5 Summary of Challenges Identified

5.1 Highway

Between the 2011 base and the 2041 reference case scenario, a forecast increase in traffic flows on the A3 is forecast to cause additional delays at strategic junction locations along the corridor, with pressure on Tolworth and Hook junctions.

In Kingston town centre, increases in demand, linked to capacity reductions associated with the Go Cycle schemes are forecast to cause flow reductions on corresponding corridors and increased junction delay due to a decrease in overall junction capacity. This is forecast to cause vehicles to re-route onto adjacent roads in order to avoid congestion. This is likely to increase pressure on these routes, which are less suited to cope with high traffic volumes.

Increase in delays at the A3 Hook junction, are forecast to increase by more than 2 minutes in the AM peak period. Certain junction arms at the Tolworth Roundabout are forecast to experience similar delay increases, although the level of change in junction saturation here is forecast to be considerably lower.

Compared to the changes forecast over the 30-year period between the base year and the reference case, the flow increases associated with the medium OA growth are relatively minimal. Despite this, high levels of junction saturation in the town centre means that a small increase in highway flow results in substantial impacts in junction delay.

Predicted increases to traffic flows in areas of the network east of the town centre connecting to the A3, is evident in the flow difference plots. This increase, coupled with a rise in traffic flows on the A3 itself between Tolworth and the junction with the A308, results in a significant increase in delay at a number of strategic points including the B282 and Malden Road junctions near Motspur Park.

The impact of the additional OA growth on Tolworth and Hook junctions on the A3 is forecast to be minimal when compared to the 2041 reference case.

Crossrail 2 has only a small impact on highway mode shift to public transport in the area, and has minimal reductions to forecast traffic flows; this is consistent with TfL's findings in other parts of outer London. Most of these reductions are focused on the A3 inbound direction, as Crossrail 2 takes a small proportion of inbound traffic during the AM peak.

This minimal impact on traffic flows means that the addition of Crossrail 2 has a minor impact on junction performance. Conversely, certain junctions at Tolworth junction and the A307 junction with Orchard Road in the town centre are forecast to experience an increase of up to 1 minute.

5.2 Public Transport

Buses

Bus demand between 2011 and 2041 is expected to increase more substantially on major corridors that feed into both Kingston and Surbiton. The key increases in passenger demand are focused around:

- A243 between Chessington and Surbiton stations, which affects routes 65 and 71;
- A240 Surbiton Road between Surbiton station and Kingston Town Centre, impacting routes 65, 71, 281, K2 and K3;
- A310 Upper Teddington Road between Fulwell, Teddington and Kingston Town Centre, affecting routes 281 and 285; and
- A308 London Road between Putney/Kingston Vale and Kingston Town Centre, which affects routes 57, 85, 213, K2, K3, K4 and K5.

Although the strategic model is not considered to be a suitable tool for assessing capacity and crowding on individual bus routes, the increase in passenger demand flows helps to identify where future changes to capacity may be required. It also helps to show where improvements to journey time reliability could be delivered.

The addition of the OA growth puts further pressure on the A308 between Kingston Hospital and Kingston Town Centre, which affects routes 57, 85, 213, K2, K3, K4 and K5, and adds further pressure on Surbiton Road affecting routes 65, 71, 281, K2 and K3. Changes in other areas of the network remain minimal.

With the introduction of Crossrail 2, demand on the buses are forecast to fall marginally when compared to the without Crossrail 2 scenario. This could be due to the additional capacity released by the new services meaning that passengers are no longer crowded off rail services and onto bus services. Lower levels of crowding on rail services makes them considerably more attractive than buses, even for short trips. A few corridors continue to see an increase in demand; however, this is driven primarily from areas with poor accessibility to the Crossrail 2 route, which includes:

- A307 Richmond Road, affecting route 65;
- Park Road, affecting route 371; and
- A307 Portsmouth Road, affecting route 465.

Rail

In summary, it has been identified that most of the issues and network constraints on the rail network result from demand originating from areas external to the Kingston borough.

The introduction of Crossrail 2 in 2041 is forecast to mitigate most of the high crowding in the borough that build up on the network between 2011 and 2041. Moderate levels of crowding on the South West Main Line remains with Crossrail

2 in place; however, most of this demand originates from areas outside of the study area. Therefore, mitigation here requires more of a sub-regional strategy, rather than a local focus.

Crossrail 2 results in a significant amount of additional passengers entering and exiting at certain stations that previously experienced low levels of passenger use. Therefore, it will be important that sufficient capacity or management measures are made available at these stations to accommodate additional demand.

Crossrail 2 is also forecast to reduce bus demand across certain parts of the borough. There is no particular pattern to these decreases, e.g. around Crossrail stations, but rather a slight reduction in bus patronage on radial routes from around the borough towards Surbiton and Kingston. To put this into context, flow decreases are generally less than 250 passengers along each corridor over the 07:00-10:00 period.

This is likely due to a number of factors, including:

- The increased attractiveness of Crossrail 2, which results in significantly higher capacity and lower wait times for rail, means that public transport passengers will have an alternative to using bus which may provide a more frequent and less crowded service;
- The increase in employment and housing growth at higher densities means that walking and cycling may become more viable alternatives for travel rather than using the bus; and
- Due to increased rail capacity, fewer public transport passengers are likely to be ‘crowded off’ rail services onto bus services.

6 Mitigation Measures

Following discussions with officers from TfL and the Royal Borough of Kingston upon Thames around a long list of potential mitigation measures, an agreed package of mitigation schemes was discussed and finalised. The challenges identified from the forecast year modelling prompted a greater need to address highway constraints as many of the public transport constraints were found to be largely addressed by Crossrail 2. Therefore, all potential mitigation schemes identified were run through the strategic highway KingHAM model.

The original list of potential mitigation schemes presented to TfL and Kingston borough is included in **Table 12**.

Table 12: Potential intervention schemes

Potential Mitigation Schemes
Crossrail 2 - Kingston, Surbiton, Tolworth branches
Kingston Town Centre. Preferred Highway Option (SDG 2014 Option 6). Modified to include: a) 2-way bus lane through Clarence Street and b) 4 lane, 1-way working on all sections of the existing gyratory being converted to 2-way working (Wood Street/Sopworth Way/Richmond Road/Cromwell Road/Queen Elizabeth Road/ Fairfield North)
Tolworth Peninsularisation Scheme (Option 2, TAP p.97) [1]
Tolworth - T2 scheme (TfL Tolworth Roundabout scheme)
Tolworth - H1 Scheme (TfL Hook Roundabout Scheme)
Tolworth - Strategic cycle and pedestrian improvements
Tolworth - Bus stop/bus route optimisation
Tolworth – New highway connections
Tolworth – Ewell Road junction
Low Car policy test with strong demand management (TfL) [2]
Bus service enhancements – improved frequency, improvements to orbital services and strengthening of Surrey buses – Kingston services
Chessington Relief Road
Relocation of Kingston Rail Station (approximately 100m to the west) [3]
New Rail Station at Chessington World of Adventures
Southern Rail Link (new rail link connecting Heathrow to south London and Surrey) [4]

Notes
[1]

- *This is a major grade-separated junction on the trunk road network. Traffic volumes are particularly high and delays are commonplace - which highlights that the junction is working at or above capacity. There are no local (strategic) routes for traffic to use as an alternative route;*
- *To maintain existing capacity, you would need to construct 2-3 lanes of highway to travel round in the anti-clockwise direction, which would need to accommodate vehicle "swept paths". This has been done at Elephant & Castle. The space is limited here to do this - even if there was the space, it would be creating several turning movements around the gyratory, which would be in addition to those movements already in operation. The traffic signal sequencing around the gyratory would be difficult to synchronise.*

- *Reduction in capacity could have a negative environmental impact with traffic queuing for longer;*
- *The pedestrian link would now have to cross double the number of lanes of traffic as present; and*
- *It is unclear how the development in the centre of the roundabout would be accessed/ serviced.*

[2] This is a Policy test undertaken by TfL on a number of other OA studies and reflects the mode switch impacts of local cycle/walk/PT improvements, along with strong demand management measures not picked up in the main LTS modelling.

[3] This is unlikely to have an impact, apart from local connectivity.

[4] Southern Rail Link - this is the scheme referenced in the MTS. However, there is no Government commitment to this scheme and its objective is to alleviate Heathrow expansion assuming no new highway trips. Therefore, this should not be regarded as an intervention for RBK growth (this would require an LTS scenario with Heathrow expansion).

The decision to take an intervention forward for testing within a package was based upon a number of factors including strategic relevance, deliverability and feasibility. Certain mitigations were deemed unsuitable for testing in the strategic models and instead required a more detailed study through micro-simulation modelling or other assessment tools.

Following these considerations, the short-list of mitigation schemes to take forward to develop the package measures were as follows:

- **Kingston Town Centre Preferred Highway Option 6 -** Preferred highway option from the Kingston Town Centre Movement Strategy. Final Report (Steer Davies Gleave November 2014). This was modified to:
    - include a 2-way bus lane through Clarence Street; and
    - 4-lane, 1-way working on all sections of the existing gyratory are to be converted to 2-way working
- **TfL Tolworth Roundabout Scheme (T2 Scheme)**
    - A dedicated lane for heavy left turn from Kingston Road to A3;
    - Extends greenway along Kingston Road; and
    - Includes a package of small scale traffic efficiency measures, urban realm & greening measures
- **TfL Hook Roundabout Scheme (H1 Scheme)**
    - New link at Hook Road Roundabout to link to the A3 (southbound)
- **Bus Service Improvements**
    - 10% increase in bus service frequency across the borough;
    - Re-routing associated with the town centre scheme; and
    - New Clarence Street 2-way bus link.

- **Demand Management**
    - A scenario reflecting ambitious pan London policy to reduce car mode share incorporating TfL's healthy streets agenda, substantial spending on public transport infrastructure including Crossrail2 and travel demand management. This could include measures such as: road user charging; a more sustainable freight policy; a work place parking levy and road space re-allocation

Further information on the technical specification of each intervention test is available in the Appendix.

Discussions took place between RBK, TfL and Arup to identify packages of schemes that could potentially mitigate against the identified challenges. These packages were aligned to the aspirations of Kingston borough, and are outlined below:

- **Package 1** tests the impact of both the Kingston Town Centre, Tolworth T2 and Hook H1 schemes along with a number of improvements to bus services;
- **Package 2** tests the same highway schemes as package 1 but with the Crossrail 2 and demand management in place. This package tests the highway interventions in the context of stronger demand management and a greater emphasis on the use and application of public transport;
- **Package 3** tests to what extent Crossrail 2 may mitigate the highway network issues if no additional physical alterations are made to the network. Note that this test has already been completed as part of the forecasting scenarios (see section 4.3); and
- **Package 4** tests to what extent Crossrail 2 may mitigate the public transport network issues if no additional physical alterations are made to the network. Note that this test has already been completed as part of the forecasting scenarios (see section 4.3).

As packages 3 and 4 have already been tested as part of the development scenarios, the results are presented in section 4.3 of this report.

Table 13 lists the agreed mitigation packages for testing and outlines the individual mitigation tests that made up each package run.

Table 13: Agreed mitigation packages for testing

	Package 1	Package 2	Package 3	Package 4
Mode	Highway	Highway	Highway	PT
Scenario	Ref Case + OA	Ref Case + OA	Ref Case + OA	Ref Case +OA
Kingston Town Centre Preferred Highway Option 6	Yes	Yes	No	N/A
Tolworth – T2 Scheme [1]	Yes	Yes	No	N/A
Hook – H1 Scheme [1]	Yes	Yes	No	N/A
Bus service improvements [2]	Yes	Yes	No	No
Crossrail 2	No	Yes [4]	Yes	Yes
Strong pan-London demand management [3]	No	Yes	No	No

[1] Requires scheme details from TfL
[2] Requires TfL/ RBK input
[3] Requires demand matrices from LTS
[4] Assuming Crossrail 2 is included in LTS Demand Management Run

6.1 Package 1

6.1.1 Introduction

Package 1 tests the impact of all major proposed highway interventions including both the Kingston town centre scheme, Tolworth T2 and Hook H1 schemes. The Kingston town centre scheme has been modified to include a 2-way bus lane through Clarence Street**.** 4-lane, 1-way working on all sections of the existing gyratory have been converted to 2-way working. The purpose of the scheme is to assess the impact of these major highway infrastructure schemes on network constraints without any interventions to manage demand or major investment in public transport.

For further information on the indicative scheme layouts tested in the KingHAM model, please refer to the Appendix – Kingston Town Centre scheme (**Figure 57**), Tolworth T2 Scheme (**Figure 58**) and Hook H1 Scheme (**Figure 59**).

6.1.2 Results

Traffic Flows

Figure 25 shows the change in highway flow (pcus) in the 08:00-09:00 AM peak within Kingston Town Centre compared with the 2041 medium OA development scenario. The results show that the impacts of the Kingston town centre improvements are forecast to have a significant impact on traffic in and around the town centre. The conversion of Cromwell Road to allow bi-directional running is forecast to significantly increase traffic flows in the proposed anti-clockwise direction by around 800 to 1,600 pcus. The new traffic movement opportunities

also increase flows on Sopwith Way/Wood Street (Westbound). The scheme is shown to reduce traffic in the existing direction of the gyratory (clockwise) direction as well as on the A307 inbound towards the town centre. Despite this, due to the reduction in road capacity around the A307, a greater number of vehicles are forecast to avoid the town centre areas by alternative routes, putting pressure on local areas including Kings Road/Richmond Park Road, Elm Road and Park Road linking to the A308. Traffic flows on the Rose Fair (A308) on the bridge over the Thames are forecast to increase with a greater proportion of traffic forecast to use Seven Kings Way to avoid busier sections of the A307 and A308.

- Large flow 'increases' on the new anticlockwise section of current gyratory; and
- Kingston Town Centre (KTC) scheme impacts generally local to town centre but with some flow increases north of the town centre and across Kingston bridge

Figure 26 below shows the change in highway flows (pcus) in the AM peak in and around the Tolworth and Hook junctions. This shows that around 400 pcus are forecast to use the new link road between Hook Roundabout and the A3 (Southbound) in the AM peak. This new connection is forecast to increase traffic flows on the A3 (Southbound) by the same amount. The new link road is forecast to marginally decrease the number of vehicles using the A309 Kingston Bypass towards Hinchley Wood and the existing southbound direction of the A3 (Esher Bypass). The movement between Hook Road (South) and Hook (Road) north on the roundabout is forecast to marginally decrease due to the scheme. Highlights from the analysis include:

- The proposed Hook H1 slip road attracts around 400 pcus per hour;
- Flows on the A3 southbound, south of the proposed on-slip, increase by around 200 pcu/hr (or +5%);
- Flows on the A309 EB Kingston bypass approaching Hook increases by 150 pcu/hr (or +14%) as there is a new opportunity to join the SB A3 at Hook;
- Increases in clockwise circulating flows at Hook roundabout but no significant delay increases;
- Corresponding reductions in EB A3 flows of around 100 pcu/hr (or -3%) between Hook, Tolworth, and reduction in clockwise circulating flows at Tolworth roundabout as requirement for this "U" turn now removed;
- Tolworth T2 scheme results in flow increase on the NB A240 Tolworth Road towards the roundabout around 125 pcu/hr (+6%);
- However, lower circulating flows resulting from the Hook H1 scheme mitigate this with a net increase of 60 pcu/hr on the WB on-slip; and
- Reductions on local roads, including Jubilee Way/Cox Lane of 80 pcu/hr or (-10%) between A240 and A243 Hook Road.

An analysis of highway traffic specifically using the new schemes (H1, T2) was undertaken for both Package 1 and Package 2. The analysis selected a link in the network, with all origins and destinations of users for that link captured and displayed for the modelled morning peak. The Package 1 observations for both Hook (**Figure 27**) and Tolworth[16] are noted below. The analysis for Package 2 is reported in the next section.

The key highlights for package 1 are:

- At Hook, to the north, traffic is being drawn in to the new link from Surbiton along the A243 Hook Road via the A3 Hook roundabout;
- To the south, using the new link originates from the Hook/ Chessington/ West Ewell neighbourhoods;
- Nearly all traffic using the new link at Hook is heading towards the M25 along the A3;
- The distribution of traffic utilising the northbound approach into the A3 Tolworth roundabout incorporates trips originating from Ewell, Stoneleigh and Worcester Park to the south; and
- All traffic using the improved left-turn on the northbound approach at Tolworth is heading towards the M25 along the A3.

[16] It was not possible to produce the same analysis for Tolworth as it is a turning capacity improvement, and not a new link

Figure 25: Change in traffic flows with package 1 (KTC) (AM peak)

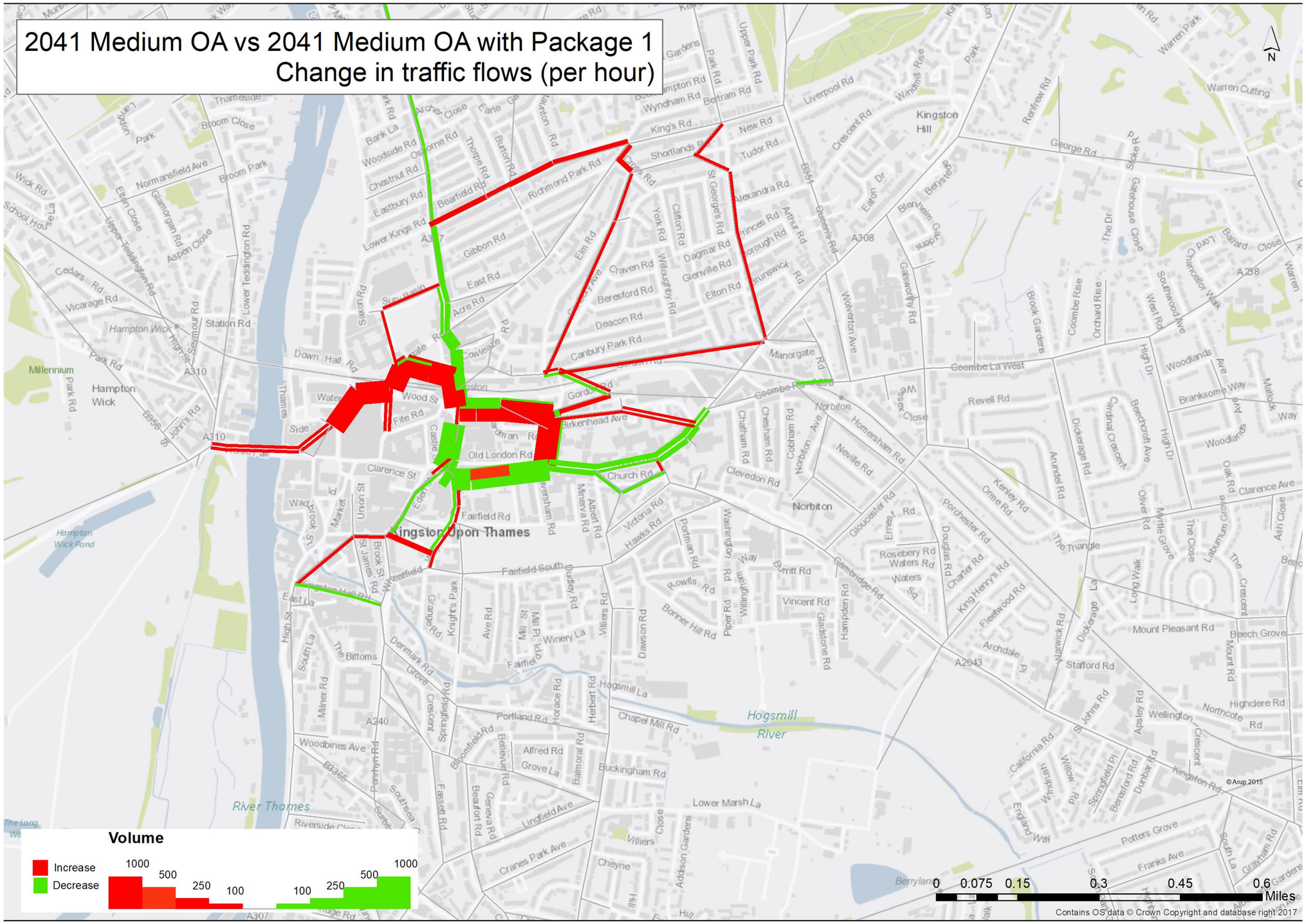


Figure 26: Change in traffic flows with package 1 (Tolworth) (AM peak)

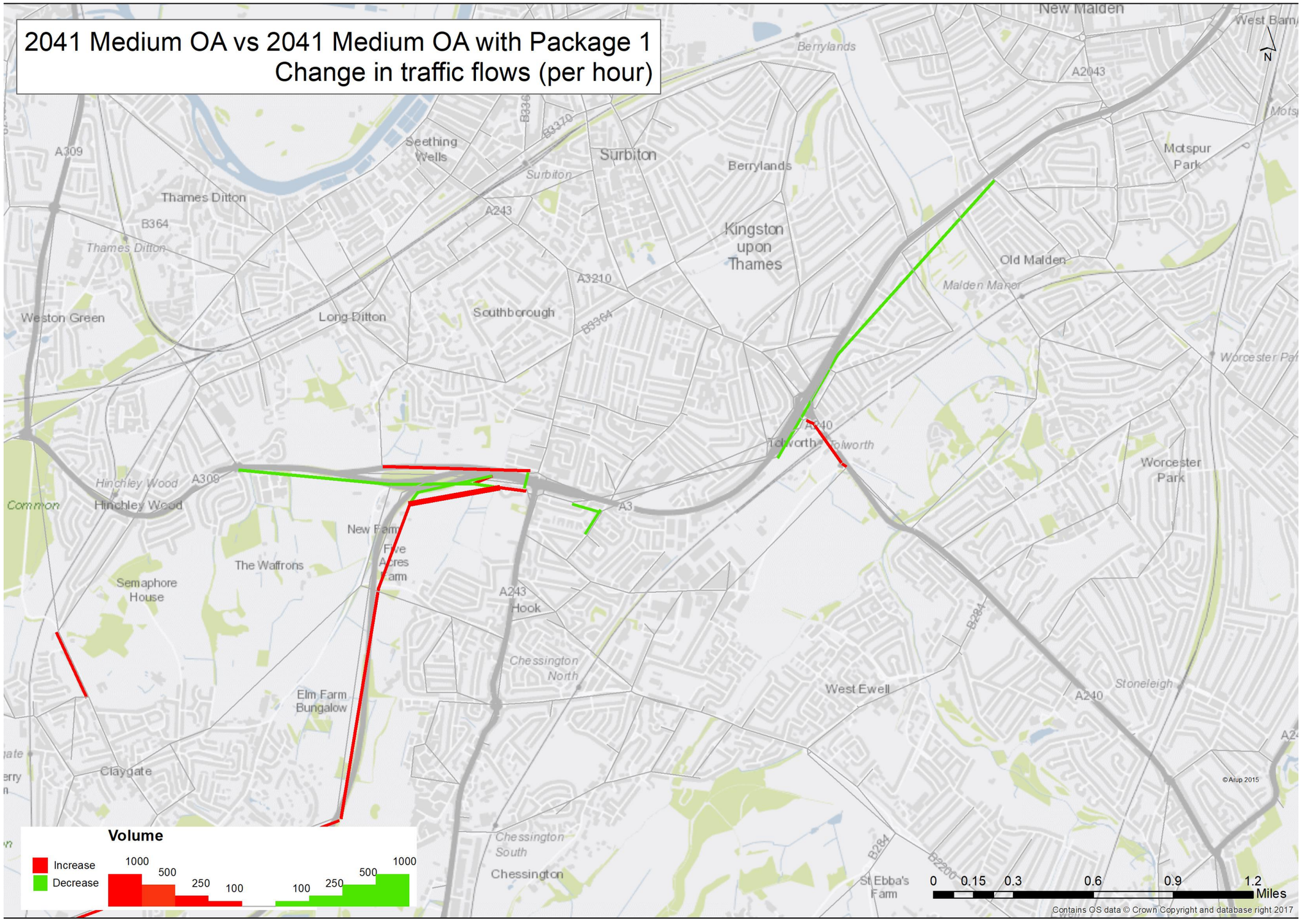
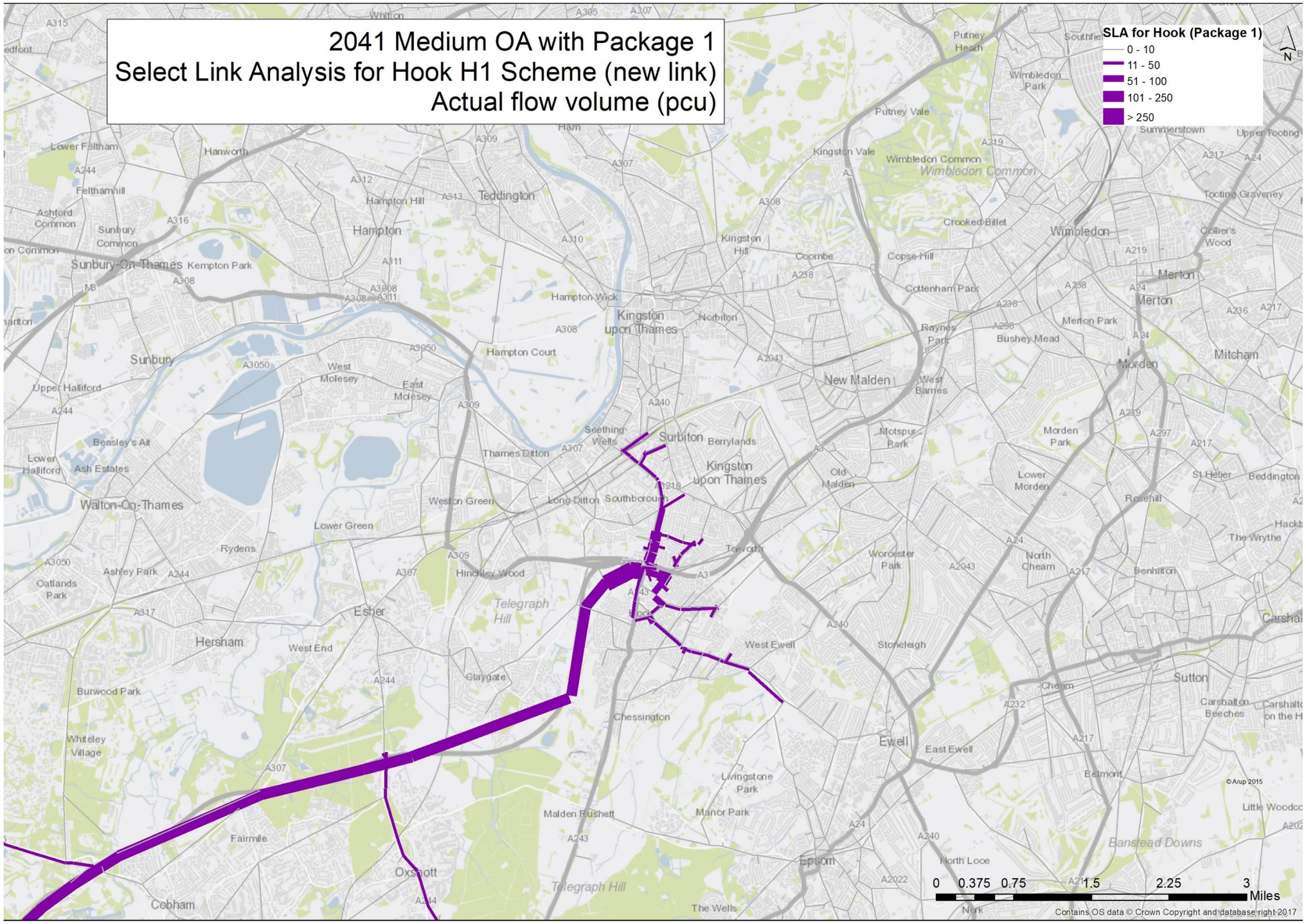


Figure 27: Traffic flows with package 1 (using new Hook link) (AM peak)



Junction Delays

Figure 28 below shows the change in junction delay (expressed as average delay per vehicle) in the AM peak between 08:00 and 09:00 within Kingston Town Centre. This plot compares to the 2041 medium OA development scenario.

The results show that within the town centre, the conversion of the gyratory to allow bi-directional running has a negative impact on several junctions. Average delay per vehicle is forecast to increase by more than 1.5 minutes at the following junctions:

- A307 (Fairfield North) and A308 (London Road);
- A308 (London Road) and Albert Road;
- A308 (Sopwith Way) and A307 (Richmond Road) north of Kingston station; and
- A307/A308 Wheatfield Way.

Other observations from the analysis include:

- Increases in delays in town centre associated with increased flows;
- Reduction in bus journey times (-26% approx.) and junction delays (-41% approx.) for buses rerouting onto the north-south Clarence Street and across Kingston;
- Although journey distances for other highway vehicles that would have previously used Clarence Street northbound increase, journey times of those vehicles decrease (-60% approx.) due to multiple junction delay reductions; and
- Junction delays increase significantly at access points onto the old gyratory.

The impact of the scheme has some positive impact on certain junctions, facilitated mostly by a reduction in car traffic on Clarence Street/Eden Street within the town centre, allowing more efficient bus movements. Junctions at the top end of Clarence Street, where it meets the A307, are forecast to experience minor reductions in delay, and at the opposite end of Eden Street (Ashdown Road/Lady Booth Road). There are also minor delay decreases forecast at the A307/A243 junction near Surbiton and the A3/A238 junction at Coombe Lane West.

Figure 29 shows the change in junction delay in the AM peak in the area surrounding Tolworth and Hook junctions compared to the 2041 medium OA development scenario.

This show that at the Hook roundabout, the new link from the roundabout to the A3 increases delays marginally on approaches to the roundabout on Hook Rise South, caused by the forecast increase in traffic making use of the new movement possible from the A309 Kingston bypass. Delays also increase on the A243 Hook

Road at the junction with Tolworth Road, similarly caused by traffic changing their routing based on the new opportunities provide by the link road.

The forecast decreases in traffic required to join the A3 southbound at Tolworth, coupled with the impact of the Tolworth T2 scheme, decreases the pressure on the junction, with delays predicted to fall by 0.5 to 1.5 minutes at the on-slip from Tolworth roundabout to the A3 southbound. Other observations include:

- Increases in clockwise circulating flows at Hook roundabout, but no significant delay increases; and
- Reduction in delay on the A240 approach to the roundabout resulting from extra capacity

Junction Saturation (V/C)

Figure 30 shows the change in junction saturation (or V/C) in the AM peak between 08:00 and 09:00 within Kingston Town Centre compared to the 2041 medium OA development scenario.

The results show that the introduction of a bus lane along the section of Eden Street and Clarence Street is forecast to have a significant impact on junction saturation at all major points along the proposed bus priority section, helping to reduce delays, particularly for local public transport services.

Due to additional bus movements allowing bi-directional running on turning from Eden Road onto the A307, the junction between the A307 and A308 (Fairfield North) is forecast to increase in saturation significantly by more than 25%.

Junctions along Gordon Road and Birkenhead Avenue are forecast to become more congested as several vehicles use these routes to avoid certain eastern sections of the gyratory.

Figure 31 shows the change in junction saturation (or V/C) in the AM peak between 08:00 and 09:00 around the Tolworth and Hook junctions.

The new link road between Hook roundabout the A3 southbound is forecast to increase junction saturation at the new on-slip. The on-slip is forecast to be at 85-100% capacity in the package scenario.

Other junctions on the network those around Hook roundabout remain significantly over capacity (100-120%) in the package 1 scenario but are not forecast to be impacted upon by the proposed Hook or Tolworth schemes.

Figure 28: Change in junction delays with package 1 (KTC) (AM peak)

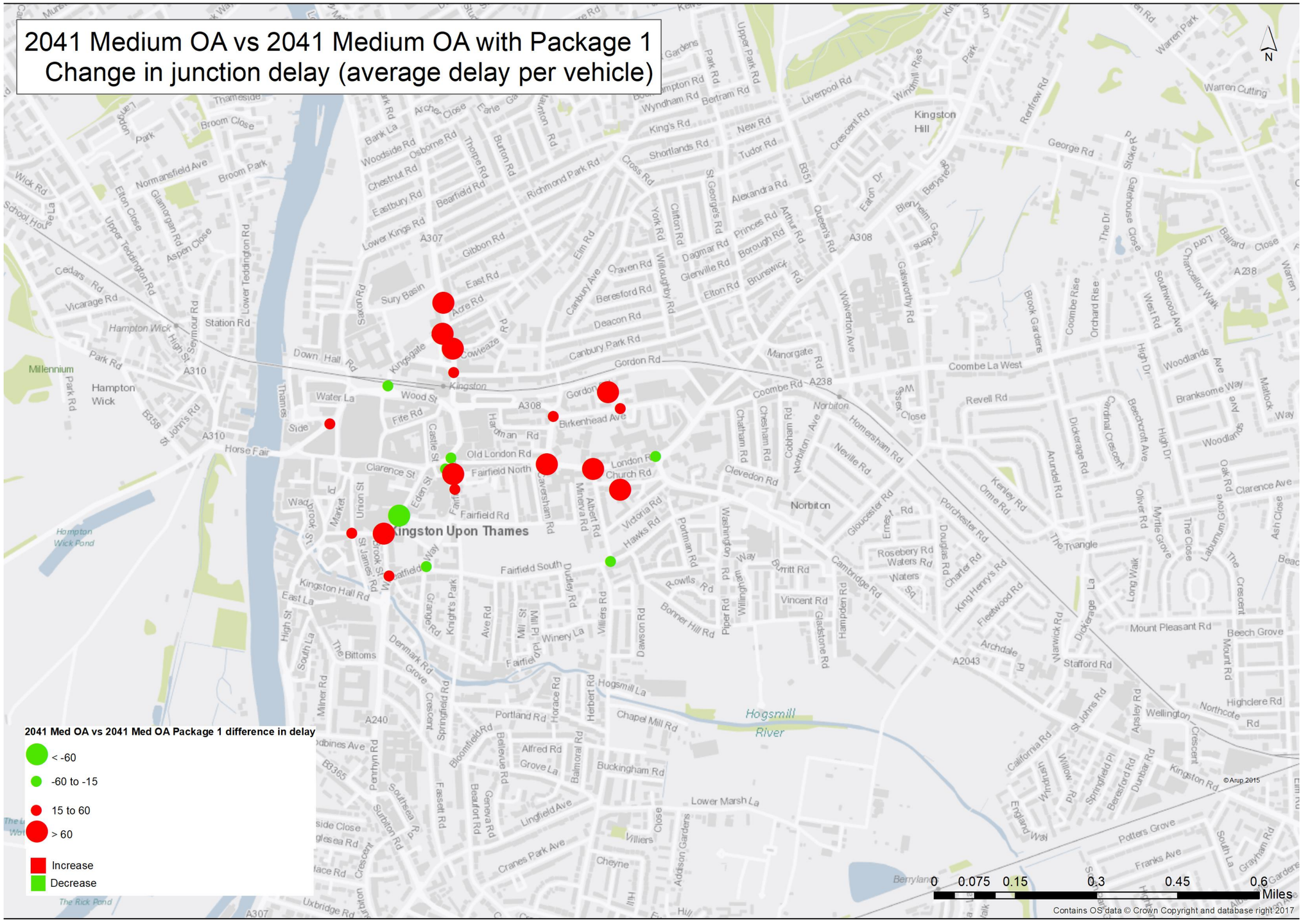


Figure 29: Change in junction delays with package 1 (Tolworth) (AM peak)

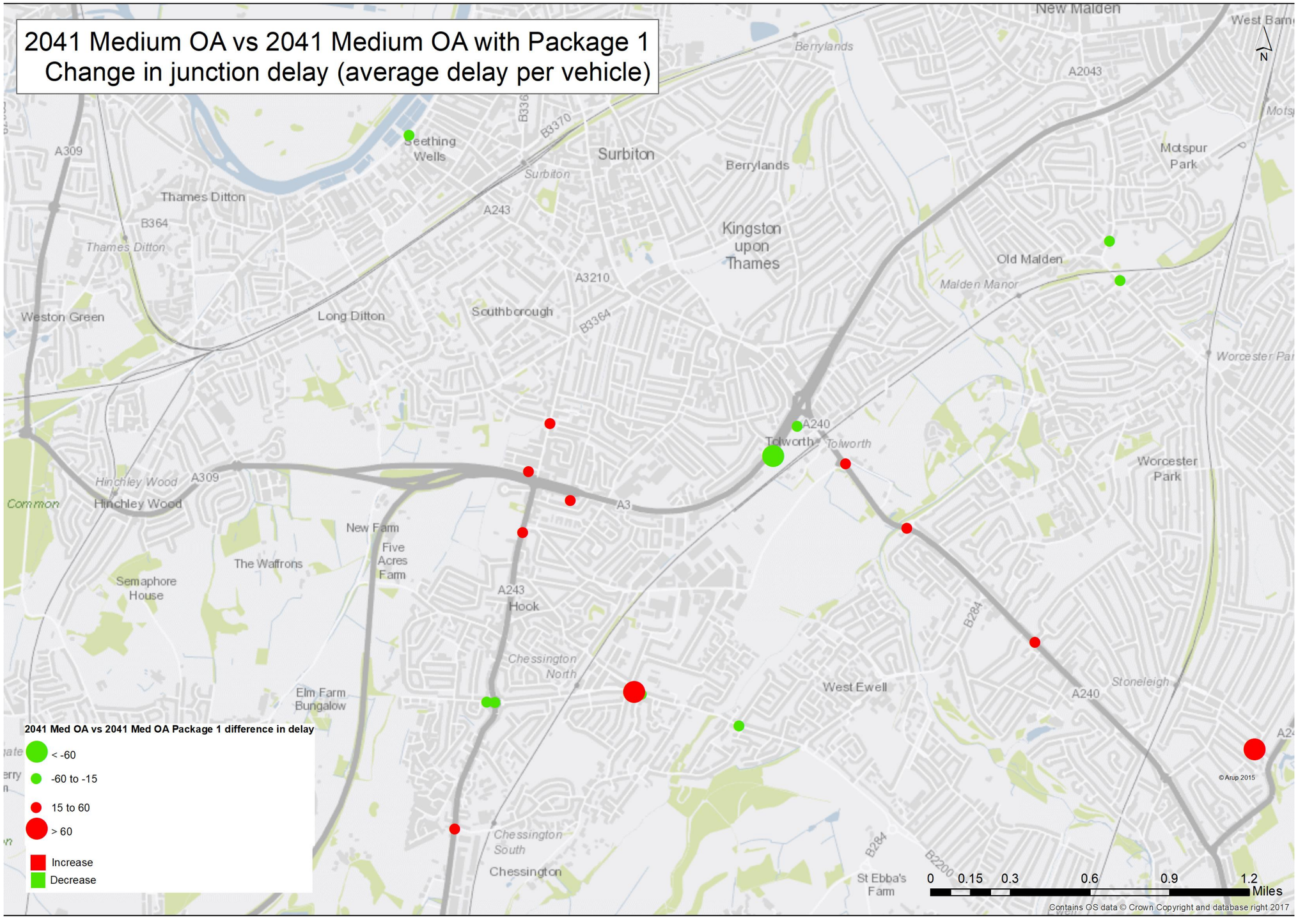


Figure 30: Change in junction stress with package 1 (KTC) (AM peak)

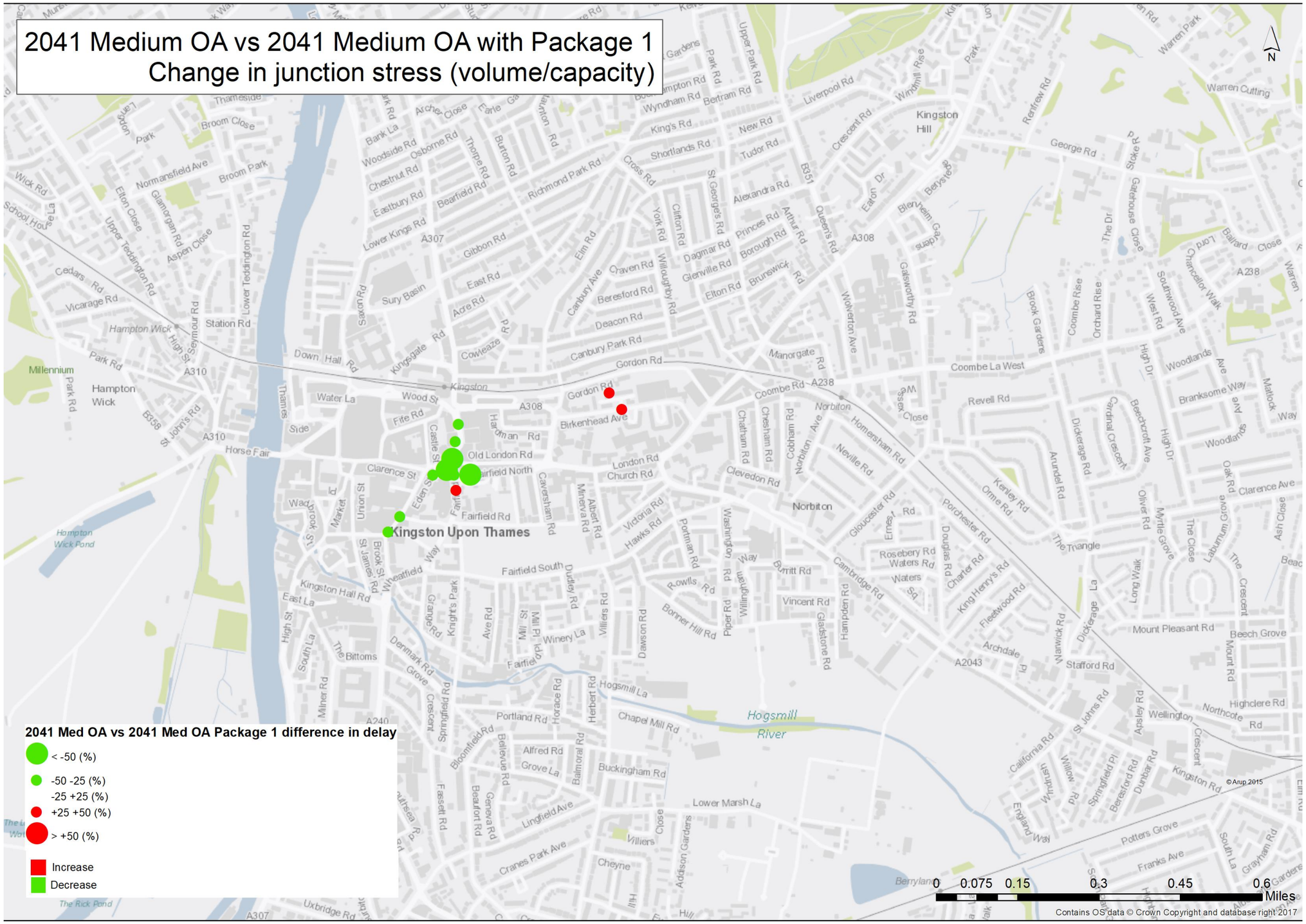
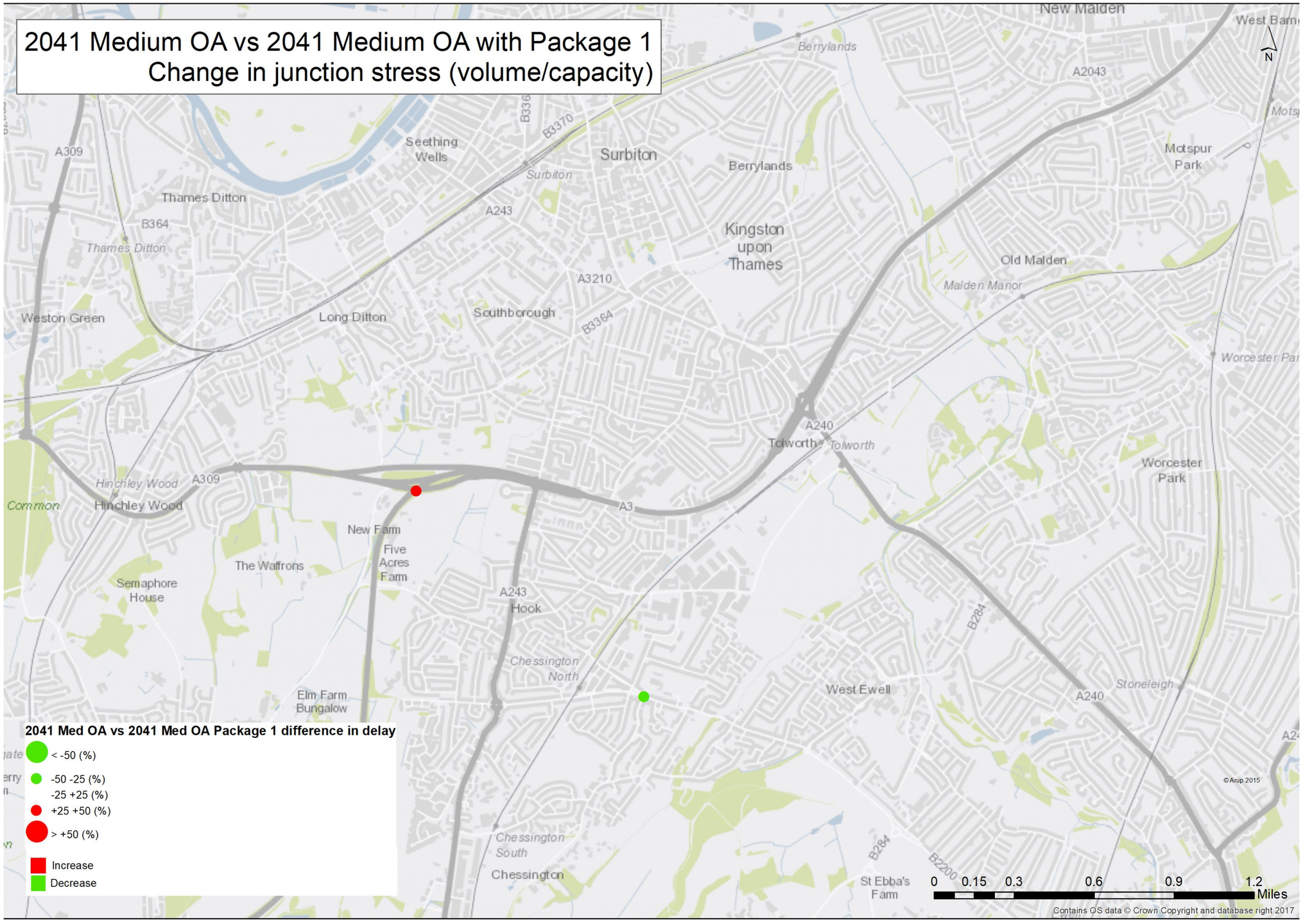


Figure 31: Change in junction stress with package 1 (Tolworth) (AM peak)



6.2 Package 2

6.2.1 Introduction

Package 2 tests the impact of all major proposed highway interventions included within Package 1 but also contains the impact of strong pan-London demand management and the introduction of a major public transport scheme in Crossrail 2. This package is used to forecast that the impact the highway schemes will have against the backdrop of policy to encourage mode shift to more sustainable modes of transport) and infrastructure interventions that significantly improve the offering of public transport within Kingston borough.

6.2.2 Results

Highway Flows

Figure 32 and **Figure 33** below shows the change in the number of highway flows (pcus) using the network in the AM peak between 08:00 and 09:00 within Kingston Town Centre compared to the 2041 medium OA development scenario.

The results of the run of package 2 on highway flows within Kingston Town Centre has an almost identical impact on the network as that of package 1. Flow increases are focused on the anti-clockwise section of the gyratory where new traffic movements have been made possible through bi-directional running. The impact of the demand management however decreases traffic flows on a widespread scale across a large proportion of the network. The decrease of between 100 to 400 pcus in the AM peak hour is forecast for the A3 in both directions, particularly between New Barnes/West Malden and Kingston Vale. Flows are forecast to decrease by a similar proportion on all major strategic routes in and out of Kingston town centre including the A308, A307 (Portsmouth Road), A307 (Richmond Road) and A310.

Changes at Hook and Tolworth junctions are also similar to package 1, where flows increase on the new A3 link road between Hook roundabout and the A3 (southbound). Differences are focused on the A243 (Hook Road) where flows are forecast to increase marginally in both directions between Hook junction and he junction with Bridge Road. The A243 (southbound) near Surbiton station is also forecast to increase by around 100 to 400 pcus. Small decreases in traffic volumes are focused for strategic routes including Ditton Road, Sugden Road and Worchester Park Road (connecting to A240 Kingston Road).

Figure 34 and **Figure 38** compare package 1 and package 2 directly to show the net effect of the demand management and Crossrail 2 on the highway network. It should be noted that the plots have been amended from the package 1 comparison to pick up smaller scale changes in highway demand.

In Kingston Town Centre, the most notable forecast decreases in highway flows include:

- Decrease in flows on the A3 (southbound) between New Malden (junction with the B282) and Tolworth of greater than 500 pcus as well as in both directions between New Malden and Kingston Vale of between 200 to 500 pcus;
- Decrease eastbound on the A308 (Hampton Court Road) across Hampton Court Park of between 200 and 500 pcus;
- Decrease eastbound on Ditton Hill and Sugden Road of between 200 to 500 pcus; and
- Decrease on southbound A310 (Kingston Road) inbound towards Kingston Town Centre and across Kingston bridge of between 200 and 500 pcus.

Some increases in flows can be observed at the following locations:

- Flows increase by 100 to 200 pcus on the A307 and A243 near Surbiton railway station as well as on the remainder of the A307 between Surbiton and the area around Kingston college; and
- Flows increase significantly by between 200 and 500 pcus on the Malden Road and B284 Church Road close to Malden Manor Station.

At Hook and Tolworth junctions, the most notable changes on the network between the package 1 and package 2 scenarios are flow increases:

- Hook Road (northbound) from around Chessington North to Hook Roundabout increased by 200 to 500 pcus. Flows between Chessington South and Chessington North stations on Leatherhead Road increase between 50 to 200 pcus; and
- Flows increase on the Kingston bypass between Hook junction and Hinchley Wood station between 50 to 200 pcus.

Forecast changes in highway flows on the A3 appear to be minimal with a reduction of between 50 to 100 pcus on the A3 southbound between Tolworth, Hook and A3 southbound. There are some significant decreases forecast in some east-west traffic, particularly on the B284 between Malden Manor and the junction with the A240 Kingston Road, and the Woodstock Lane South between the area around Chessington North and Claygate station.

The select link analysis for Package 2 for the Hook H1 scheme is shown in **Figure 36**. The overall observations for both the H1 and T2 schemes indicate the same traffic origin/ destination patterns as for Package 1.

Figure 32: Change in traffic flows with package 2 (KTC) (AM peak)

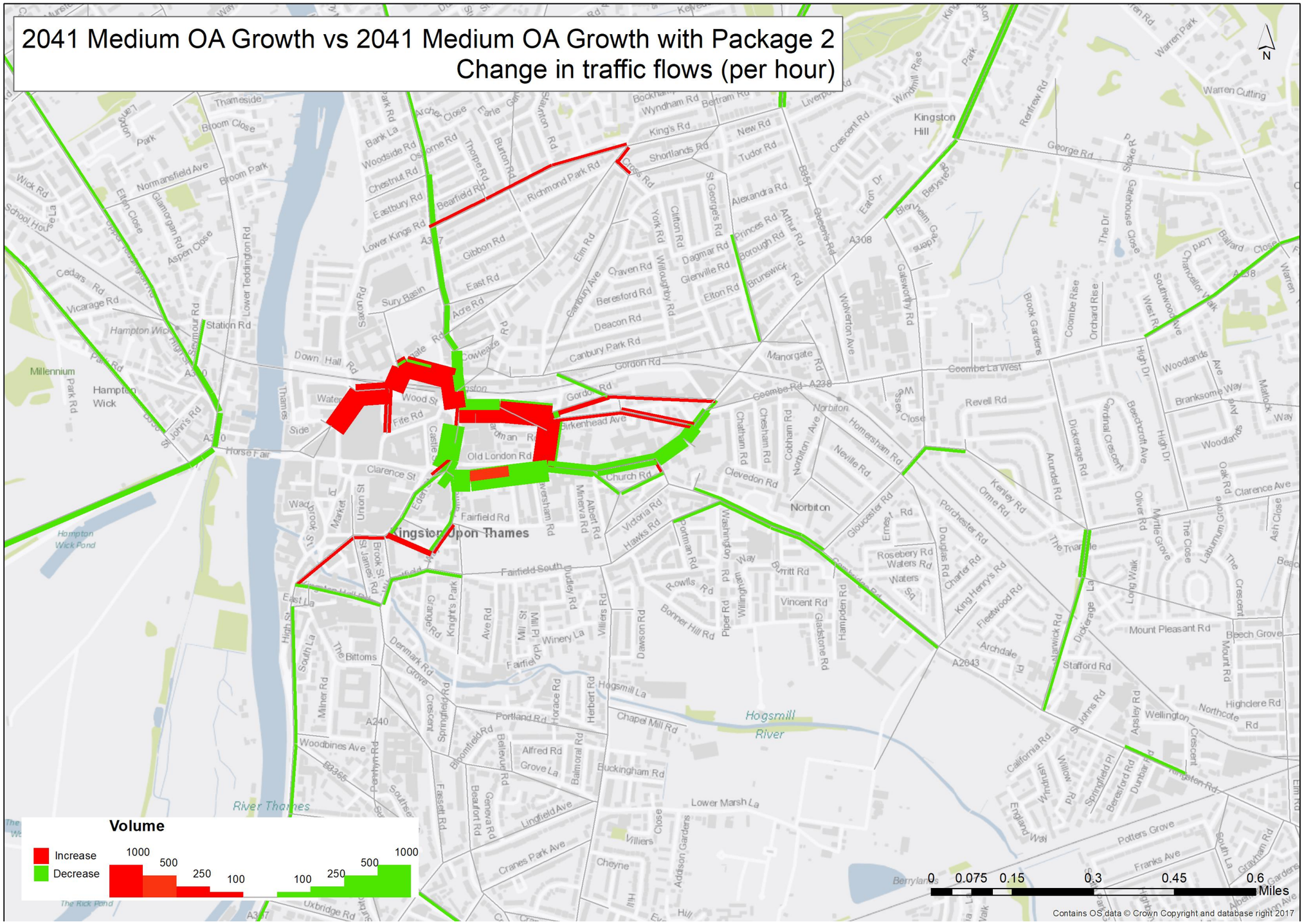


Figure 33: Change in traffic flows with package 2 (Tolworth) (AM peak)

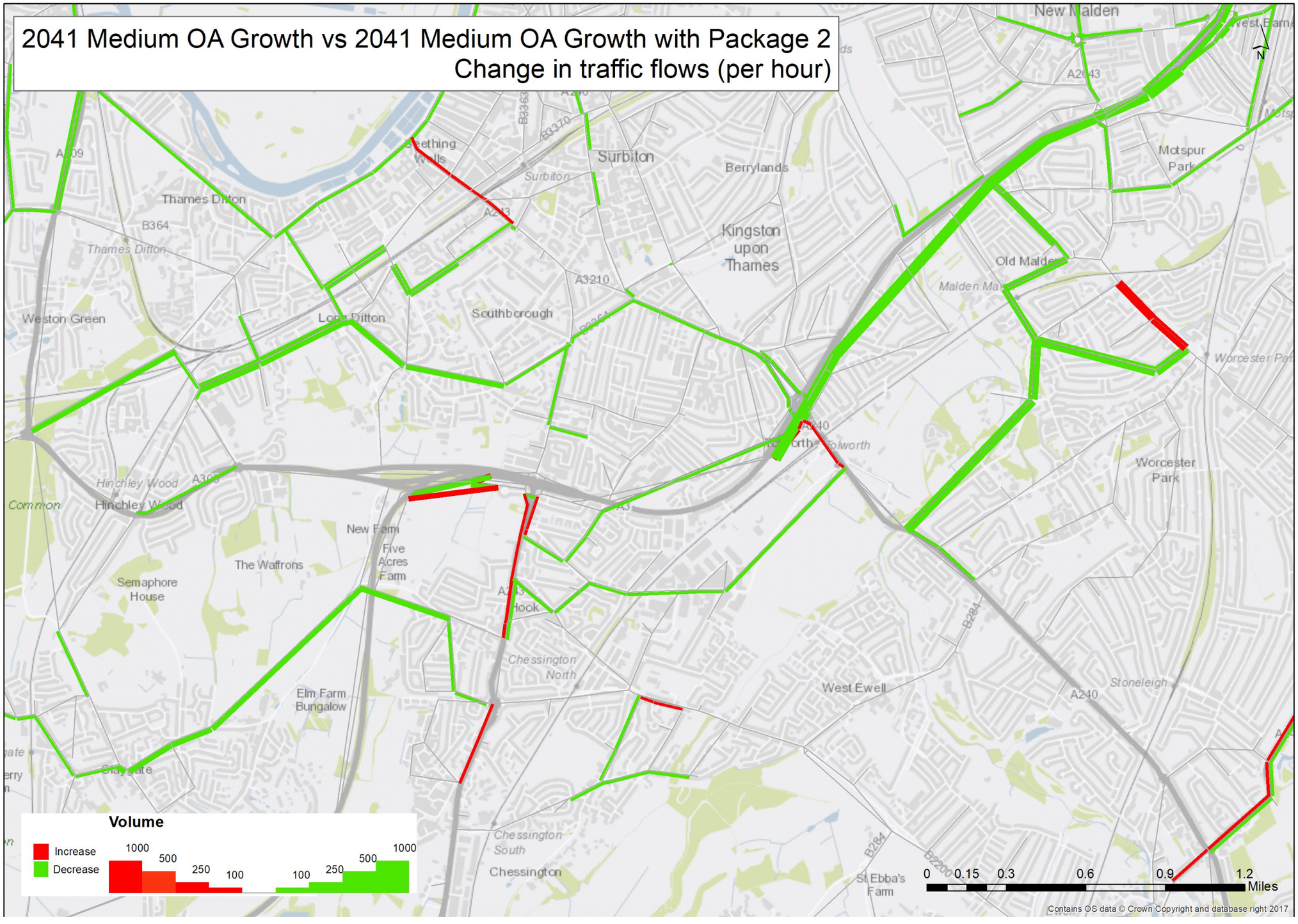


Figure 34: Change in traffic flows package 1 - package 2 (KTC) (AM peak)

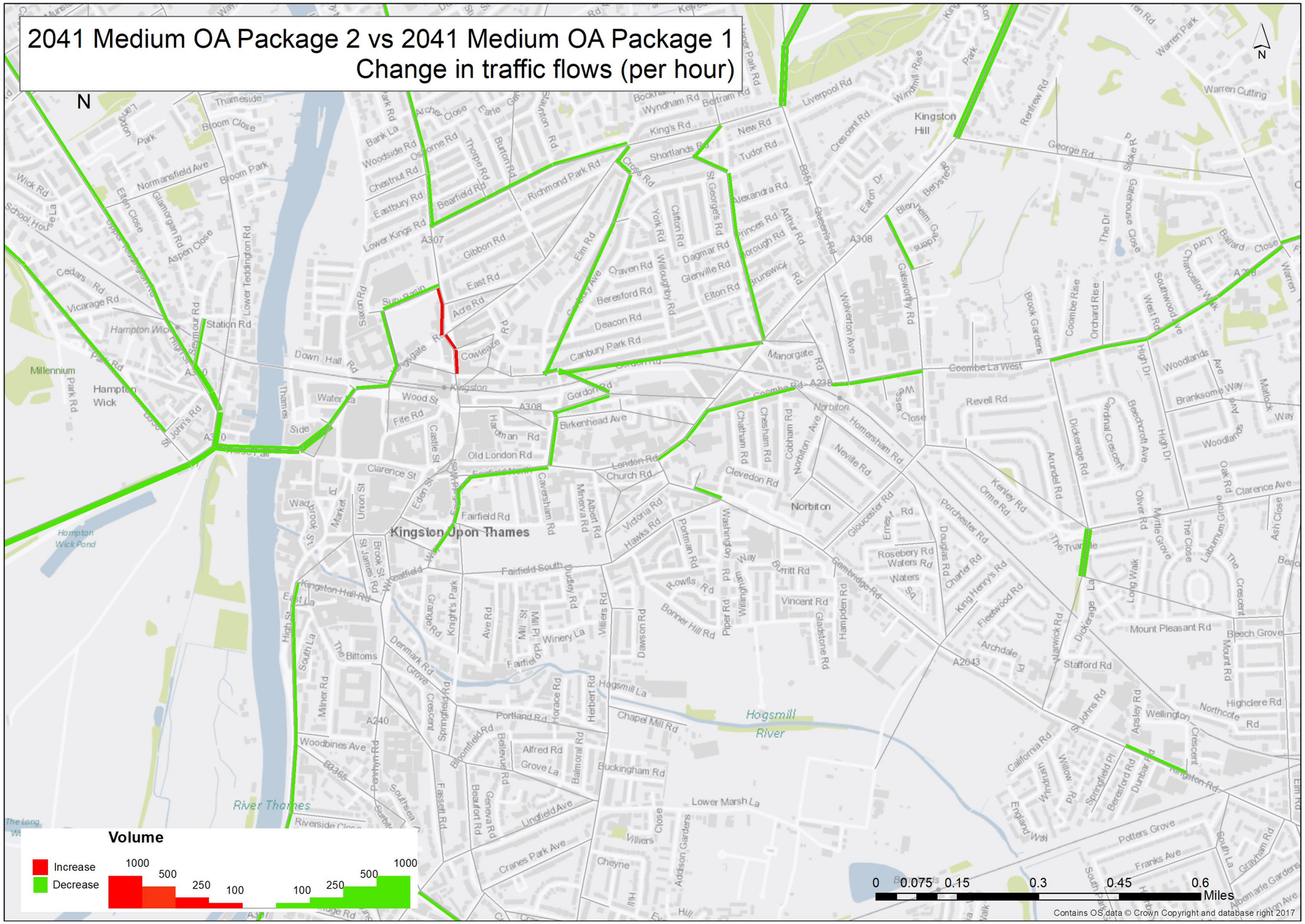


Figure 35: Change in traffic flows package 1 - package 2 (Tolworth) (AM peak)

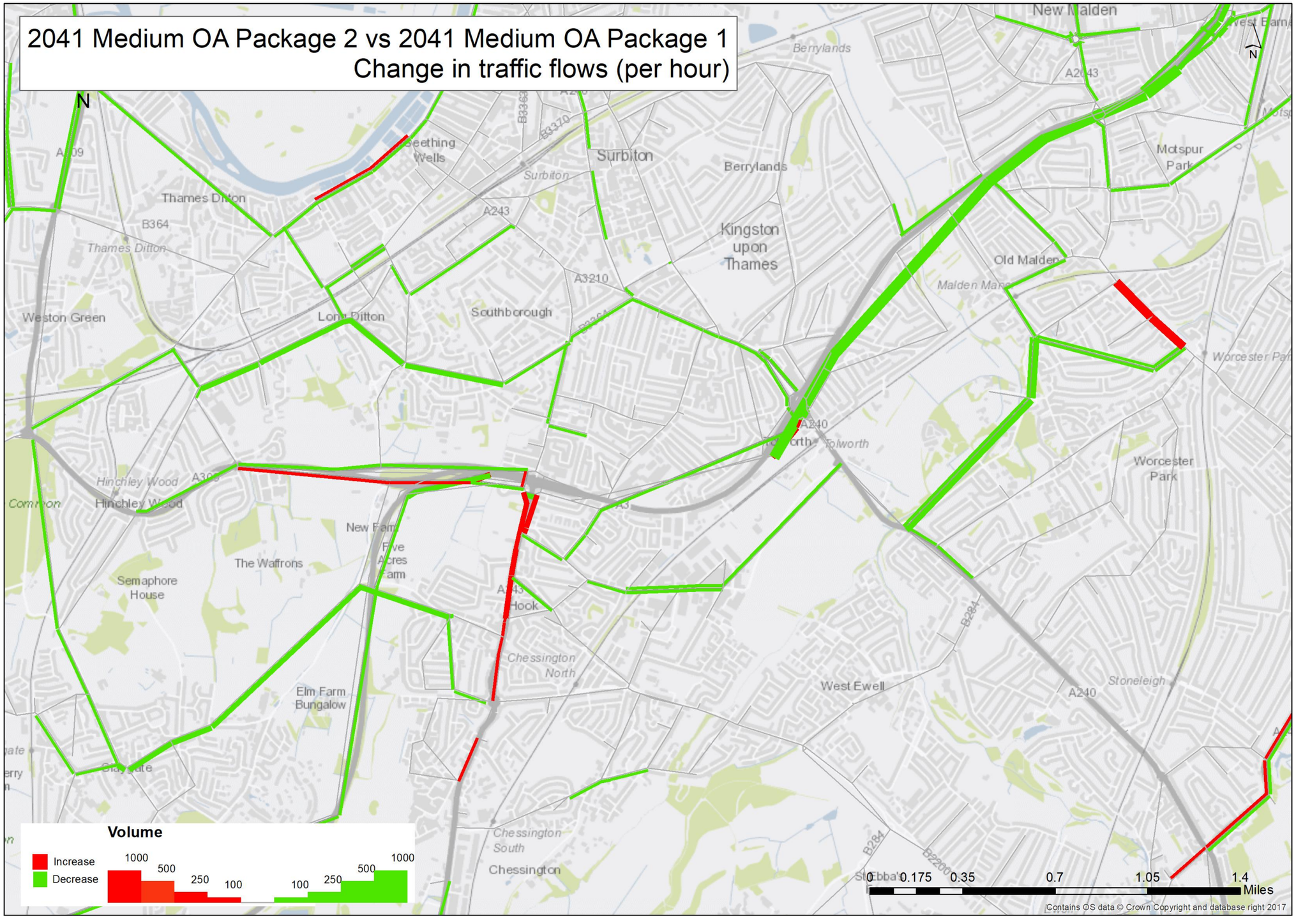
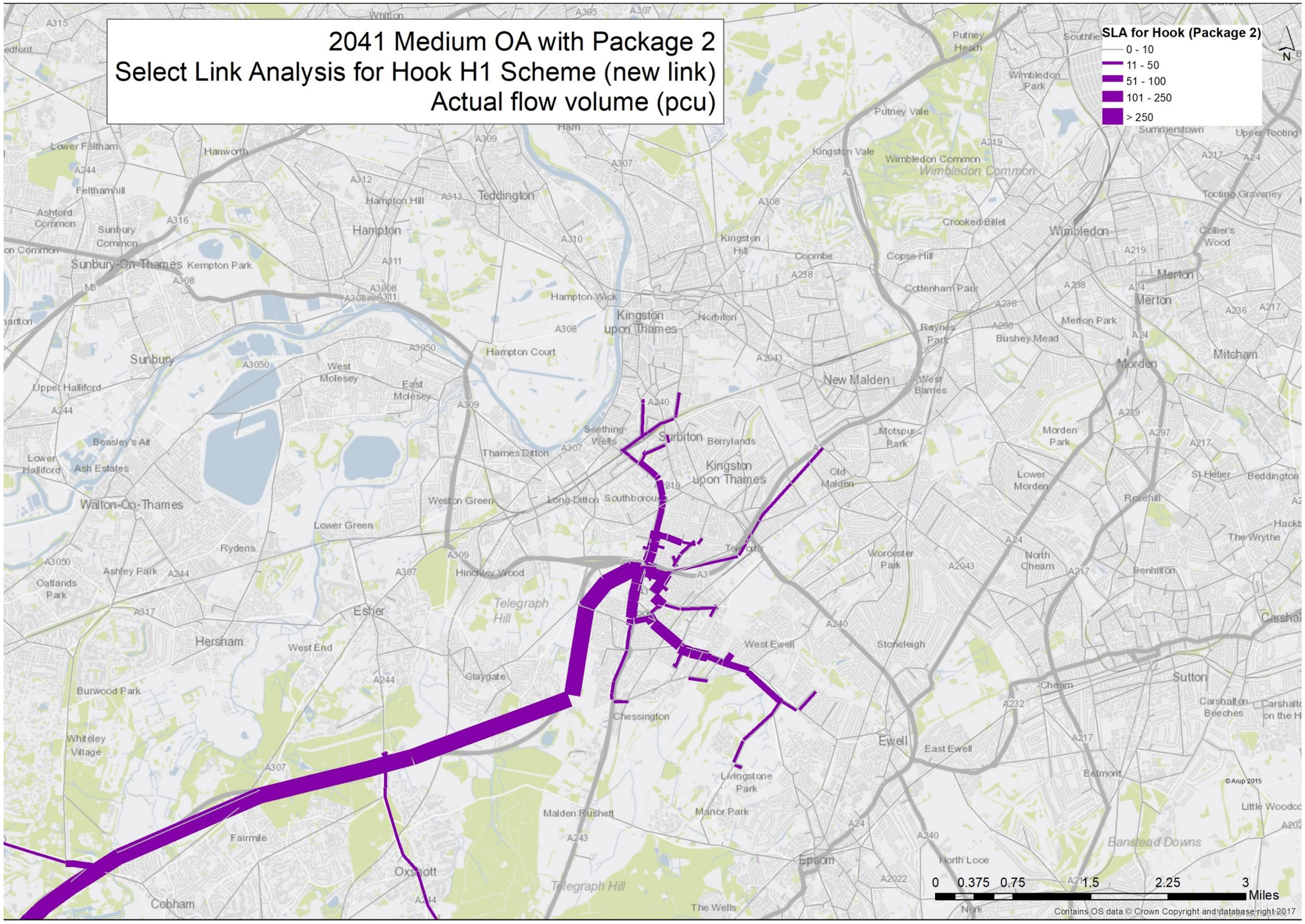


Figure 36: Traffic flows with package 2 (using new Hook link) (AM peak)



Junction Delays

Figure 37 below show the change in junction delay (expressed as average delay per vehicle) in the AM peak between 08:00 and 09:00 within Kingston Town Centre compared with the 2041 medium OA development scenario.

The conversion of the gyratory to allow bi-directional running is forecast to continue to add increased delay at key junctions along the route, despite the additional of techniques to further manage traffic demand. Delays are forecast to increase by greater than 90 seconds at the A307/A308 junction with London Road. The impact of Crossrail 2 and the increased demand to access Kingston station is also forecast to increase delays on the A307/A308 junction (Richmond Road) outside Kingston mainline station.

Elsewhere in the town centre, the bus lane conversion within Clarence Street and Eden Street continues to have a positive impact on junction delays within this area with delays decreasing by 0.5 to 1.5 minutes. Similarly, in the town centre near Villers Road, Hawks Road and Fairfield South, junction delays are forecast to decrease, some by greater than 1.5 minutes. This could be due to a fewer number of vehicles on the network limiting the number of vehicles rat-running through this significantly constrained area of the network.

Figure 38 below show the change in junction delay (expressed as average delay per vehicle) in the AM peak between 08:00 and 09:00 near Kingston and Tolworth junctions on the A3 compared with the original 2041 medium OA development scenario.

The results show that because of the proposed scheme in conjunction with demand management, the benefits at junctions are wide spread across most of the network.

Junction delays are forecast to decrease at the following points:

- Approaches to Hook roundabout from the A3 decrease by between 0.5 and 1.5 minutes although delays at these points are forecast to remain high at greater than 2 minutes average delay per vehicle;
- Delays decrease at junctions along Hook Road between Hook roundabout and the area surrounding Chessington South station;
- Delays decrease significantly at Tolworth junction with delays forecast at between 15-60 seconds in the package 2 scenario; and
- Flow benefits are also evident at junctions along several north-south routes including A240 Kingston Road south of Tolworth junction and A2043.

Figure 39 and **Figure 40** compare package 1 and package 2 directly to show the net effect of the demand management and Crossrail 2 on junction delay. The model forecast shows that within Kingston town centre, delays are likely to fall across all major junctions because of demand management and Crossrail 2. In greatest beneficial change to junction delay (greater than 1.5 minutes) is forecast at the following junctions:

- Brook Street and Wheatfield Way;

- Albert Road and A308 London Road; and
- A308 Sopwith Way and A307 Richmond Road near Kingston railway station.

There are also major reductions in delay forecast at previous constrained areas of the network where vehicles were previously forecast to attempt to avoid using the congested gyratory. An example of this on the plots is the junction with Canbury Park Road/Gordon Road and Queen Elizabeth Road north of the inner Gyratory.

The model also forecasts minor improvements to junctions along the A3 including at the junction with Coombe Lane West (0.5 to 1.5 minutes) and the junction with Malden Road (greater than 1.5 minutes) near Motspur Park railway station.

On the area of the network surrounding Tolworth and Hook Junctions on the A3, the results are equally spread out across the network. Decrease in delays are concentrated around Hook junction (including both off ramps approaching Hook roundabout), although it should be noted that most of these changes are around 30 – 90 seconds average delay per vehicle. Benefits are also extended to junctions along Hook Road (A243) towards Chessington North and Chessington South Stations and the junction with Bridge Road.

Junctions at Tolworth including on and off ramps to the A3 southbound are forecast significant improvements to delay with demand management in place. The link between Tolworth Roundabout and the A3 southbound is expected to see a reduction in delays of greater than 1.5 minutes average delay per vehicle.

Improvements are also forecast along the A240 Kingston Road connecting to Tolworth junction. Delay is forecast to change marginally by 0.5 to 1.5 minutes despite the junction remaining significantly over-saturated in the package 2 scenario.

Junction Saturation (V/C)

Figure 41 shows the change in junction saturation (or V/C) in the AM peak between 08:00 and 09:00 within Kingston Town Centre.

The bus lane conversion on Clarence Street and Eden Road is forecast to deliver similar improvements to the level of junction saturation within those areas of the town centre. Junction saturation deteriorates significantly however on the A307 and A308 junction near Wheatfield Way, a situation that is likely deteriorated by a reduction in lane capacity in this area.

Figure 42 shows the change in junction saturation (or V/C) in the AM Peak between 08:00 and 09:00 in the areas of the network around Tolworth and Hook.

The results show that package 2 has minimal impact on the area with very few improvements or deteriorations in junction saturation forecast when compared to the medium OA growth scenario. The forecast improvements to junction capacity are at:

- Tolworth junction on-slip to the A3 (southbound), which improves its V/C by 25-50%;

- Junction with Moor Lane and Bridge road near Chessington North station improves by 25%; and
- Junction with the A3 and south lane is forecast to improve by 25%.

Figure 43 and **Figure 44** show the change in junction saturation (expressed as V/C %) between the package 1 and package 2 scenarios, highlighting the net impact of demand management techniques and Crossrail 2.

In Kingston Town Centre, changes to junction saturation are forecast to be minimal with only a small number of junctions expected to see a significant change of greater than 25%. These junctions include:

- A307 Richmond Road and East Road (north of Kingston Town Centre);
- Canbury Park Road and Gordon Road (north of A308 London Road);
- South Lane and Bodley Lane near junction with A3 Bypass; and
- Beverley Way and Coombe Lane West at junction with A3 Kingston Bypass.

It is worth noting that other junctions may experience a benefit of between 0 and 25% V/C, but these are not reflected in the attached plots.

Around Hook and Tolworth junctions, junction saturation is forecast to remain relatively unchanged between the scenarios (less than 25% change). The only junction expected to receive an improvement of saturation of greater than 25% is that with Highdown and the Manor Drive, near the A2043 and Worcester Park railway station.

Figure 37: Change in junction delay with package 2 (KTC) (AM peak)

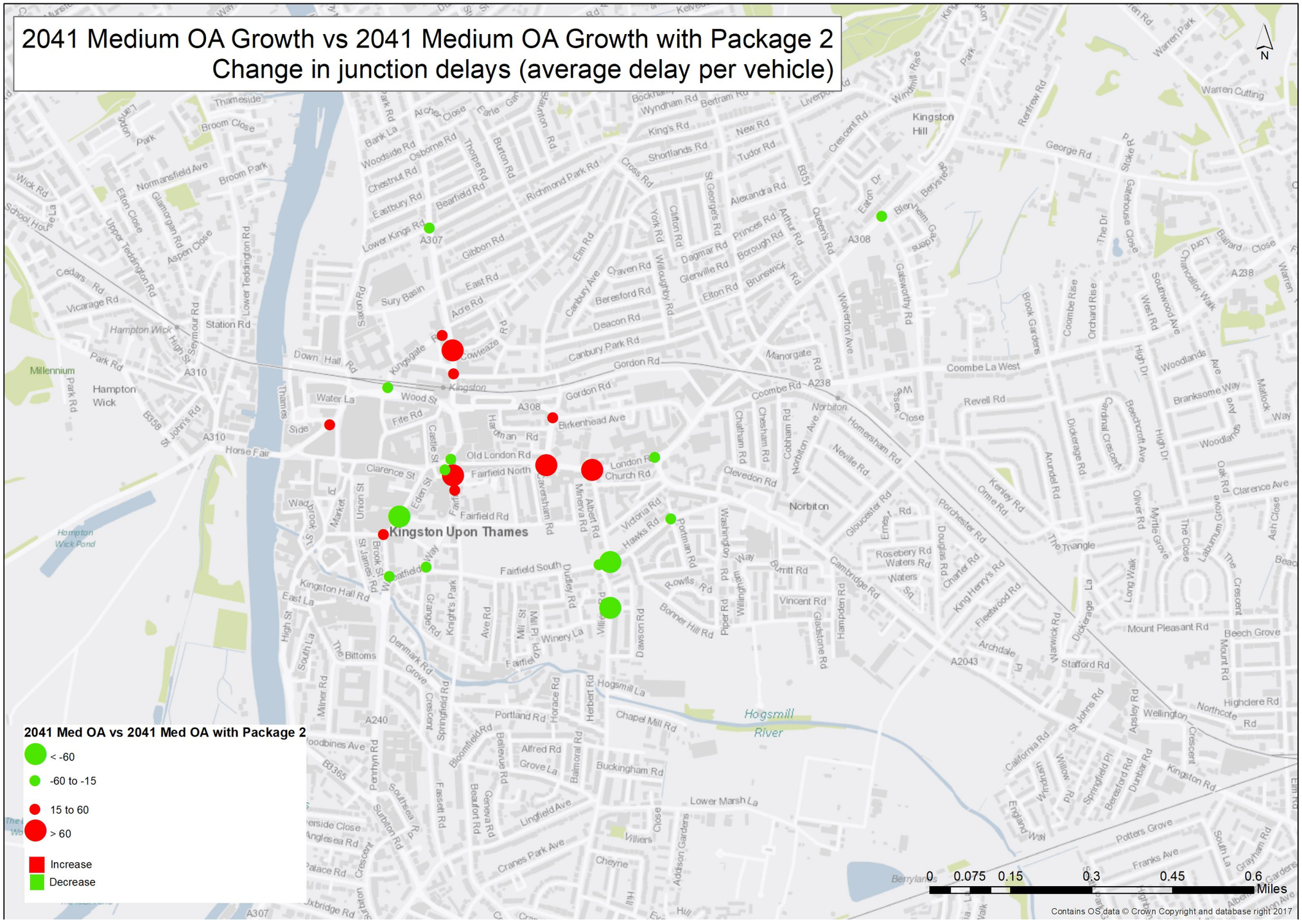


Figure 38: Change in junction delay with package 2 (Tolworth) (AM peak)

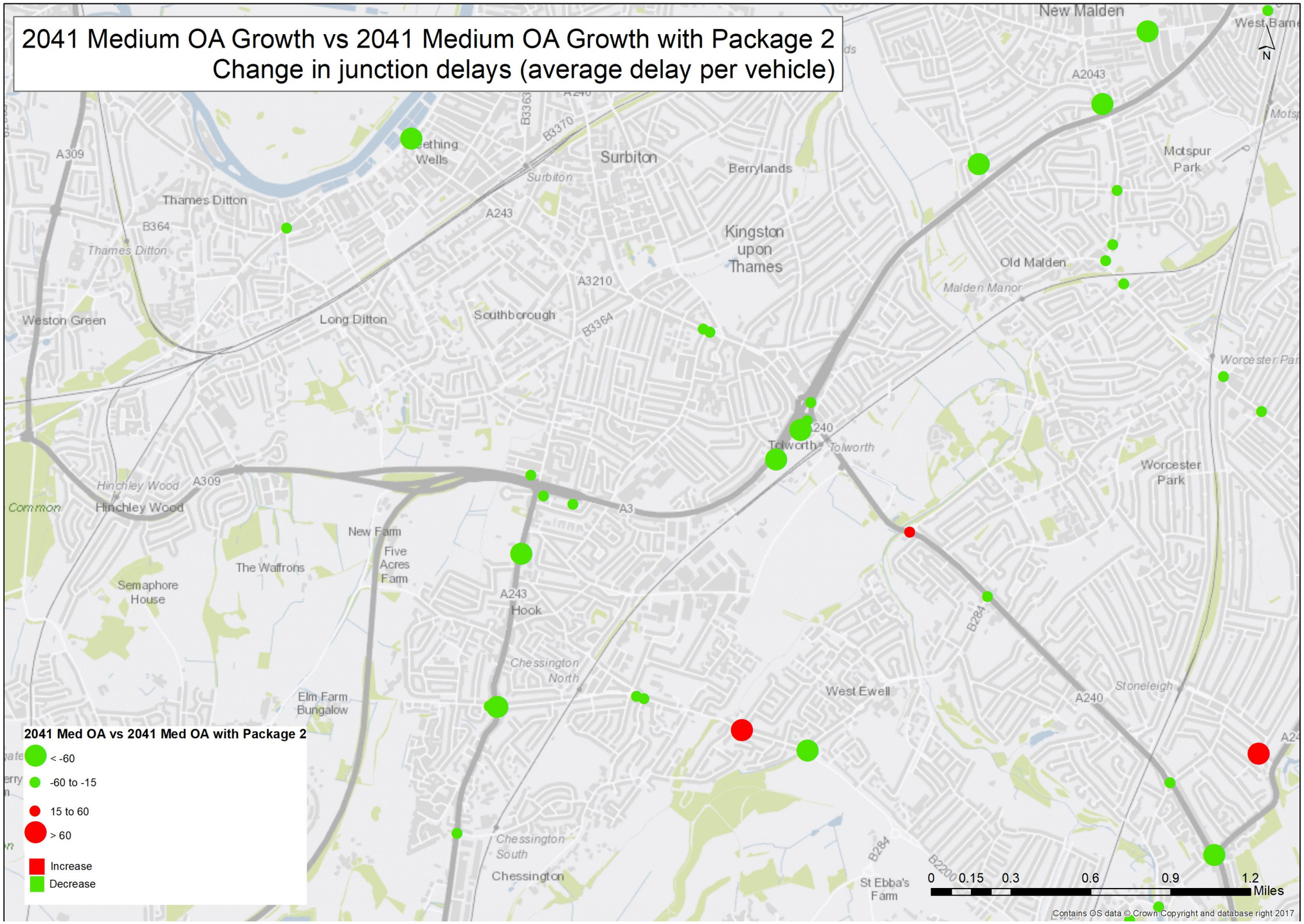


Figure 39: Change in junction delay package 1 to package 2 (KTC) (AM peak)

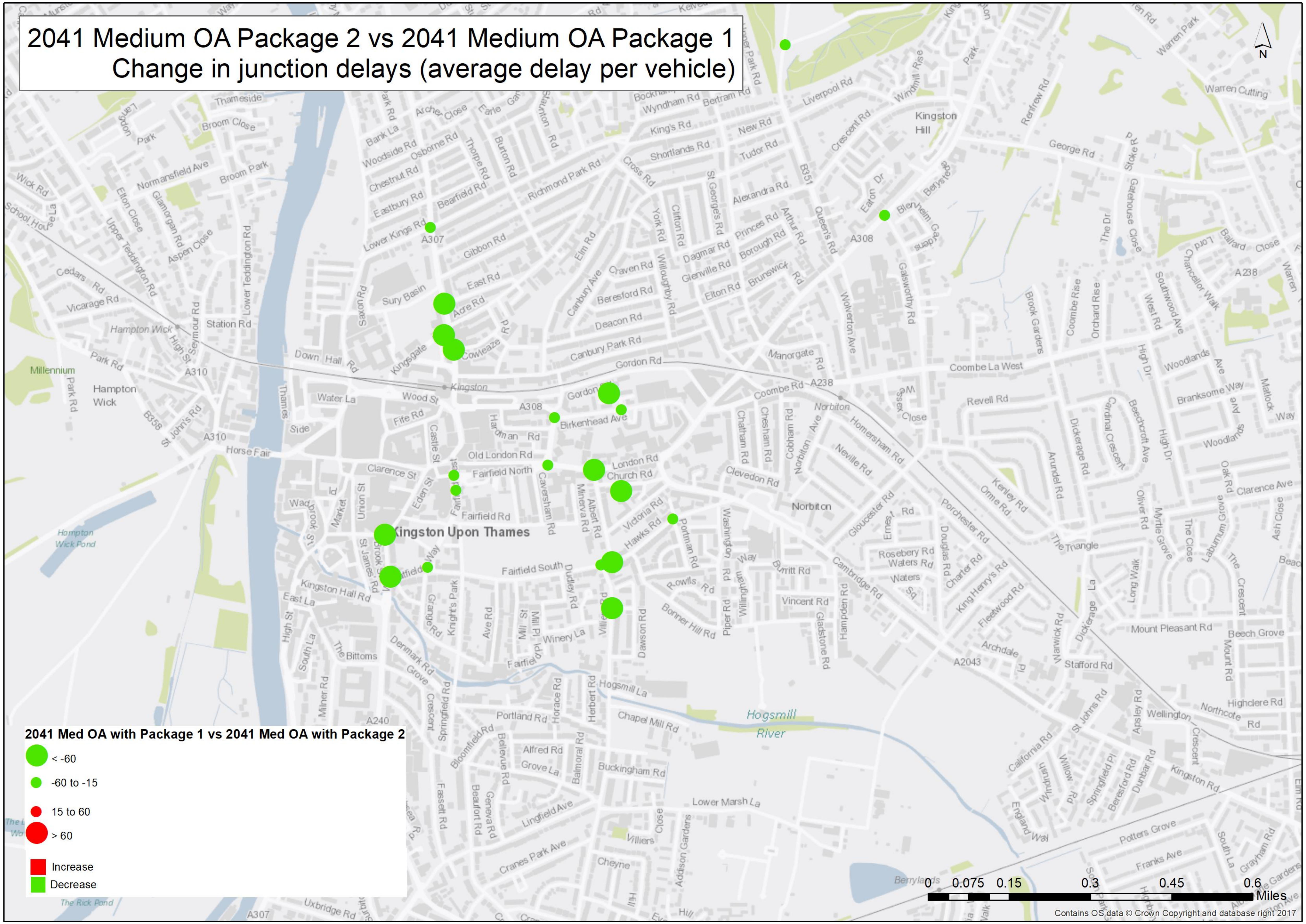


Figure 40: Change in junction delay package 1 to package 2 (Tolworth) (AM peak)

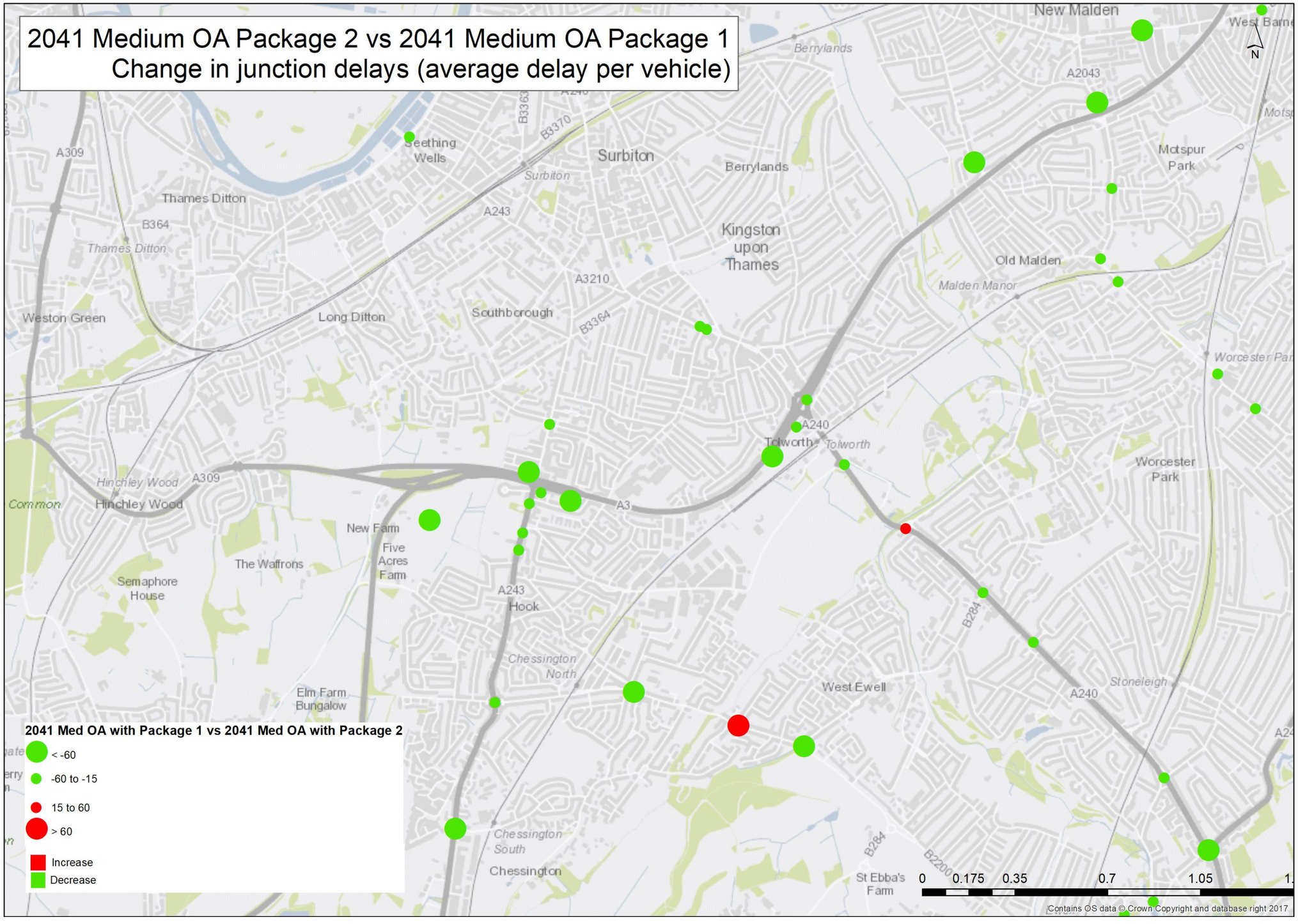


Figure 41: Change in junction stress with package 2 (KTC) (AM peak)

Figure 42: Change in junction stress with package 2 (Tolworth) (AM peak)

Figure 43: Change in junction stress package 1 to package 2 (KTC) (AM peak)

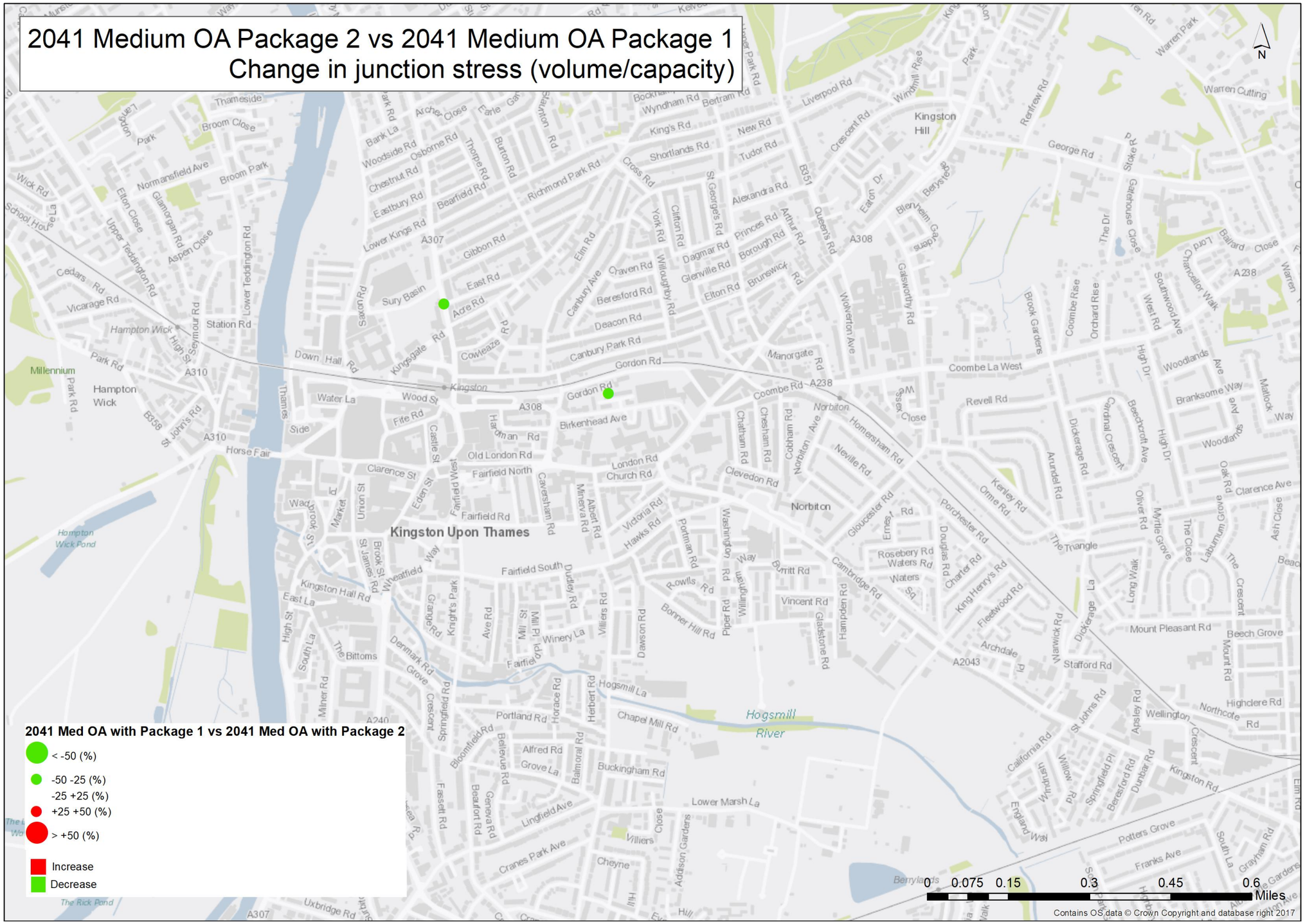
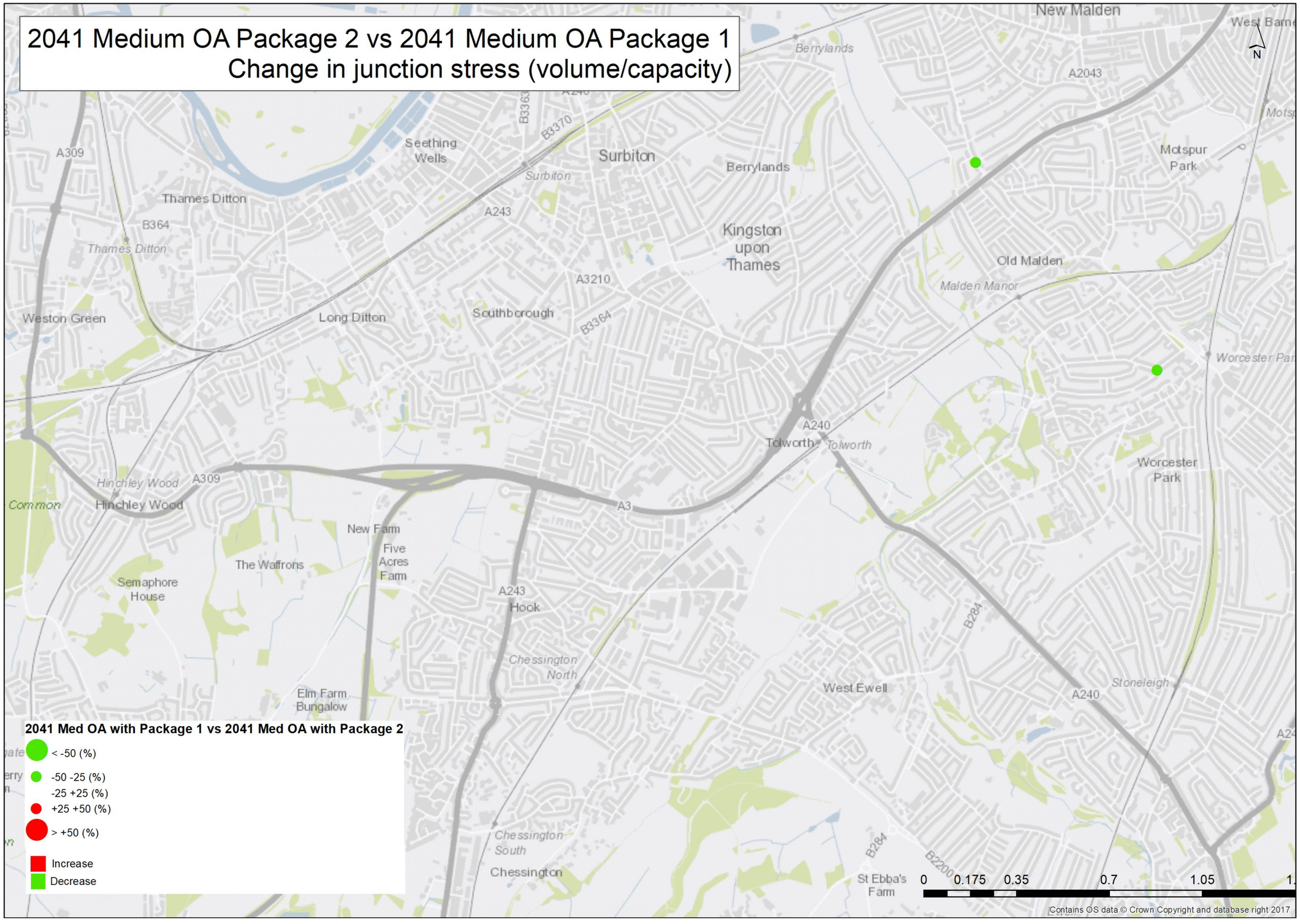


Figure 44: Change in junction stress package 1 to package 2 (Tolworth) (AM peak)



7 Conclusion

Using TfL-approved transport modelling, the Kingston Transport Study has undertaken a detailed analysis of pressures on the highway and public transport networks for the current day and for future forecasts based on 2041 with levels of housing and employment from the current 2016 London Plan and committed transport schemes. On top of this, RBK has provided housing and employment forecasts providing 15,000 homes and 30,000 jobs over and above the London Plan. The study has tested the impacts of these forecasts and tested a number of packages of transport schemes to mitigate the impact of potential future growth.

Based on London-plan based growth in employment and jobs, there are forecast to be significant stresses on both the highway and public transport networks by 2041 with increases in traffic flows and consequential significant increases in traffic delays. Although the assessment of traffic conditions includes transport schemes likely to be in place by 2041, a number of these schemes within the borough relate to the Go Cycle programme. Whilst these schemes improve conditions for cyclists, and should help facilitate a shift to more sustainable modes, they do result in a reduction in road capacity resulting from the reallocation of road space.

Crowding on rail services through the borough is forecast to worsen considerably by 2041, particularly on the SWML services through Surbiton.

Although Crossrail 2 is in the very early stages of planning and no decision to build it has been made, it is expected that permission to build the line will be sought in the early 2020's, followed by construction and potential opening by the early to mid-2030's. As well as generating new travel opportunities with consequential benefits to mode choice and increased public transport patronage, Crossrail 2 will offer substantial relief to the expected train crowding and will largely mitigate against the forecast levels of train crowding, despite the increase in passengers.

A number of packages of highway schemes have been assessed and could help to mitigate traffic conditions in the borough. The conversion of the existing one-way gyratory to two-way operation, along with sustainable transport options including a bus-only operation along Clarence Street, could significantly improve the nature of the town centre including reducing severance, linking the station to the town centre and reducing bus journey times through the Clarence Street bus corridor. Results have shown that the impacts are relatively local but do include increases in delay at several junctions. If this scheme is to be progressed, further work will be required on developing detailed designs, combined with detailed micro-simulation modelling to ensure that the scheme is viable.

However, except for the Go Cycle schemes, none of the highway-based schemes assessed will lead to a shift away from car-based travel or effect a switch to more sustainable modes. This will require a much more radical approach. To this end, a demand management scenario has been tested, based on an ambitious pan-London policy to reduce car mode share that incorporated TfL's healthy streets agenda, substantial spending on public transport infrastructure (including Crossrail 2), and

travel demand management. This could include measures such as: road user charging; a more sustainable freight policy; and a work place parking levy and road space re-allocation. Further work needs to be undertaken on the exact nature of what demand management should comprise of, and how it could be implemented across the GLA, and the modelled forecasts indicate that this is probably the only realistic way of reducing the reliance on car-based travel within and through the borough.