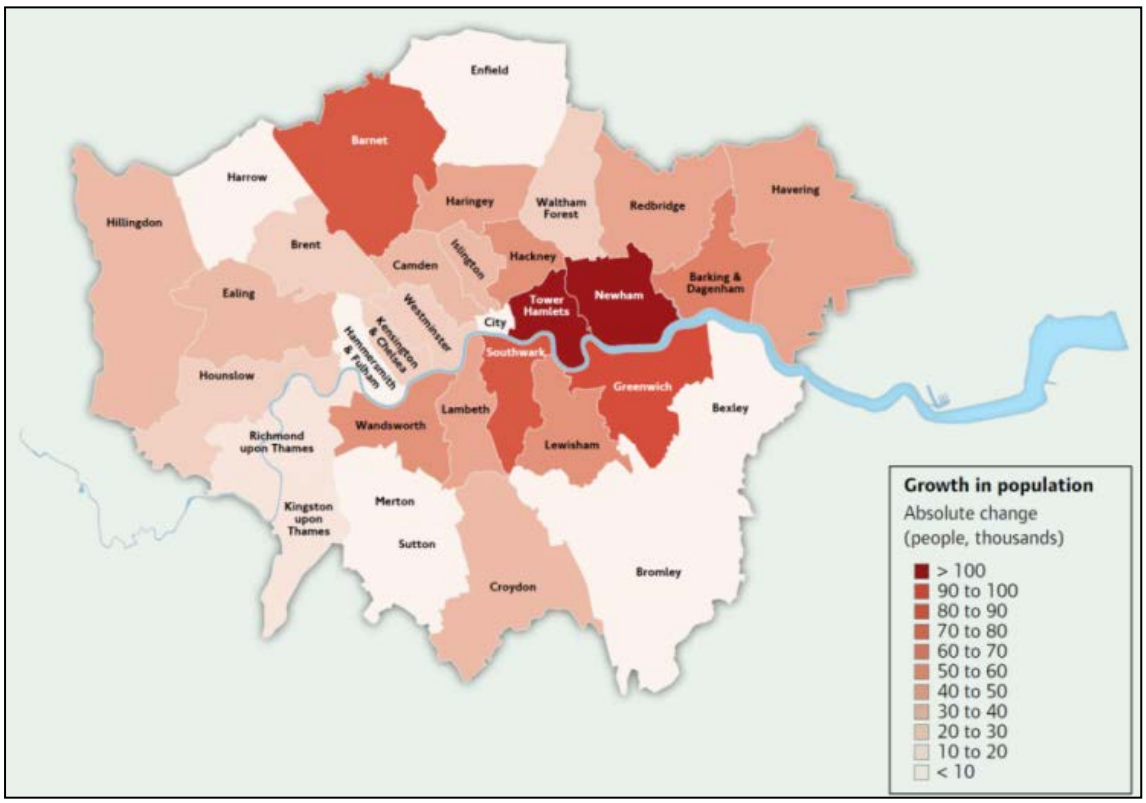
2. Reference case (2021)

2.1. The Silvertown Tunnel scheme is evaluated against an assumed future 2021 reference case ("Do-Minimum") scenario. The reference case represents an estimate of likely transport patterns in the future without the introduction of the Silvertown Tunnel project. While proposals to the east of Silvertown are outside the scope of this assessment, the reference case includes an assumption that the Woolwich Ferry will be replaced (retained as a free service with 30% additional capacity).

Population and employment forecasts

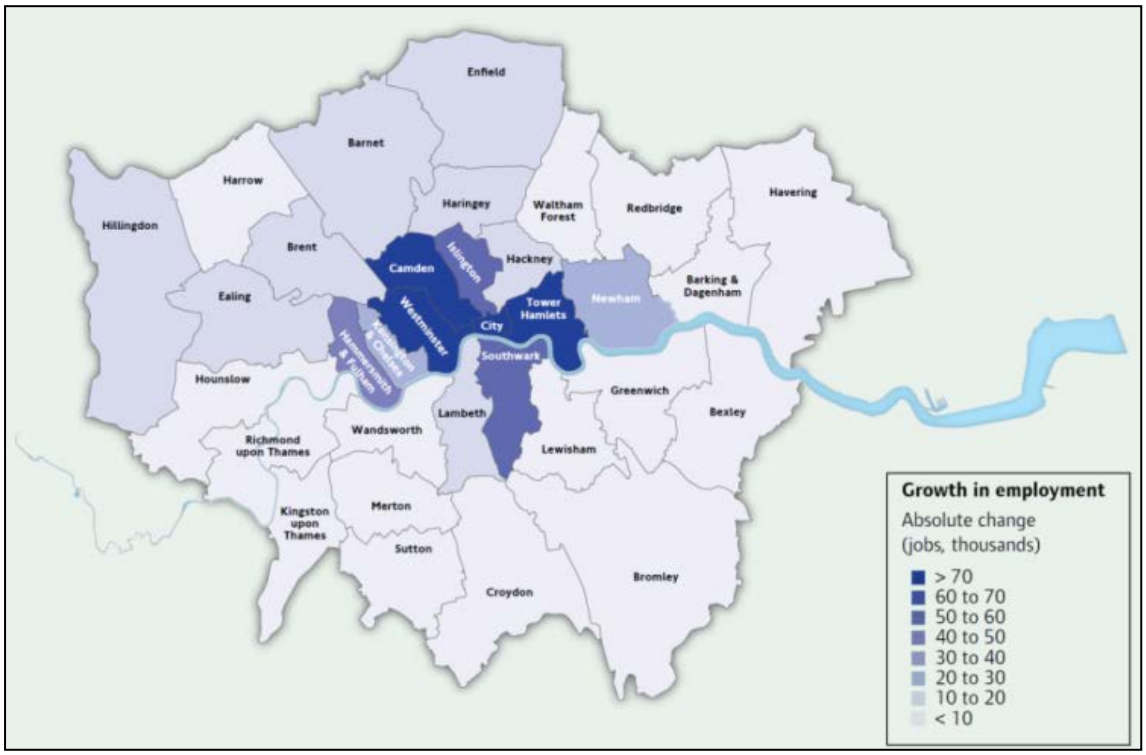
2.2. The 2021 and 2031 reference cases incorporate forecast changes in population and employment (as contained in the Mayor's 2009 London Plan). This document anticipates that population growth between 2011 and 2031 in the east and southeast sub-region will be considerably more rapid than in the other sub-regions. GLA forecasts predict that London's population will grow by around 1,150,000 people (or 14 percent) between 2011 and 2031, as shown in Figure 2-1.

Figure 2-1: Forecast changes in London's population, 2006 to 2031



2.3. The London Plan also forecasts an additional 750,000 jobs by 2031 across London, with around 20 percent of these jobs in the east and south east London sub-region, as shown in Figure 2-2.

Figure 2-2: Forecast changes in London's employment, 2006 to 2031



Changes to transport networks between 2012 and 2021

2.4. The Reference Case includes assumptions regarding the development of the transport network. On the highway network there are three main sets of changes from the 2012 base year:

1) the junctions of the A206 Woolwich Road / Gallions Road and Gallions Road / Bugsby's Way have been converted from priority control to signal control;

2) the road network in the Olympic Park area of Stratford changes significantly from 2012 with the addition of many new links for through traffic; and

3) the reference networks include increases to the capacity of the Dartford Crossing resulting from the introduction of free-flow electronic charging.

2.5. Public transport changes include upgrade schemes for National Rail (including Crossrail and Tilbury & Southend) and DLR/ LUL. A full list of public transport assumptions is included in Appendix A. Note that the public transport network in the base model is factored up from a 2007 model, and therefore the reference case includes schemes from the years 2008-2011.

Modelled forecasts from 2012 to 2021

Trip volumes and mode share

2.6. Forecast changes in travel demand are driven primarily by the forecast increase in population and employment within London and across the southeast of England. The boroughs adjacent to the Blackwall and Silvertown Tunnels (Greenwich, Newham and

Tower Hamlets) are also expected to see a continued increase in the public transport mode share as a result of continued investment including the opening of Crossrail.

2.7. Table 2.1 records the predicted change in the number of morning peak trips with an origin or destination in Greenwich, Newham and Tower Hamlets by mode. The definition of car trips includes those driving a car or van and those travelling as passengers. The definition of public transport (PT) trips includes travel by bus, DLR, Underground and National Rail. The 2012 base trips match the mode shares from the London Travel Demand Survey well.

2.8. While the proportion of travel by car and van is predicted to fall in these boroughs (from 51% to 48%), the absolute number of car trips is expected to rise as a result of population and employment growth (from 60,000 to around 68,000 in the morning peak hour).

Table 2.1: Morning peak hour (0800-0900) trips with an origin in Greenwich, Newham and Tower Hamlets

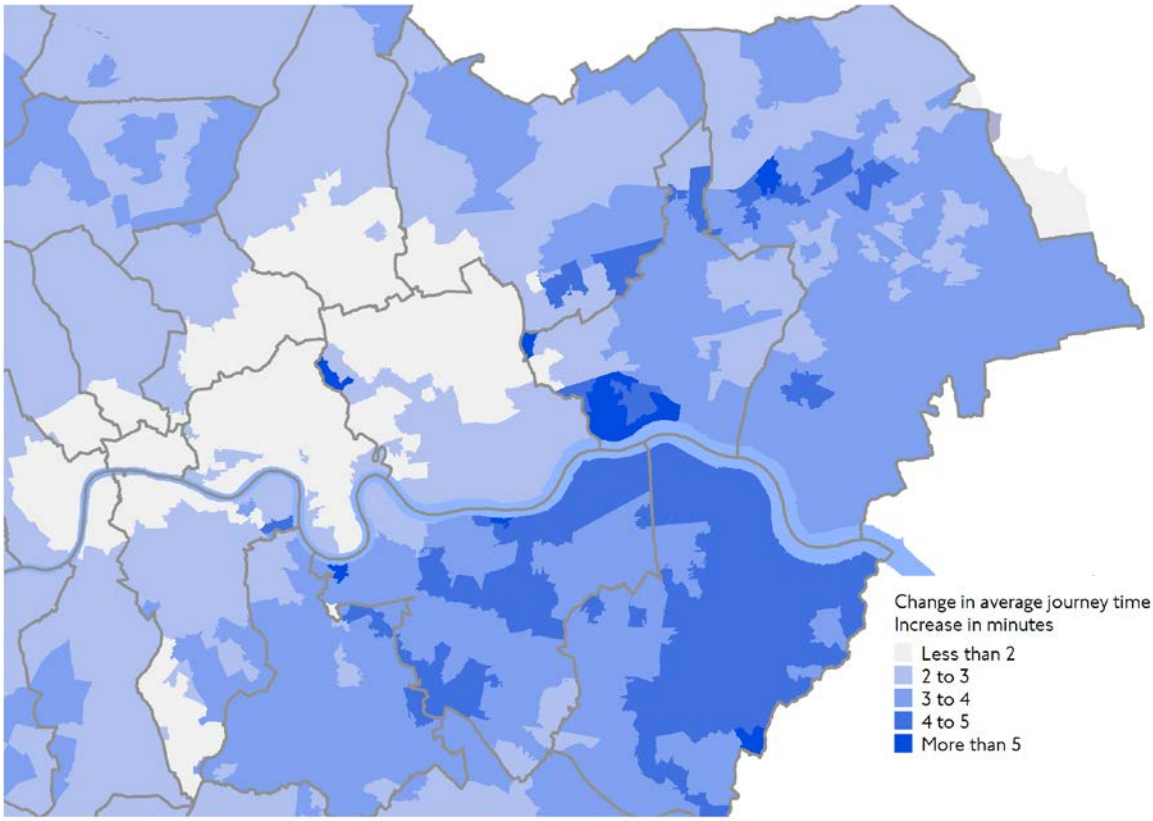
	2012 base trips (and mode share %)		2021 reference case trips (and mode share %)	
	Car	PT	Car	PT
Greenwich	26,200 (61.5%)	16,400 (38.5%)	29,700 (57.7%)	21,700 (42.3%)
Newham	20,000 (49.2%)	20,600 (50.8%)	22,400 (45.5%)	26,900 (54.5%)
Tower Hamlets	13,800 (39.9%)	20,900 (60.1%)	15,600 (37.9%)	25,500 (62.1%)
Sub-total	**60,000 (50.9%)**	**57,900 (49.1%)**	**67,600 (47.7%)**	**74,100 (52.3%)**
East sub-region[3]	**218,800 (56.4%)**	**169,200 (43.6%)**	**236,200 (54.2%)**	**199,300 (45.8%)**

Connectivity

2.9. The changes in flows and delays modelled are predicted to impact upon highway journey times across east and southeast London. Figure 2-3 shows the change in highway connectivity between 2012 and 2021. This is a measure of the average journey time from all model zones in London to each model zone. Average journey times to each zone generally increase in east and southeast London due to increased congestion. The largest increases are mainly in southeast London boroughs.

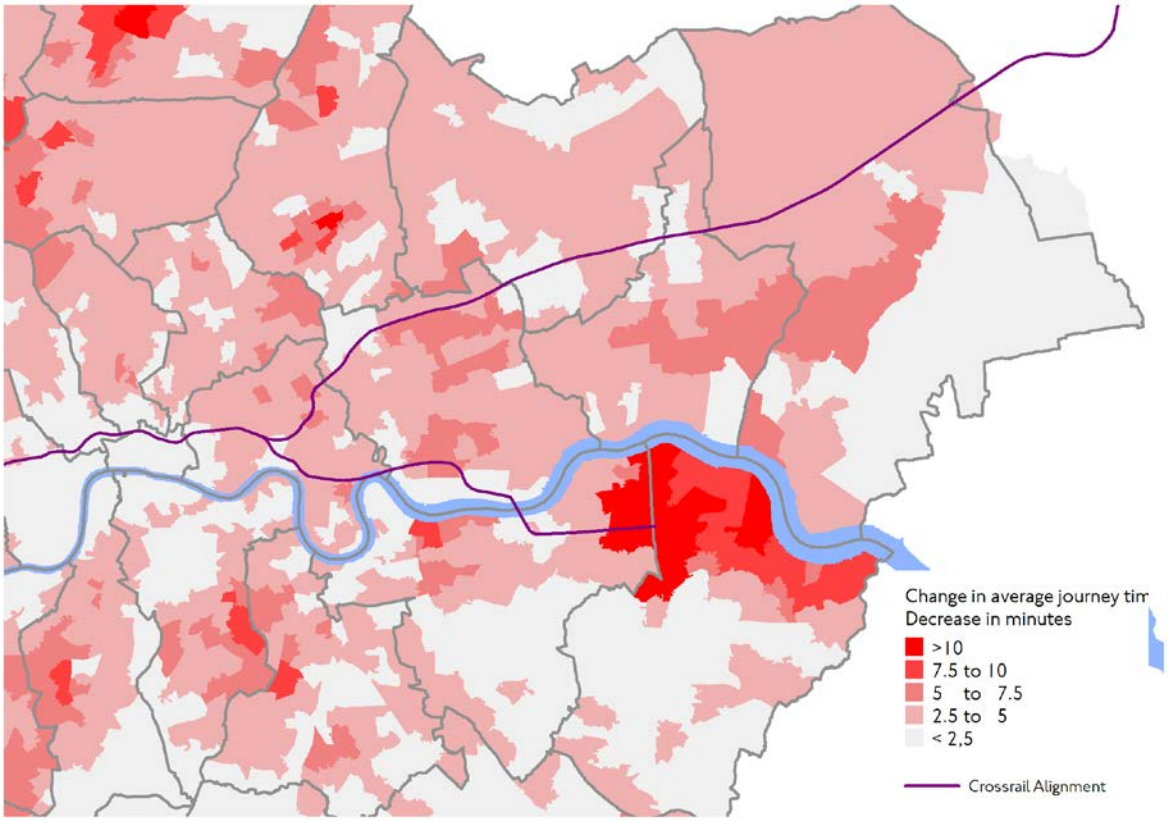
[3] Barking & Dagenham, Bexley, Greenwich, Lewisham, Hackney, Havering, Newham, Redbridge, Tower Hamlets, Waltham Forest

Figure 2-3: Change in average highway journey time to each zone (morning peak hour, change from 2012 to 2021)



2.10. The increase in highway journey times is in stark contrast to the decreases in journey times achieved by the ongoing improvements in public transport. Figure 2-4 shows the change in public transport connectivity between 2012 and 2021 (change in average morning peak journey times to each zone) attributable to public transport investment. The largest reduction in journey times is seen along the Crossrail alignment at Abbey Wood where opening of the new line results in significant improvements in connectivity.

Figure 2-4: Change in average public transport journey times to each zone (morning peak hour, change from 2012 to 2021)[4]



Traffic flows and delays

2.11. Figure 2-5 shows the change in traffic flows in the morning peak hour across east and southeast London from 2012 to 2021. It can be seen that there are large increases in flows across the strategic road network, e.g. A13, North Circular, A102, A2 and M25 and to a lesser extent across large sections of the road network. Since the Blackwall Tunnel is currently operating at capacity already the predicted change in the tunnel itself is smaller than surrounding roads. Figure 2-6 shows an example of existing northbound queues on the A102 Blackwall Tunnel Approach.

[4] Note that Woolwich Arsenal Crossrail station is not included in this version of the public transport network but will be included in the version used for the final submission.

Figure 2-5: Flow changes on the road network in the morning peak hour (0800-0900) from 2012 to 2021

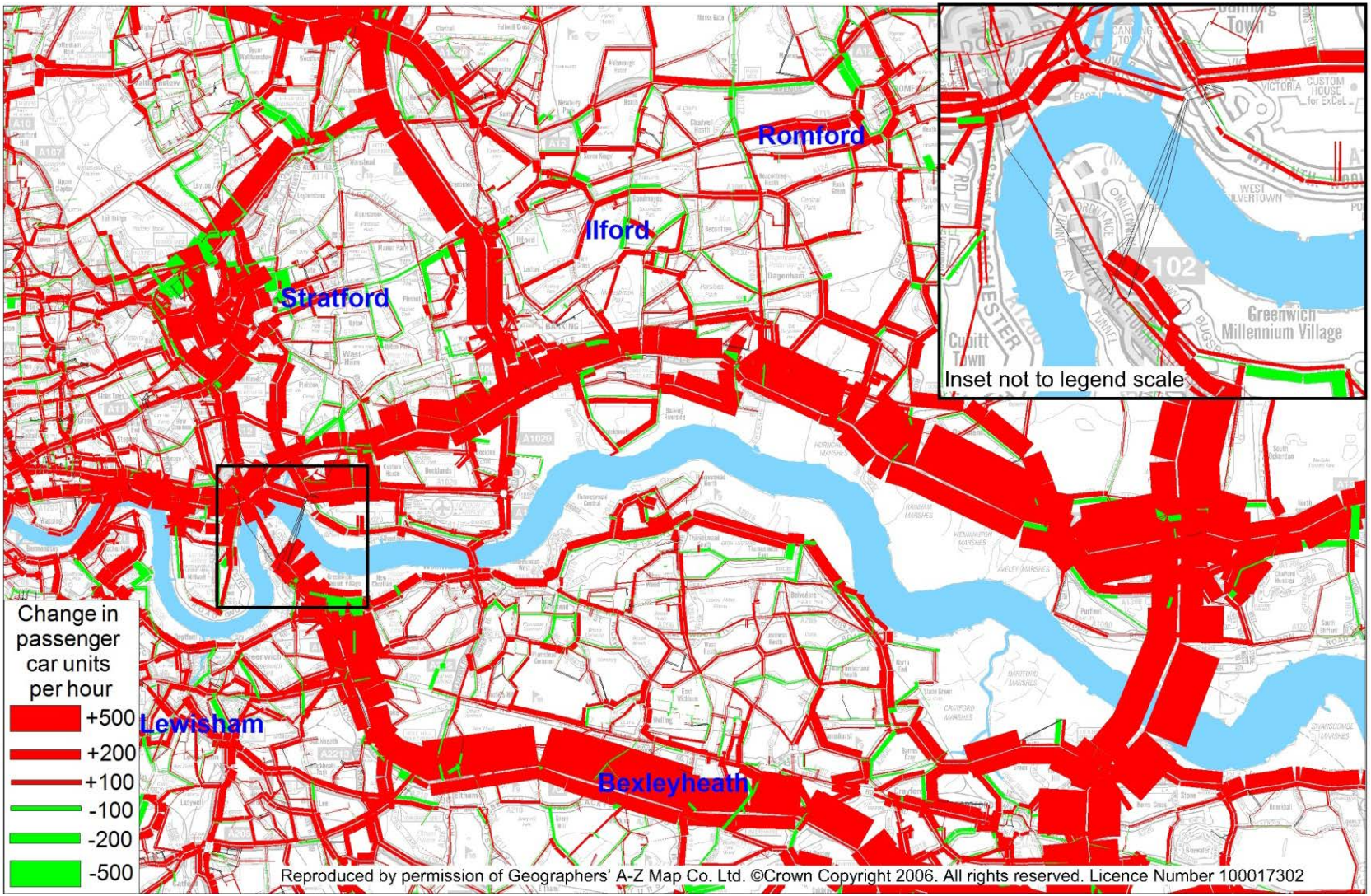


Figure 2-6: A102 Blackwall Tunnel Approach

2.12. Figure 2-7 shows the impact of increased traffic flow has on junction delay between 2012 and 2021 in the morning peak hour (0800-0900). Increases in delay can be seen across the highway network as a result of increased traffic flows. Some of the largest increases in junction delay occur on the A13, M25, A2 and the northbound approaches to the Blackwall Tunnel.

2.13. Figure 2-8 shows the change in traffic flows in the inter-peak (average hour) across east and southeast London from 2012 to 2021. As in the morning peak, there are large increases in flows across the strategic road network, e.g. A13, North Circular, A102, A2 and M25 and to a lesser extent across large sections of the network.

2.14. Figure 2-9 shows the impact that the forecasts increases in traffic flow have on junction delay between 2012 and 2021 in the inter-peak (average hour). Increases in delay can be seen across the highway network as a result of increased traffic flows. Compared to the morning peak the level of increase in delay is smaller reflecting the lower levels of traffic on the network in the inter-peak period.

2.15. Figure 2-10 shows the change in traffic flows in the evening peak across east and south east London from 2012 to 2021. As in the morning and inter-peaks, there are large increases in flows across the strategic road network, e.g. A13, North Circular, A102, A2 and M25 and to a lesser extent across whole sections of the network.

2.16. Figure 2-11 shows the impact that the increase in traffic flow has on junction delay between 2012 and 2021 in the evening peak hour. Increases in delay can be seen across the highway network as a result of increased traffic flows. Some of the largest increases in junction delay occur on the A13, M25, A2 and southbound approaches to the Blackwall Tunnel.

Figure 2-7: Junction delay changes in the morning peak hour (0800-0900) from 2012 to 2021

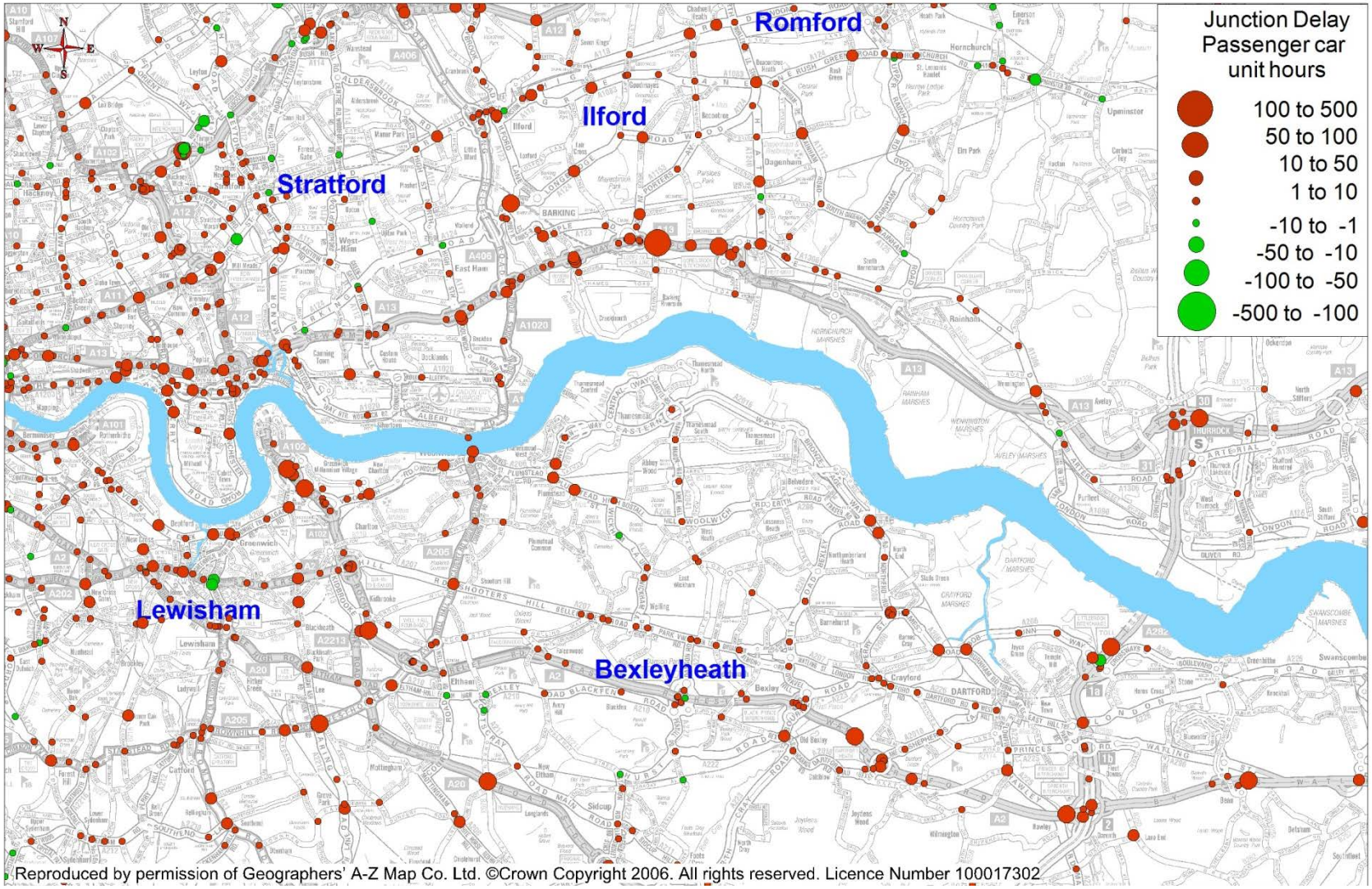


Figure 2-8: Flow changes on the road network in the inter-peak (average hour) from 2012 to 2021

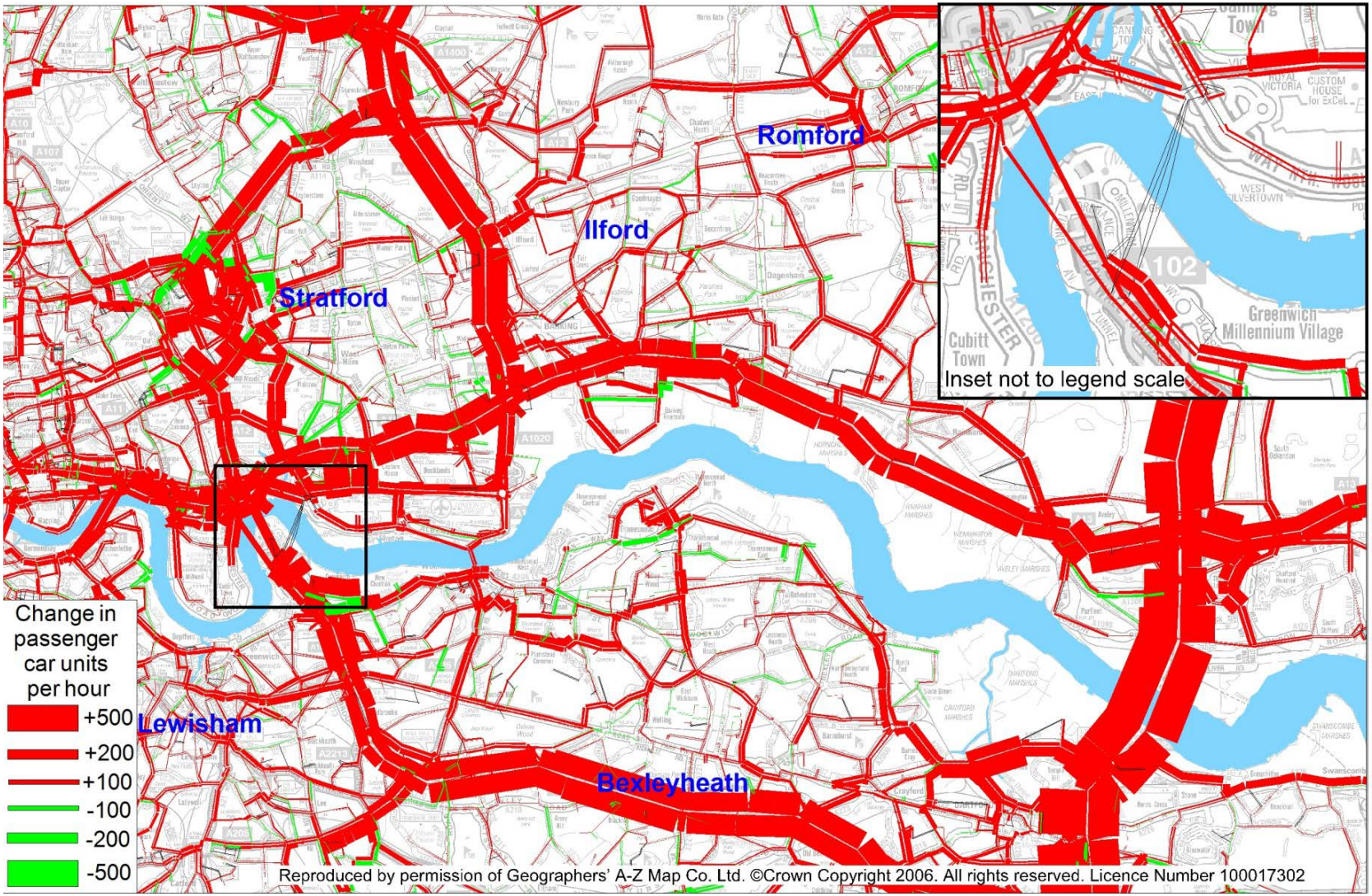


Figure 2-9: Junction delay changes in the inter-peak (average hour) from 2012 to 2021

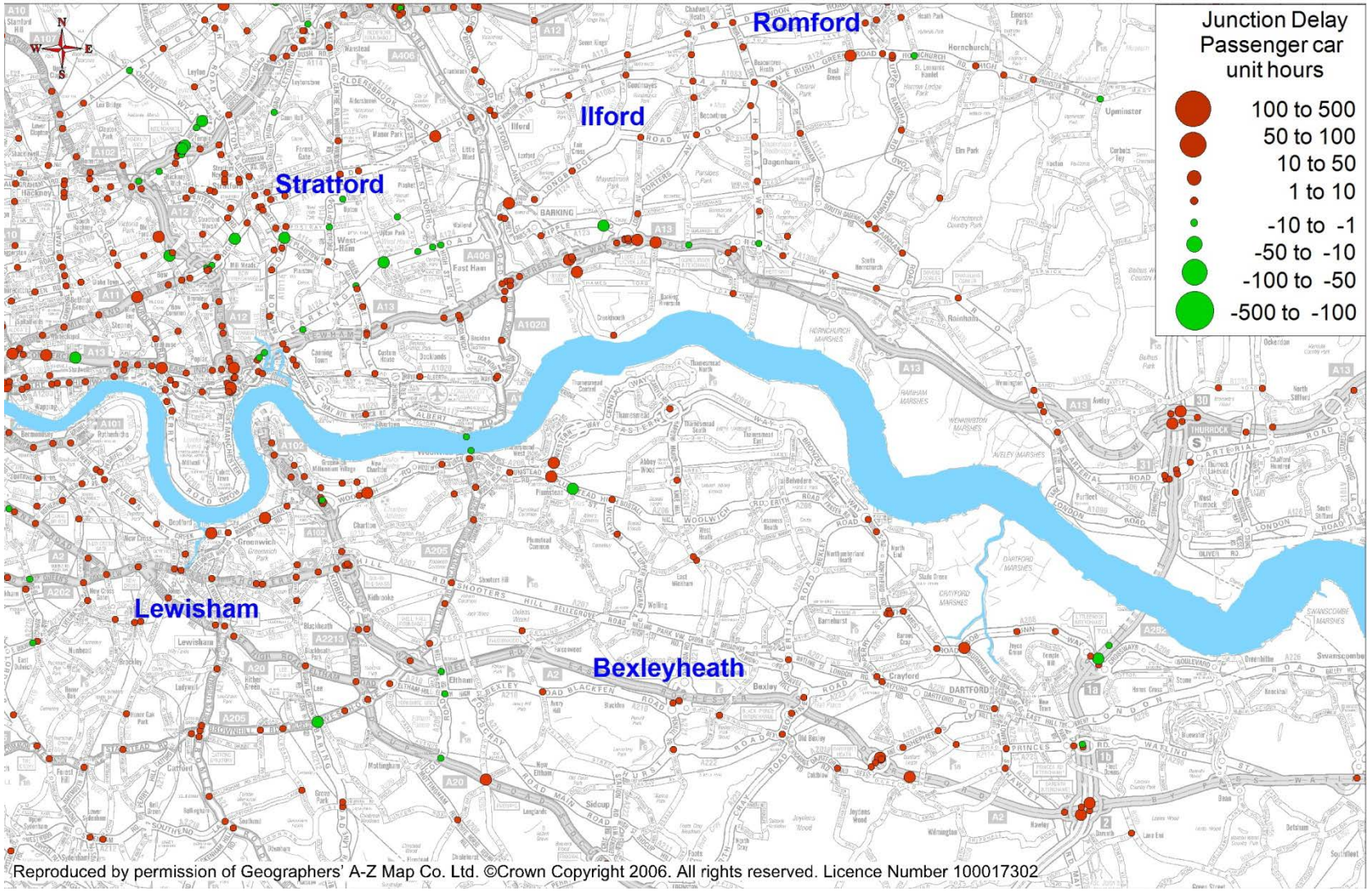


Figure 2-10: Flow changes on the road network in the evening peak hour (1700-1800) from 2012 to 2021

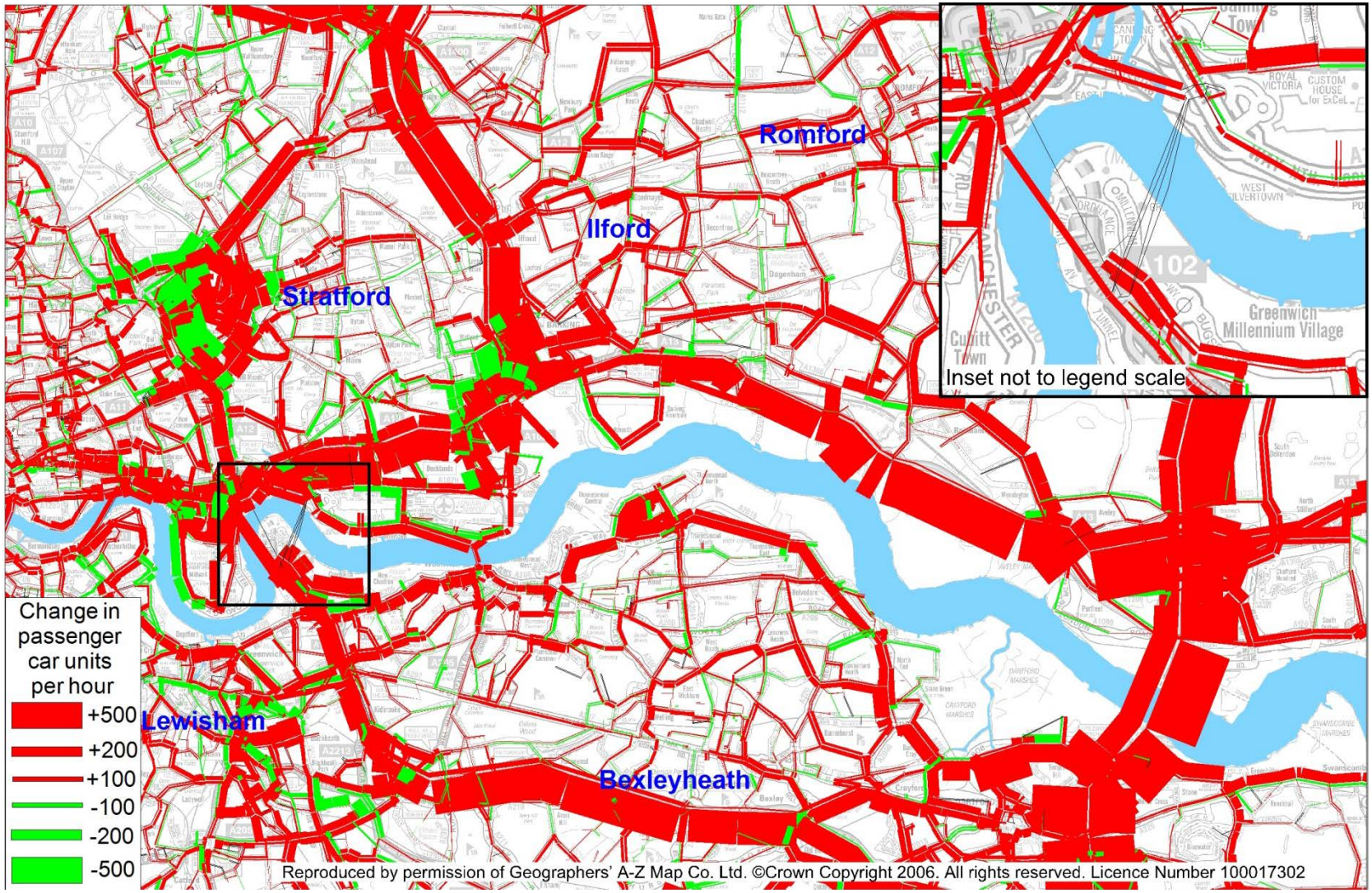
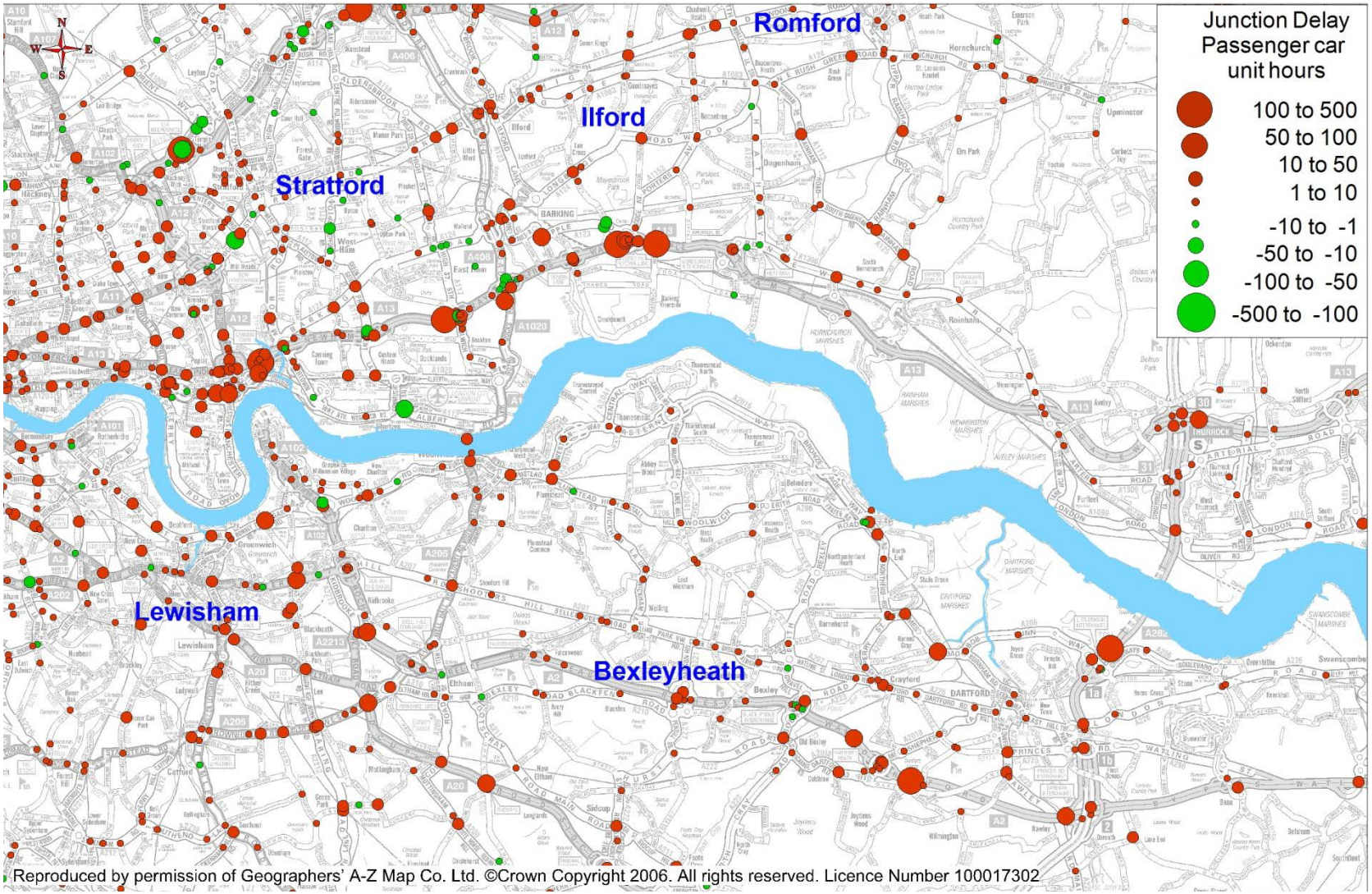


Figure 2-11: Junction delay changes in the evening peak hour from 2012 to 2021



2.17. Statistics aggregated to borough-level are a useful way to summarise the impacts at numerous junctions into an area-wide indicator. Changes in vehicle delays can be expressed as 'delay PCU hours', a measure which represents the sum of delay to all vehicles expressed in passenger car units (PCUs)[5]. Table 2.2 presents the forecast change in total delay PCU-hours by borough in the East sub-region.

Table 2.2: Borough-level journey delay statistics (2012 to 2021 reference case)

Borough	Change in total PCU-delay-hours (morning peak hour, 2012-2021)	Change in total PCU-delay-hours (evening peak hour, 2012-2021)
Greenwich	+26%	+28%
Newham	+15%	+18%
Tower Hamlets	+29%	+29%
Host boroughs	**+24%**	**+30%**
Barking & Dagenham	+31%	+32%
Bexley	+27%	+23%
Hackney	+19%	+10%
Havering	+19%	+25%
Lewisham	+23%	+32%
Redbridge	+29%	+43%
Waltham Forest	+15%	+24%
East sub-region	**+24%**	**+27%**

The reference case represents 2021, and includes growth in population and employment from the 2009 London Plan. Population is expected to increase more rapidly in east and south east London than in other sub-regions.

The reference case also includes committed transport schemes. Public transport connectivity across east and southeast London improves because of planned investment including Crossrail. The Woolwich Ferry is assumed to have been enhanced with 30% additional capacity. The reference case does not include the Silvertown Tunnel.

From 2012 to 2021 the proportion of travel by car is expected to fall in Greenwich, Newham and Tower Hamlets, but the growth in population and employment result in an increase in total car trips.

This leads to large increases in flows across the strategic road network with increases in journey times and congestion. Flows across the Blackwall Tunnel are expected to change by a smaller amount because of capacity constraints.

[5] Traffic is composed of various types of vehicles, the range and relative composition of which can vary from location to location. Traffic modelling software frequently utilises a common unit, known as the Passenger Car Unit (PCU), to represent general traffic. Common vehicle types are assigned a conversion factor so that an equivalent PCU value can be generated from classified vehicle data collected. For example, typical values include 0.4 for a motorcycle, 1.0 for a passenger car and 2.0 for buses and coaches.

3. Silvertown Tunnel: Changes in connectivity

3.1. The Silvertown Tunnel improves journey times for a range of cross-river journeys. Table 3.1 shows the number of minutes saved for selected journeys from south to north of the River Thames and vice versa in the morning peak hour in 2021 with the Silvertown Tunnel (central case) compared to the reference case without any new river crossings. Time savings are achieved by providing more direct connections between origins and destinations and by reducing congestion. It should be noted that for this connectivity analysis the quickest route between an origin and destination may not be via the new infrastructure to be provided.

3.2. For northbound journeys, large time savings of between 10 and 25 minutes are forecast between places such as Lewisham and Stratford, as well as Charlton to the Royal Docks. These journey time savings occur as the result of a more direct route, to the Royal Docks in particular, as well as the elimination of the majority of queues on the northbound approach. Due to less congestion impacting southbound trips in the morning peak (evening is the peak direction where larger savings would be expected), lower time savings are forecast with a reduction of between 1 and 5 minutes estimated.

Table 3.1: Journey time savings with Silvertown and Blackwall Tunnels (both tunnels charged, morning peak hour 0800-0900, 2021, in minutes)

Northbound	To Stratford	To Royals	To Canary Wharf
Lewisham	13	22	16
Charlton	15	23	17

Southbound	To Lewisham	To Charlton
Stratford	1	1
Royals	4	3
Canary Wharf	3	2

3.3. Table 3.2 shows the equivalent number of minutes saved for selected journeys cross-river journeys in the evening peak hour in 2021 with the Silvertown Tunnel (central case) compared to the reference case without any new river crossings. This shows the greatest benefits for southbound journeys.

Table 3.2: Journey time savings with Silvertown and Blackwall Tunnels (both tunnels charged, evening peak hour 1700-1800, 2021, in minutes)

Northbound	To Stratford	To Royals	To Canary Wharf
Lewisham	2	9	4
Charlton	1	9	3

Southbound	To Lewisham	To Charlton
Stratford	16	16
Royals	19	20
Canary Wharf	5	17

3.4. Two other measures of connectivity can be calculated for the assessment of the Silvertown Tunnel project:

- Access to jobs – the number of jobs within a specified travel time provides an indication of how attractive a place might be as a residential location; and
- Access to economically active population – the number of potential employees within a specified travel time provides an indication of how attractive a place might be to businesses in terms of their potential labour catchment.

3.5. Maps have been produced showing changes in access to economically active population and jobs within 45 mins travel time for both highway and public transport trips. Public transport connectivity plots are not shown in this section but the Introductory Transport Assessment includes a discussion of past and potential future improvements to cross-river public transport. All plots in this section therefore focus on highway journey times. The changes in connectivity are shown comparing the reference case with the Silvertown Tunnel central case scenario in 2021.

3.6. Figure 3-1 shows the change in the number of jobs accessible within 45 minutes by zone (morning peak hour in 2021). It can be seen that increases in connectivity occur south of the Thames in Greenwich, Lewisham, Bexley and Bromley. A significant proportion of Greenwich is estimated to see over 400,000 additional jobs accessible within a 45-minute travel time. There are smaller but still quite significant changes in parts of Lewisham and Bexley of between 100,000 and 400,000 potential jobs. The improvement in access to jobs for communities to the north of the river is much less marked because the change in southbound journey times in the morning peak hour is less and because there is less employment on the south side of the river.

3.7. Figure 3-2 shows the change in the number of economically active people accessible within 45 minutes by zone (morning peak hour 0800-0900 in 2021). This measure can be used as a proxy for the potential attractiveness of a location for businesses being able to access a large workforce. The largest gains are north of the River Thames in parts of Newham and Tower Hamlets, the two areas closest to the new crossing.

3.8. The plots show the potential for the Silvertown Tunnel to support growth in east and southeast London by improving river crossing connectivity. Due to the tidal nature of flows at Blackwall, the connectivity benefits are greatest for residential areas south of the Thames and employment areas north of the river.

Figure 3-1: Change in jobs accessible within 45 mins by zone with the Silvertown and Blackwall Tunnels (both charged, morning peak hour 0800-0900 in 2021)

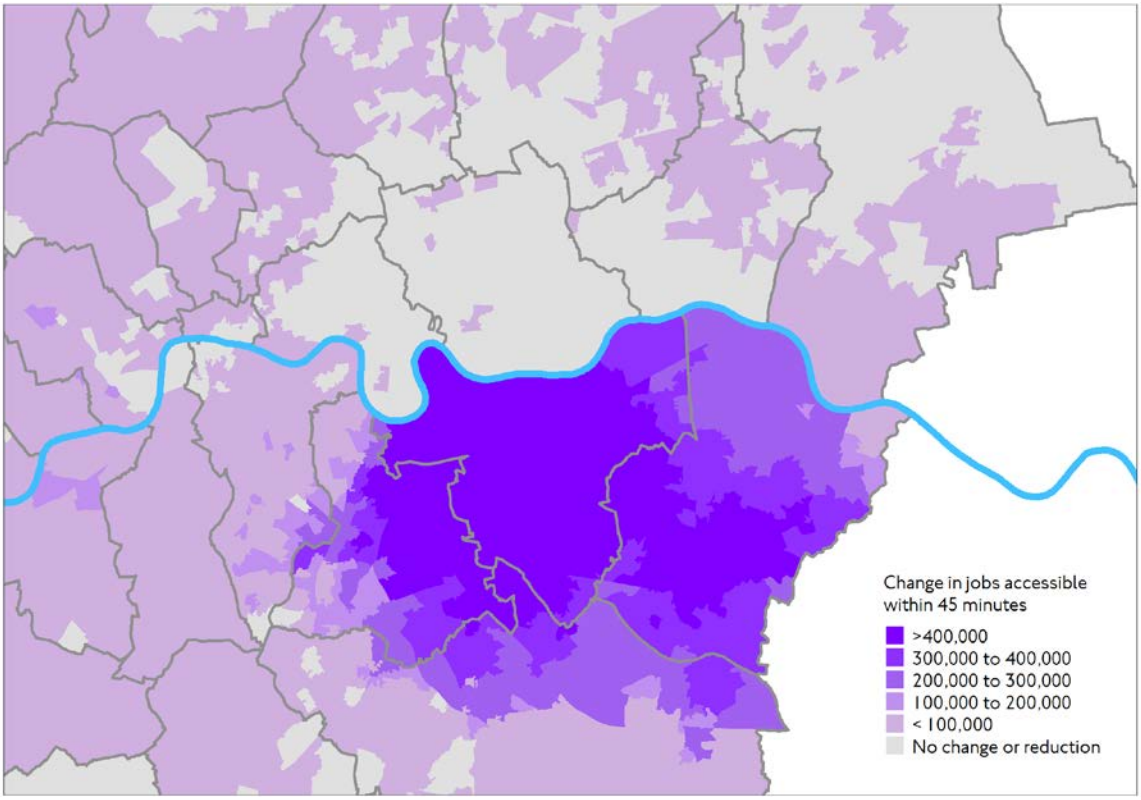
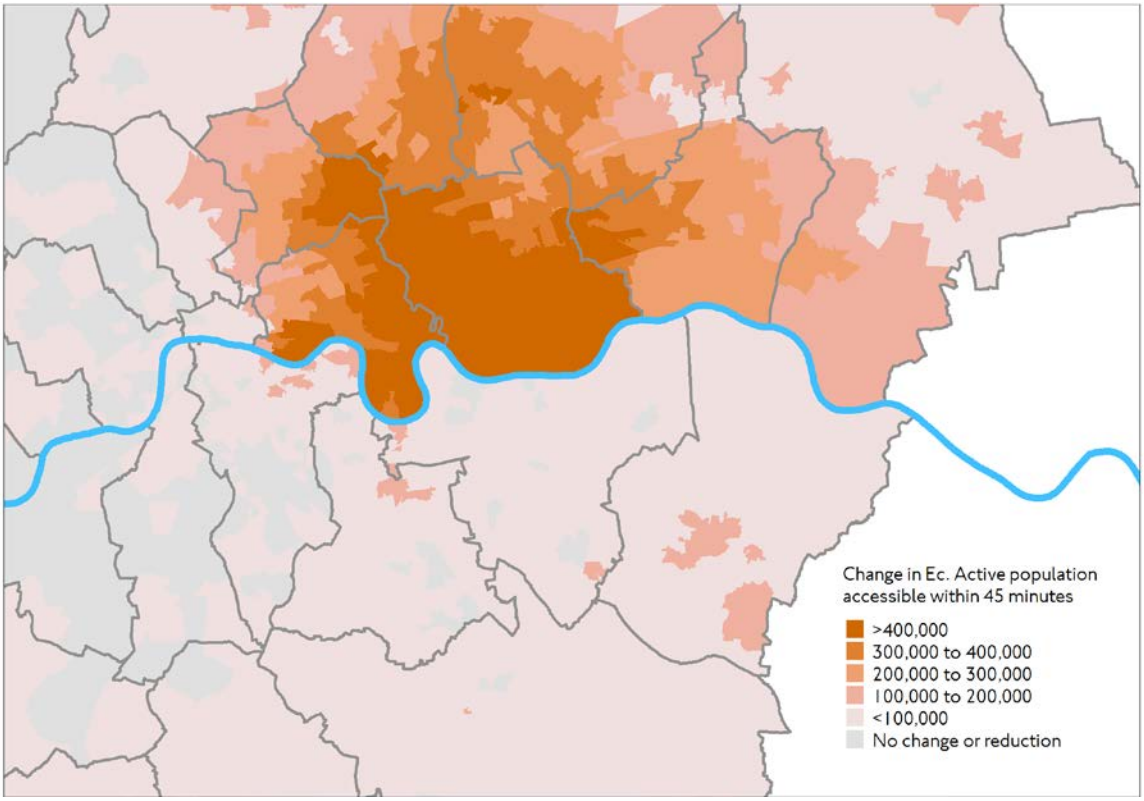


Figure 3-2: Change in economically active population within 45 mins by zone with the Silvertown and Blackwall Tunnels (both charged, morning peak period 0800-0900 in 2021)



Queues at the Blackwall Tunnel are tidal in nature and therefore the implementation of the Silvertown Tunnel and user charging at the Blackwall and Silvertown Tunnels leads to the greatest journey time savings for northbound traffic in the morning peak and southbound traffic in the evening peak. In the northbound morning peak hour (0800-0900), for example, savings of 22 minutes are forecast from Lewisham to the Royal Docks.

This results in the largest connectivity benefits for residents south of the river and businesses north of the river. For example, a significant proportion of Greenwich is estimated to see over 400,000 additional jobs accessible within a 45-minute highway travel time.

4. Silvertown Tunnel: Changes in trip distribution and mode shift

4.1. Despite an increase in road capacity the Silvertown Tunnel (central case) is forecast to have only a very marginal impact on overall mode shares (Table 4.1), largely due to charging of Silvertown and Blackwall Tunnels.

Table 4.1: Morning peak hour trips with an origin in Greenwich, Newham and Tower Hamlets

	2021 reference case trips (and mode share %)		2021 central case trips (and mode share %)	
	Car	PT	Car	PT
Greenwich	29,700 (57.7%)	21,700 (42.3%)	29,700 (57.9%)	21,600 (42.1%)
Newham	22,400 (45.5%)	26,900 (54.5%)	22,300 (45.4%)	26,900 (54.6%)
Tower Hamlets	15,600 (37.9%)	25,500 (62.1%)	15,600 (37.8%)	25,600 (62.2%)
Sub-total host boroughs	**67,600 (47.7%)**	**74,100 (52.3%)**	**67,600 (47.7%)**	**74,100 (52.3%)**
East sub-region[6]	**236,200 (54.2%)**	**199,300 (45.8%)**	**236,200 (54.2%)**	**199,300 (45.8%)**

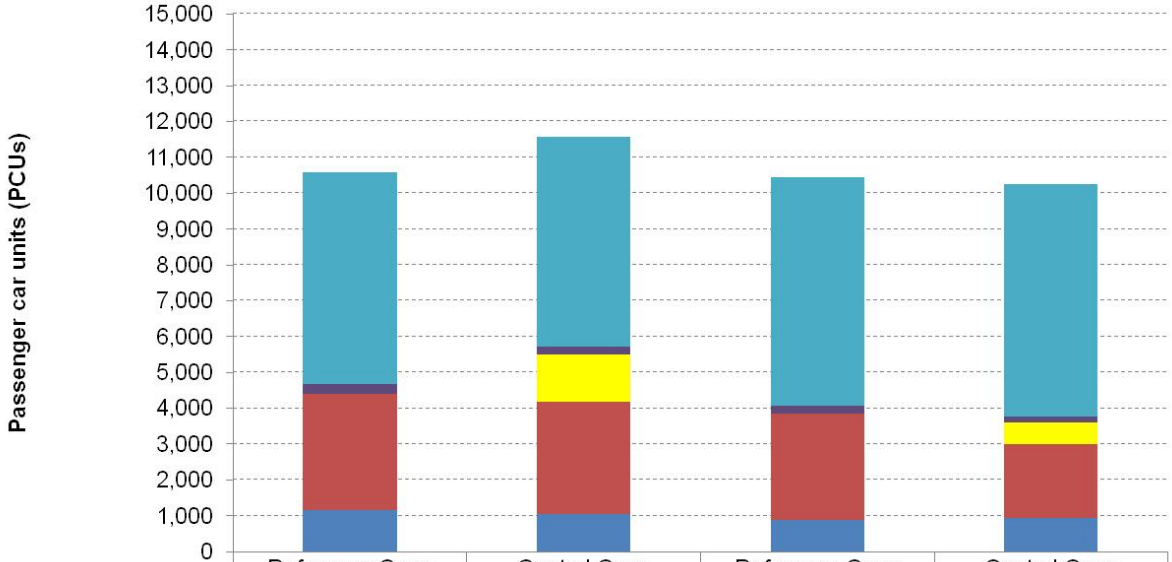
4.2. However, the changes in connectivity indicated by the previous section are likely to lead to users changing their patterns of travel to take advantage of better connectivity across the river. This effect is called trip re-distribution. Work is ongoing to understand other impacts that could contribute to traffic demand such as those associated with changes in land use.

4.3. Figure 4-1 shows the change in total traffic flows crossing the river in east London in 2021 in both directions (morning peak hour). The central case increase in traffic flows in the peak direction across Blackwall and Silvertown Tunnels combined is estimated to be around 1,200 vehicles more than the 2021 reference case. This increase is due in part to the effect of re-distribution which is expected to increase total river crossing demand in east London by around 200 vehicles. This means that the majority of the increased traffic flow estimated on the Blackwall and Silvertown Tunnels is due to a combination of formerly queuing traffic that is able to cross the river in the peak hour with the Silvertown Tunnel and re-routeing traffic (choosing different routes for the same journeys). As a result delays are almost eliminated from the Blackwall Tunnel Approach in the time period.

[6] Barking & Dagenham, Bexley, Greenwich, Lewisham, Hackney, Havering, Newham, Redbridge, Tower Hamlets, Waltham Forest

4.4. In the southbound direction the total traffic crossing the river falls slightly. This is because there is less congestion in the reference case and so the model forecasts that fewer users would be willing to pay the charge to use the crossings. This leads to an overall reduction of around 300 vehicles or 10% in traffic volumes on the Blackwall and Silvertown Tunnels combined. The re-distribution effect is largely responsible for the reduction seen on the crossings as there is only a relatively small change in queuing and routeing.

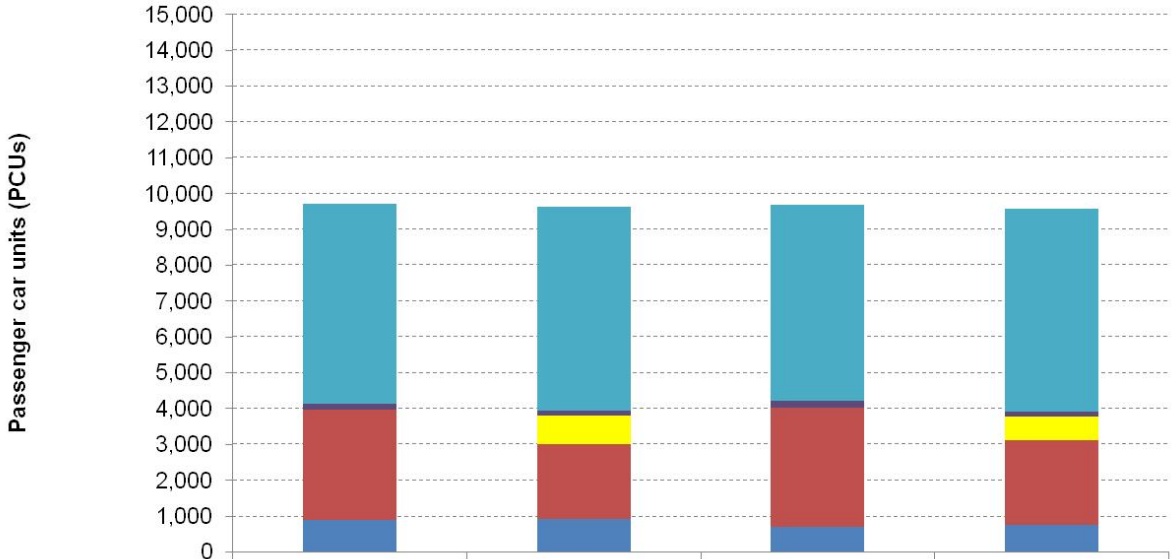
Figure 4-1: Cross-river traffic flows in the morning peak hour (0800-0900), 2021



	Reference Case Northbound	Central Case Northbound	Reference Case Southbound	Central Case Southbound
Dartford Crossing	5,900	5,870	6,370	6,490
Woolwich Ferry	270	220	210	170
Silvertown Tunnel	0	1,310	0	580
Blackwall Tunnel	3,240	3,140	2,970	2,080
Rotherhithe Tunnel	1,160	1,040	890	930

4.5. Figure 4-2 shows the total change in traffic flows crossing the river in east London in 2021 for both directions (average inter-peak hour). For Blackwall and Silvertown Tunnels combined, northbound traffic is estimated to reduce by around 200 vehicles. Around 25% of this reduction is likely to be a result of the re-distribution effect with the remainder due to traffic using other routes. In the southbound direction there is a reduction of around 300 vehicles or around 10%, a slightly larger reduction in traffic flow than northbound due to lower levels of congestion in the southbound direction.

Figure 4-2: Cross river traffic flows in the average inter-peak hour, 2021

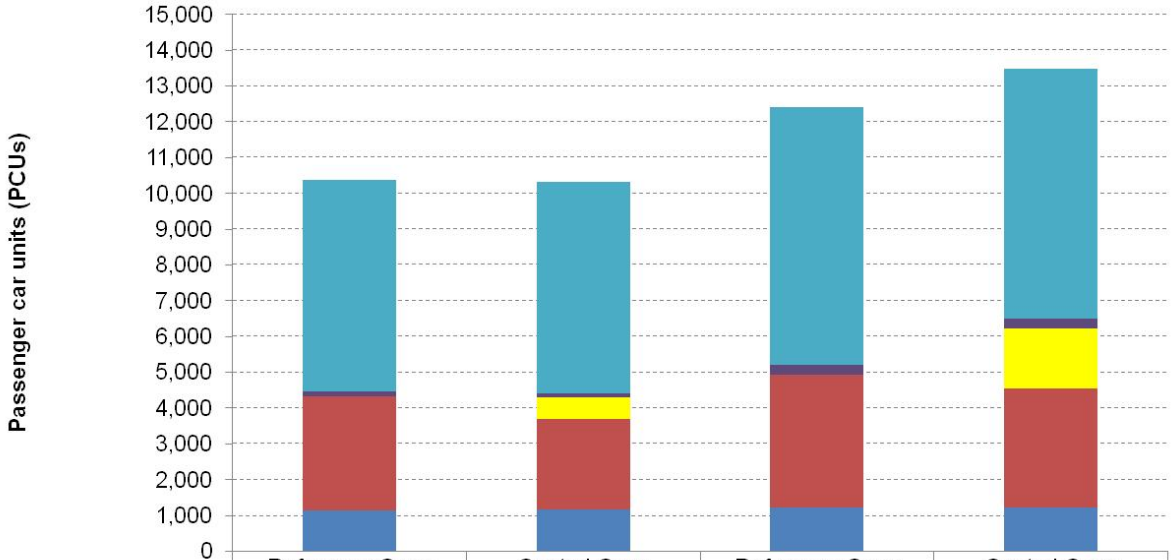


	Reference Case Northbound	Central Case Northbound	Reference Case Southbound	Central Case Southbound
Dartford Crossing	5,590	5,680	5,490	5,670
Woolwich Ferry	170	120	170	130
Silvertown Tunnel	0	800	0	680
Blackwall Tunnel	3,060	2,100	3,340	2,340
Rotherhithe Tunnel	900	920	700	770

4.6. Figure 4-3 shows the total change in traffic flows for crossing the river in east London in 2021 in both directions (evening peak hour). The increase in traffic flows in the southbound direction across the Blackwall and Silvertown Tunnels combined is around 1,300 vehicles or an increase of just over a third over the reference case without additional crossings. The majority of the increased traffic flow estimated on the Blackwall and Silvertown Tunnels is due to a combination of formerly queuing traffic that is able to cross the river in the peak hour with the Silvertown Tunnel and re-routeing of traffic that previously used other crossings, rather than additional crossing demand. As a result delays are almost eliminated from the A12 approach to the Blackwall Tunnel in the evening peak.

4.7. In the northbound direction the total traffic crossing the river is almost unchanged. This is because there is less congestion in the first place and so the modelling suggests that the time saving from using the crossing is almost offset by the cost of the charge.

Figure 4-3: Cross river traffic flows in the evening peak hour, 2021



	Reference Case Northbound	Central Case Northbound	Reference Case Southbound	Central Case Southbound
Dartford Crossing	5,900	5,900	7,200	7,000
Woolwich Ferry	140	110	270	260
Silvertown Tunnel	0	600	0	1,670
Blackwall Tunnel	3,190	2,540	3,720	3,350
Rotherhithe Tunnel	1,150	1,160	1,210	1,210

4.8. The above figures highlight that total traffic flows through the Blackwall and Silvertown Tunnels are predicted to increase considerably in the peak period and peak direction as a result of the additional capacity. As described above, the model indicates that only a marginal proportion of this increase is due to mode shift, and that the vast majority of the increase is due to the release of queues (which would lead to a more peaked profile within the peak periods), users choosing different routes to carry out existing journeys, and redistribution of existing highway trips. Conversely, in other periods of the day, small decreases in flows are predicted as a result of the user charging applied.

4.9. In the Silvertown Tunnel central case, the total weekday (0600-2200) volume of traffic through the combined Blackwall and Silvertown Tunnels is predicted to increase more modestly from 42,500 to 44,300 vehicles (4% increase) in the northbound direction. Southbound flows are predicted to increase from 36,000 to 37,200 vehicles (3% increase). Figures 4-4 and 4-5 show the estimated daily profiles of the northbound and southbound flows.

4.10. This estimate of the change in daily flows and the weekday hourly profile is calculated from the model (hourly) results using the following parameters:

- The morning peak (0700-1000), evening peak (1600-1900) and other weekday time periods (0600-0700, 1000-1600 and 1900-2200) are calculated from the modelled hours employing the annualisation factors described in Appendix B of the Silvertown Tunnel Economic Assessment Report;
- The profile of traffic flows within the peak and other time periods are derived from the observed base flow profile at Blackwall Tunnel;
- In the 2021 reference case it is assumed that the morning peak profile will remain

unchanged as it is operating at capacity, and that northbound hourly flows will not exceed 2,900 vehicles at any other period of the day.

Figure 4-4: Estimated hourly profile of northbound flows (weekday 0600-2200)

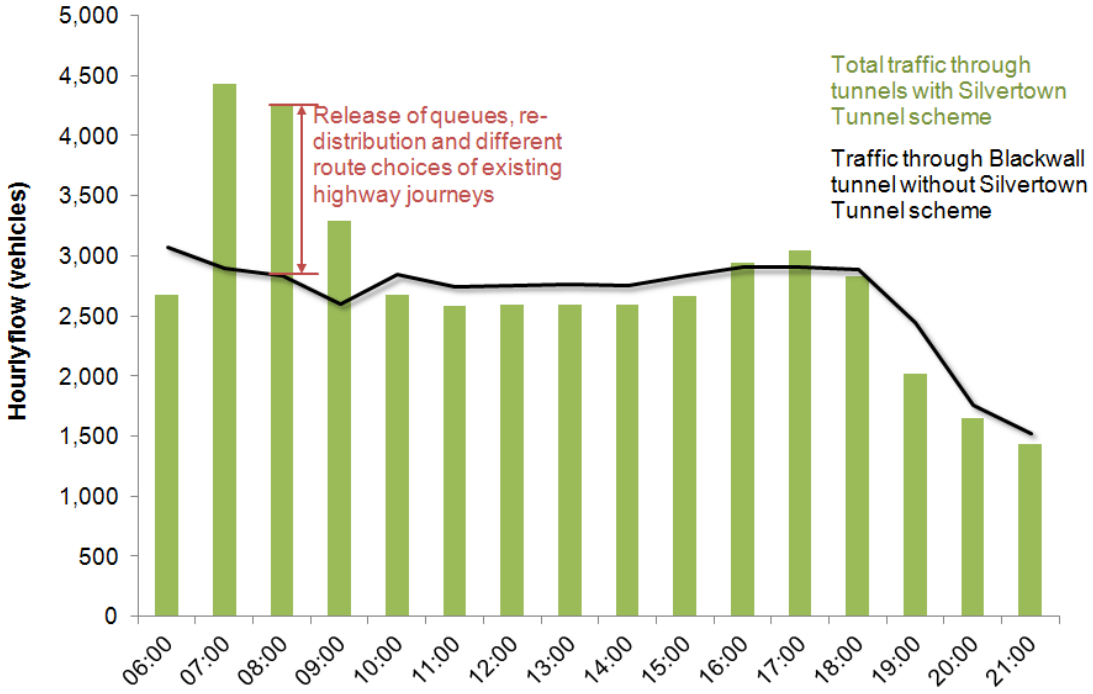
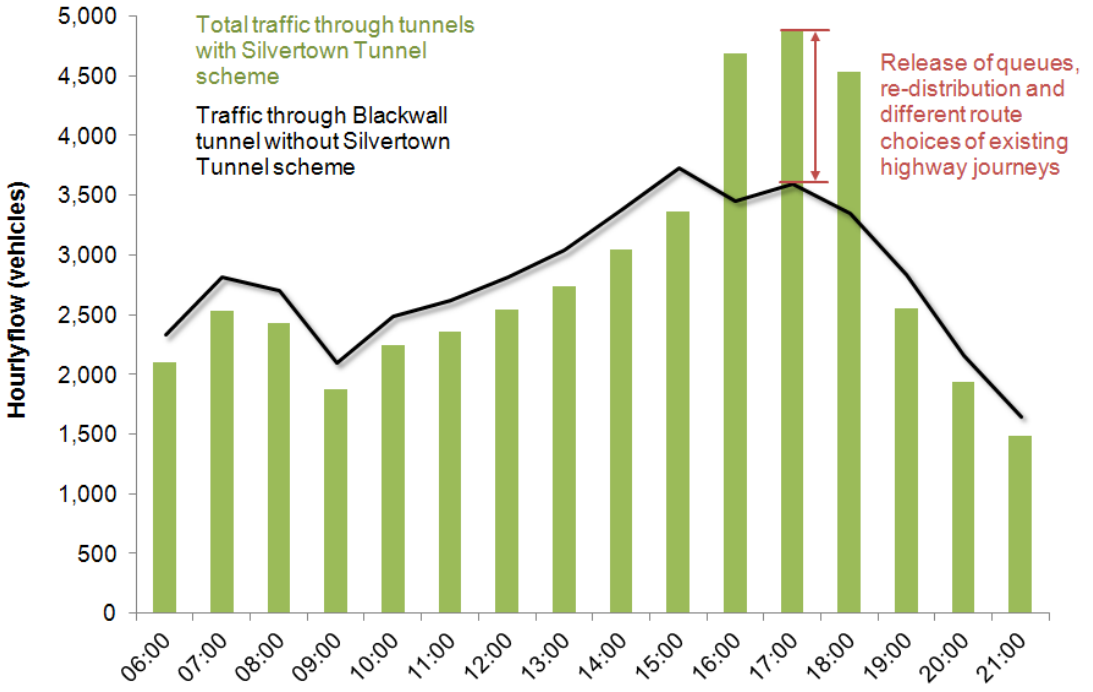


Figure 4-5: Estimated hourly profile of southbound flows (weekday 0600-2200)



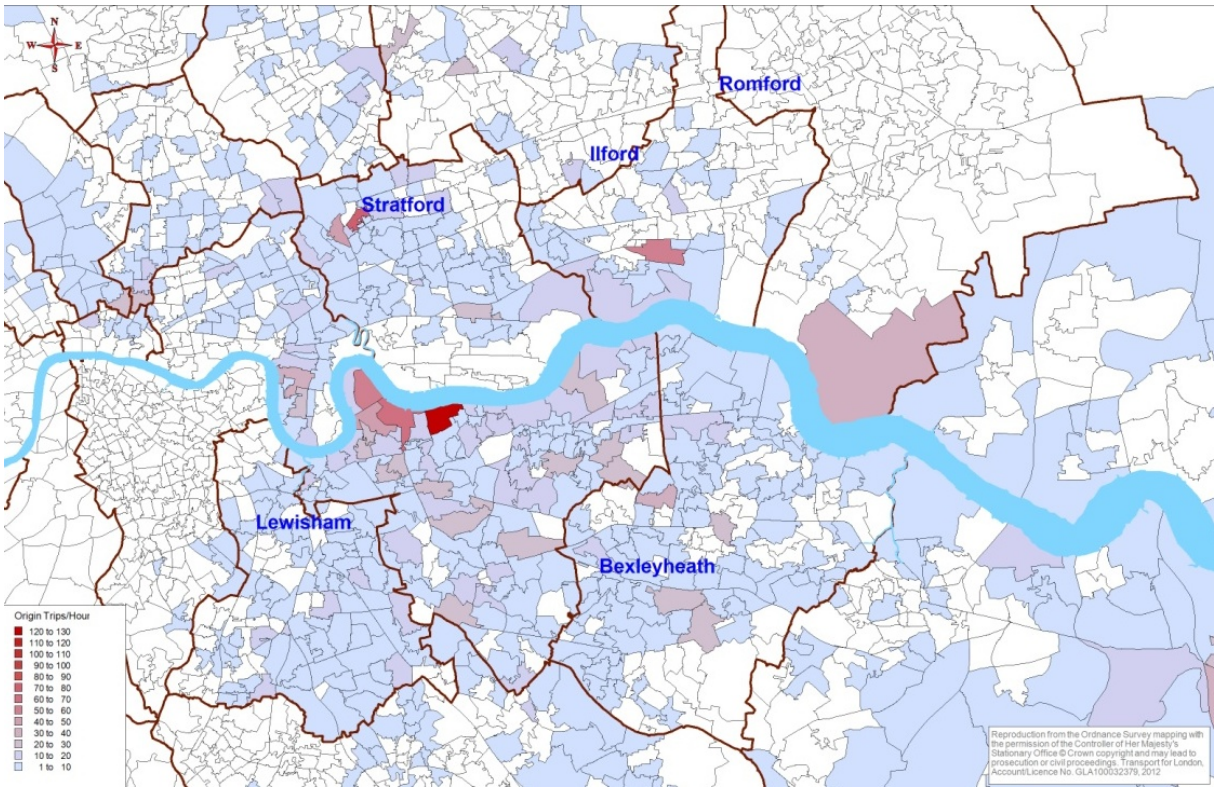
Distribution of trips that use Blackwall and Silvertown Tunnel

4.11. This section describes the trip patterns associated with forecast usage of the Blackwall and Silvertown Tunnels. Figures 4.6 and 4.8 show the origin of trips forecast to use the Blackwall and Silvertown Tunnels in the morning peak. As such these maps forecast the areas from which people will travel to use the new crossing, and hence most directly benefit from the additional connectivity. For the purposes of this analysis a 'local' car trip is defined as having one or both ends of a trip in Tower Hamlets, Newham, Barking & Dagenham, Havering, Lewisham, Greenwich or Bexley.

4.12. Figures 4.7 and 4.9 show the routeing and number of trips that are forecast to use each of the tunnels in the morning peak hour in 2021. In each case green represents northbound traffic and red southbound traffic.

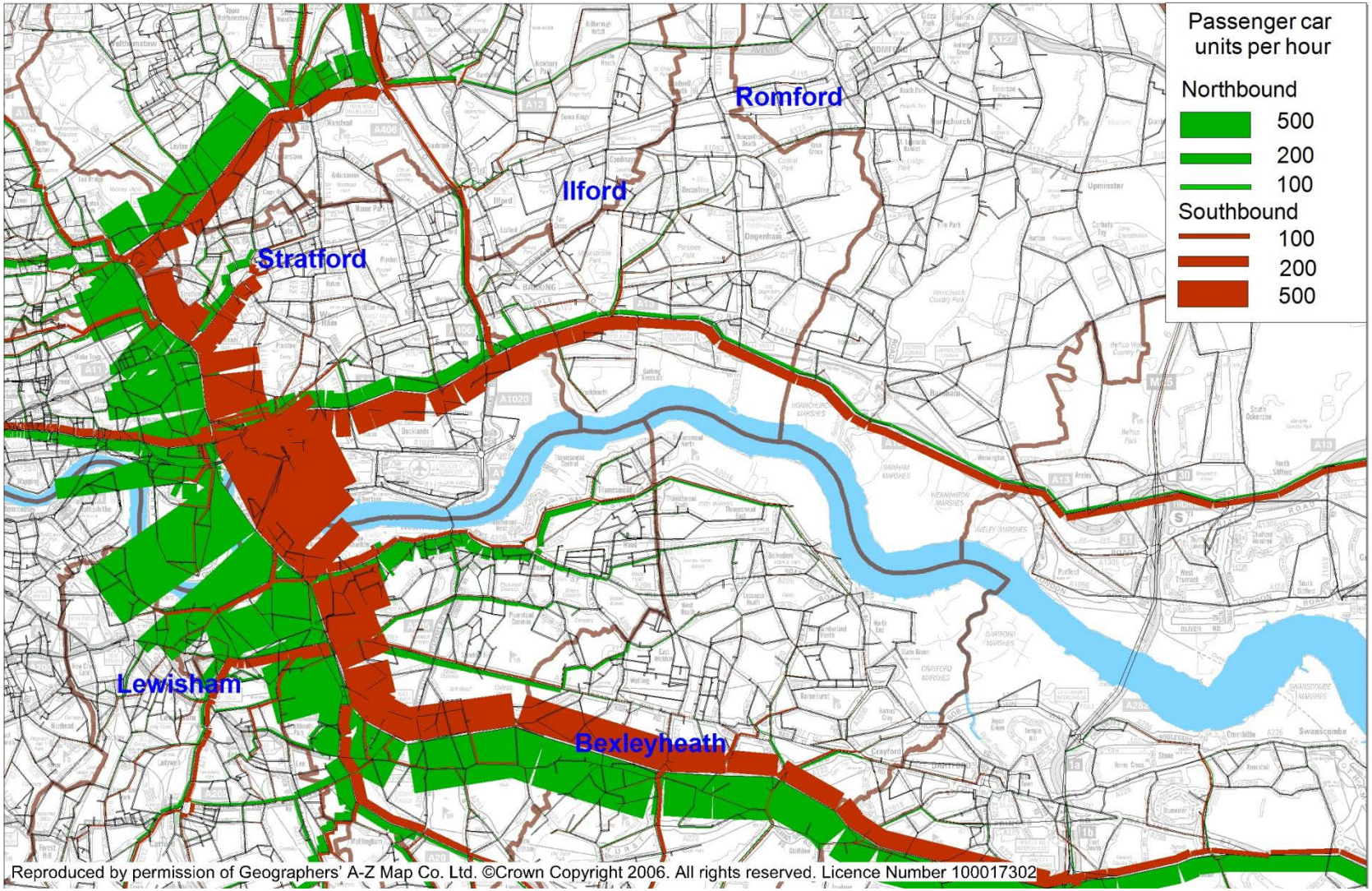
4.13. Figure 4-6 shows the morning peak hour origins for vehicles using Blackwall Tunnel. It can be seen that the crossing is used largely for local trips but also serves as a key crossing for more strategic traffic from Kent. On the northern side of the river, again the tunnel serves mostly more local trips but then also serves trips from Essex, Havering and Central London. Overall a large proportion of car trips are local with around 85% of car trips estimated to be using Blackwall defined as such for northbound and southbound movements.

Figure 4-6: Origin of trips using a charged Blackwall Tunnel (morning peak hour 0800-0900, 2021)



4.14. Figure 4-7 shows the routeing and number of trips that are forecast to use a charged Blackwall Tunnel in the morning peak in 2021. Due to its direct connections to the A12 and A13, Blackwall is forecast to remain the preferred crossing for many strategic and local cross-river movements. The key corridor served is that from the A2 to the A12 and A406.

Figure 4-7: Routeing of trips using a charged Blackwall Tunnel (morning peak hour 0800-0900, 2021)



4.15. Figure 3-8 shows the morning peak hour origins for vehicles using the Silvertown Tunnel. On the south side, it can be seen that the crossing is used by those travelling from areas in the east of Lewisham through to Kent and on the northern side largely from the Royal Docks, Canary Wharf and the City. In total the vast majority of car trips are local with 95% of car trips estimated to be using the Silvertown Tunnel defined as such for northbound and southbound movements.

Figure 3-8: Origin of trips using a charged Silvertown Tunnel (morning peak hour 0800-0900, 2021)

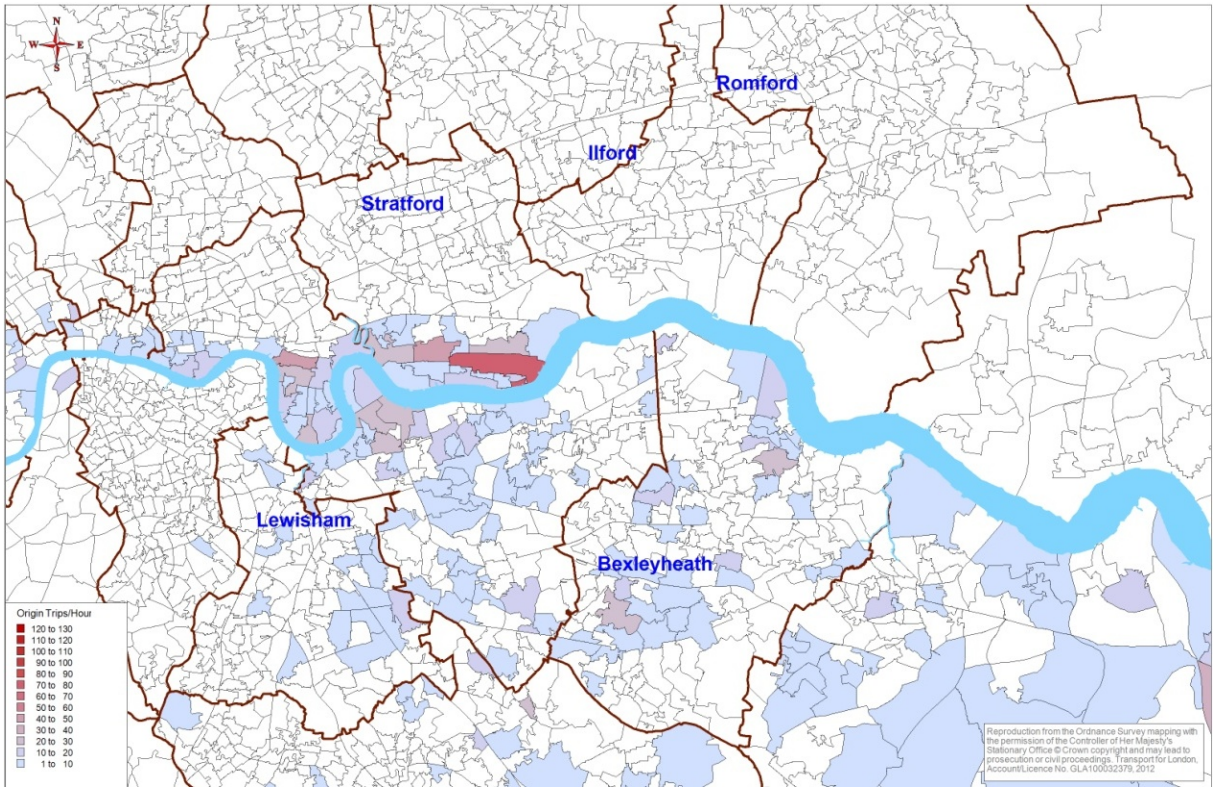
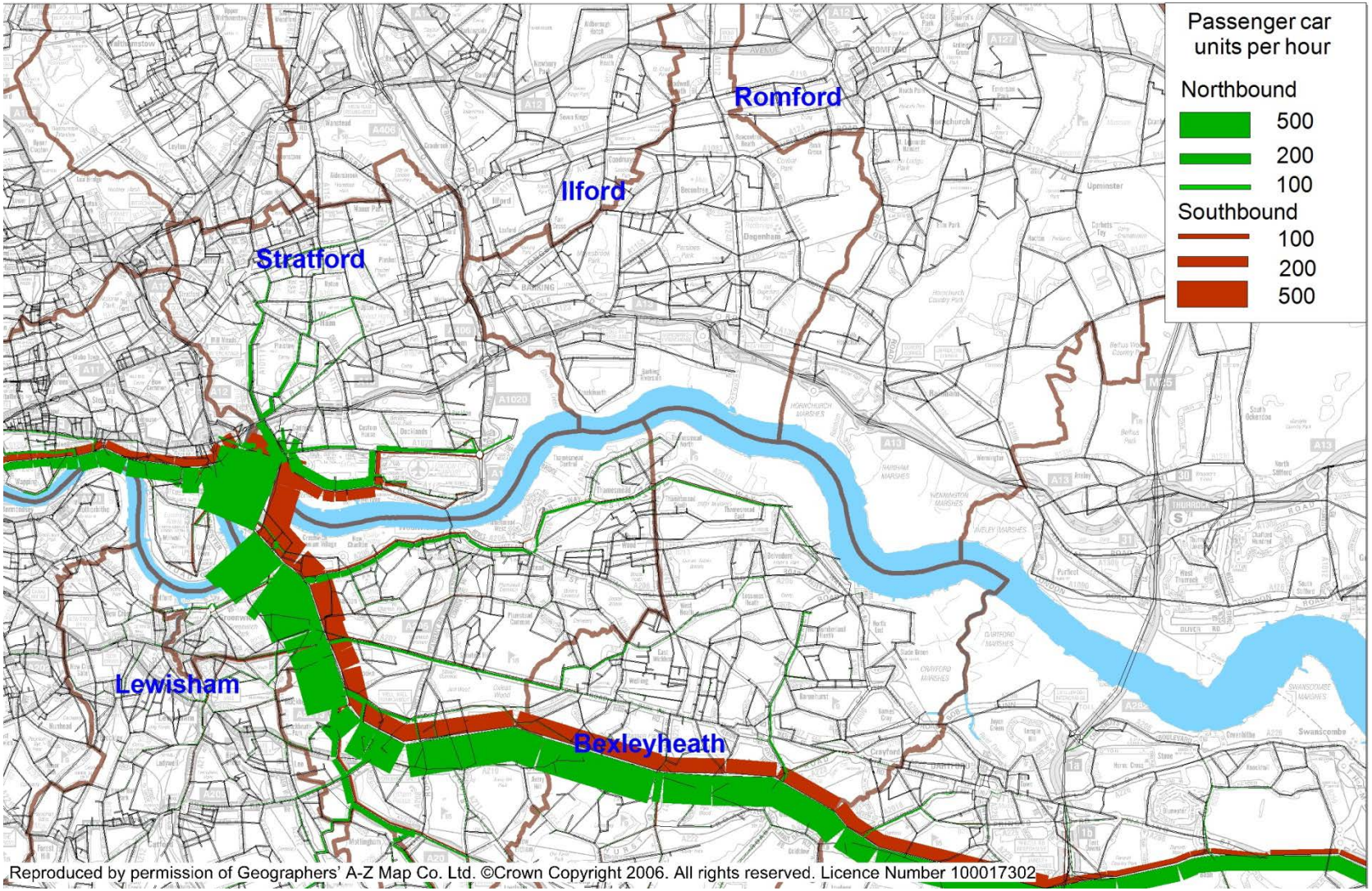


Figure 4-9: Routeing of trips using a charged Silvertown Tunnel (morning peak hour 0800-0900, 2021)



The Silvertown Tunnel is expected to only make a marginal change to mode shares because of the demand management effect of charging the Blackwall and Silvertown Tunnels.

The changes in connectivity, however, are expected to result in users changing their travel patterns. This effect is known as trip re-distribution. Work is under way to understand other impacts that could influence demand, such as related land use changes.

The forecast increase at Blackwall and Silvertown Tunnels combined is around 1,200 vehicles in the morning peak hour compared to the reference case. Most of this increase comes from the release of previously queued traffic at Blackwall (where delays are almost eliminated) and re-routeing of traffic that previously used other crossings. Re-distribution is likely to account for a small proportion of the increase, in the order of 200 vehicles. Daily (0600-2200) weekday traffic is expected to increase by around 4% northbound and 3% southbound.

Trips using the Blackwall and Silvertown Tunnels are mostly local journeys (defined as having at least one end in Tower Hamlets, Newham, Barking and Dagenham, Havering, Lewisham, Greenwich or Bexley). Blackwall Tunnel remains the preferred crossing for many strategic movements, such as from the A2 to A12 and A406, and local cross-river movements. Silvertown Tunnel caters for more local trips to the Royal Docks as well as those into the City.

5. Silvertown Tunnel: Changes in traffic assignment

5.1. The traffic assignment estimates the routes that road users will choose when travelling and the estimated impact of this on traffic flows and delays. It should be noted that one of the largest impact associated with providing new links across the river is likely to be that of road users changing the route they take to travel between the same places. This leads to changes in traffic flows on the surrounding road network.

5.2. The following figures show the changes in traffic flows and resulting junction delays forecast as a result of the implementation of Silvertown Tunnel and the charging of Silvertown and Blackwall Tunnels. Changes in traffic flows are expressed in passenger car units (PCUs) per hour, whereby reductions in flows are shown in green and increases in red. Junction delays are expressed in PCU-hours, a measure of average delay per vehicle multiplied by the number of vehicles. Reductions in delay are shown in green and increases in red.

5.3. Figure 5-1 shows the change in traffic flows in the morning peak hour in 2021. It can be seen that there are increases in flows northbound on the Blackwall and Silvertown approach roads due to the extra capacity that Silvertown Tunnel provides. However, as shown previously in Figure 3-1, there is a small decrease in the southbound flow.

5.4. Although the largest changes in traffic flow are close to the crossings, key strategic roads such as the A12, A13, M11 and M25 do see small increases in at least one direction. In the southbound direction, for example, flows increase slightly on the A13 going East and the M25 going south due to traffic shifting away from the newly charged Blackwall Tunnel.

5.5. Figure 5-2 shows the change in junction delay as a result of implementing Silvertown Tunnel (central case) in the morning peak hour in 2021. The plot shows that significant reductions in junction delay are achieved on the northbound approaches to the Blackwall and Silvertown Tunnels. The implementation of Silvertown assists in removing a 'bottleneck' for northbound traffic crossing the river itself, while charging both Blackwall and Silvertown Tunnels helps to manage overall traffic levels on the surrounding network, including the southern approach on the Greenwich Peninsula, which is common to both tunnels. Dartford Crossing and Woolwich Ferry also benefit from small reductions in delay due to northbound trips transferring to use the less congested Blackwall / Silvertown cross-river route.

5.6. The construction of Silvertown Tunnel and charging both Silvertown and Blackwall Tunnels results in a decrease in congested hours across the highway network. Delay declines by around 25% in Greenwich, increases by 5% in Tower Hamlets and remains broadly unchanged in Newham and the remaining boroughs in east and southeast London. It should be noted that the modelling does not yet contain mitigation measures for those areas which experience increases in delay.

Figure 5-1: Flow changes as a result of Silvertown Tunnel (morning peak hour 0800-0900, 2021)

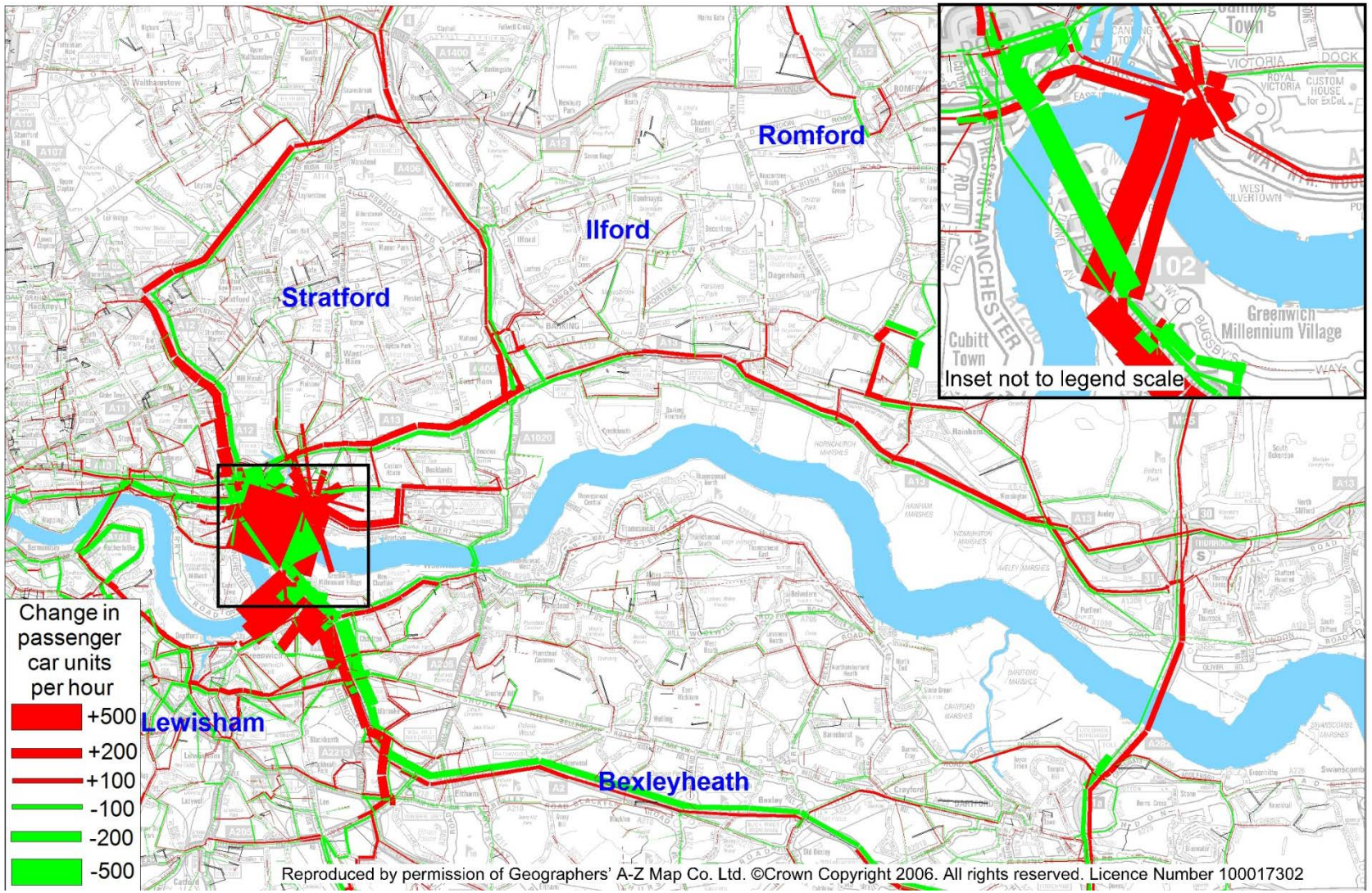
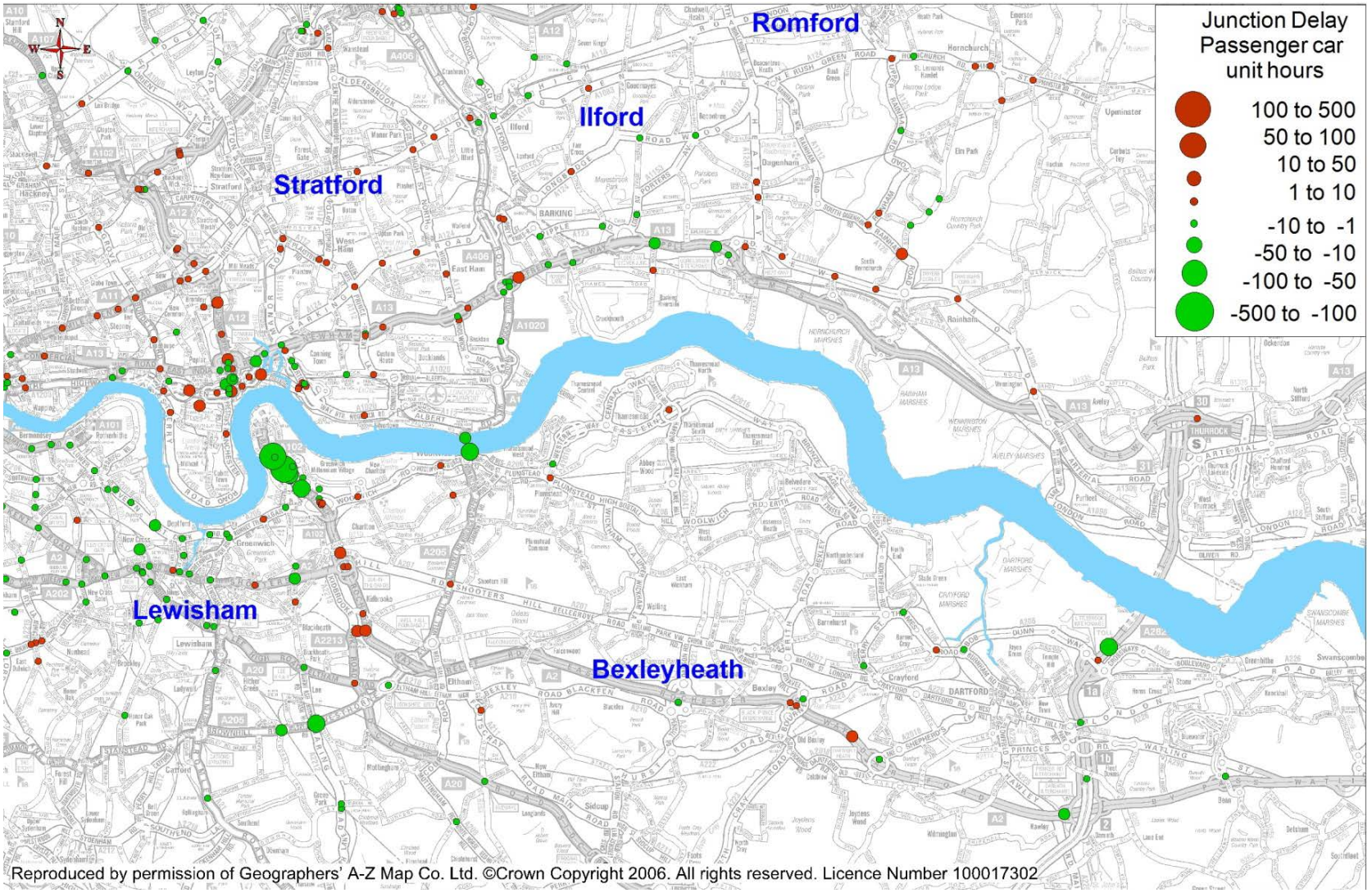


Figure 5-2: Junction delay changes as a result of Silvertown Tunnel (morning peak hour 0800-0900, 2021)



5.7. Figure 5-3 shows the change in traffic flows in the average inter peak hour in 2021 due to the implementation of Silvertown Tunnel (central case). It can be seen that on the approaches in both directions the number of vehicles falls due to the charge applied to the crossings (½ Dartford rate for both southbound and northbound vehicles). A decrease in flows is also experienced on the A2, the western section of the A13 and the A102. An increase can be seen on the M25 and Dartford Crossing as people are no longer able to take advantage of a free crossing at Blackwall. Similarly, a small increase can be observed on the Rotherhithe Tunnel, as such it is considered not necessary to charge Rotherhithe as a result of this small increase

5.8. Figure 5-4 shows the change in junction delay as a result of implementing Silvertown Tunnel (central case) in the average inter peak hour in 2021. The plot shows that delay at junctions reduces on the immediate approaches to Silvertown and Blackwall, although some increases do occur further west towards Rotherhithe and Tower Bridge which will remain as charge-free crossings.

5.9. The implementation of Silvertown Tunnel (central case scenario) results in a decrease in congested hours across the highway network. Delay declines by 5% in Greenwich and 9% in Tower Hamlets, while remaining broadly unchanged in Havering, Barking & Dagenham, Bexley and Newham.

5.10. Figure 5-5 shows the change in traffic flows in the evening peak hour in 2021 due to Silvertown Tunnel. It can be seen that there are increases in flows southbound on the Blackwall and Silvertown approach roads due to the extra capacity that Silvertown Tunnel provides. However, there are decreases northbound due to the charges deterring traffic which would have otherwise crossed at this location under a Blackwall (no charge) scenario.

5.11. Figure 5-6 shows the impact of the junction delay as a result of implementing Silvertown Tunnel (central case) in the evening peak hour in 2021. Significant reductions in junction delay are achieved on the southbound approaches to Blackwall and Silvertown Tunnels. The implementation of Silvertown Tunnel assists in removing a 'bottleneck' for southbound traffic crossing into the Greenwich Peninsula. It can be seen that additional minor delays occur at a range of junctions south of the River Thames due to heavier flows of traffic being able to cross the river at this location.

Figure 5-3: Flow changes as a result of Silvertown Tunnel (average inter-peak hour, 2021)

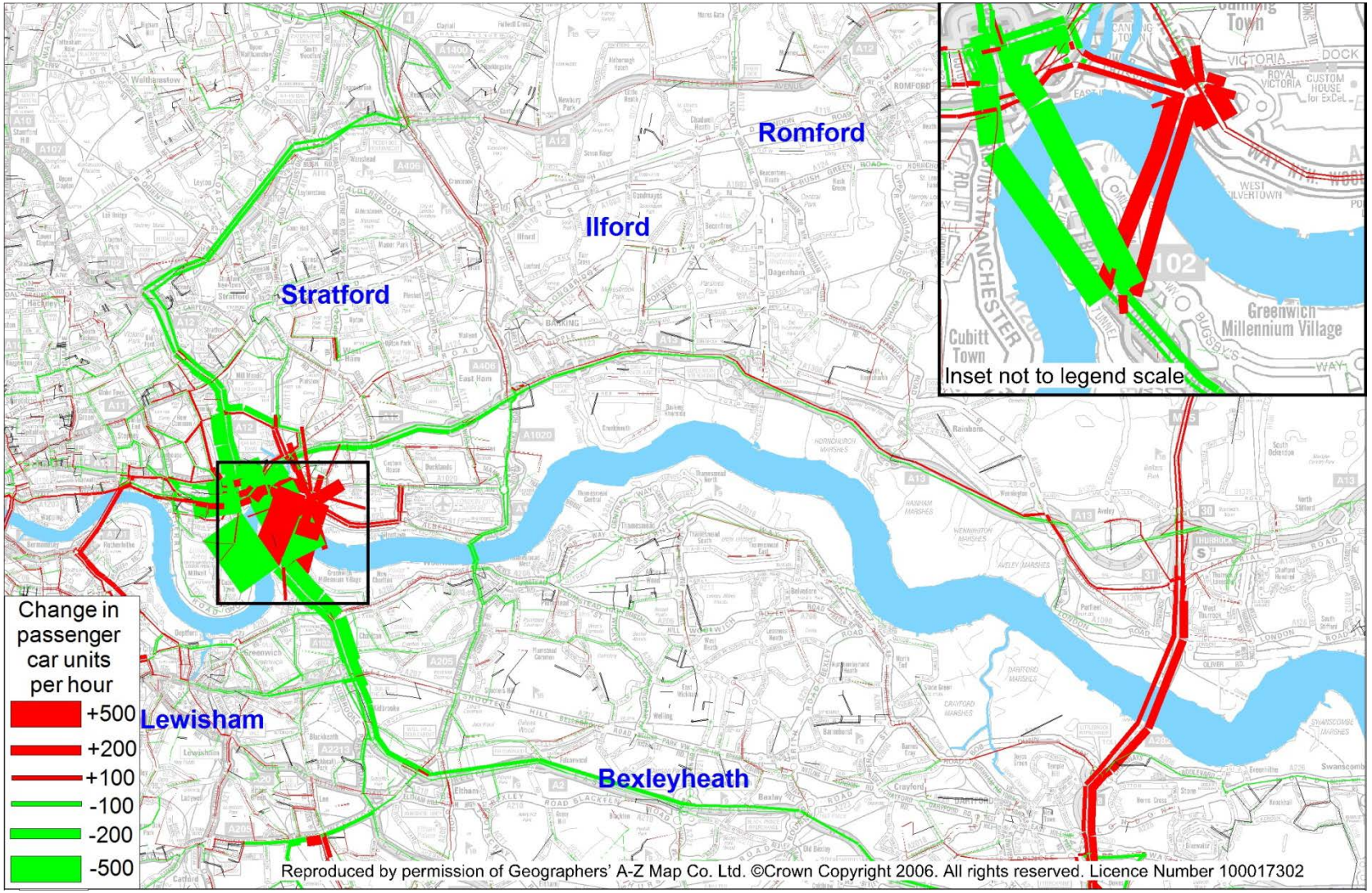


Figure 5-4: Junction delay changes as a result of Silvertown Tunnel (average inter-peak hour, 2021)

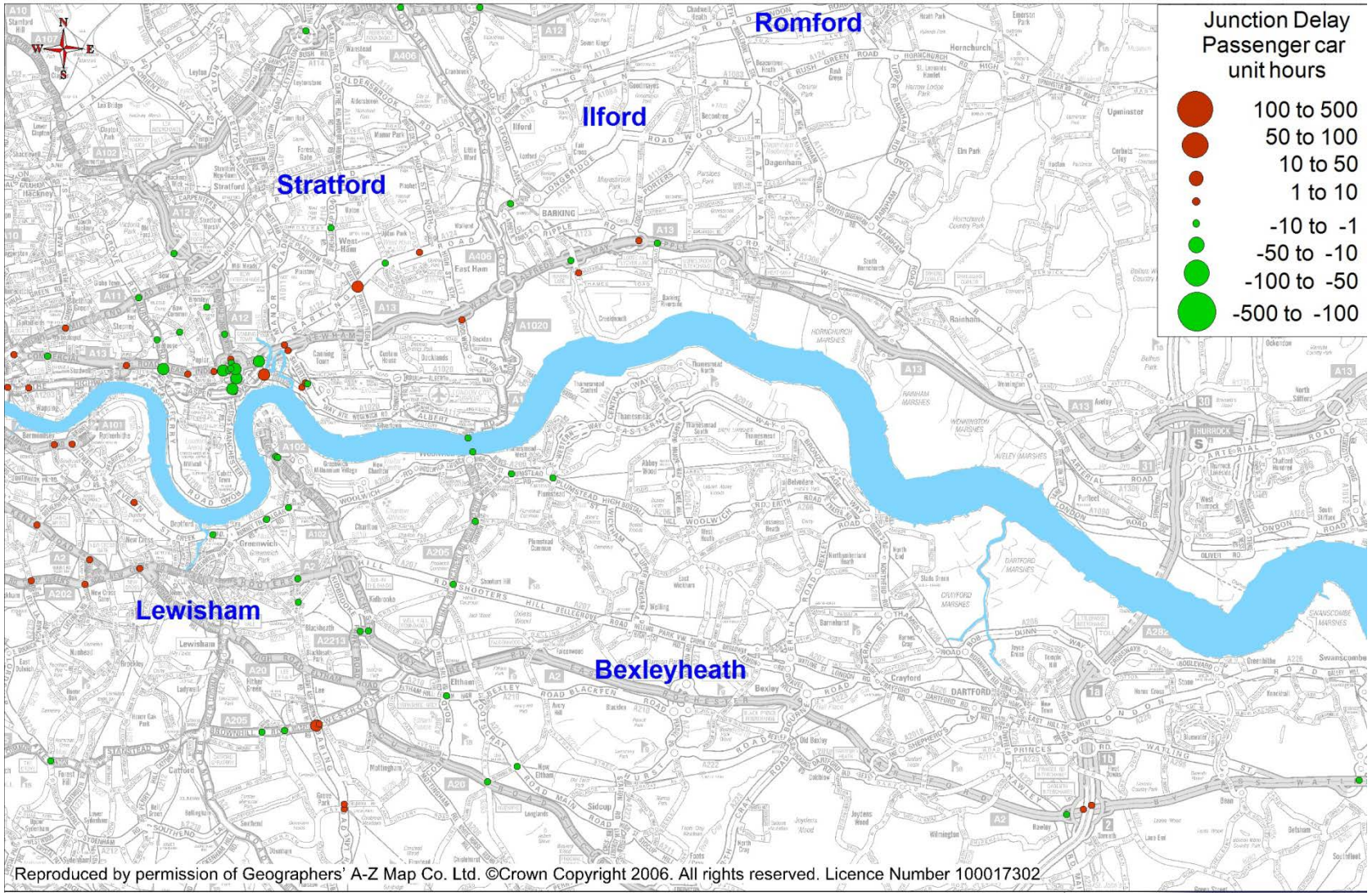


Figure 5-5: Flow changes as a result of Silvertown Tunnel (evening peak hour 1700-1800, 2021)

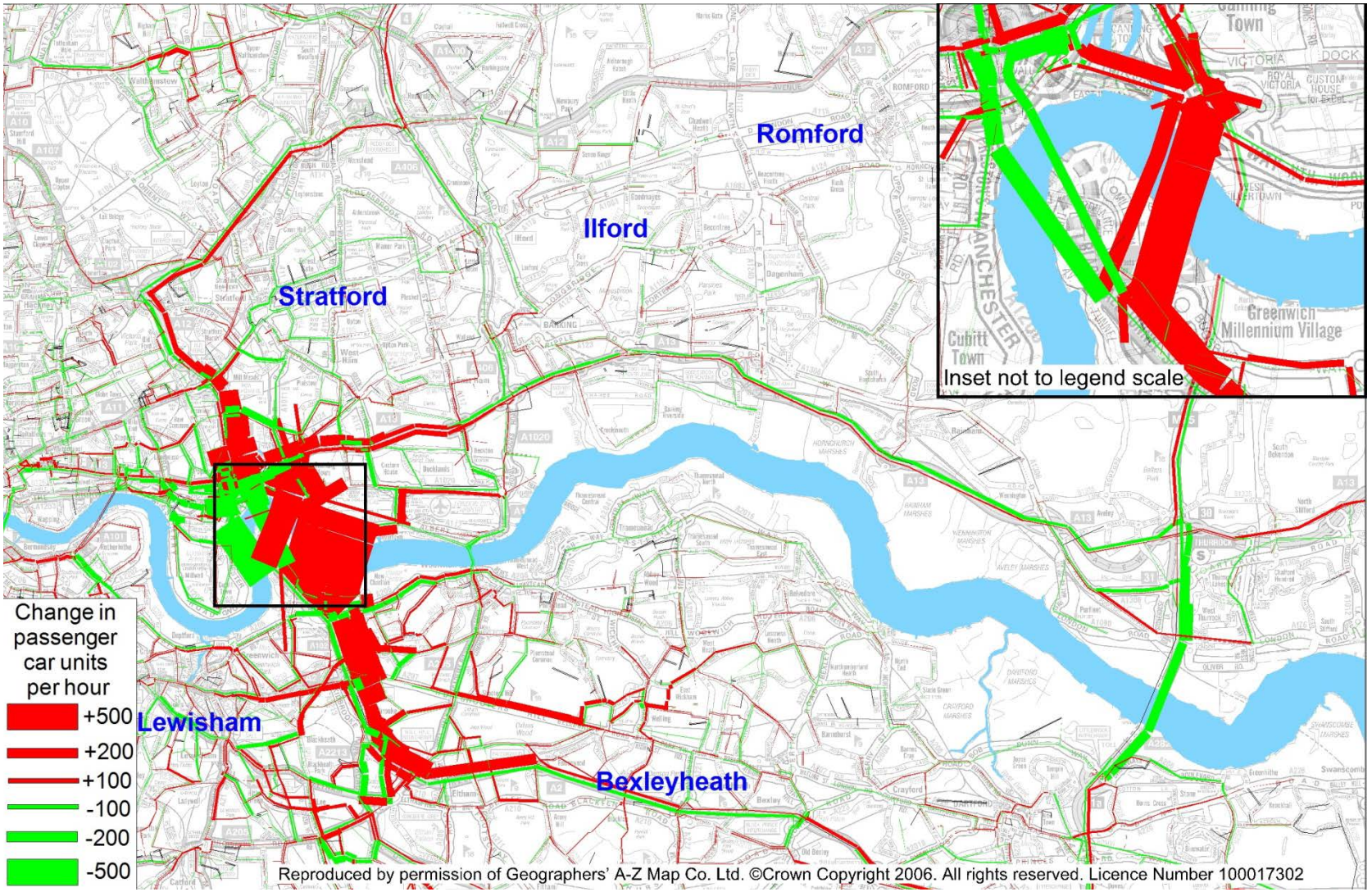
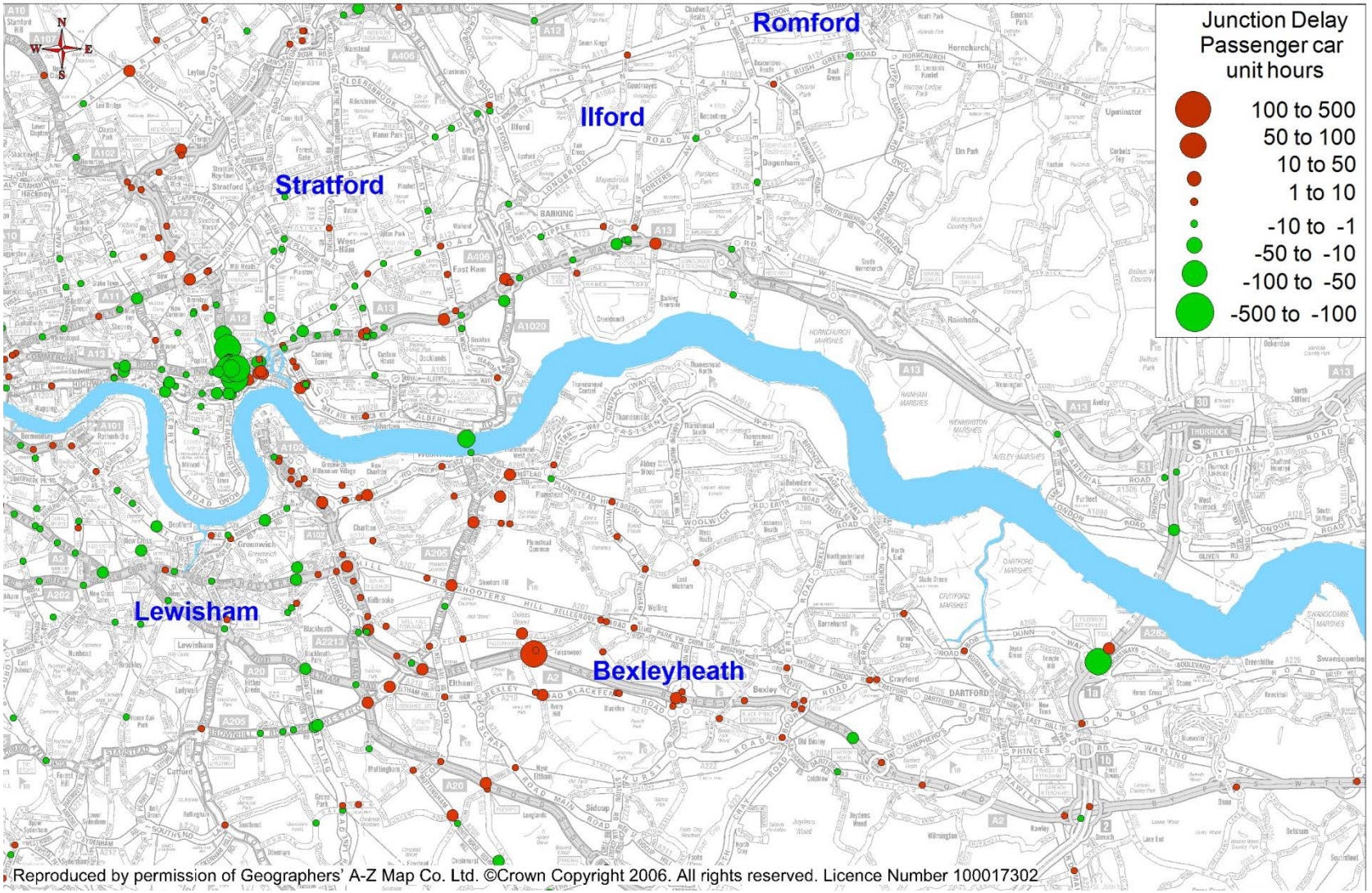


Figure 5-6: Junction delay changes as a result of Silvertown Tunnel (evening peak hour 1700-1800, 2021)



5.12. The previous maps highlight the complexity of some of the modelled network impacts. Journey time and delay statistics aggregated to borough-level are a useful way to summarise the impacts at numerous junctions into an indicator that illustrates a net impact over a wider area. The implementation of Silvertown Tunnel (central case) results in a decrease in congested hours across the east London highway network, as shown in Table 5.1.

Table 5.1: Borough-level journey time and delay statistics (2021 reference case to central case)

Indicator	Borough	Central case change in morning peak hour	Central case change in evening peak hour
Total travel time	Greenwich	-9%	+9%
	Newham	0%	-2%
	Tower Hamlets	+3%	-17%
	Host boroughs	**-3.0%**	**-2.7%**
Total delay PCU-hours	Greenwich	-22%	+14%
	Newham	+1%	-3%
	Tower Hamlets	+7%	-27%
	Host boroughs	**-7.7%**	**-6.7%**

The increase in capacity provided by Silvertown Tunnel removes a bottleneck for northbound traffic in the morning peak and southbound in the evening peak.

Charging both tunnels helps to manage overall traffic levels on the surrounding network.

Across the host boroughs delays reduce by around 8% in the morning peak and 7% in the evening peak. Further work is required to look at mitigating increases in delay using more detailed local traffic modelling.

6. Summary

6.1. This report has set out the latest traffic modelling that has been undertaken to assess the likely impacts of the Silvertown Tunnel and the effect of charging the Silvertown Tunnel and the existing Blackwall Tunnel.

6.2. The modelling indicates that the Silvertown Tunnel reduces cross-river journey times in the morning and evening peaks, increasing residents' access to jobs and business access to employees. This increased connectivity results in some changes in trip patterns. The extra capacity releases queued traffic in the morning and evening peak hours, resulting in reduced delays across the host boroughs.

6.3. The process of model development and review is ongoing and the forecasting outputs will be updated and refined for the final Transport Assessment in spring 2015. Work is ongoing to understand other impacts that contribute to traffic demand such as those associated with changes in land use. Further work is also in progress to look at the local impacts using more detailed local models to develop mitigation measures.

Appendix A: Public Transport Network Changes in the Reference Case

Train Operating Company	Scheme Name	Year.
NATIONAL RAIL		
Brighton Main Line	Brighton Main Line RUS (Gatwick Express to Brighton in peaks) - 2016	2016
Chiltern	Chiltern Speed Adjustment (Metropolitan) - 2016	2021
Crossrail 1	Crossrail 1 (Abbey Wood / Shenfield - Heathrow / Maidenhead)	2021
East Coast	East Coast - 2tph Leeds services all day	2016
Midland	East Midlands 5tph from St Pancras incl Corby	2016
High Speed 1	Eurostar International Services to St Pancras	2016
Heathrow	Heathrow Terminal 5 (Express / Connect)	2016
Tilbury & Southend	HLOS1 - c2c Services	2016
Chiltern	HLOS1 - Chiltern Services	2016
Great Eastern	HLOS1 - Great Eastern Services	2016
East Coast	HLOS1 - Great Northern Services	2016
Great Western	HLOS1 - GW Thames Valley Services	2016
West Coast	HLOS1 - London Midland Services	2016
South Western	HLOS1 - South West Trains Services	2016
Southern	HLOS1 - Southern Inners	2016
West Anglia	HLOS1 - West Anglia Services	2016
High Speed 1	HS1 Domestic Services and associated South Eastern changes (IKF)	2016
South Eastern	South Eastern changes associated with new HS1 Domestic Services	2016
Overground	London Overground SLC2 - 4c378 on Watford Services	2016
Overground	London Overground SLC3 - East London Line (excl Clapham Jn)	2016
Overground	London Overground SLC3 - East London Line Phase 2b to Clapham Jn	2016
Overground	London Overground SLC3 - North London Line (incl GoB & WLL)	2016
Overground	London Overground Speed Adjustment (Bakerloo)	2026
West London	New Station: Imperial Wharf (WLL)	2016
South Central	New Station: Mitcham Eastfields (South London)	2016

West London	New Station: Shepherds Bush (WLL)	2016
South Western	South West Trains - Southampton/Poole/Weymouth services	2016
Southern	Southern - South Croydon to Shepherds Bush Services	2016
Southern	Southern - Watford Jn / Milton Keynes Services	2016
South Eastern	Thameslink KO2 - Blackfriars Services	2021
South Eastern	Thameslink KO2 - Cannon St Services	2021
South Eastern	Thameslink KO2 - Charing Cross Services	2021
East Coast	Thameslink KO2 - GN Suburban Services	2021
South Central	Thameslink KO2 - London Bridge Services	2021
Thameslink	Thameslink KO2 - Through Services	2021
South Eastern	Thameslink KO2 - Victoria (SE) Services	2021
South Central	Thameslink KO2 - Victoria (South Central) Services	2021
West Coast	West Coast (VHF) London Midland Services	2016
West Coast	West Coast Virgin High Frequency Services	2016

LUL

Hammersmith & City / Circle Lines	New Station: White City Extension to Hammersmith	2008
Piccadilly	Extension to Heathrow Terminal 5	2008
Jubilee	PPP Upgrade incl 7th car	2010
Waterloo & City	PPP Upgrade	2008
Victoria	PPP Upgrade - new trains	2010
Victoria	PPP Upgrade - signalling upgrades	2012
Northern	PPP Upgrade - phase 1 (signalling upgrades)	2014
Northern	PPP Upgrade - phase 2 (revised service patterns)	2018
Piccadilly	PPP Upgrade incl new trains	2021
Metropolitan	New Trains	2016
Metropolitan	PPP Upgrade - new trains & partial service	2016
Metropolitan	Full service post PPP upgrade	2018
Hammersmith & City / Circle Lines	PPP Upgrade incl new trains - partial service	2016
Hammersmith & City / Circle Lines	Full service post PPP upgrade	2018
District	PPP Upgrade - new trains	2015
District	Signalling upgrades / Full service	2018
Bakerloo	WTT 36 - no trains terminating at Willesden Jn	2008
Bakerloo	PPP Upgrade incl new trains	2026

DLR

DLR Bank Lewisham 3 car	Bank - Lewisham 3 car upgrade	2010
DLR Stratford 3 car	Poplar - Stratford 3 car upgrade	
DLR Woolwich A	Woolwich Arsenal extension	2009
DLR Stratford Int	Stratford International - Canning Town	2010

Appendix B: Alternative charging scenarios

Description of scenarios

This appendix sets out the traffic modelling results for alternative charging scenarios. The scenarios are defined as follows:

No charge	Silvertown and Blackwall Tunnels in operation as in the central case scenario but with no charges. Woolwich Ferry upgraded (+30% capacity and charged).
Silvertown-only charge	Silvertown and Blackwall Tunnels in operation as in the central case scenario. Silvertown Tunnel charged with the same pricing structure as the central case (Dartford rate in peak period and direction, ½ Dartford rate out of the peak times and in the counter-peak direction), and Blackwall uncharged. Woolwich Ferry upgraded (+30% capacity and charged).
Central case	As described in main report.
Peak direction sensitivity test	Silvertown and Blackwall Tunnels in operation as in the central case scenario. Both Blackwall and Silvertown Tunnels charged at double the central case charges in the peak direction (off-peak and counter peak charges as in the central case). Woolwich Ferry upgraded (+30% capacity and charged).

Connectivity

Table B 1 shows the number of minutes saved for selected journeys from south to north of the River Thames in the morning peak hour in 2021. The various charge scenarios are compared to the 2021 reference case.

Table B 1: Journey time savings due to Silvertown Tunnel (morning peak hour 0800-0900, 2021, northbound, in minutes)

From	To	Ref case journey time (mins)	Change in no charge scenario (mins)	Change in Silvertown-only charge scenario (mins)	Change in central case scenario (mins)	Change in peak direction sensitivity test (mins)
Lewisham	Stratford	53	-6	+1	-13	-17
Lewisham	Royals	52	-17	-1	-22	-24
Lewisham	Canary Wharf	49	-10	0	-16	0
Charlton	Stratford	40	-9	-1	-15	-18
Charlton	Royals	39	-19	-2	-23	-24
Charlton	Canary Wharf	36	-13	-2	-17	-19

Under the no charge scenario, northbound time savings of up to 20 minutes are estimated, in particular towards the Royal Docks where the Silvertown Tunnel represents a shorter route. By contrast, the Silvertown-only charge scenario produces only very minor journey time savings of up to 2 minutes northbound in the morning peak. It should be noted that the Blackwall and Silvertown Tunnels share a common northbound approach, so those vehicles willing to pay the charge to enter the Silvertown Tunnel are still forced to queue on the A102 approach until they reach the Silvertown entry road.

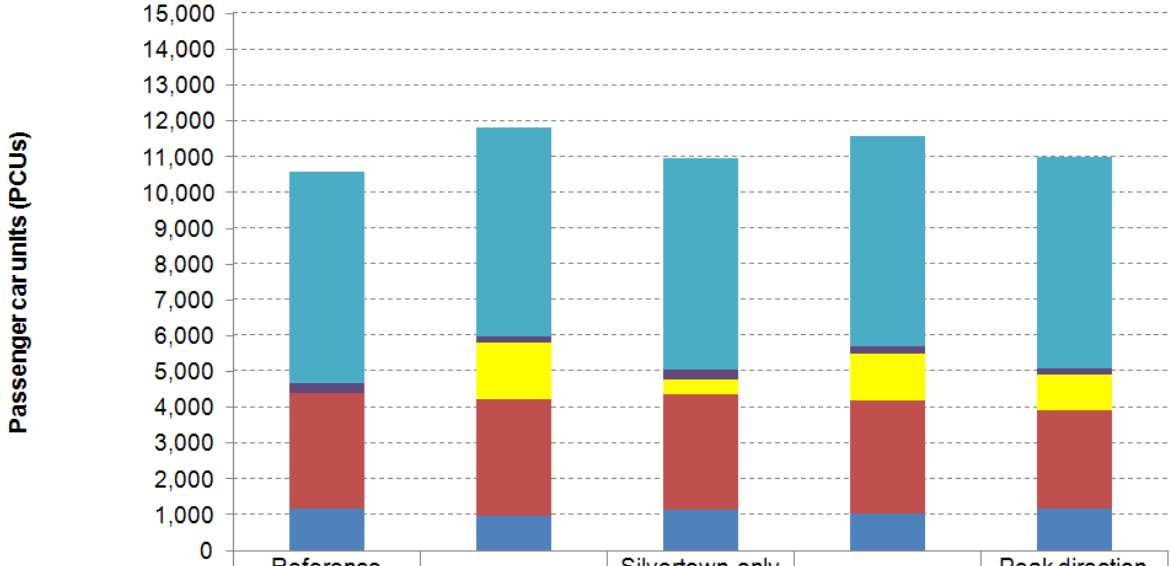
In the central case charging scenario, the forecast journey time savings are around 5 minutes more than in the no charge scenario. The time savings forecast in the high charge scenario are only marginally more than the central case charge. Note that the model predicts that there will be some reassignment of trips to the Rotherhithe Tunnel (notably Lewisham to Canary Wharf), negating the journey time saving benefits for these users.

There is less congestion for southbound trips in the morning peak and therefore lower time savings are delivered with reductions of between 0 and 4 minutes estimated for the no charge and central case scenarios.

Traffic Flows and Trip distribution

Figures B1 and B2 show the change in total traffic flows crossing the river in east London in 2021 in both directions (morning peak hour). Under the no charge scenario the increase in traffic flows in the northbound peak direction across the Blackwall and Silvertown Tunnels combined is around 1,600 vehicles or a 50% increase on reference case flows. Conversely, under the Silvertown charge scenario, the increase is much smaller at only 400 PCUs. The doubling of charges in the peak direction sensitivity test leads to a reduction of around 700 PCUs on the Blackwall and Silvertown Tunnels combined relative to the central case.

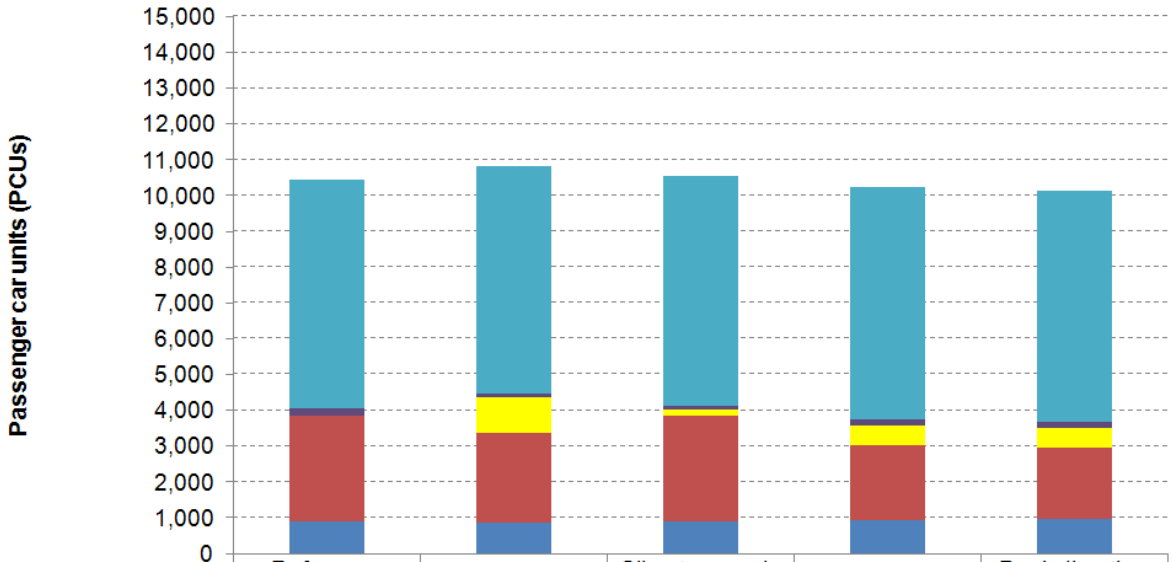
Figure B 1: Cross-river northbound traffic flows in the morning peak hour (0800-0900) in 2021



	Reference Case	No charge	Silvertown-only charge	Central case	Peak direction test
Dartford Crossing	5,900	5,820	5,900	5,870	5,900
Woolwich Ferry	270	170	270	220	180
Silvertown Tunnel	0	1,610	410	1,310	970
Blackwall Tunnel	3,240	3,240	3,240	3,140	2,750
Rotherhithe Tunnel	1,160	970	1,140	1,040	1,180

In the southbound direction the total traffic crossing the river increases only slightly in the no charge scenario. There is some re-distribution of trips from the Blackwall to the Silvertown Tunnel and both operate within their capacity. Under the Silvertown charge scenario only a very small proportion of southbound vehicles choose to use the charged Silvertown Tunnel, namely only those vehicles for whom the journey via the new tunnel is sufficiently faster that they are willing to pay the charge. Both the central case and peak direction sensitivity test are forecast to result in a net reduction in vehicles travelling through the Blackwall and Silvertown Tunnels combined.

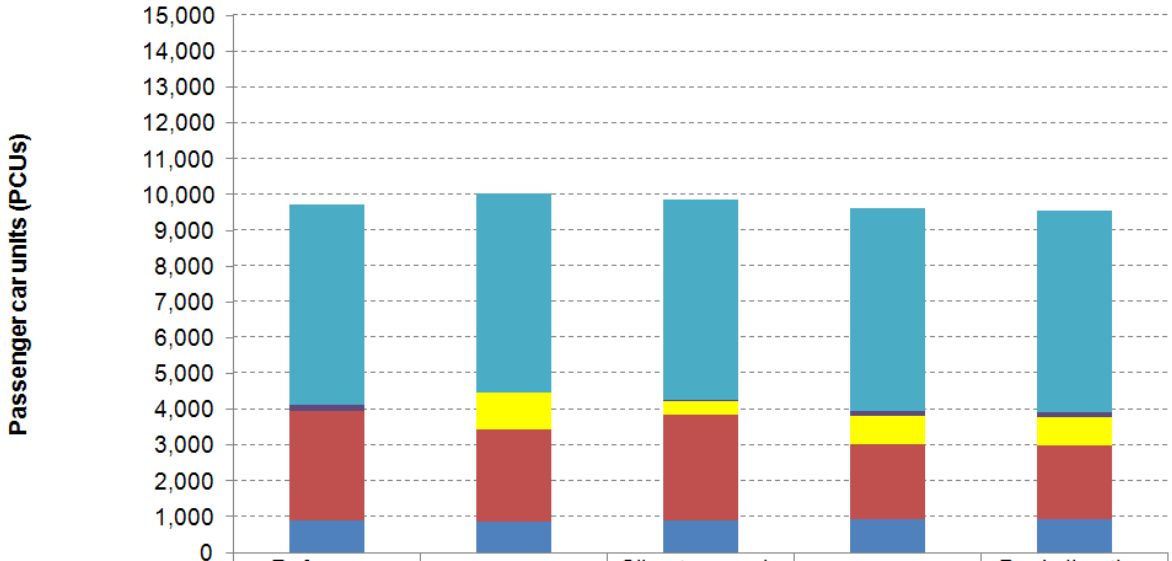
Figure B 2: Cross-river southbound traffic flows in the morning peak hour (0800-0900) in 2021



	Reference Case	No charge	Silvertown-only charge	Central case	Peak direction test
Dartford Crossing	6,370	6,360	6,400	6,490	6,480
Woolwich Ferry	210	110	120	170	170
Silvertown Tunnel	0	990	160	580	550
Blackwall Tunnel	2,970	2,490	2,980	2,080	1,990
Rotherhithe Tunnel	890	870	880	930	950

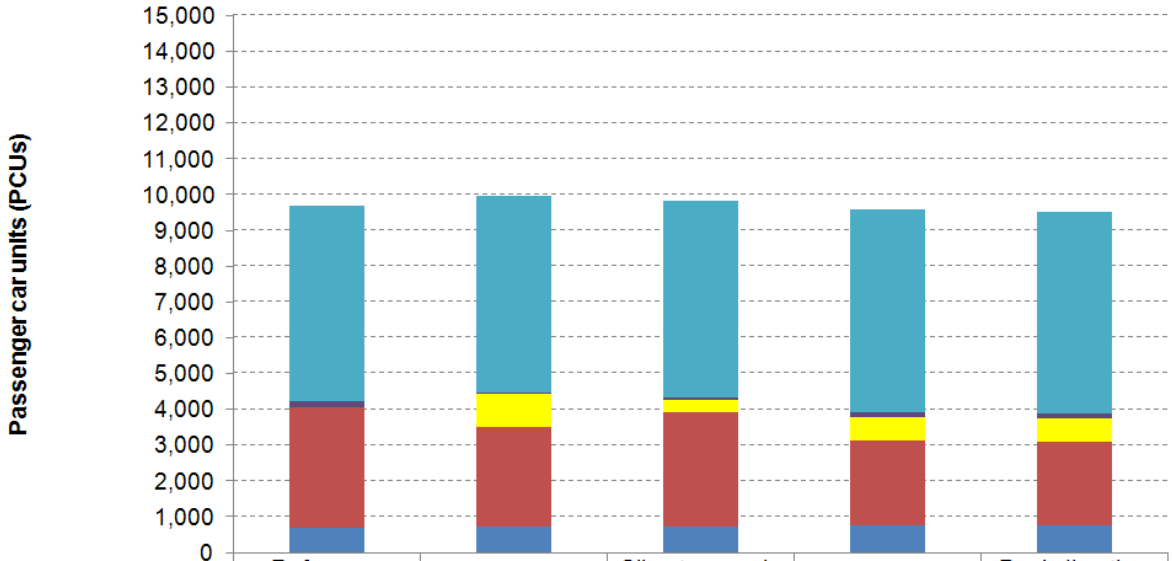
Figures B3 and B4 show the change in cross-river traffic flows in east London in the average inter-peak hour in 2021. In both directions the no charge scenario leads to a small net increase in cross-river trips and some re-distribution of traffic from Blackwall Tunnel to Silvertown Tunnel. Under the Silvertown-only charge scenario only a small proportion of traffic uses the charged Silvertown Tunnel and therefore Blackwall Tunnel flows are virtually unchanged from the reference case. The central case and peak direction sensitivity test are forecast to lead to a net reduction in flows through the Blackwall and Silvertown Tunnels.

Figure B 3: Cross-river northbound traffic flows in the average inter-peak hour in 2021



	Reference Case	No charge	Silvertown-only charge	Central case	Peak direction test
Dartford Crossing	5,590	5,540	5,580	5,680	5,660
Woolwich Ferry	170	20	60	120	110
Silvertown Tunnel	0	1,020	350	800	800
Blackwall Tunnel	3,060	2,570	2,970	2,100	2,070
Rotherhithe Tunnel	900	870	890	920	920

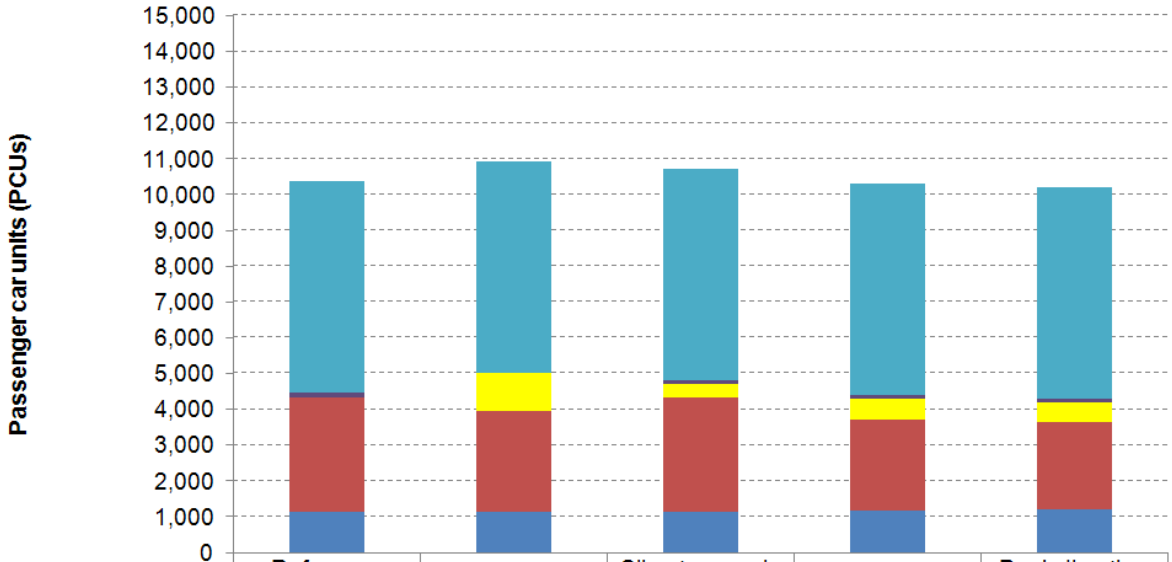
Figure B 4: Cross-river southbound traffic flows in the average inter-peak hour in 2021



	Reference Case	No charge	Silvertown-only charge	Central case	Peak direction test
Dartford Crossing	5,490	5,490	5,510	5,670	5,630
Woolwich Ferry	170	40	70	130	120
Silvertown Tunnel	0	940	330	680	670
Blackwall Tunnel	3,340	2,790	3,210	2,340	2,320
Rotherhithe Tunnel	700	710	710	770	770

Figures B5 and B6 show the change in total traffic flows crossing the river in east and southeast London in 2021 in both directions (evening peak hour). In the northbound direction, the no charge and Silvertown-only charge scenarios reflect the morning peak counter-peak direction. Under the no charge scenario there is some re-distribution of Blackwall Tunnel traffic to Silvertown Tunnel, while Silvertown charge scenario shows little impact on Blackwall Tunnel. The central case and peak direction sensitivity test are both forecast to lead to a reduction in overall cross-river trips.

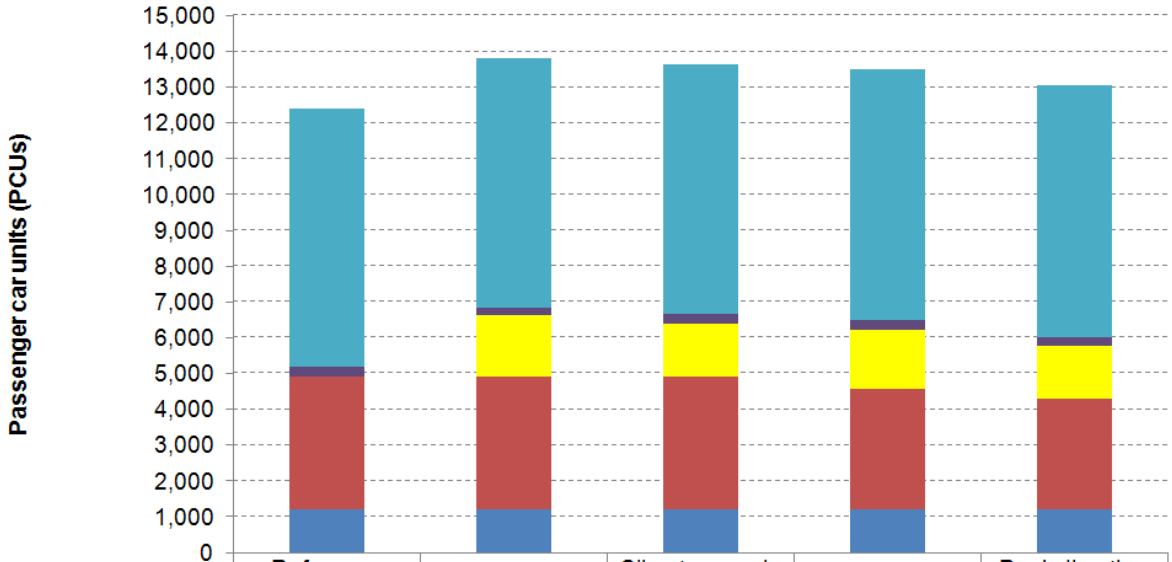
Figure B 5: Cross-river northbound traffic flows in the evening peak hour (1700-1800) in 2021



	Reference Case	No charge	Silvertown-only charge	Central case	Peak direction test
Dartford Crossing	5,900	5,900	5,900	5,900	5,900
Woolwich Ferry	140	30	110	110	110
Silvertown Tunnel	0	1,060	370	600	550
Blackwall Tunnel	3,190	2,810	3,180	2,540	2,440
Rotherhithe Tunnel	1,150	1,130	1,150	1,160	1,190

In the peak southbound direction, the Blackwall Tunnel continues to operate at capacity under both the no charge and Silvertown charge scenarios. Under the no charge scenario the increase in traffic flows in the southbound peak direction across the Blackwall and Silvertown Tunnels combined is around 1,700 vehicles or a 46% increase on reference case flows. Under the Silvertown-only charge scenario, the volume of southbound traffic using the Silvertown Tunnel is only slightly less than the no charge scenario. The demand is relatively inelastic to the charge since there is no spare capacity at the Blackwall Tunnel. In the central case Blackwall Tunnel is forecast to operate just under its operational capacity and in the peak direction sensitivity test at just over 3,000 PCUs per hour.

Figure B 6: Cross-river southbound traffic flows in the evening peak hour (1700-1800) in 2021



	Reference Case	No charge	Silvertown-only charge	Central case	Peak direction test
Dartford Crossing	7,200	6,970	6,980	7,000	7,020
Woolwich Ferry	270	220	250	260	240
Silvertown Tunnel	0	1,700	1,470	1,670	1,480
Blackwall Tunnel	3,720	3,720	3,720	3,350	3,090
Rotherhithe Tunnel	1,210	1,210	1,210	1,210	1,210

The following figures summarise the modelled changes in flows and junction delays as a result of implementing the Silvertown Tunnel under the no charge, Silvertown-only charge and peak direction sensitivity test scenarios.

No charge scenario

Figure B 7 shows the change in traffic flows in the morning peak hour in 2021 due to the implementation of Silvertown Tunnel (no charge). It can be seen that there are large increases in flows northbound on the Blackwall and Silvertown approach routes due to the extra capacity that Silvertown Tunnel provides. There is no change in the Blackwall Tunnel northbound flow but a small re-distribution of southbound flows to the Silvertown Tunnel.

The increase in northbound traffic is observed close to the crossings and on strategic roads such as the A2/A102, A206, A12 and A13. There is also some re-distribution of M25 northbound traffic to the free Blackwall-Silvertown crossing.

Figure B 7: Flow changes as a result of Silvertown Tunnel (no charge, morning peak hour 0800-0900, 2021)

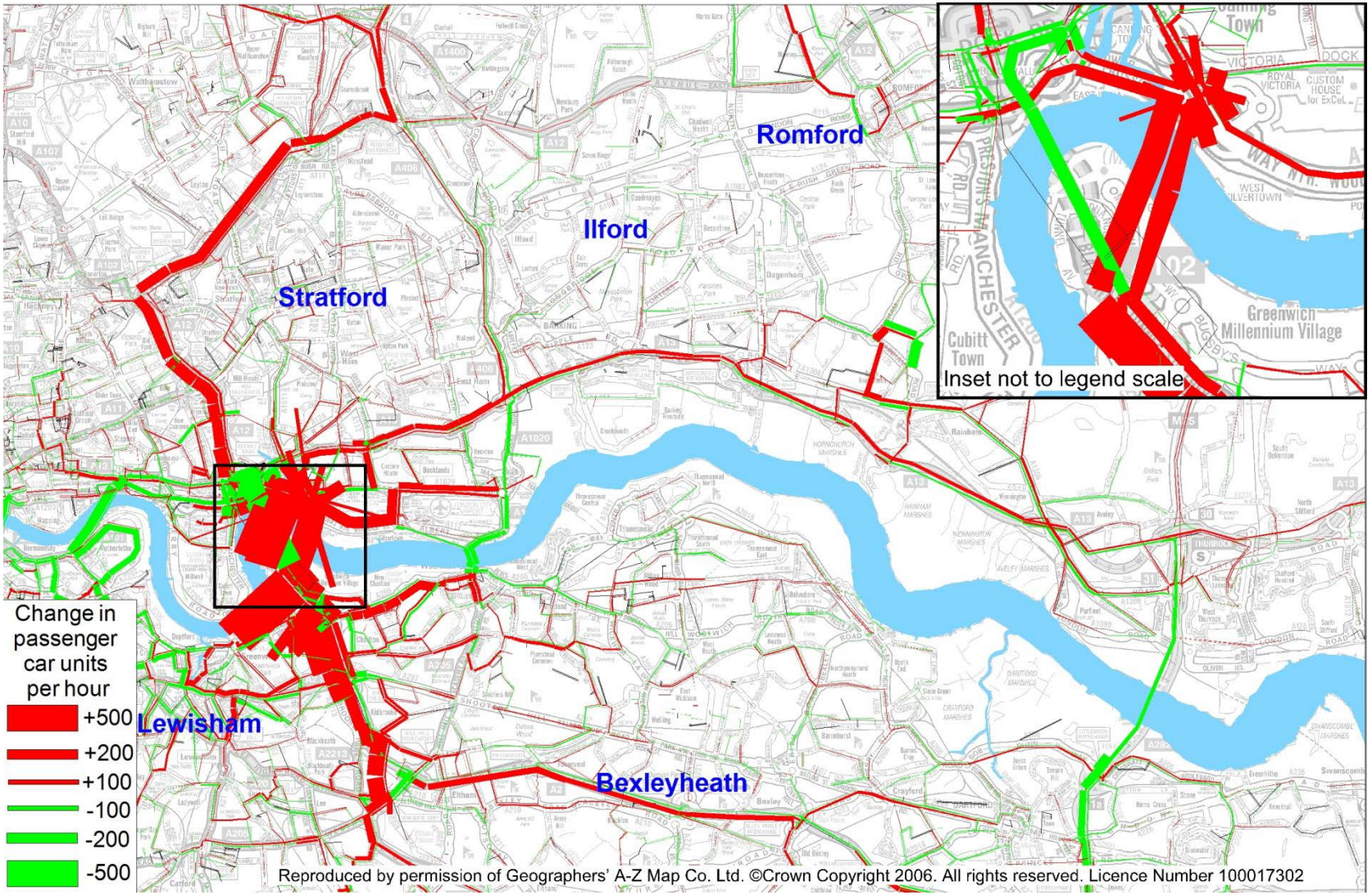


Figure B 8 shows the change in junction delay as a result of implementing Silvertown Tunnel (no charge) in the morning peak hour in 2021. The plot shows that significant reductions in junction delay are achieved on the northbound approaches to the Blackwall and Silvertown Tunnels. However, the increase in northbound flows have significant impacts on the surrounding network leading to increased junction delay at Kidbrooke, Leamouth Circus and East India Dock Road. The increase in northbound traffic also leads to smaller increases in delay over a wide area of Tower Hamlets, Newham and Greenwich. By contrast Southwark experiences a reduction in junction delays.

Figure B 9 shows the change in traffic flows in the average inter-peak hour in 2021 due to the implementation of Silvertown Tunnel (no charge). The patterns are similar to those observed in the morning peak hour, although less pronounced due to the lower level of congestion in the reference case at this time of the day. The impact of vehicles re-routeing from the Woolwich Ferry to the Blackwall and Silvertown Tunnels can be clearly seen.

Figure B 10 shows the change in junction delay as a result of implementing Silvertown Tunnel (no charge) in the morning peak hour in 2021. The re-assignment of traffic from Blackwall to Silvertown leads to small reductions in some junctions in Poplar but small increases in junction delay around the A2/A102 and Barking Road.

Figure B 11 shows the change in traffic flows in the average inter-peak hour in 2021 due to the implementation of Silvertown Tunnel (no charge). It can be seen that there are large increases in flows southbound on the Blackwall and Silvertown approach routes due to the extra capacity that Silvertown Tunnel provides. This increase in southbound traffic flows is observed on the A12, A406 North Circular Road, A2 and A207 Shooter's Hill. Smaller increases in flows are observed across a variety of local roads in Newham and Greenwich. It should be noted that the modelling is strategic in nature and does not include any mitigation measures that might be introduced such as new traffic calming or management measures.

Figure B 12 shows the change in junction delay as a result of implementing Silvertown Tunnel (no charge) in the morning peak hour in 2021. The introduction of the Silvertown Tunnel leads to a very large reduction in junction delays on the southbound approach to the Blackwall Tunnel. However, the overall large increase in southbound flows leads to increased delays at several junctions including Falconwood, Leamouth Circus and Beckton. The increase in southbound traffic also leads to smaller increases in delay over a wide area of Tower Hamlets, Newham and Greenwich. By contrast Southwark experiences a reduction in junction delays.

Figure B 8: Junction delay changes as a result of Silvertown Tunnel (no charge, morning peak hour 0800-0900, 2021)

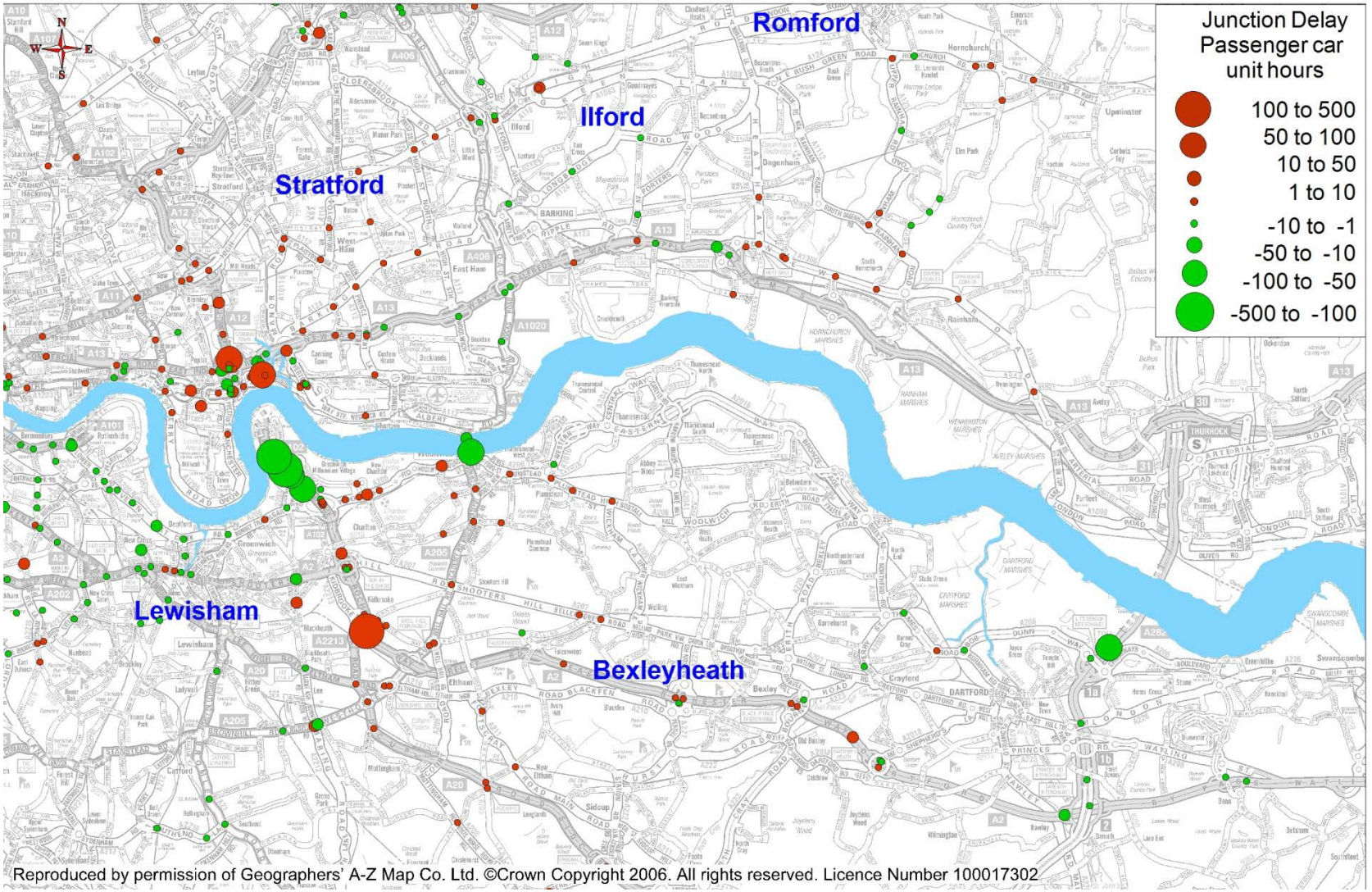


Figure B 9: Flow changes as a result of Silvertown Tunnel (no charge, average inter-peak hour, 2021)

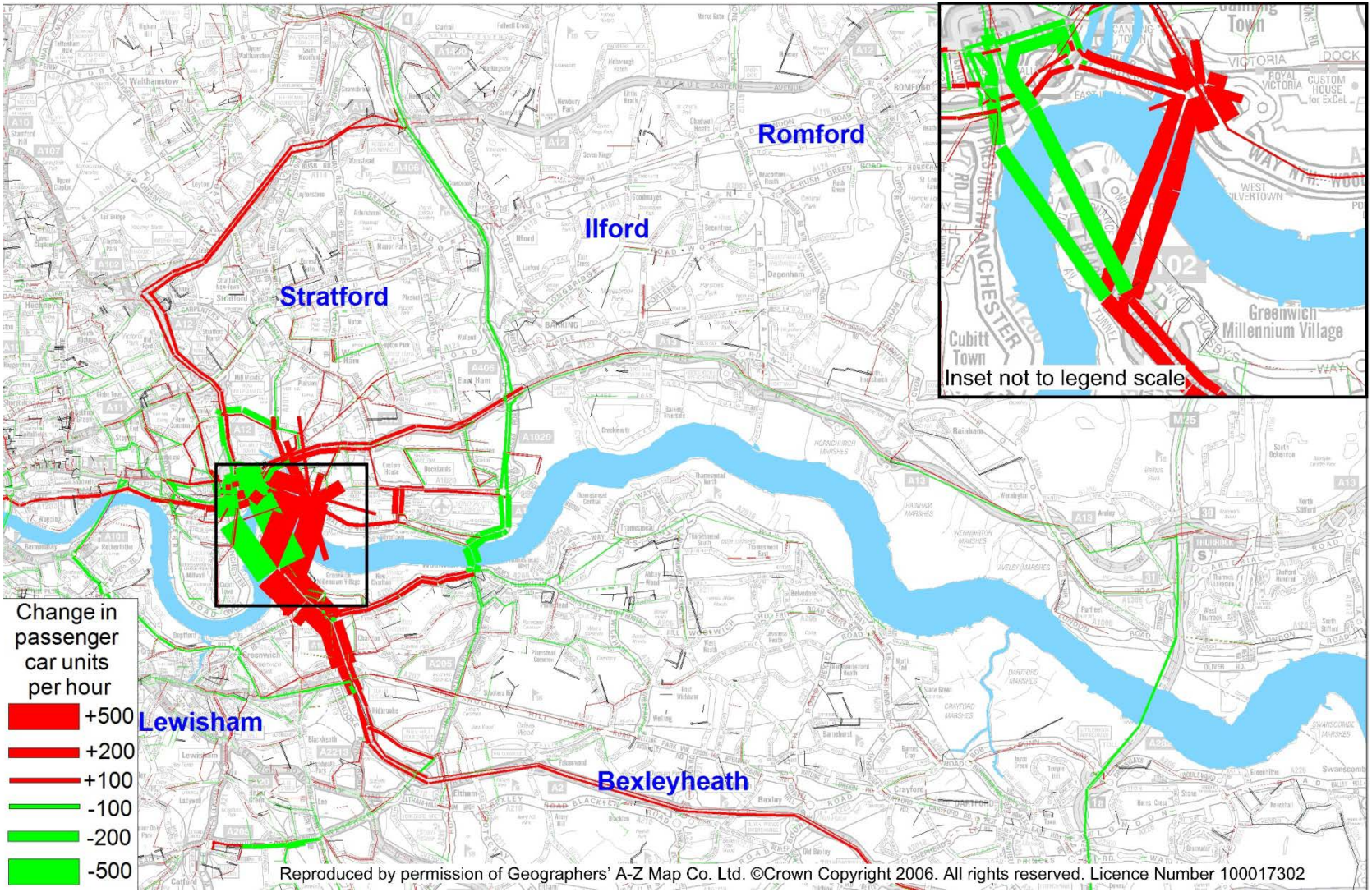


Figure B 10: Junction delay changes as a result of Silvertown Tunnel (no charge, average inter-peak hour, 2021)

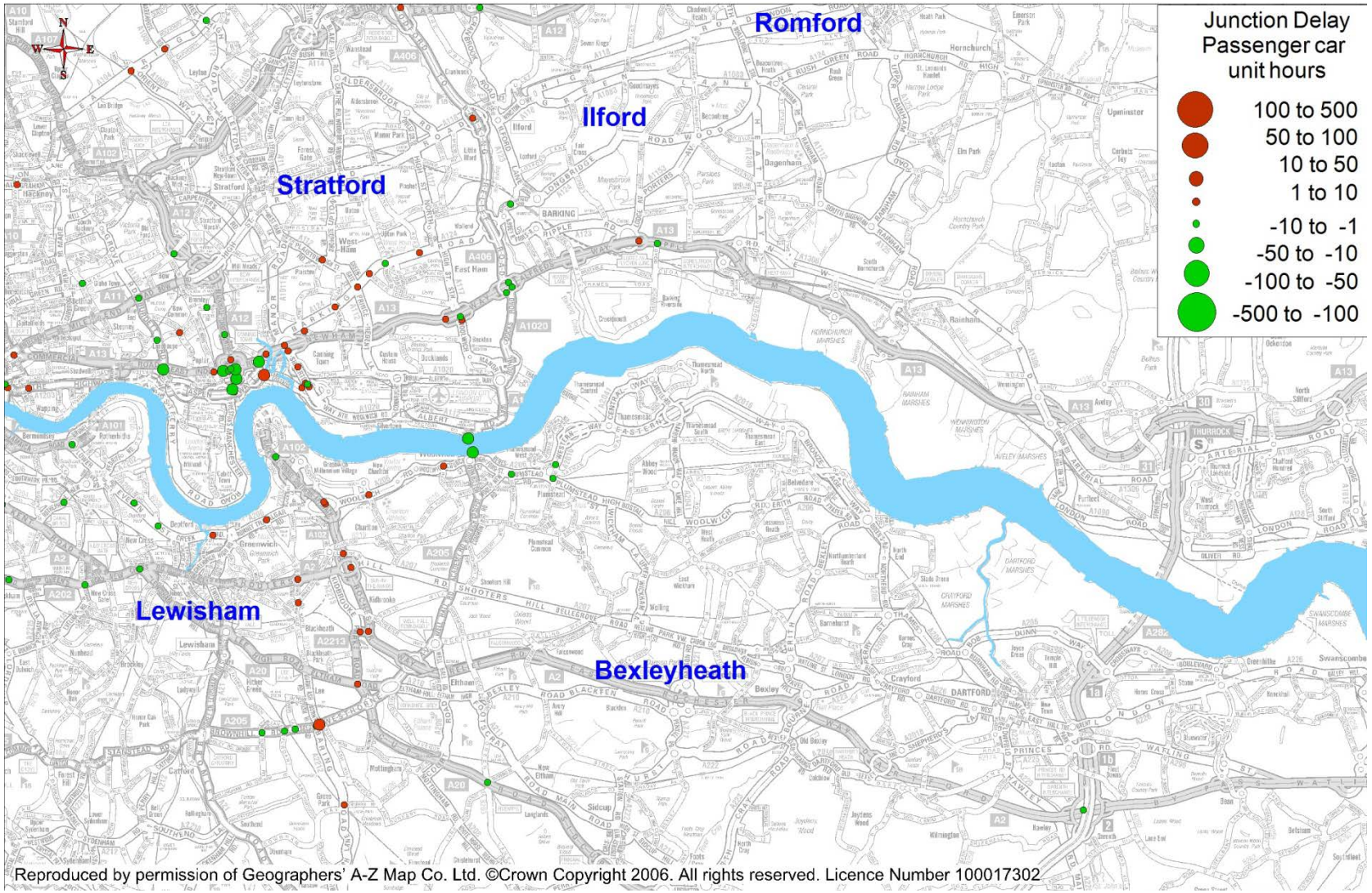


Figure B 11: Flow changes as a result of Silvertown Tunnel (no charge, evening peak hour 1700-1800, 2021)

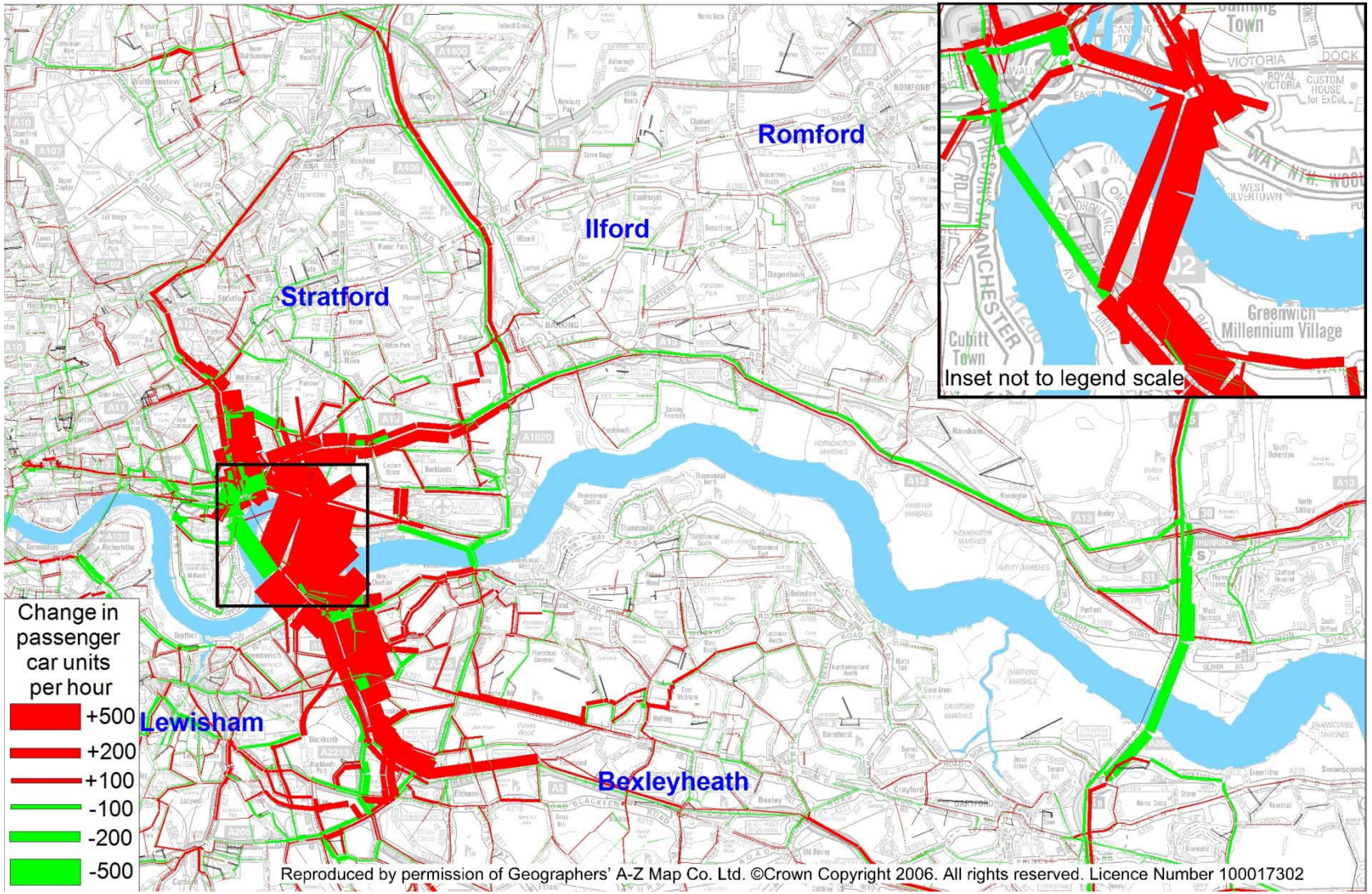
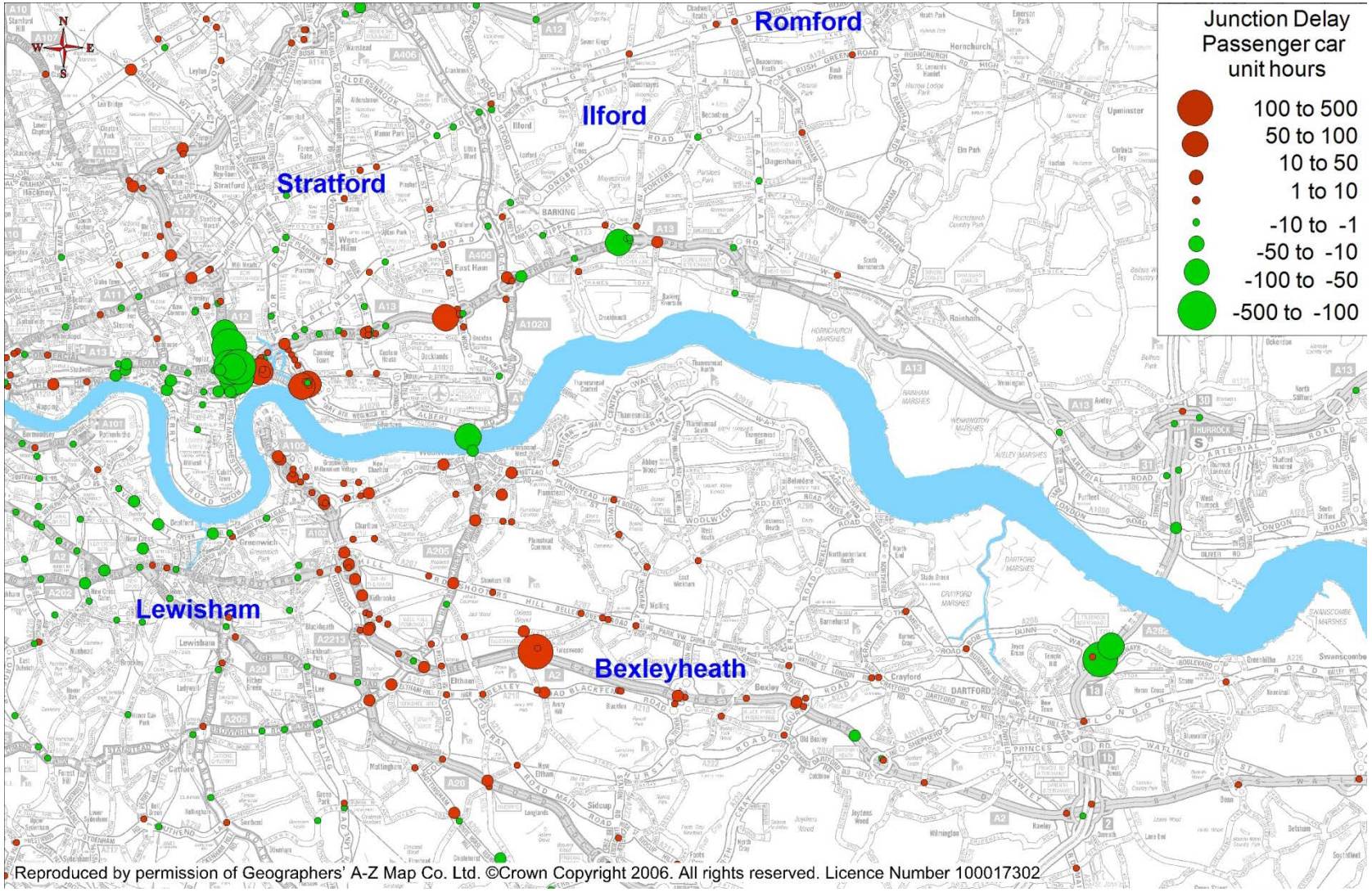


Figure B 12: Junction delay changes as a result of Silvertown Tunnel (no charge, evening peak hour 1700-1800, 2021)



Silvertown-only charge scenario

Figure B 13 shows the change in traffic flows in the morning peak hour in 2021 due to the implementation of Silvertown Tunnel (Silvertown only charged). The changes in flows on the network are much smaller than the no charge scenario with small increases in northbound flows on the A2 and A12.

Figure B 14 shows the change in junction delay as a result of implementing Silvertown Tunnel (Silvertown only charge) in the morning peak hour in 2021. A significant localised reduction in junction delay at the Blackwall Tunnel northbound approach is observed. However, the increase in northbound flows on the shared approach to the Blackwall and Silvertown Tunnels leads to increased junction delays on the A2/A102 corridor.

Figure B 15 shows the change in traffic flows in the average inter-peak hour in 2021 due to the implementation of Silvertown Tunnel (Silvertown only charged). The traffic flows impacts are relatively small on the strategic road network. The re-assignment of vehicles from Woolwich Ferry to Silvertown Tunnel reduces traffic through Beckton.

Figure B 16 shows the change in junction delay as a result of implementing Silvertown Tunnel (Silvertown only charge) in the average inter-peak hour in 2021. The modelled impacts are much smaller than the no charge scenario.

Figure B 17 shows the change in traffic flows in the evening peak hour in 2021 due to the implementation of Silvertown Tunnel (Silvertown only charged). While the changes in flows on the network are smaller than the no charge scenario, there are still significant increases in southbound flows on the A12 ad A2. The corresponding reduction in southbound flows on the Dartford Crossing can be observed. The model also shows increased traffic flows on more local roads in southeast London similar to the no charge scenario.

Figure B 18 shows the change in junction delay as a result of implementing Silvertown Tunnel (Silvertown only charge) in the evening peak hour in 2021. The junction delay impacts are similar to the no charge scenario with a large reduction in delays approaching the Blackwall Tunnel southbound, and corresponding increases in junction delays on the A2 (Falconwood) and the A13 (Beckton).

Figure B 13: Flow changes as a result of Silvertown Tunnel (Silvertown charge, morning peak hour 0800-0900, 2021)

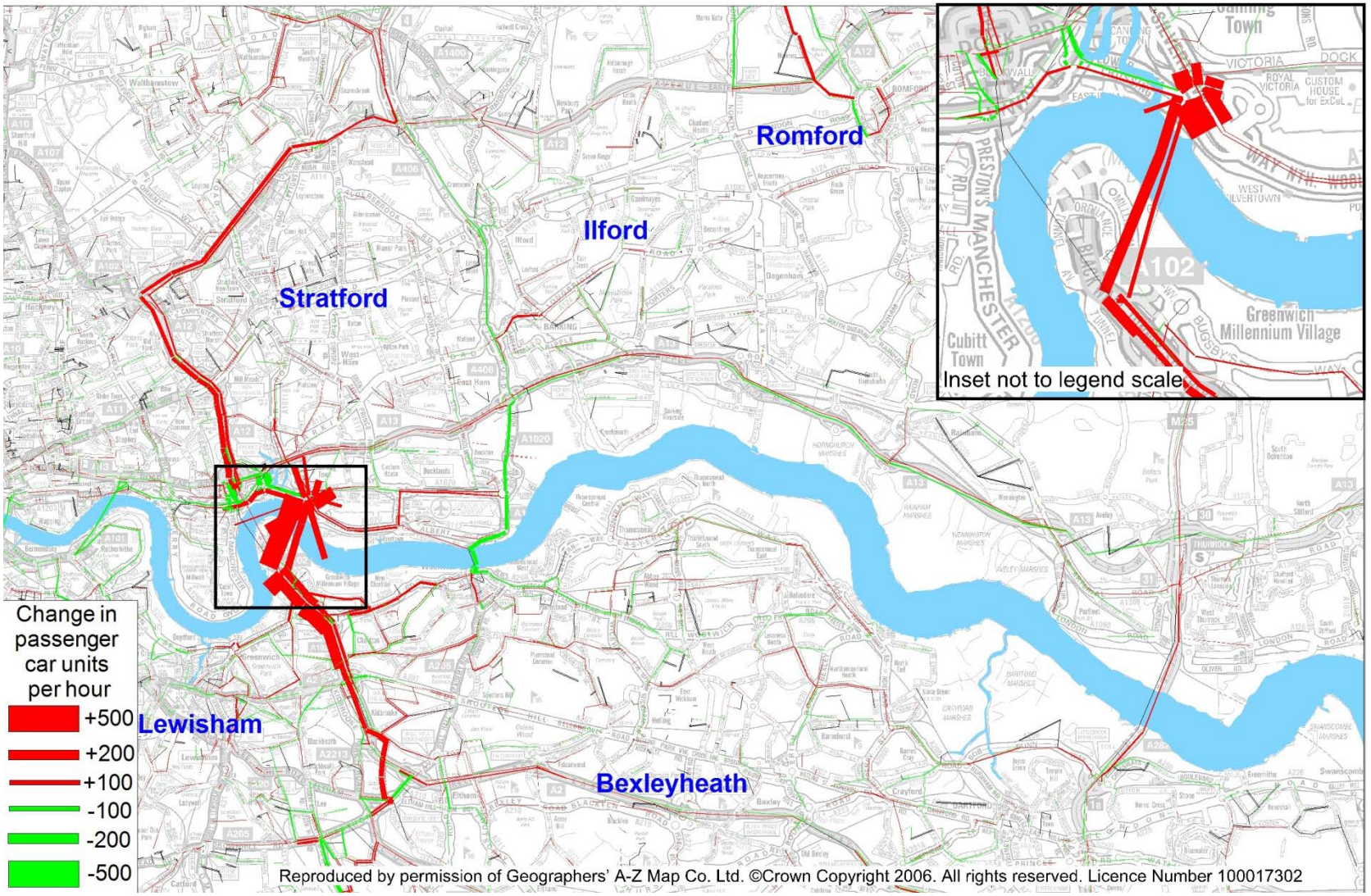


Figure B 14: Junction delay changes as a result of Silvertown Tunnel (Silvertown charge, morning peak hour 0800-0900, 2021)

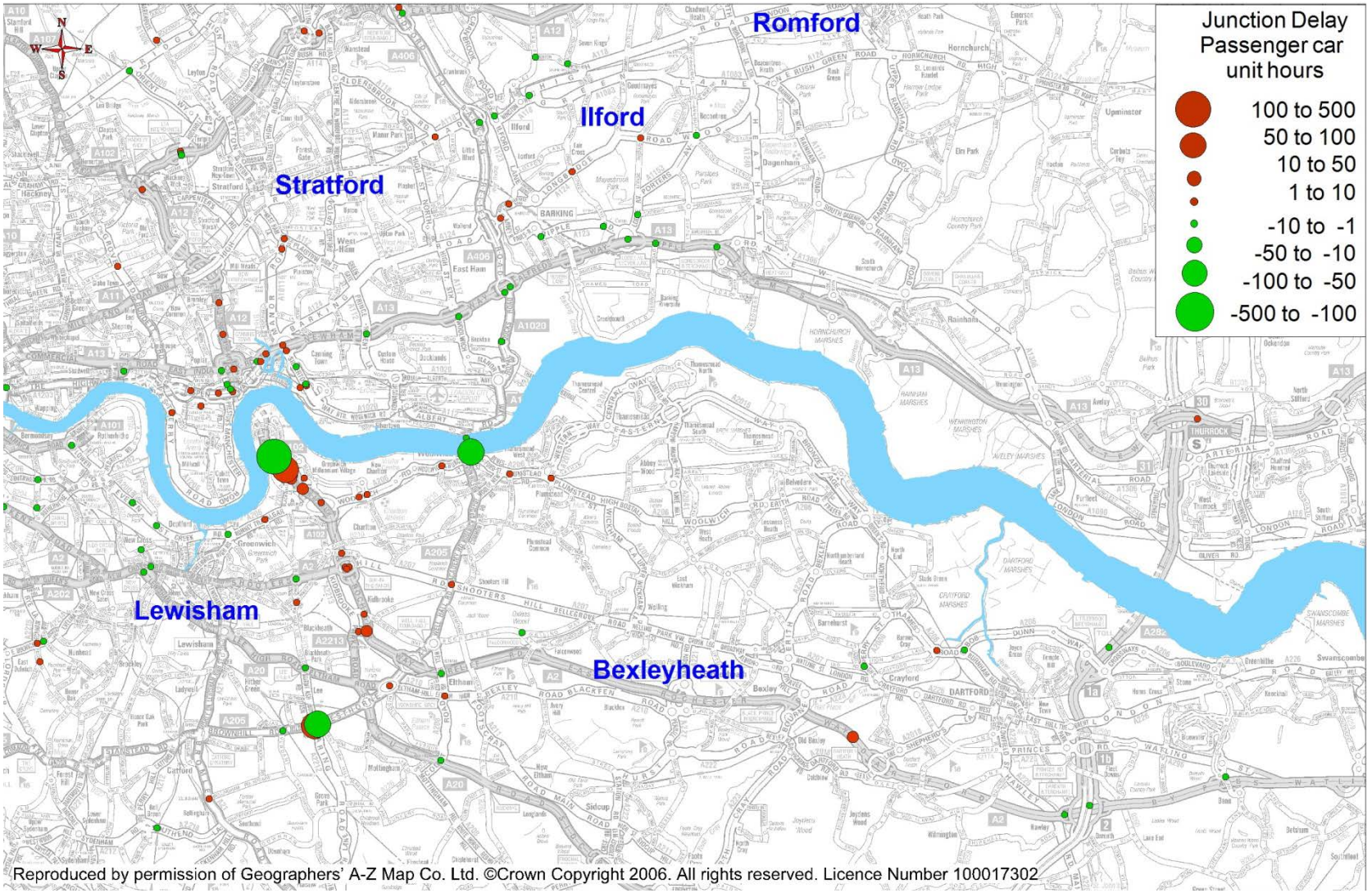


Figure B 15: Flow changes as a result of Silvertown Tunnel (Silvertown charge, average inter-peak hour, 2021)

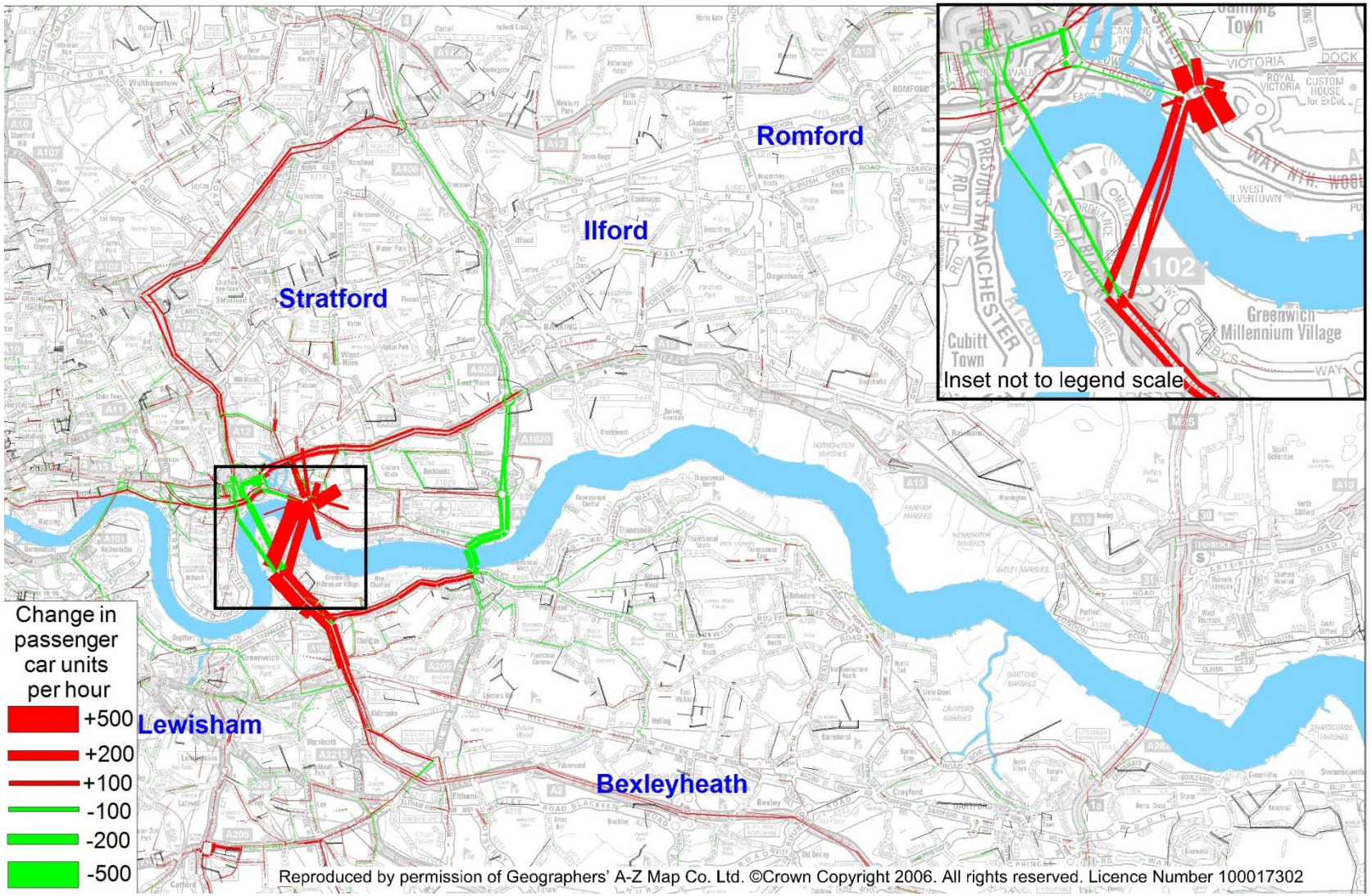


Figure B 16: Junction delay changes as a result of Silvertown Tunnel (Silvertown charge, average inter-peak hour, 2021)

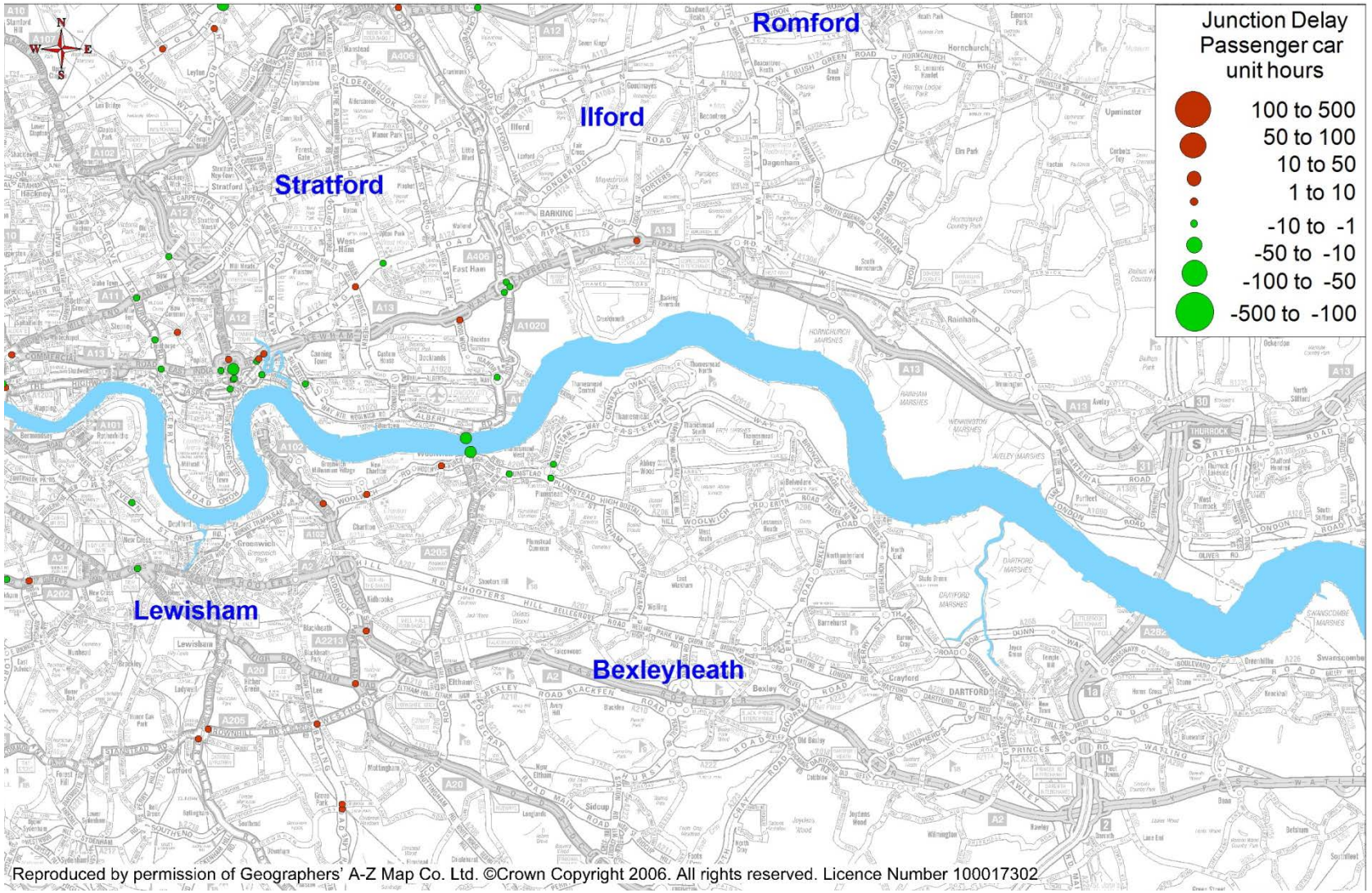


Figure B 17: Flow changes as a result of Silvertown Tunnel (Silvertown charge, evening peak hour 1700-1800, 2021)

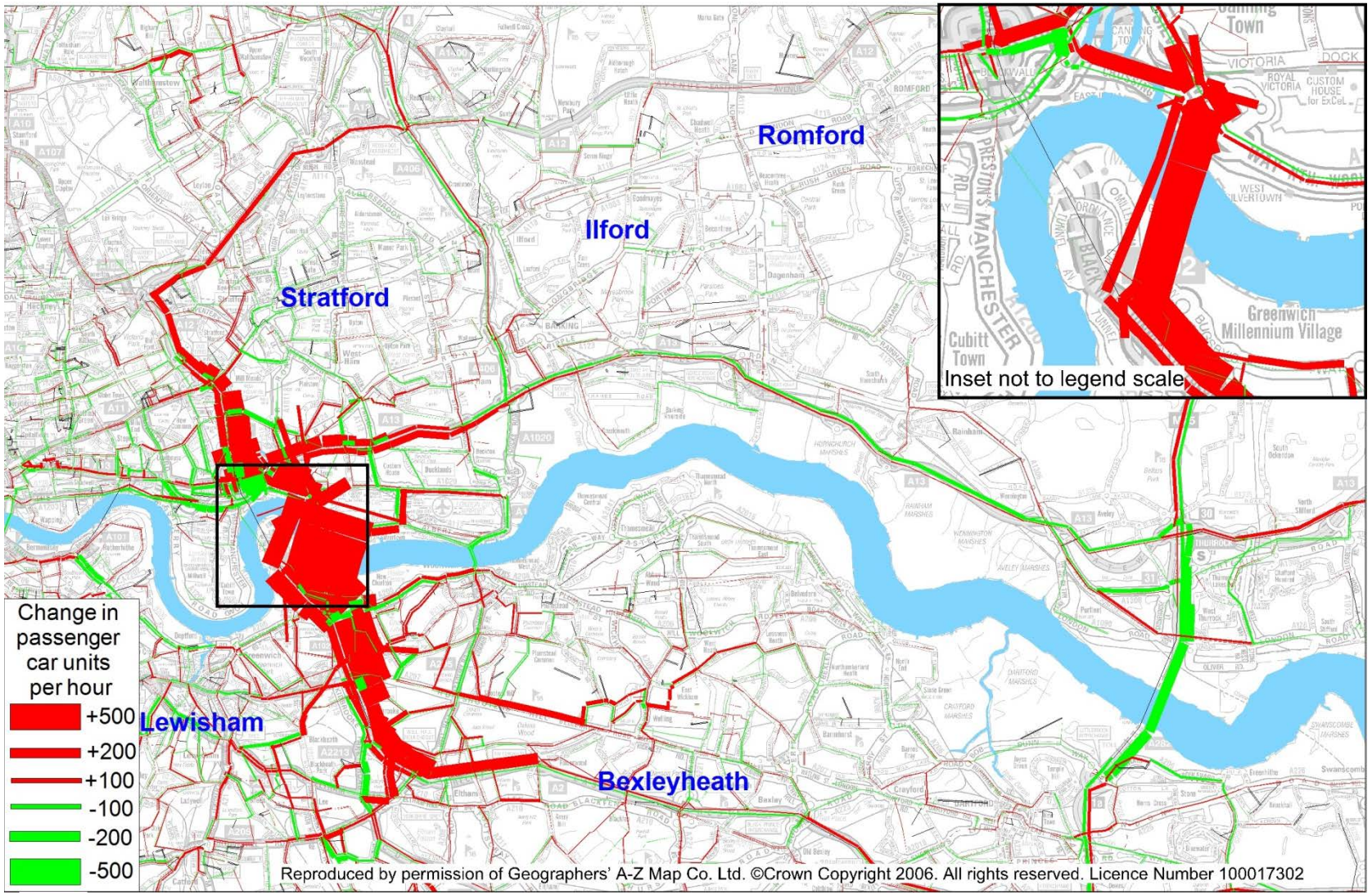
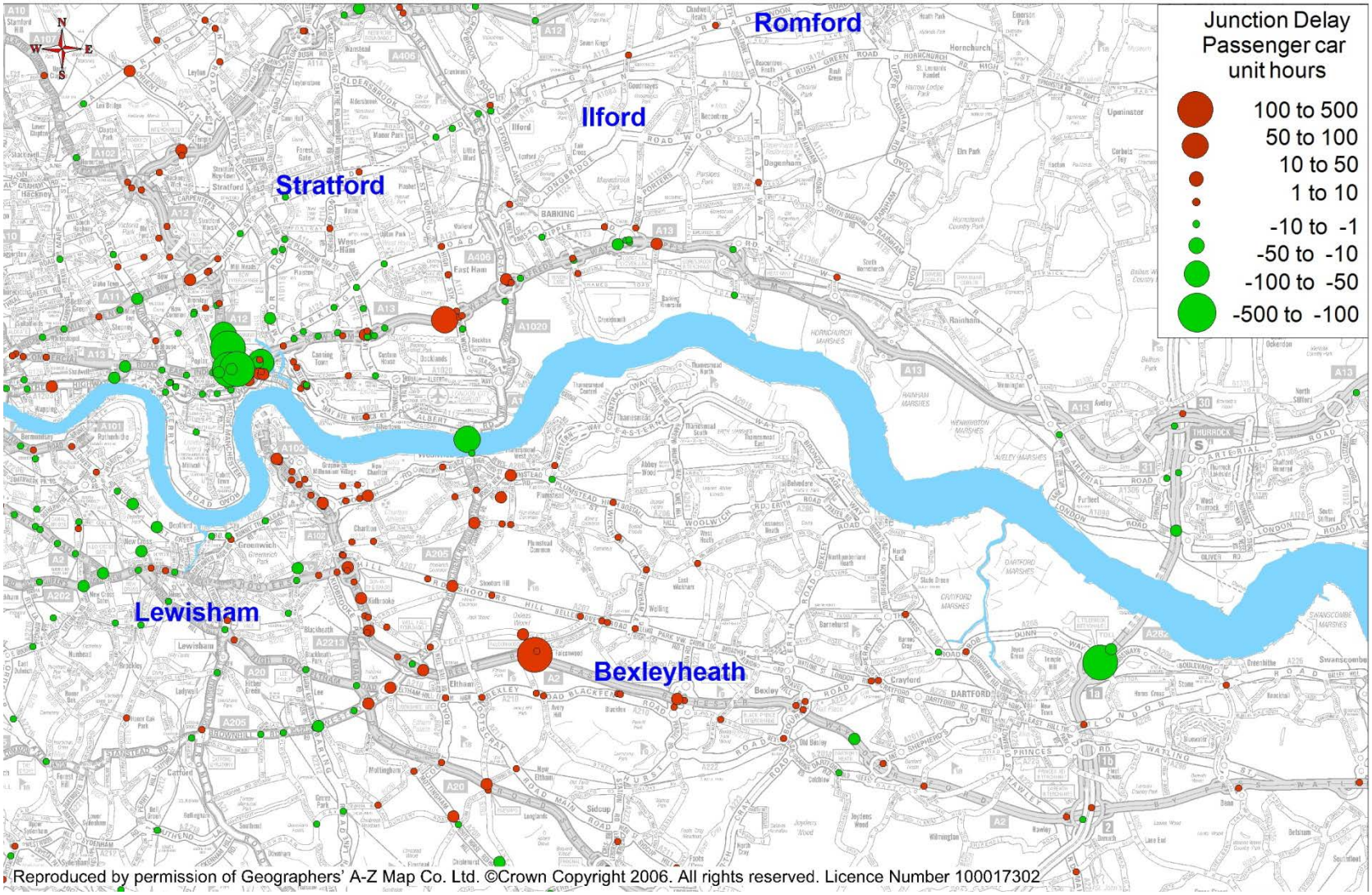


Figure B 18: Junction delay changes as a result of Silvertown Tunnel (Silvertown charge, evening peak hour 1700-1800, 2021)



Peak direction sensitivity test

For the peak direction sensitivity test both Blackwall and Silvertown Tunnels are charged at double the central case charges in the peak direction (off-peak and counter peak charges as in the central case).

Figure B 19 shows the change in traffic flows in the morning peak hour in 2021 due to the implementation of Silvertown Tunnel (peak direction sensitivity test). The wider network changes in flows (A102, A12, A13) are lower than the central case.

Figure B 20 shows the change in junction delay as a result of implementing Silvertown Tunnel (peak direction sensitivity test) in the morning peak hour in 2021. There is a considerable reduction in delays on the northbound A102 Blackwall Tunnel Approach. However, the effects of traffic seeking to divert to the Rotherhithe Tunnel and Tunnel Bridge is responsible for small increases in delay at a number of junctions across Lewisham and Southwark.

Figure B 21 shows the change in traffic flows in the average inter-peak hour in 2021 due to the implementation of Silvertown Tunnel (peak direction sensitivity test). The forecast changes in traffic flows are the same as those observed in the central case scenario.

Figure B 22 shows the change in junction delay as a result of implementing Silvertown Tunnel (peak direction sensitivity test) in the average inter-peak hour in 2021. The scale of changes is the same as that observed in the central case scenario.

Figure B 23 shows the change in traffic flows in the evening peak hour in 2021 due to the implementation of Silvertown Tunnel (peak direction sensitivity test). This scenario has less impact on some sections of the wider network than the central case (A13 in both directions).

Figure B 24 shows the change in junction delay as a result of implementing Silvertown Tunnel (peak direction sensitivity test) in the evening peak hour in 2021.

Figure B 19: Flow changes as a result of Silvertown Tunnel (peak direction sensitivity test, morning peak hour 0800-0900, 2021)

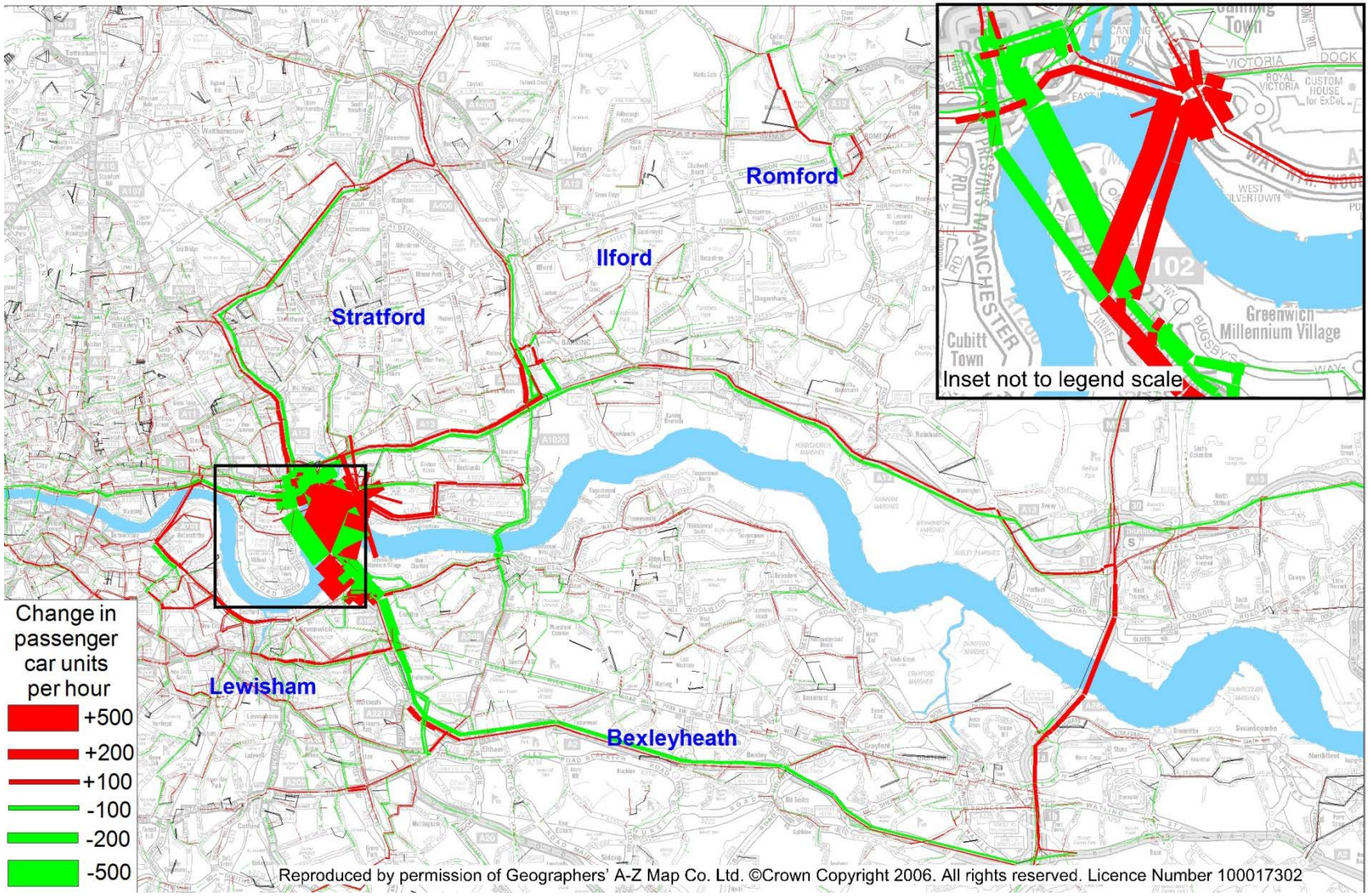


Figure B 20: Junction delay changes as a result of Silvertown Tunnel (peak direction sensitivity test, morning peak hour 0800-0900, 2021)

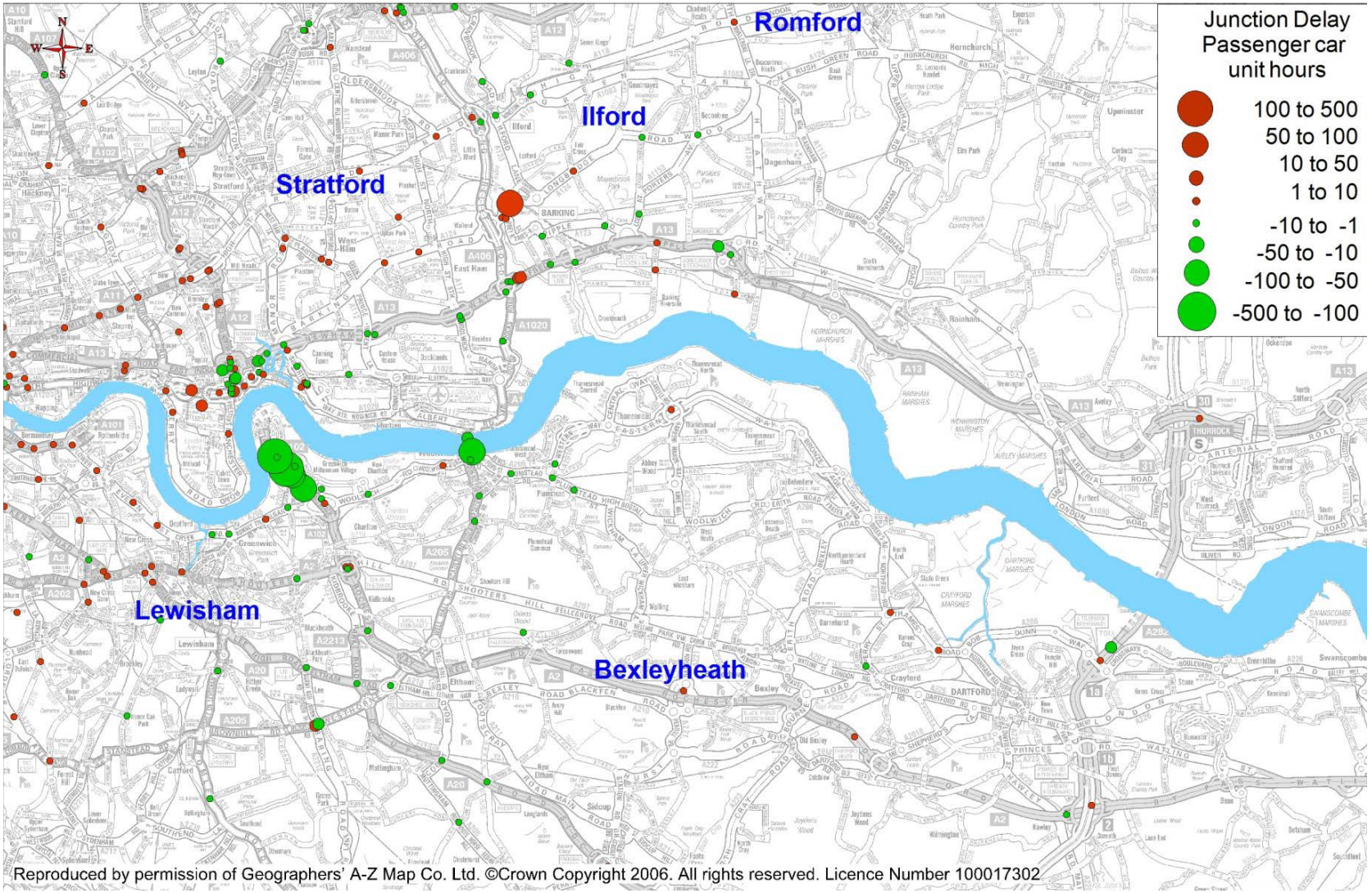


Figure B 21: Flow changes as a result of Silvertown Tunnel (peak direction sensitivity test, average inter-peak hour, 2021)

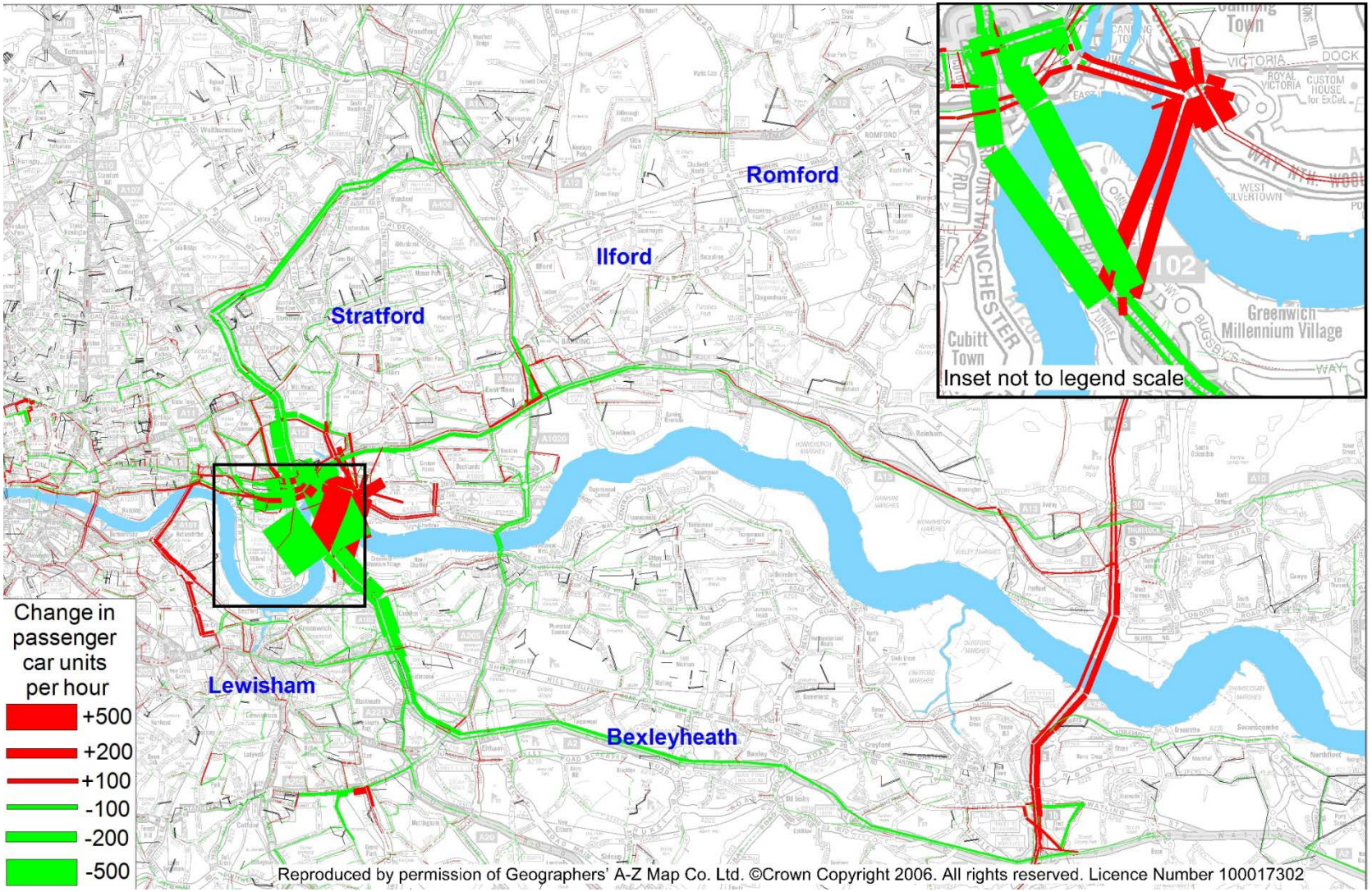


Figure B 22: Junction delay changes as a result of Silvertown Tunnel (peak direction sensitivity test, average inter-peak hour, 2021)

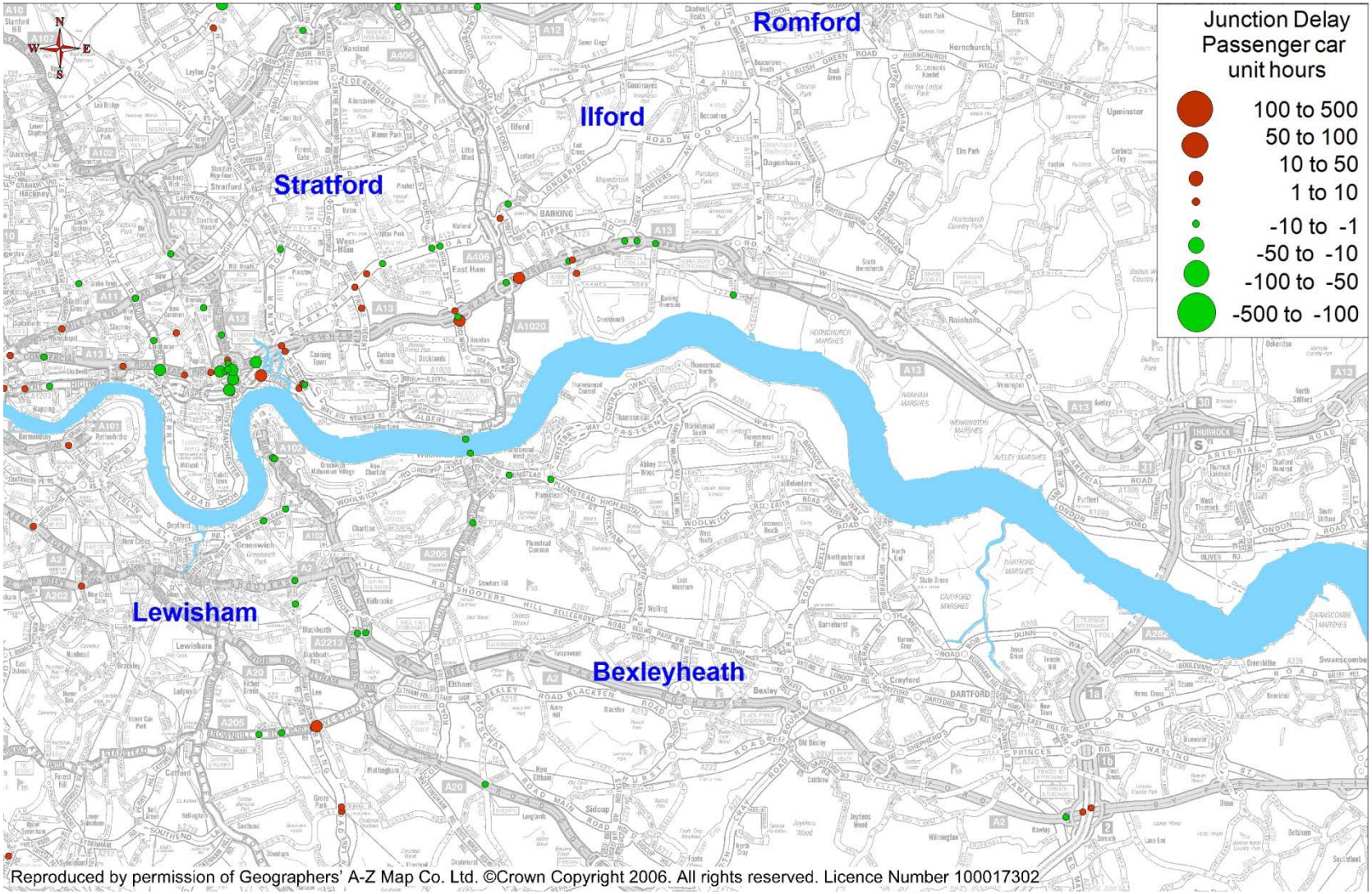


Figure B 23: Flow changes as a result of Silvertown Tunnel (peak direction sensitivity test, evening peak hour 1700-1800, 2021)

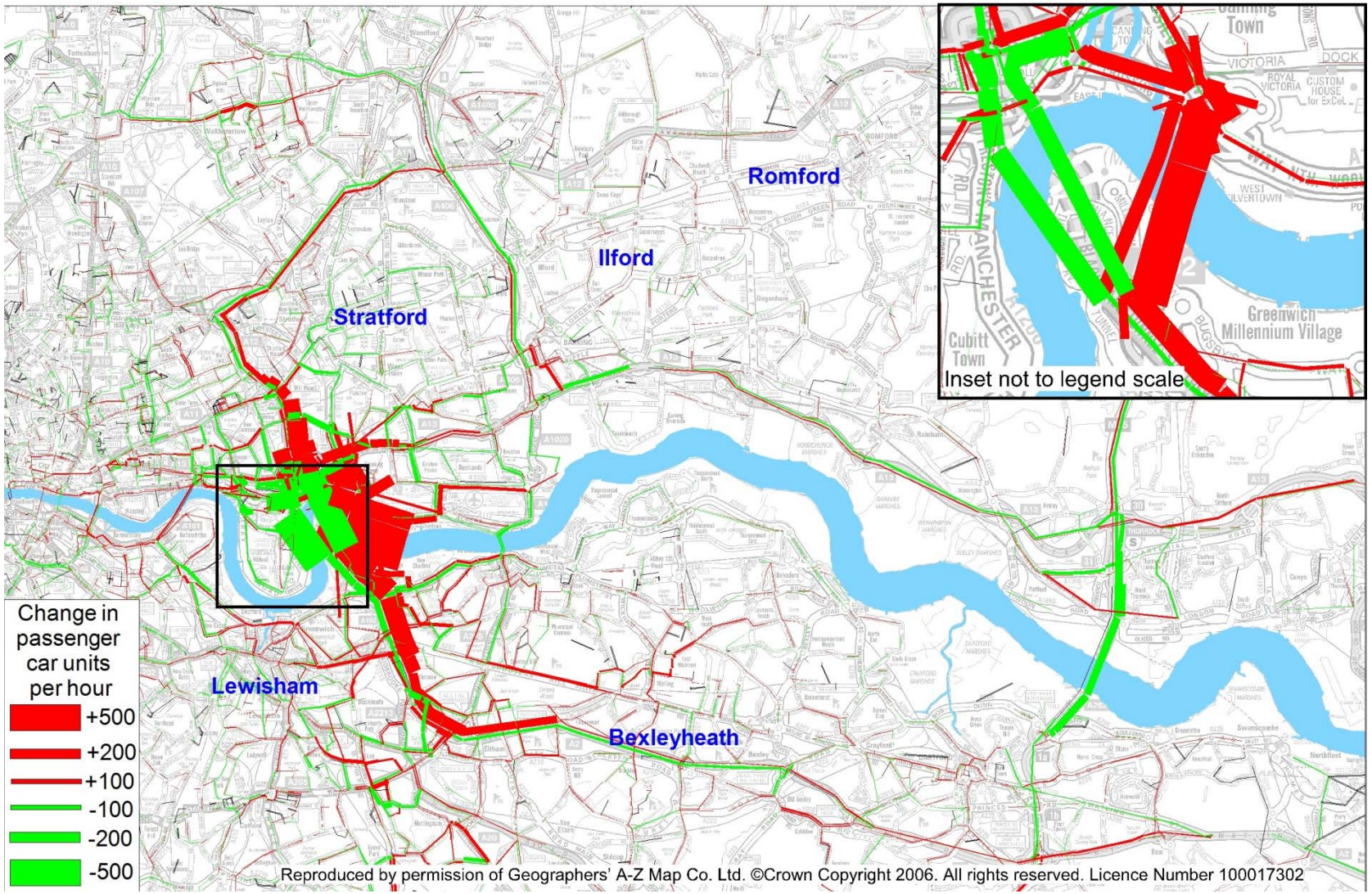
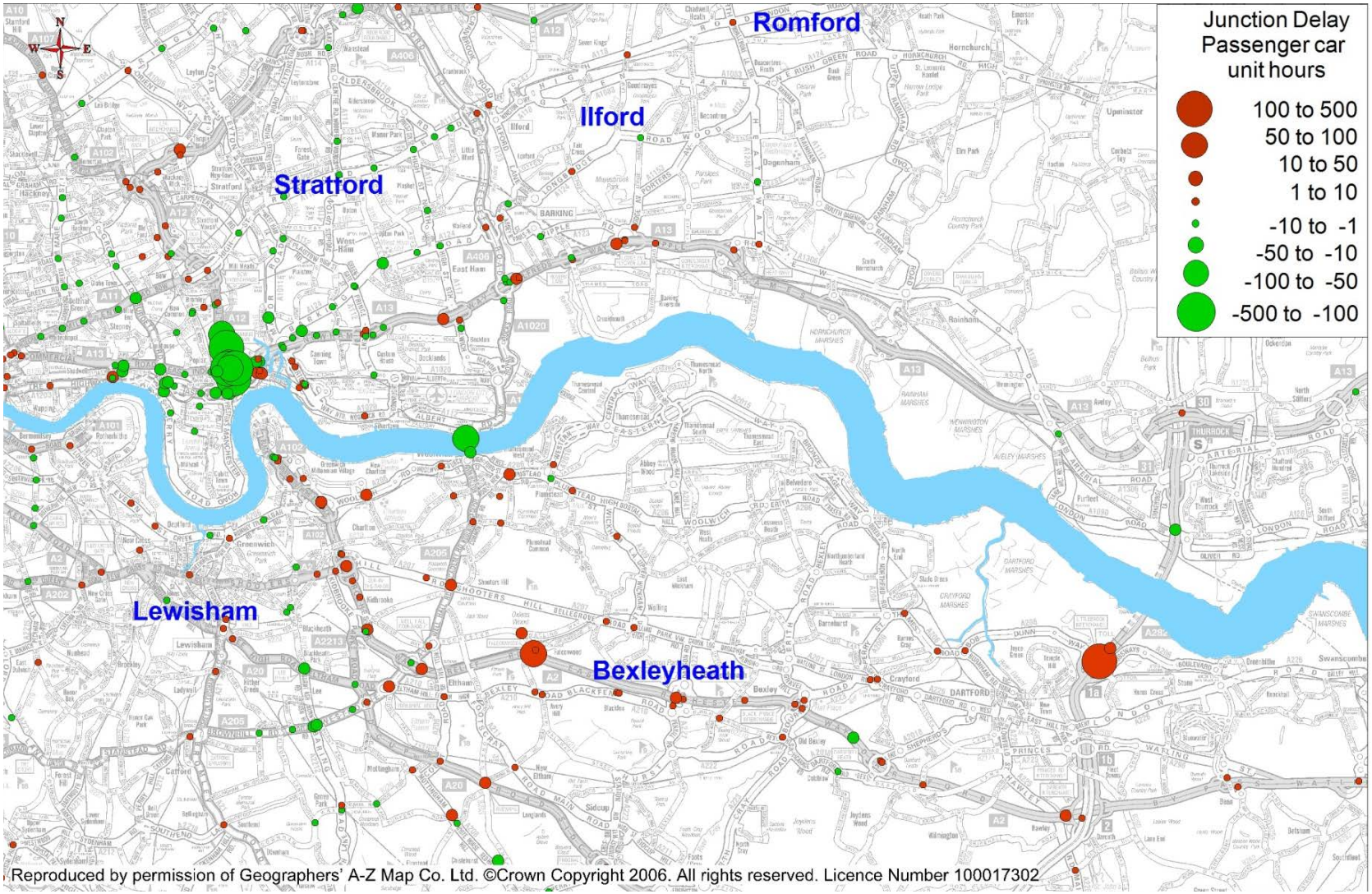


Figure B 24: Junction delay changes as a result of Silvertown Tunnel (peak direction sensitivity test, evening peak hour 1700-1800, 2021)



The previous maps highlight the complexity of some of the modelled network impacts of Silvertown Tunnel and the charging scenarios. Statistics aggregated to borough-level area useful way to summarise the impacts at numerous junctions into an area-wide indicator. Table B 2 shows the change in total congestion (PCU delay hours) for the three host boroughs (Greenwich, Newham, Tower Hamlets,).

Table B 2: Borough-level delay statistics (relative to 2021 reference case)

Indicator	Borough	No charge	Silvertown-only charge	Central case	Peak direction sensitivity test
Total delay PCU-hours (morning peak hour)	Greenwich	-8%	0%	-22%	-26%
	Newham	+2%	-1%	+1%	-0%
	Tower Hamlets	+9%	+1%	+7%	-1%
	Host boroughs	**-0.6%**	**0.0%**	**-7.7%**	**-11.6%**
Total delay PCU-hours (evening peak hour)	Greenwich	+23%	+17%	+14%	+8%
	Newham	+3%	0%	-3%	-4%
	Tower Hamlets	-21%	-16%	-27%	-31%
	Host boroughs	**+0.8%**	**-0.5%**	**-6.7%**	**-10.2%**

Summary

The option of introducing the Silvertown Tunnel without road user charging has some considerable negative impacts on the surrounding network, notably in Greenwich in the evening peak, and the impact over the three host boroughs as a whole mounts to no net improvement. While the no charge scenario shows improved resilience compared to the reference case, the high levels of traffic forecast throughout the day would in effect mean that the tunnels would struggle to recover from an unplanned incident.

The Silvertown-only charging option does not reduce congestion at the Blackwall Tunnel. This is primarily because a high number of vehicles are estimated to queue to use a potentially uncharged Blackwall Tunnel. This queue is estimated to block the shared approach to the Blackwall and Silvertown Tunnels, leading to very low usage of the Silvertown Tunnel as well as high levels of delay. Therefore it is preferable that the Blackwall and Silvertown Tunnels are treated as a single operational entity and both charged.

The central case and peak direction sensitivity test both lead to reduced congestion at the Blackwall Tunnel. The central case leads to considerable improvements in journey time, and is forecast to almost completely eradicate the queues at the Blackwall Tunnel in peak periods and in peak directions. The peak direction sensitivity test produces the greatest net benefits to the surrounding road network in the host boroughs with a 26% reduction in morning peak hour delays in Greenwich and a 31% reduction in the evening peak hour in Tower Hamlets.

Appendix C: Scenario including Gallions Reach and Belvedere crossings

Description of scenario

A separate consultation has recently concluded on proposals for additional river crossings to the east of Silvertown. This appendix presents the results of one of the traffic model scenarios relating to the impact of additional crossing capacity on demand for Silvertown Tunnel. A scenario with two new bridge crossings has been selected since this represents the maximum potential diversion of demand away from the Blackwall and Silvertown Tunnels.

In this scenario the Blackwall and Silvertown Tunnels are identical to the central case scenario. The Woolwich Ferry is removed. There are two new bridges to the east of Silvertown Crossing at Gallions Reach and Belvedere. The four crossings – Blackwall, Silvertown, Gallions Reach, Belvedere – are all subject to the same user charges as the central case scenario.

For the sake of comparability, the results presented in this appendix are for 2021.

Connectivity

Table C 1 shows the number of minutes saved for selected journeys from south to north of the River Thames and vice versa in the morning peak hour in 2021. Both the central case and the scenario including Gallions Reach and Belvedere are compared to the reference case. The additional crossings to the east of Silvertown have very little impact on the journey time savings forecast for Silvertown Tunnel.

Table C 1: Journey time savings due to combined crossings (morning peak hour, 2021, in minutes)

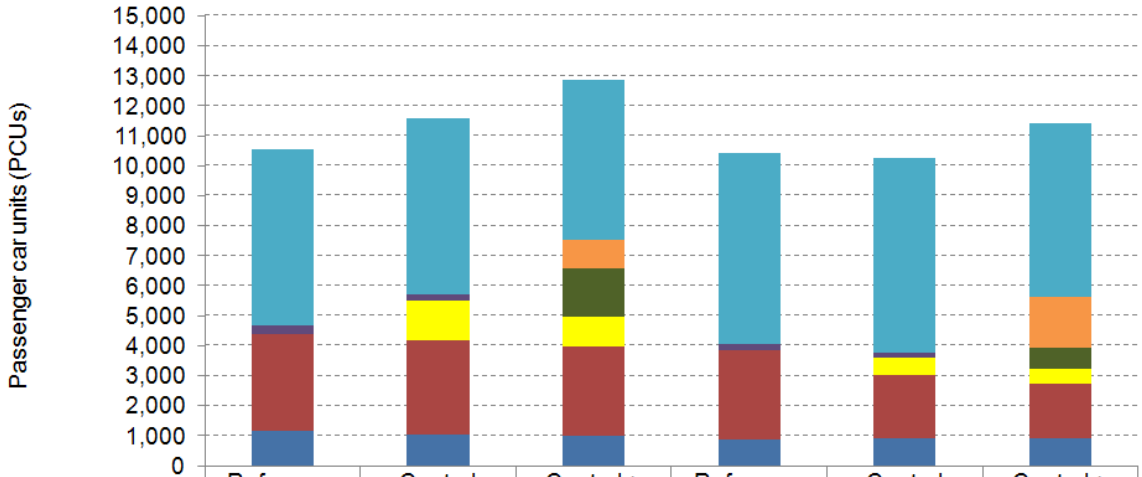
	To Stratford		To Royals		To Canary Wharf	
Northbound	Central case	Central + Gallions + Belvedere	Central case	Central + Gallions + Belvedere	Central case	Central + Gallions + Belvedere
Lewisham	13	15	22	23	16	18
Charlton	15	17	23	24	17	19

	To Lewisham		To Charlton	
Southbound	Central case	Central + Gallions + Belvedere	Central case	Central + Gallions + Belvedere
Stratford	1	1	1	1
Royals	4	4	3	3
Canary Wharf	3	2	2	2

Traffic Flows and Trip Distribution

Figure C 1 shows the change in total traffic flows crossing the river in east London in 2021 in both directions (morning peak hour). The addition of new crossings to the east of Silvertown reduces demand for the Blackwall and Silvertown Tunnels combined by around 500 PCUs northbound and 350 PCUs southbound.

Figure C 1: Cross-river traffic flows in the morning peak hour (0800-0900) in 2021

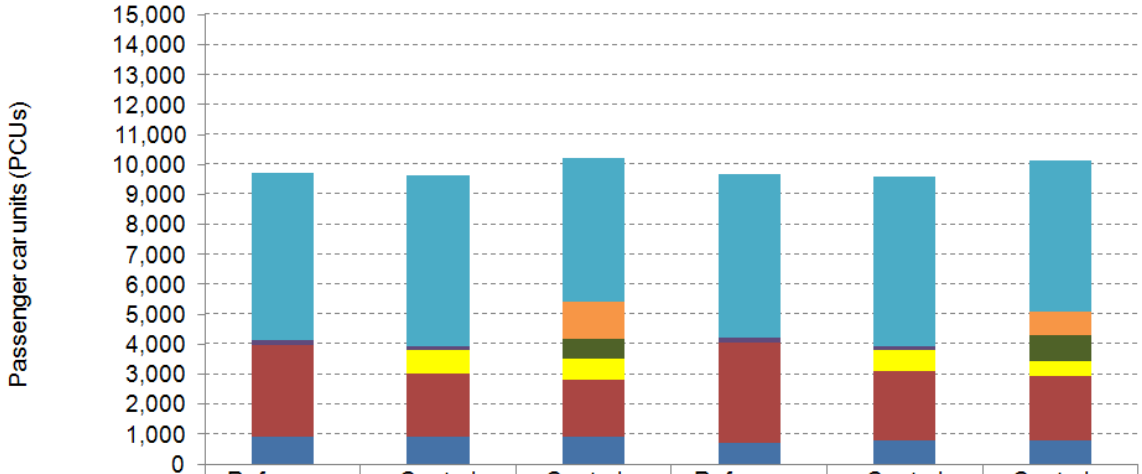


	Reference Case Northbound	Central Case Northbound	Central + Gall + Bel Northbound	Reference Case Southbound	Central Case Southbound	Central + Gall + Bel Southbound
Dartford Crossing	5,900	5,870	5,320	6,370	6,490	5,780
Belvedere Bridge	0	0	950	0	0	1,690
Gallions Bridge	0	0	1,620	0	0	690
Woolwich Ferry	270	220	0	210	170	0
Silvertown Tunnel	0	1,310	990	0	580	520
Blackwall Tunnel	3,240	3,140	2,980	2,970	2,080	1,790
Rotherhithe Tunnel	1,160	1,040	990	890	930	930

Figure C 2 shows the change in cross-river traffic flows in east London in the average inter-peak hour in 2021. The impact of the new crossings to the east of Silvertown translates into reductions in flow at the Blackwall and Silvertown Tunnels combined of between 80 and 150 PCUs per hour.

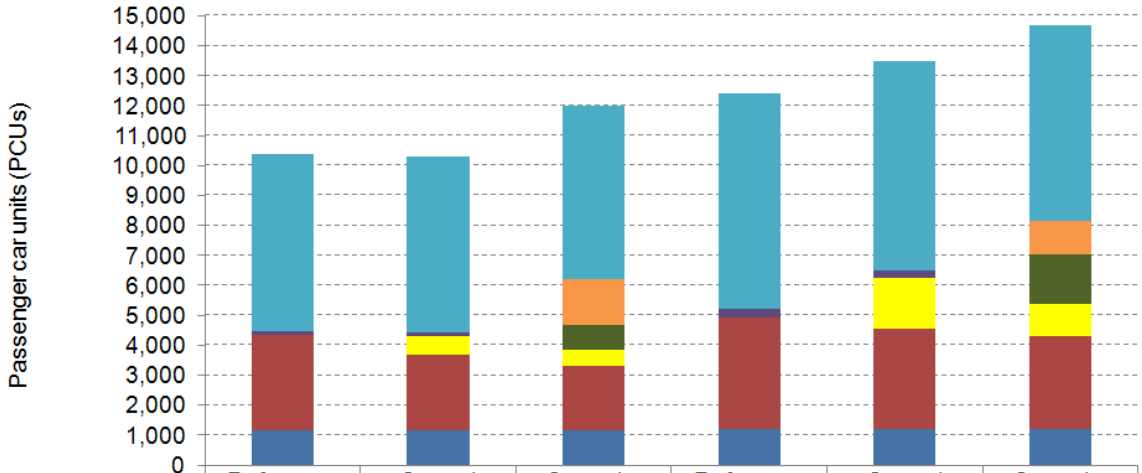
Figure C 3 shows the change in total traffic flows crossing the river in east London in 2021 in both directions (evening peak hour). The greatest impact of the additional crossings to the east of Silvertown is observed in the evening peak hour, where flows at the Blackwall and Silvertown Tunnels combined are reduced by 800 PCUs in the peak direction.

Figure C 2: Cross-river traffic flows in the average inter-peak hour in 2021



	Reference Case Northbound	Central Case Northbound	Central + Gall + Bel Northbound	Reference Case Southbound	Central Case Southbound	Central + Gall + Bel Southbound
Dartford Crossing	5,590	5,680	4,790	5,490	5,670	5,050
Belvedere Bridge	0	0	1,230	0	0	770
Gallions Bridge	0	0	680	0	0	870
Woolwich Ferry	170	120	0	170	130	0
Silvertown Tunnel	0	800	720	0	680	530
Blackwall Tunnel	3,060	2,100	1,880	3,340	2,340	2,150
Rotherhithe Tunnel	900	920	920	700	770	770

Figure C 3: Cross-river traffic flows in the evening peak hour (1700-1800) in 2021



	Reference Case Northbound	Central Case Northbound	Central + Gall + Bel Northbound	Reference Case Southbound	Central Case Southbound	Central + Gall + Bel Southbound
Dartford Crossing	5,900	5,900	5,800	7,200	7,000	6,540
Belvedere Bridge	0	0	1,520	0	0	1,100
Gallions Bridge	0	0	830	0	0	1,650
Woolwich Ferry	140	110	0	270	260	0
Silvertown Tunnel	0	600	540	0	1,670	1,080
Blackwall Tunnel	3,190	2,540	2,150	3,720	3,350	3,110
Rotherhithe Tunnel	1,150	1,160	1,160	1,210	1,210	1,210

The following figures summarise the modelled changes in flows and junction delays as a result of implementing the Blackwall-Silvertown Crossing and fixed link crossings at Gallions Reach and Belvedere.

Figure C 4 shows the change in traffic flows in the morning peak hour in 2021 due to the implementation of Silvertown-Gallions-Belvedere combined. The addition of the crossings to east of Silvertown does not fundamentally alter the flow changes forecast on the immediate Blackwall and Silvertown Tunnel approaches.

Figure C 5 shows the change in junction delay as a result of implementing Silvertown-Gallions-Belvedere in the morning peak hour in 2021. The increased flows on the A13 Newham Way and A1261 Aspen Way lead to some delays around Leamouth.

Figure C 6 shows the change in traffic flows in the average inter-peak hour in 2021 due to the implementation of Silvertown-Gallions-Belvedere combined. A net reduction in flows is observed in both directions on several corridors, including the M25, A102, A12 and A13 Newham Way between the Blackwall and Belvedere crossings.

Figure C 7 shows the change in junction delay as a result of implementing Silvertown-Gallions-Belvedere in the average inter- peak hour in 2021.

Figure C 8 shows the change in traffic flows in the evening peak hour in 2021 due to the implementation of Silvertown-Gallions-Belvedere combined. The addition of the crossings to east of Silvertown leads to a slight reduction in flows on the Blackwall Tunnel and its approaches than in the central case, due to cross-river trips re-assigning to Gallion Reach.

Figure C 9 shows the change in junction delay as a result of implementing Silvertown-Gallions-Belvedere in the morning peak hour in 2021. Compared to the Silvertown Tunnel central case scenario, the introduction of the new crossings east of Silvertown leads to a reduction in localised delays in Greenwich as some of the more local traffic diverts to the Gallions Reach crossing.

Figure C 4: Flow changes as a result of combined crossings (morning peak hour 0800-0900, 2021)

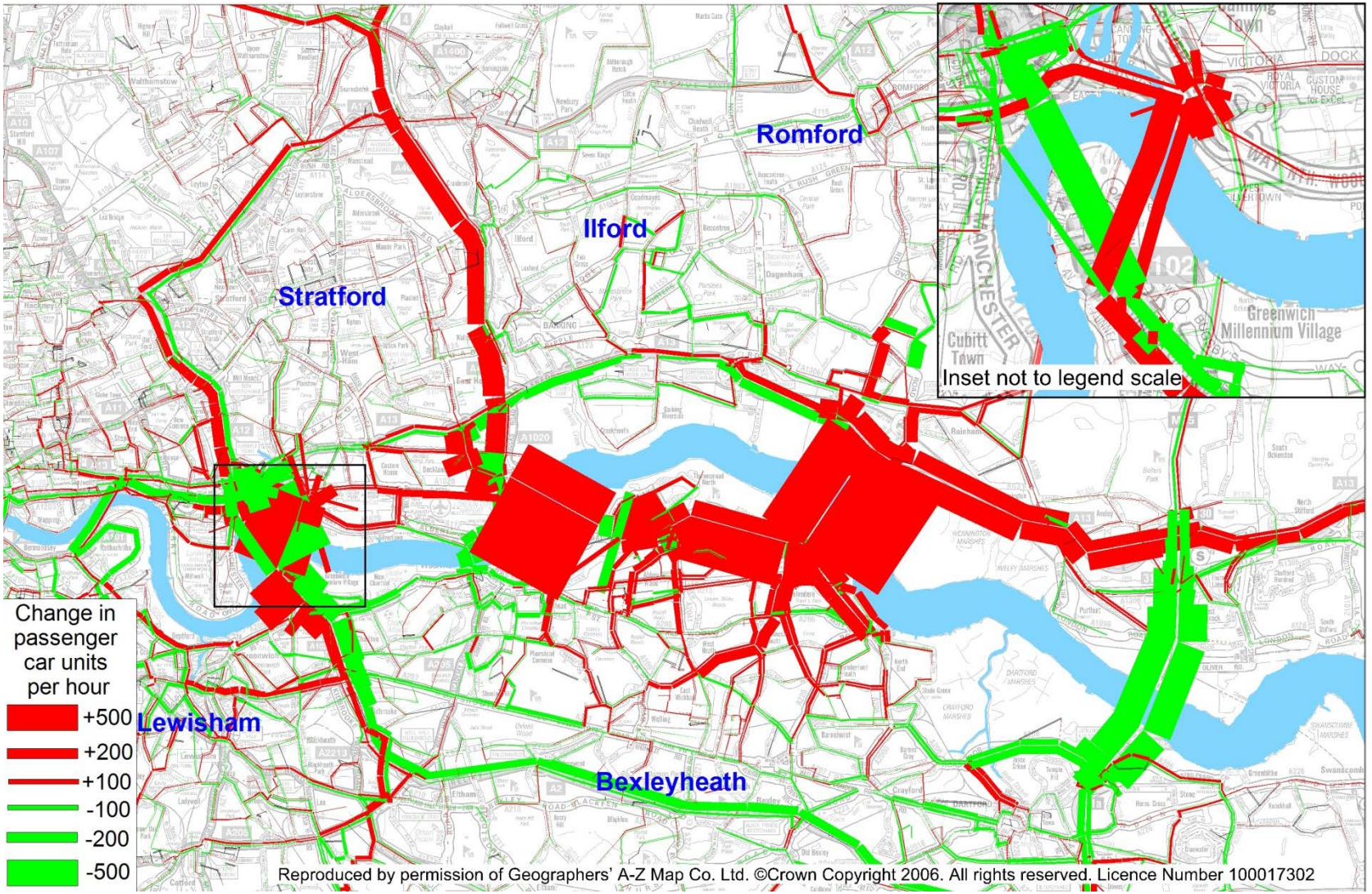
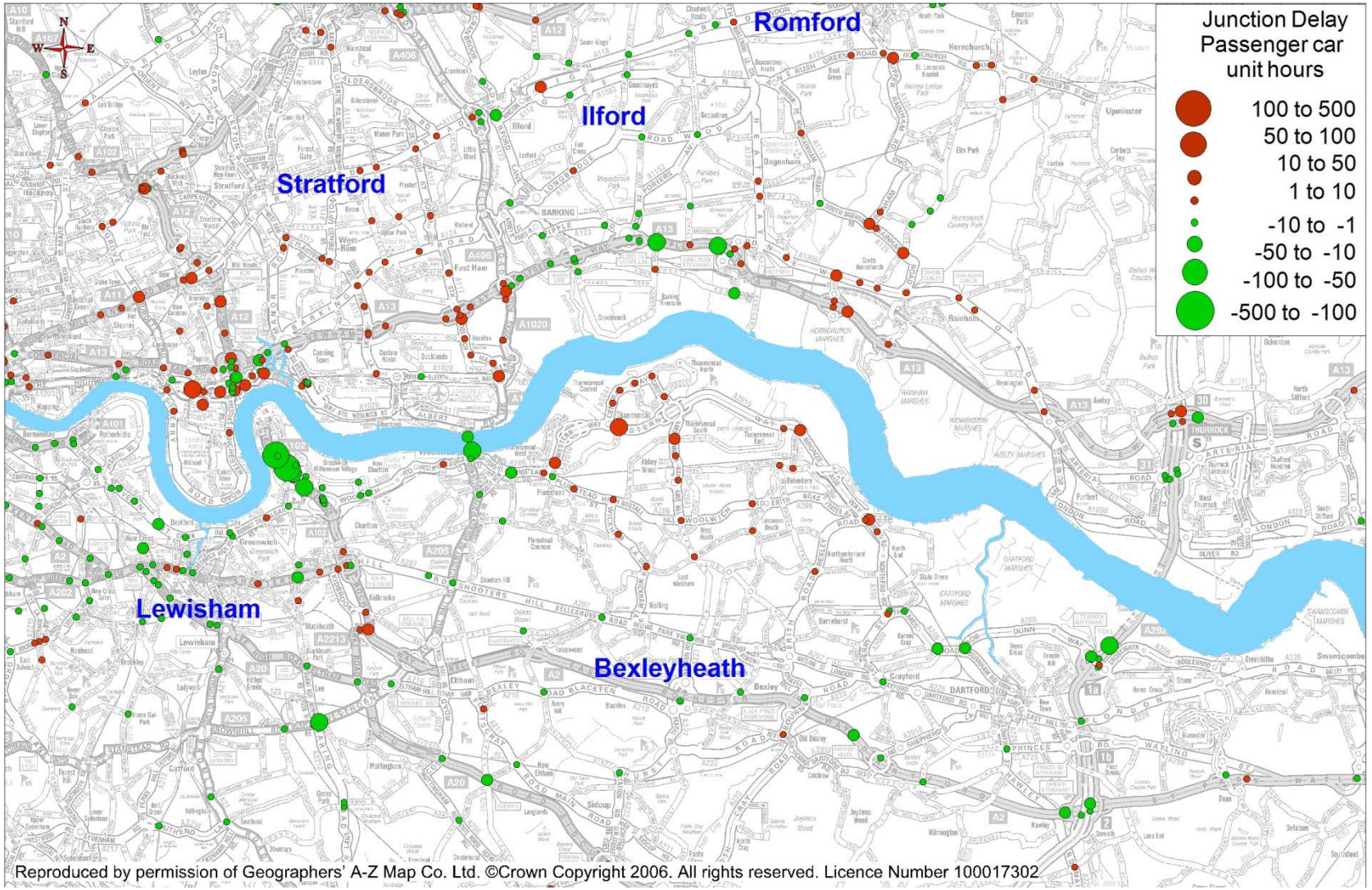


Figure C 5: Junction delay changes as a result of combined crossings (morning peak hour 0800-0900, 2021)



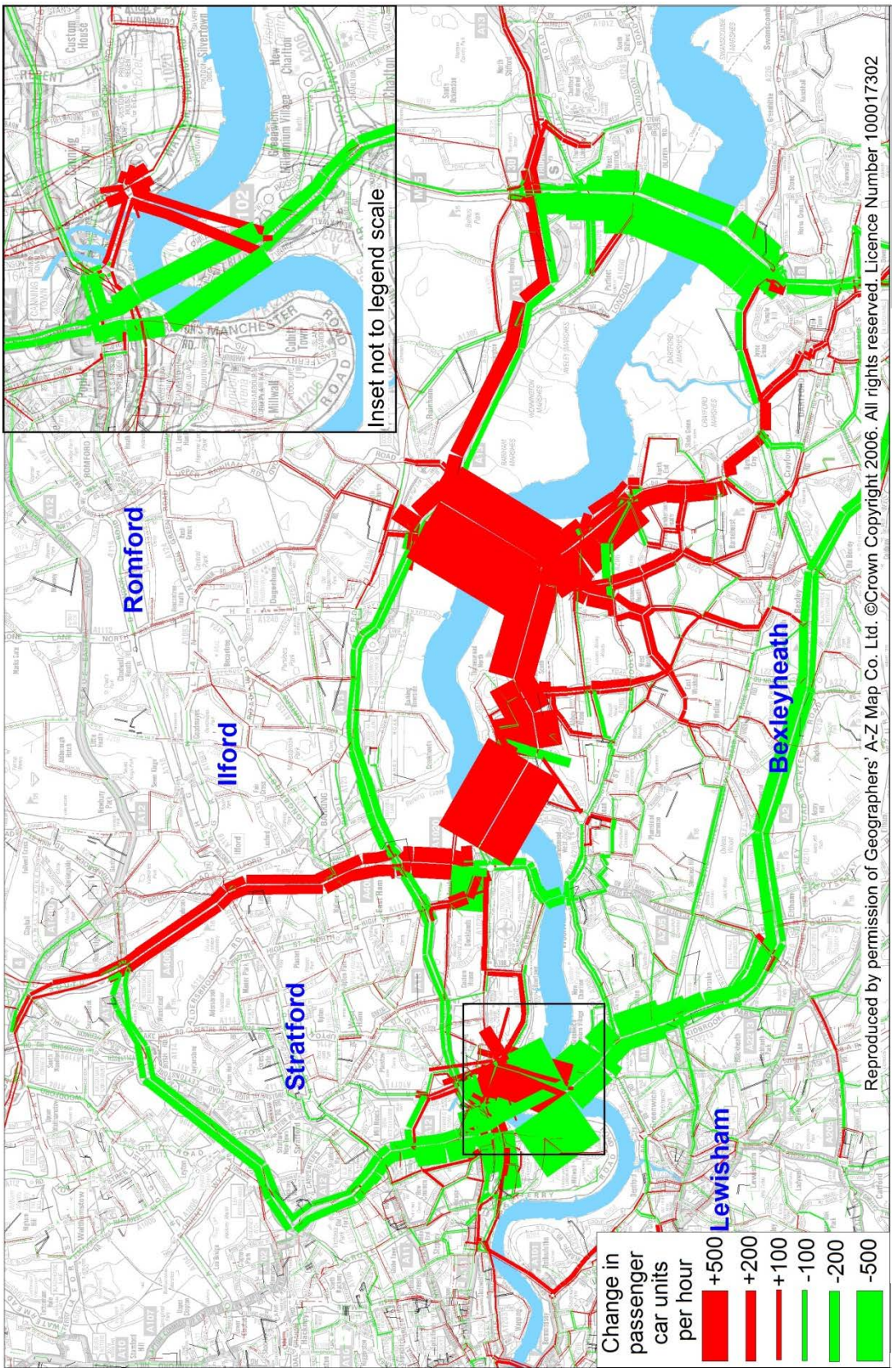


Figure C 6: Flow changes as a result of combined crossings (average inter-peak hour, 2021)

Figure C 7: Junction delay changes as a result of combined crossings (average inter-peak hour, 2021)

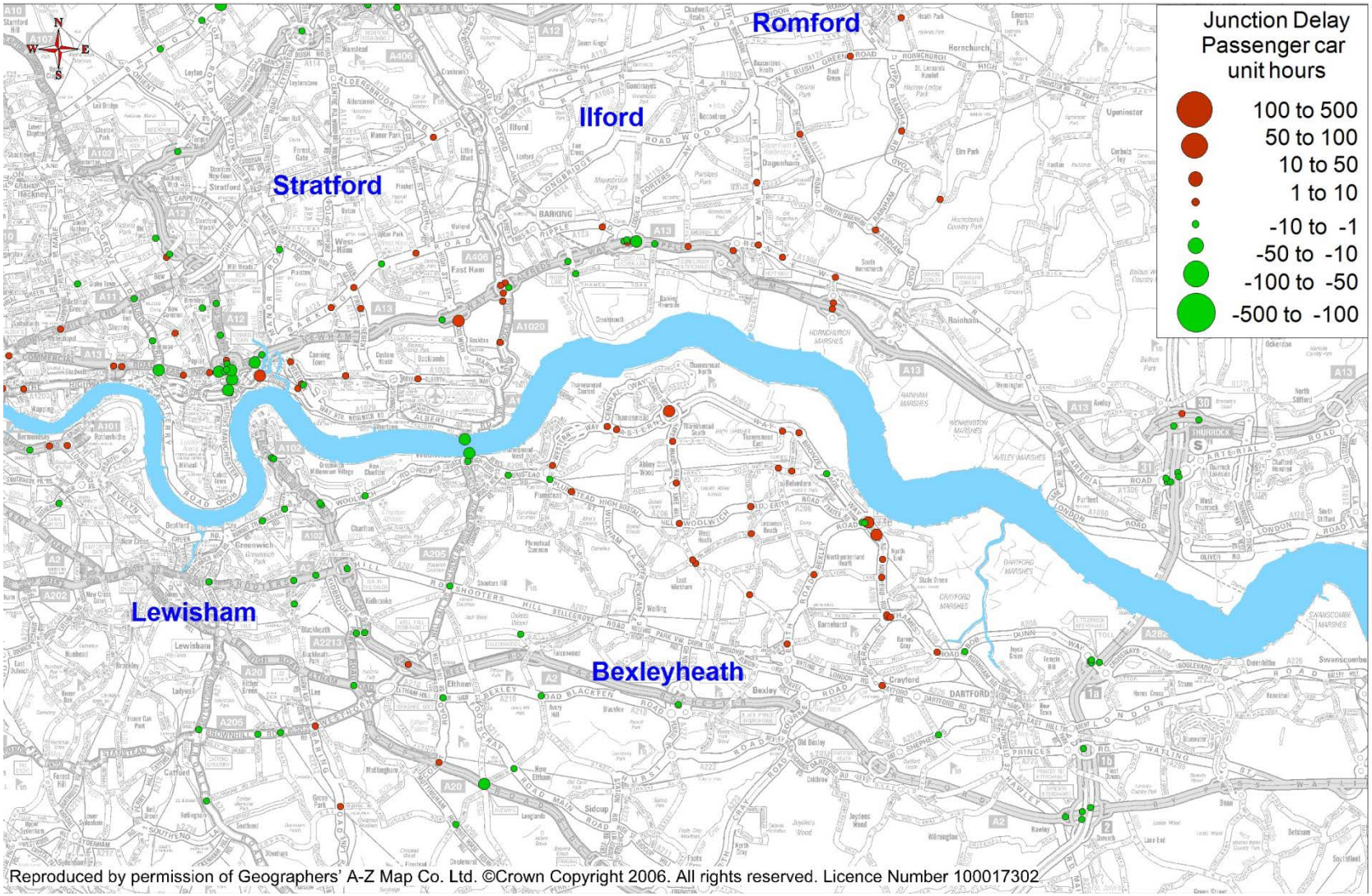


Figure C 8: Flow changes as a result of combined crossings (evening peak hour 1700-1800, 2021)

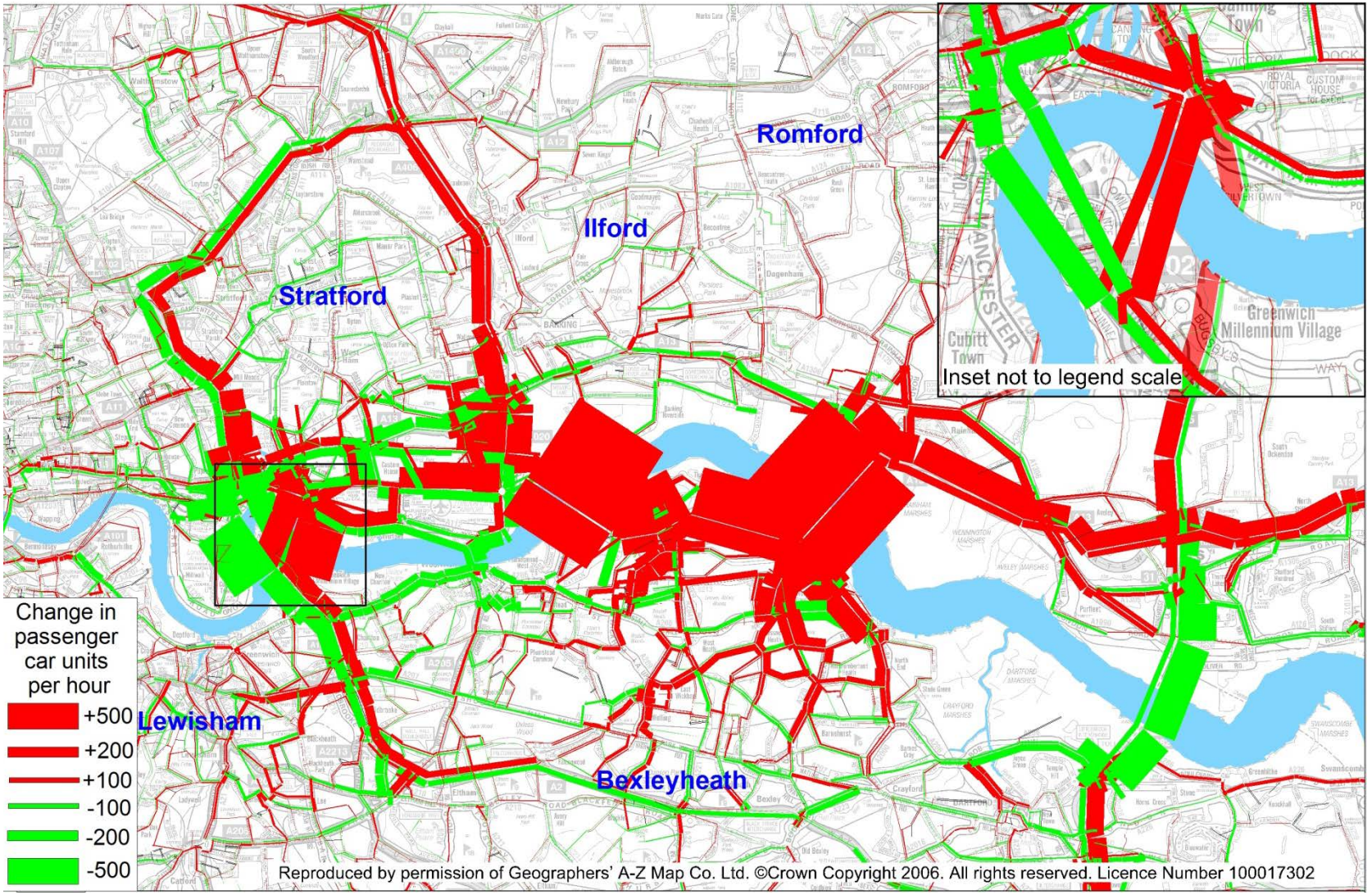


Figure C 9: Junction delay changes as a result of combined crossings (evening peak hour 1700-1800, 2021)

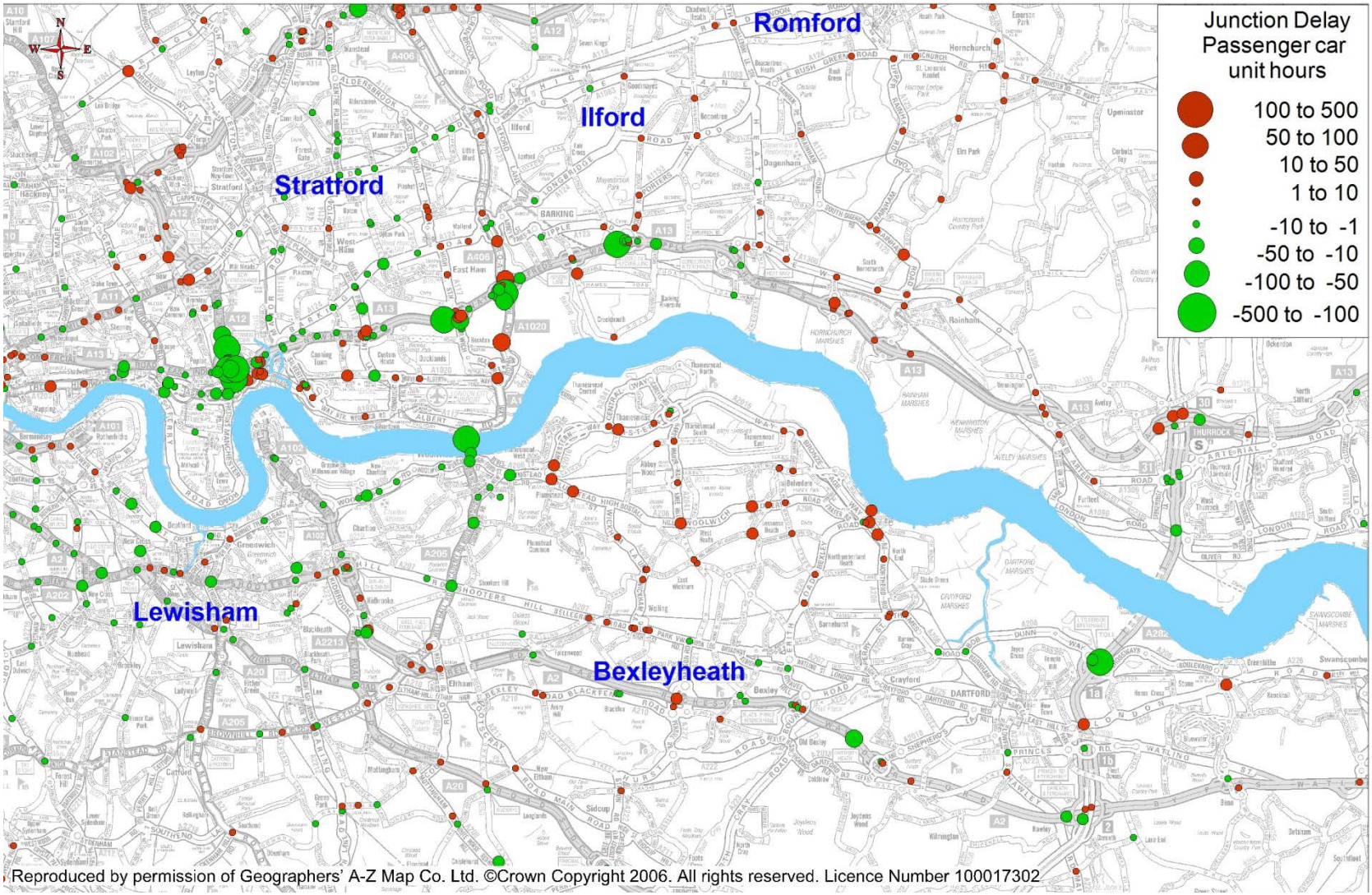


Table C 2 presents the borough-level summary statistics of forecast changes in total delays (PCU delay hours) in the morning and evening peak hours.

Table C 2: Borough-level delay statistics (relative to 2021 reference case)

Indicator	Borough	Central case	Central case + Gallions + Belvedere
Total delay PCU-hours (morning peak hour)	Greenwich	-22%	-26%
	Newham	+1%	+6%
	Tower Hamlets	+7%	+8%
	Host boroughs	**-7.7%**	**-7.5%**
Total delay PCU-hours (evening peak hour)	Greenwich	+14%	+1%
	Newham	-3%	-10%
	Tower Hamlets	-27%	-26%
	Host boroughs	**-6.7%**	**-12.4%**

Summary

The addition of new crossings to the east of Silvertown reduces demand for the Blackwall and Silvertown Tunnels combined by around 500 PCUs in the morning peak hour northbound and 800 PCUs in the evening peak hour southbound.

Focussing on the impacts around the Blackwall and Silvertown Tunnels, the impacts observed in Greenwich and Tower Hamlets are relatively similar to the central case. The diversion of some local traffic to Gallions Reach in the evening peak hour leads to a smaller increase in delays in Greenwich in the evening peak hour.