Solent Sub-Regional Transport Model strategic level outputs relating to a potential new bridge across the River Medina

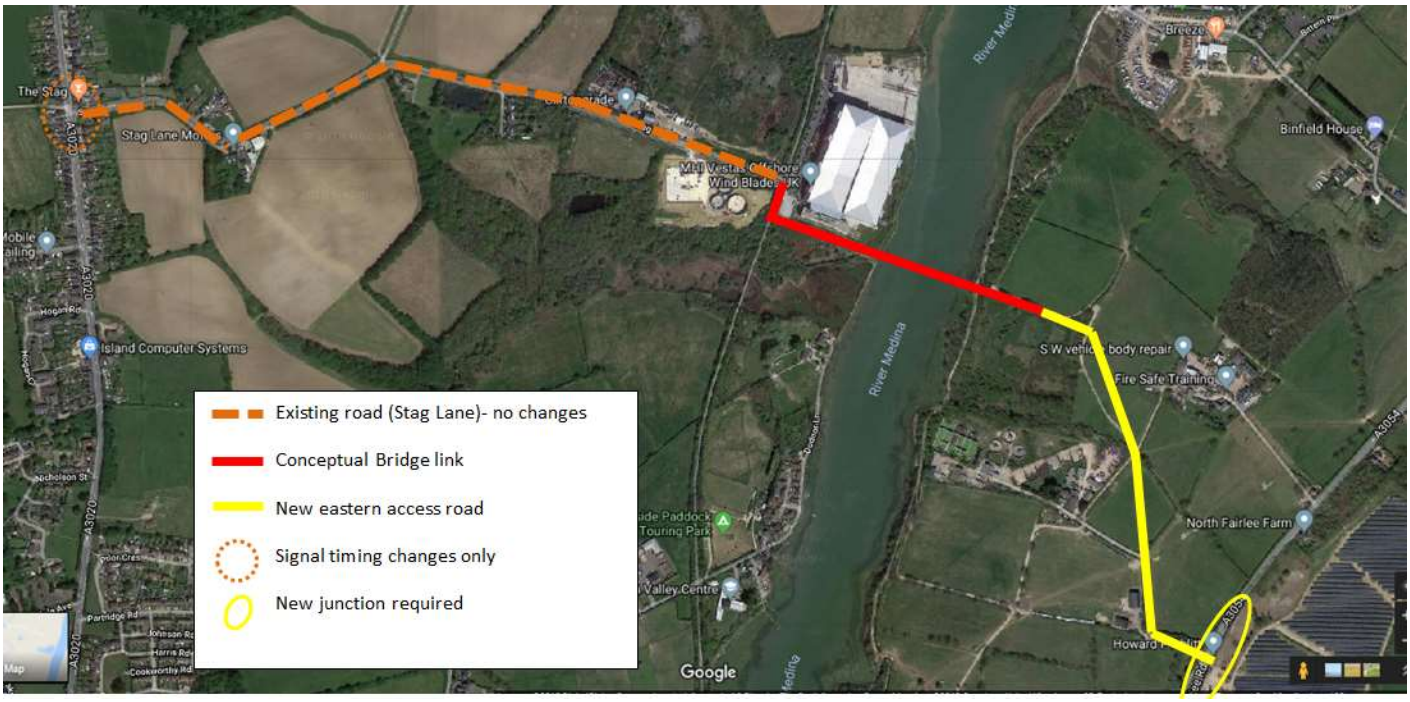
November 2018

1. Introduction

This note provides a summary of results of a test of a potential new bridge across the River Medina which was tested utilising the Solent Sub-Regional Transport Model.

A specific model test- 2036 Do Something (DS)2 was commissioned to test the potential impacts of the bridge in a scenario which contained:

- Committed development
- IWC Local Plan proposed development allocations
- Committed and proposed mitigations on the existing highway network
- Conceptual Medina Bridge on the general alignment indicated below



The bridge itself was modelled as a 7.3 metre width road, with 30mph speed limits, no vehicle weight restrictions, and with a shared footpath/cycleway along one side. These are similar parameters to those for study work undertaken by Portsmouth City Council into a new bridge at Tipner.

Access to the bridge was modelled as follows:

Western access:

- Utilising existing Stag Lane from A3020 Cowes Road without changes from current as far as the Vestas factory entrance (single carriageway, single lane each direction, width approximately 6 to 6.5m, 30mph speed limit, predominantly rural)
- Stag Lane/ A3020 Cowes Road junction: No physical layout changes to this junction were modelled as options appear extremely limited, but a retiming of the signals to increase capacity/ reduce waiting time for the northbound right turn movement from A3020 northbound to Stag Lane eastbound was modelled. The reason for this is that the holding capacity of the northbound right turn lane is limited by its short length (approx. 25 metres, or no more than 4 to 5 cars) and there appears to be no scope to increase this, thus if queues of northbound right turning vehicles developed, these could “block back” beyond the right turn lane, significantly impeding northbound Newport-Cowes traffic.

Eastern access:

- New Link road between bridge and A3054 Fairlee Road, assumed to be of same parameters as Stag Lane ie width approximately 6 to 6.5m, 30mph speed limit, predominantly rural.
- Eastern bridge link/ A3054 Fairlee Road: It is unclear when the test was specified whether a roundabout junction at this location would function adequately under modelled traffic flows, or if land availability would permit a suitably sized roundabout to be accommodated. A signalised junction would have a smaller footprint. Therefore the junction was modelled as a signalised T-junction with dedicated southbound right turn and dedicated northbound left turn lanes on A3054 Fairlee Road to hold traffic turning to access the bridge.

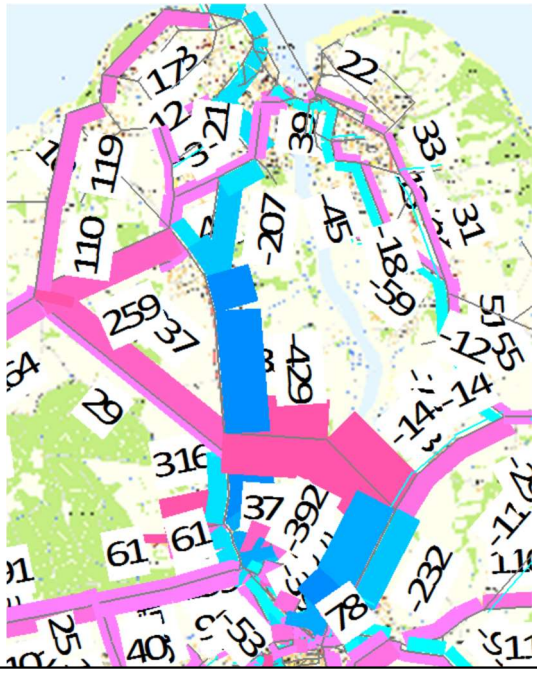
1.1 Forecast usage of the hypothetical bridge and effects on local network

The test results indicated total usage of the bridge of:

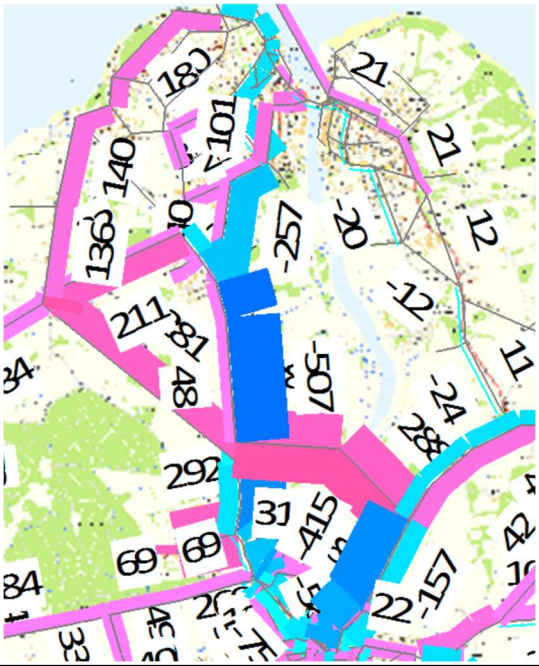
- 759 veh/hr in the AM peak hour
- 606 veh/hr in the PM peak hour

These flows are evenly balanced rather than tidal, ie eastbound and westbound flows are similar in both peak periods, and are in the range of 288-383 veh/hr in a single direction. These flows are less than half (and perhaps less than a third) of likely maximum capacity of a single carriageway rural road with a 30mph speed limit.

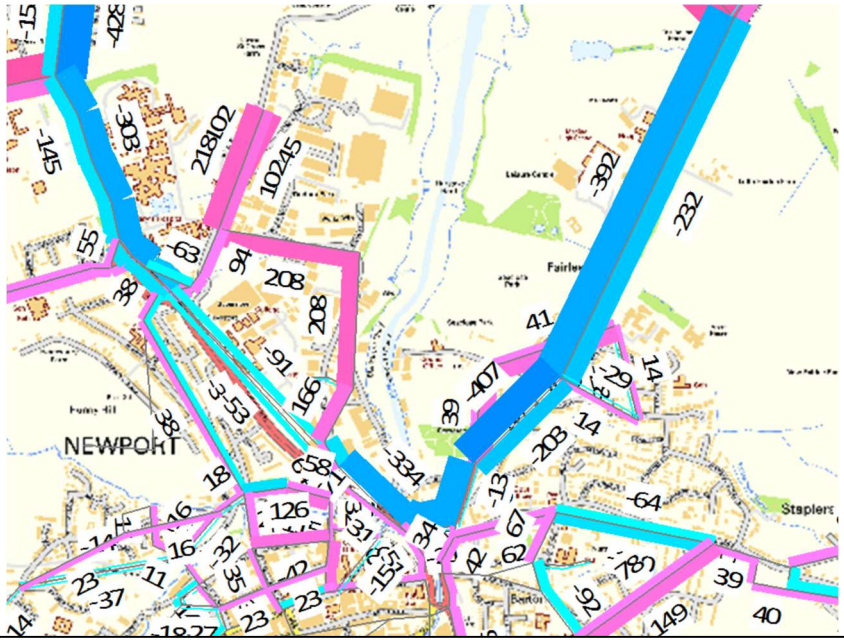
Some substantial changes to local traffic routing are forecast in the "with bridge" scenario compared to the 2036 Baseline, as shown in the figures below.



Changes in forecast traffic flows, Newport & Cowes areas, 2036 DS2 AM peak vs 2036 BL



Changes in forecast traffic flows, Newport & Cowes areas, 2036 DS2 PM peak vs 2036 BL



Changes in forecast traffic flows, central Newport, 2036 DS2 AM peak vs 2036 BL

South of the potential bridge in central Newport, there are large (~150 to ~400 veh/hr) traffic flow reductions in the peaks in both directions on both the A3054 & A3020 north of Medina Way. There are also smaller reductions in traffic flow on Medina Way itself (~50 to 250 veh/hr range). These reductions in traffic flows result in forecast reductions to delays at a number of junctions on Medina Way and connecting routes (see later pages).

North of the potential bridge, the flow change plots indicate some significant traffic re-routing on the west side of the Medina. In particular, large flow reductions on the A3020 Cowes Road are forecast in the southbound direction in both peaks. Also notable are large flow increases (+ ~250 veh/hr) in the southbound direction on Noke Common Road, a relatively minor rural road which in the 2036 Baseline is forecast to handle fewer than 100 veh/hr in this direction; and increased traffic flows on some main roads in the western part of West Cowes which link towards Noke Common Road.

It appears that significant additional delays are forecast at the Stag Lane/ Cowes Road junction, possibly due to modelling signal timings aimed at avoiding delays to northbound traffic due to the short right turn lane (see page 1) resulting in disruption & delay to the southbound traffic flow. Southbound traffic is particularly affected with forecast delays of 231 seconds (3.85 minutes) in the AM peak and 189 seconds (3.15 mins) in the PM peak. There were negligible modelled delays in the 2036 Baseline for this junction. These additional delays appear to then result in some traffic being forecast to divert via Noke Common Road as this would provide a faster journey than the direct A3020 route.

A similar pattern related to the bridge access junction on the east side of the Medina is also observable particularly in the PM peak, where traffic flows on A3054 Fairlee Road are lower, and flows on Staplers Road, which provides an alternative route to Wootton and Ryde, are higher (+150 veh/hr). The bridge access junction imposes significant delays on northbound traffic on A3054 Fairlee Road (111 seconds in the AM peak, 102 seconds in the PM peak) such that for some journeys, it appears that alternative routes such as Stapler's Road would be a faster route for some journeys.

With forecasts of nearly 5,000 additional PCU-minutes of delay in the AM peak and just over 4,300 PCU-minutes in the PM peak these additional delays at the bridge access junctions are significant at the network-wide scale – accounting for around 10% of all delay minutes on the network in both peak periods.

There is a possibility that forecast delays at these junctions as modelled may deter some traffic from using the bridge due to delays accessing the bridge negating time savings achieved by using it.

These results point to a need to consider whether the access junctions or routes for the potential bridge could be better optimised to reduce delays to major flows on the main roads they interface with.

1.2 High level assessment of network wide impacts versus 2036 Baseline

2036 Do Something 2 (DS2) AM peak compared to 2036 BL

- Total network wide junction delay 51398 mins (+13.9% vs 2036 baseline)
- Average Junction arm RFC (across all junctions) = 60 (1% worse)
- % of junction arms above 85% RFC = 21.7% (0.2% better)
- % of junction arms above 100% RFC = 8.3% (0.4% worse)

- Systra assessment of RFC impacts vs 2036 Baseline:
    - significant RFC impacts on 16 individual junction arms
    - severe RFC impacts on 6 individual junction arms
    - 20 junctions in total with significant/ severe impact on RFC on one or more arms

2036 Do Something 2 (DS2) PM peak compared to 2036 BL

- Total network wide junction delay: 49,883 mins (+3.9% vs 2036 baseline)
- Average Junction arm RFC (across all junctions) = 59% (1% better)
- % of junction arms above 85% RFC = 19.6% (3.6% better)
- % of junction arms above 100% RFC = 8.7% (1.2% worse)

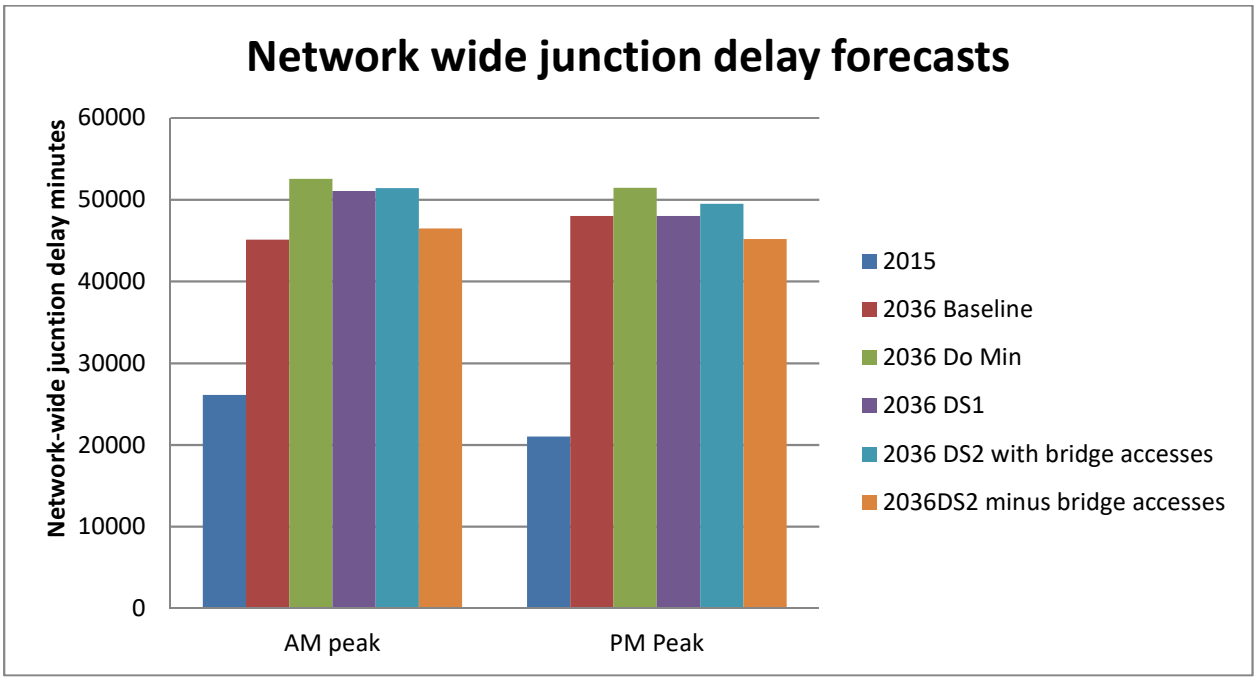
- Systra assessment of RFC impacts vs 2036 Baseline:
    - significant RFC impacts on 16 individual junction arms
    - severe RFC impacts on 3 individual junction arms
    - 15 junctions in total with significant/ severe impact on RFC on one or more arms
- Additional junctions showing RFC sig/sev impacts above 2036 BL:

The above results , and all results shown forward of this point, assume Queens Road/ West Street/Newport Street/ John Road junction in Ryde performs as per 2036 DM results- see comments in other document re performance of alterations to this junction modelled in 2036 DS1 test

1.2 Comparison of network-wide 2036 results to 2015

The chart below shows comparison of forecast network-wide junction delay minutes in the following scenarios:

- 2015 Baseline
- 2036 Baseline
- 2036 Do Minimum (Local Plan proposed development and committed infrastructure schemes)
- 2036 Do Something 1 (Local Plan proposed development, committed infrastructure plus additional mitigations)
- 2036 Do Something 2 (Local Plan proposed development, committed infrastructure plus additional mitigations, plus potential Medina Bridge)
- 2036 Do Something 2 minus bridge accesses (Local Plan proposed development, committed infrastructure plus additional mitigations, plus Medina Bridge but minus delays incurred at junctions to access it)



At a whole-network level, the results of the 2036 DS2 test indicate that the potential Medina Bridge, as tested, would result in small increases in net delay compared to the 2036 DS1 test.

However, as described previously, this is largely due to significant additional delays forecast at the junctions which would connect the bridge to the existing network (Stag Lane/ A3020 Cowes Road and new bridge access/ A3054 Fairlee Road) due to traffic accessing the bridge disrupting existing traffic flows.

The 2036 DS2 "minus bridge accesses" bars in the chart above indicate what network-wide delays would be if no additional delay occurred at the bridge access route junctions.

If access to the potential bridge could be achieved with minimal impact on existing traffic at the two junction locations, these results indicate that at a whole-network level, delay could be reduced to close to the 2036 Baseline results (ie network-wide delays without additional proposed development) or perhaps even below it in the PM peak.

1.3 Forecast Impacts within major settlements

The below table shows the sum of forecast total delays across junctions within three of the largest settlements on the island for the AM & PM peak hours in 2036.

AM peak

	2036 BL	2036 DS1	2036 DS2
Newport	16875	22649	19295
Ryde	4560	4827	4872
Sandown & Shanklin	8936	5754	5788

PM Peak

	2036 BL	2036 DS1	2036 DS2
Newport	15526	18178	17150
Ryde	4560	4762	4691
Sandown & Shanklin	12178	7452	7418

In the AM peak, the inclusion of a Medina Bridge reduces forecast total delays in the Newport area by 3354 vehicle minutes (a 14.8%) relative to the 2036 DS1 scenario. However these results do not indicate that the bridge would fully mitigate the delay impacts of Local Plan development as the 2036 DS2 total delays are still 14.3% higher than the 2036 Baseline (versus a 34.2% increase in the 2036 DS1 scenario).

In the PM peak, the benefit of the Medina Bridge to junctions in Newport is forecast as being smaller- a 5.7 % reduction in total delay relative to 2036 DS1 is forecast. This is still a 10.5% uplift on delays relative to the 2036 Baseline.

No meaningful changes to the total delay at junctions across the Ryde or Sandown/Shanklin areas are forecast, indicating that the effects of the bridge are limited to the Newport and Cowes areas and there does not appear to be a wider effect on the network.

1.4 Network wide impacts- Summary:

These results indicate that as modelled the potential Medina Bridge results in fairly substantial reductions in total delays relative to the 2036 DS1 test (and in some cases the 2036 baseline) at some key junctions in Newport, but that delays at the bridge access route junctions negate reductions in delay achieved in central Newport , resulting in slight increases in overall delay at a whole-network level.

However if the bridge access route junctions could be provided without significant detrimental impacts, these forecasts suggest potentially substantial improvements to whole-network delay, as well as reductions in delays in specific parts of Newport may be achievable.

Additionally, the forecast usage of the bridge appears relatively low in these results (less than 50% of the likely capacity of the bridge). Utilisation of the bridge might be affected by delays in accessing it . If free-er flowing conditions at the access route junctions could be achieved, there is a possibility that utilisation of the bridge might be higher, possibly resulting in further diversion of traffic flows away from central Newport.

Additionally, access route junctions which impact less on the existing network might be expected to reduce traffic diversions along minor roads to avoid delays which have been forecast in the test carried out.

2.1 Individual junction impacts

The plots overleaf indicate changes to junction delays between the 2036DS2 (bridge test) and 2036 DS1 (with development & mitigations, without Medina Bridge test).

Red circles indicate additional delay forecast in the "with Medina Bridge" test, relative to the "without" test, whilst green circles indicate reductions in delay forecast as a result of the bridge.

The *per-PCU plots* indicate the changes in delay forecast to be experienced by each individual vehicle/driver.

The *total junction delay plots* indicate the net change in delay across all traffic using that junction and is indicative also of the number of vehicles experiencing reductions in delay, and also may indicate where reduction in delays may be economically significant.

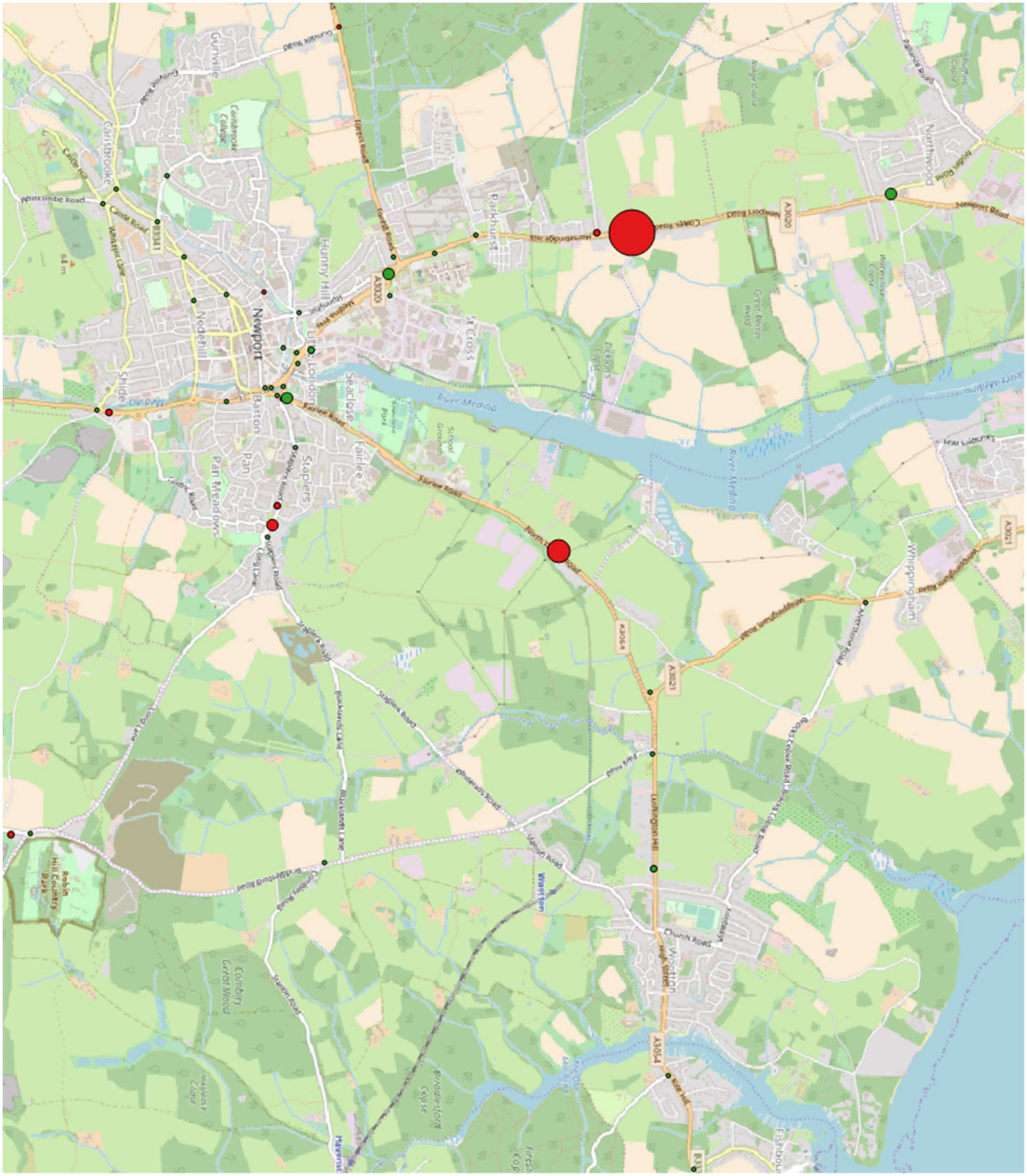
2.2 Interpretation of results

The plots on page 8 and 9 indicate the scale of changes in delay that would be experienced by drivers of each vehicle. In the AM & PM peak, small changes to junction delays - mostly reductions- of typically a few seconds per vehicle are forecast at junctions in central Newport. However large additional delays are forecast at the bridge access junctions, particularly the western end (Stag Lane/ A3020 Cowes Road).

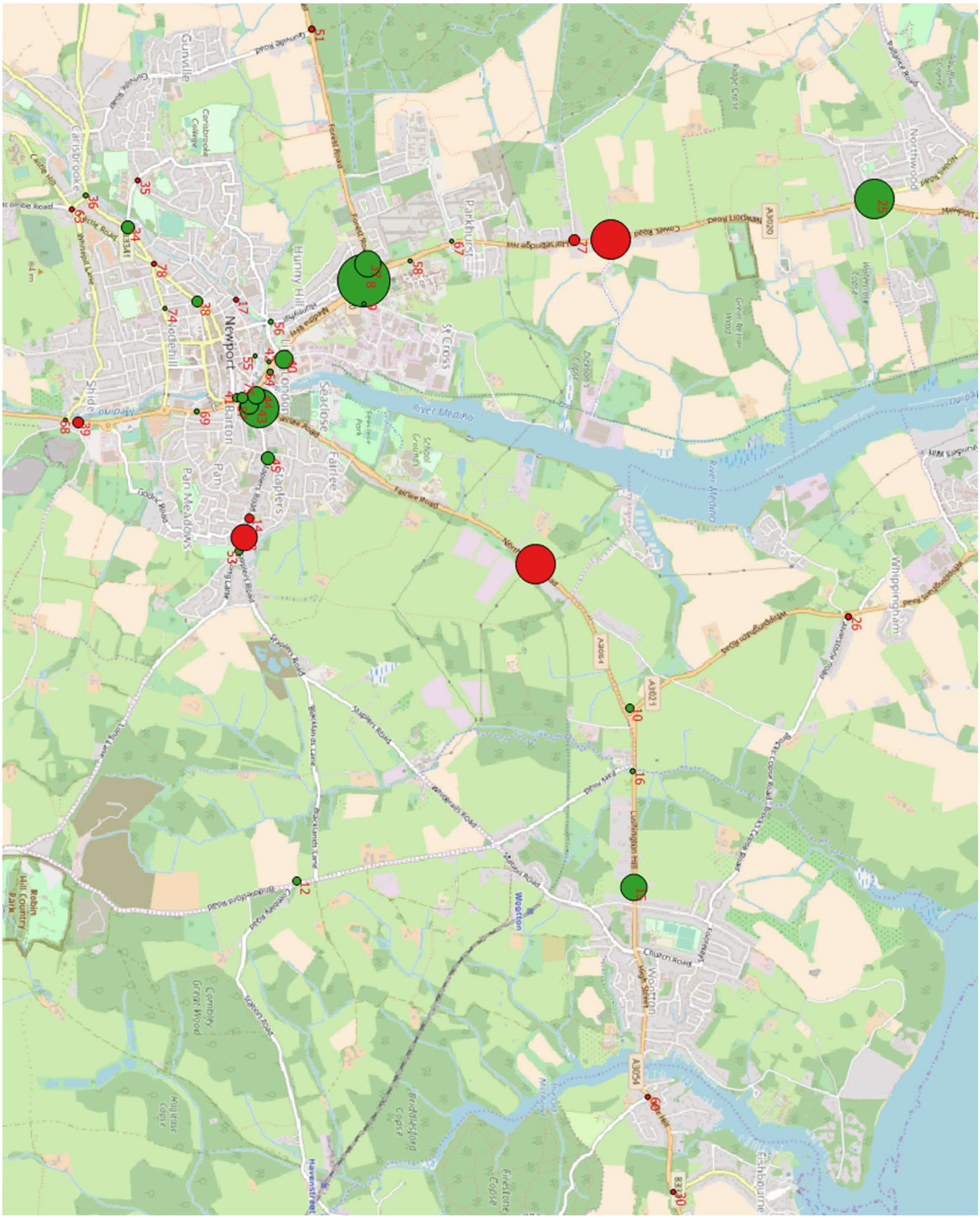
The plot on page 10, showing changes to total delays in the AM peak indicates that whilst the per-vehicle time savings at junctions in central Newport are small, when these small savings are multiplied by the number of vehicles, the time savings are significant- but that the additional delays at the bridge access junctions are of a similar scale. Also notable is the forecast additional net delay at the Staplers Road/ Long Lane gyratory.

2036 AM peak- changes to per-PCU junction delays (DS1 vs DS2)

2036 PM peak- changes to per-PCU junction delays (DS1 vs DS2)



2036 AM peak- changes to total junction delays (DS1 vs DS2)



3. Summary

Overall, the results from the SRTM test undertaken indicate that a potential Medina Bridge between the A3020 Cowes Road, and A3054 Fairlee Road would result in some reductions to traffic delays at various junctions in central Newport. The time savings per user however are forecast to be relatively small- measured in seconds rather than minutes per vehicle.

At an aggregate scale, the time savings may be more significant, and reductions to traffic flows in Newport are forecast to help improve the operation of a number of junctions which would otherwise be under greater pressure in a 2036 with development scenario.

The forecasts do however predict negative impacts which appear to primarily stem from delays at the junctions where the bridge access routes would connect to the existing highway network. The additional delays generated at these locations are forecast to exceed the scale of delay reductions achieved elsewhere on the network and may also result in some traffic re-routing via possibly undesirable minor routes. There is also a possibility that the additional congestion forecast at these junctions in these tests may deter some traffic from using the bridge.

There is potential to investigate whether alternative junction arrangements would perform better, and reduce or remove some of the negative impacts forecast in this test. However existing development and land use, especially for the western access the bridge, may constrain what is possible in this regard.