

Technical Note

Project:	North Hertfordshire Local Plan Model Testing	Job No:	60271338
Subject:	Preferred Local Plan Model Testing – Problem Locations		
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1 Introduction

AECOM was asked by North Hertfordshire District Council (NHDC) to look at what impact a preferred Local Plan Scenario would have on the transport network in the future. This assessment focuses on the evaluation of the Preferred Local Plan Scenario as identified at the time of testing, including a range of potential development sites across the North Herts District area.

To inform the model testing the Welwyn & Hatfield and Stevenage and Hitchin Model (WHaSH) has been utilised. This model covers the whole of the Welwyn and Hatfield area, Stevenage Borough and the majority of the North Hertfordshire District around Hitchin, Letchworth and Baldock, the network coverage is shown in **Figure 1.1** below.

This technical note seeks to outline the broad locations where it is expected that mitigation may be required on the network in future years as a result of the Local Plan Development being in place. It also provides an indication of whether the network will be able to cope with the expected level of highway demand in the future by the quantum of development in the specified locations. This approach is consistent with Hertfordshire County Council's (HCC's) requirements for draft local plans.

2 Background

The Welwyn / Hatfield and Stevenage / Hitchin Model, referred to hereafter as WHaSH, is an integration of the Highways England approved SATURN model of the Stevenage and Hitchin area (SHUM) and its extension to the southern boundary to encompass the Welwyn and Hatfield urban areas. This integrated model incorporates the majority of the A1(M) Strategy corridor.

The existing WHaSH model was originally developed by AECOM in February 2014 and Highways England reviewed the 2013 Base Year model in March 2014 providing AECOM and HCC with a series of comments and recommendations. The model was enhanced to address these comments in light of new data collection and an extensive highway network review. In addition, the prior matrix was enhanced and the calibration, matrix estimation and assignment procedures are set up to follow the TAG unit M3.1 guidelines, January 2014. The enhanced WHaSH model is now more accurate and representative along the A1(M) and in Welwyn and Hatfield areas.

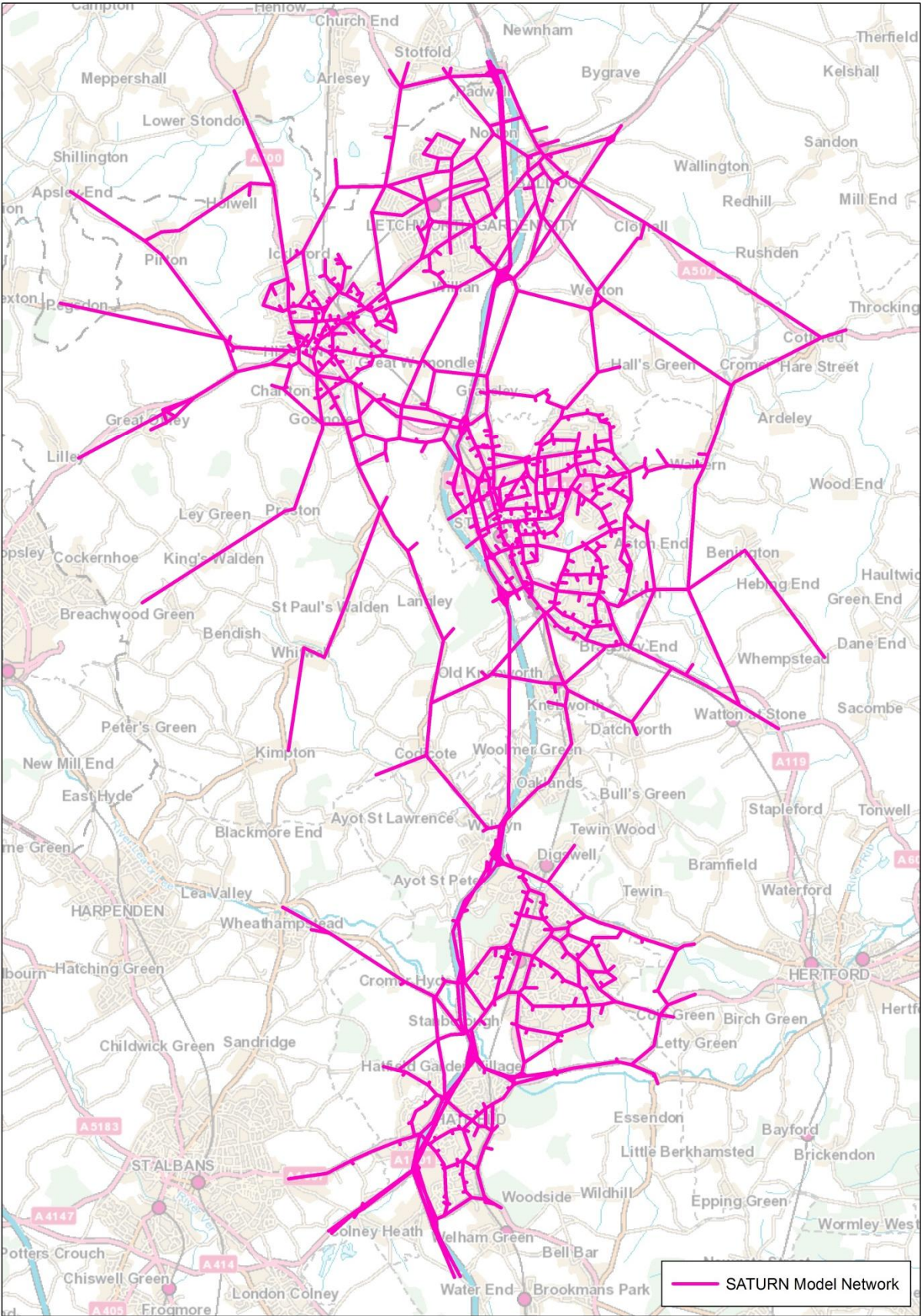
The two towns of Baldock and Letchworth Garden City, whilst in the WHaSH model area, are located to the northern periphery and did have limited network and zonal representation. Large development sites are proposed in both towns and the direct highway impacts of these have not been tested to date. There was therefore a need to extend the WHaSH model coverage to represent the urban areas of Letchworth and Baldock and A1(M) junction 10 in order to support the testing of development in the area, and better inform the Local Plan development. This extended model, referred to hereafter as **WHaSH-BL**, has been used to test the impact of the Preferred Option Local Plan scenario, with the network area defined below.

The future year for the model testing that has been undertaken is 2031, and the base year for the model is representative of June 2013.

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Figure 1.1 – WHaSH Modelled Highway Network



3 Demand Development

An important part of forecasting the likely traffic conditions on the highway network includes understanding changes to travel demand. Demand changes are a reflection of changes in income, transport prices, demographics and land use changes. The methodology employed for developing the forecast demand matrices for the 2031 future year is discussed below.

The methodology can be broken down into four stages. Stage 1 of the process is the same, irrespective of the level of future year development. However, details of Stages 2 to 4 differ depending on the development scenario being tested.

- **Stage 1** – Development of background growth factors for internal to internal (within the modelled area) and internal to external trips. These factors were derived using the National Trip End Model (NTEM) forecasts and TEMPRO. This ensured that the forecasts benefit from nationally and locally derived growth projections in accordance with government guidance. For external to external movements, the COMET model has been used which covers the whole of Hertfordshire. This essentially creates the Do Minimum Scenario
- **Stage 2** – Collection and assessment of development information in the area is undertaken to calculate the number of trips that specific developments can be expected to generate. These trips are then allocated to a relevant model year (2031 in this instance), development scenarios and trip demand purposes.
- **Stage 3** – The trip distribution for the development trips is determined using existing or adjacent zones to that which the development is based in.
- **Stage 4** – The future background growth (Stage 1) and proposed development trips (Stage 2 and 3) are added to the base year demand to produce final future year trip demand matrices. Trips were not constrained back to TEMPRO growth.

Each Stage is considered in more detail in the following sub-sections.

3.1 Stage 1 Background Growth Factors

Growth factors for cars were derived from the latest datasets from the National Trip End Model (NTEM v6.2) and applied to each detailed model zone within the specific NTEM area. Two sets of factors were produced, for AM and PM peak periods, forecasted from the model base year of 2013, to the proposed North Hertfordshire Local Plan period end of 2031. Fuel and income factors adjusted the growth according to guidance set out in WebTAG Unit M-4 and the WebTAG Data Book. For zones outside of the detailed model area, a coarser factor was applied to represent traffic growth in the east of England.

Background freight growth used National Transport Model (NTM) factors for light and heavy goods vehicles, forecasted from 2013 to 2031. These factors tend to be more realistic in representing longer distances usually travelled by these vehicle types, and were applied across the whole model area. A summary of the growth factors identified is provided in **Appendix A**

The growth factors for cars, LGVs and HGVs were applied to the 2013 base model demand matrices for the AM and PM peak. They were then furnished to balance the number of trips accessing and leaving each model zone, before they were assigned onto the highway network.

3.2 Stage 2 Development information and trip generation (Local Plan scenario)

Trip rates were derived from TRICS software for the list of developments to be tested in the Local Plan scenario. The rates were based on the proposed land-use type, e.g. residential, employment, schools, with surveys selected in TRICS that best represented the proposed scale and type of development proposed. The average arrival and departure rates were then selected for each use-type in the AM and PM peak periods.

To determine the actual number of trips assigned to each development, the appropriate trip rate was scaled up by its proposed size. For example, for residential, this was the number of houses planned; for

employment it was based on the estimated floorspace of the site, and for schools, the expected number of pupils in each year of education. A summary of this information is provided in **Appendix B**.

It is understood that the proposed Local Plan retail allocations are relatively small-scale and aimed at maintaining existing market share, therefore we would not be expecting any net change in trips from the retail allocations so the retail allocations have not been included.

3.3 Stage 3 Trip Distribution (Local Plan scenario)

With trips totals generated for arrivals and departures for new developments, in the AM and PM peak, a mechanism was required to distribute them throughout the model. An established method for achieving this is through the use of 'parent zones' – a base model zone of similar use, located near to the proposed development. Each selected parent zone's trip distribution was extracted from the model and factored accordingly to match the development's trip total. This allowed a development matrix to be built up for the AM and PM peak, which was subsequently furnished to balance the number of trips entering and leaving each development zone.

The development matrices are part of the overall final demand matrices for the Local Plan scenario, the building of which is detailed in the next sub-section.

3.4 Stage 4 Matrix Building (Local Plan scenario)

The final set of demand matrices for the Local Plan scenario were built for four user classes, which reflected the same number of user classes defined for the original WHaSH model. The user types were:

- Cars Other – incorporating commuting, education and leisure journeys
- Cars Employers Business – representing business related journeys
- LGVs – journeys made by Light Goods Vehicles
- HGVs – journeys made by Heavy Goods Vehicles

The following steps were required to combine the background demand from Stage 1 with the development matrices, and external-to-external trips from the COMET model:

- The forecast matrices developed in Stage 1, for the background growth scenario, were adjusted so that trip distribution from the 2013 base model was used in the zones where development trips were allocated; this was to ensure that growth in those zones was from those developments only, with no additional background growth to exaggerate demand
- The development matrices for AM/PM were added to the adjusted Stage 1 matrices for the Car Other user class; no development trips were added to the Car Employers Business matrix
- LGV and HGV matrices were unchanged from Stage 1 apart from the final step, below
- A final adjustment was made so that trips in all user-class matrices were overwritten with equivalent external-to-external trips from the wider COMET model

Two separate sets of matrices have been created for the assessment; a reference case (Do Minimum – DM) and Local Plan Development Scenario (Do Something - DS). Both the Do Minimum and Do Something scenarios have assumed Tempro growth in the areas of the model outside of the core North Herts district area, essentially meaning that the difference between the Do Minimum and Do Something scenario is the specified local plan development outlined in Appendix B. The total level of growth identified in the Do Minimum and Do Something scenarios is identified below.

Table 3.1 Summary of growth in demand in the model area for each Scenario

Peak	Base Year (2013) Matrix Total	Ref. Case 2031	DS 2031	Additional Trips
AM	82,280	96,842	101,231	4,389 (5%)
% growth over base year	-	18%	23%	-
PM	78,290	92,657	97,452	4,795 (5%)
% growth over base year	-	18%	24%	-

4 Scenario Testing

This section begins to explore the transport impact of the new housing development scenario on the highway network along routes in the vicinity of the sites and at particular network pinch points.

The new demand forecasts were assigned to the WHaSH-BL model 2031 network for the AM peak (08:00-09:00) and PM peak (16:00-17:00) hour. Outputs generated for use in analysing the impacts include a number of plots displaying changes in assigned traffic volumes, changes in junction delays and out-turn volume over capacity ratios (V/C%) for key routes in the vicinity of the sites.

This analysis has been undertaken for the Do Minimum scenario and then also for the Do Something scenario. The Do Minimum scenario essentially represents a scenario if traffic growth continued at a rate associated with growth of the economy, and changes in people’s travel habits, therefore representing the performance of the transport network regardless of any proposed developments, or put another way can help inform what transport investment might be required despite Local Plan growth proposals. We have then also reviewed the performance of the network in a Do Something scenario, when all the Local Plan scenario growth in North Herts is included, and Temprow assumptions of growth have been utilised in surrounding areas of Stevenage and Welwyn and Hatfield has been included.

- Do Minimum scenario is the BY network with GlaxoSmithKline (GSK) & Smart Motorways schemes (Reference Case network) / Do Minimum demand (background growth).
- Do Something scenario is the Reference Case network + 13 DM mitigation schemes / Do Something demand (Local Plan growth in North Herts & Temprow Growth elsewhere within the WHaSH_BL model area).

Following these assignments in the Saturn transport model, we have identified a number of locations where the performance of the network has deteriorated to a level where some form of intervention is required. This could be because junction delay has increased significantly as a result increased traffic, or the road capacity is reaching its design capacity and queues may form or traffic speeds may drop significantly. The design capacity in the model does not necessarily take into account how the road is utilised (e.g. on-street parking) but this is still a suitable indicator to assess network stress for this level of testing.

The performance indicators we have examined include:

- Junction delay increasing ‘significantly’.
- Design capacity
- Queues forming
- Traffic speeds dropping ‘significantly’.

The criteria for identifying a problem location or pinch point was defined as a junction with node delays over 100 seconds during the last two iterations of the assignment. There are a whole range of indicators that could be used, but node delay enables us to focus on the most significant pinch points on the network and identify in more detail what the issues are.

4.1 Impact Assessment

The Do Minimum and Do Something model scenario have been analysed to understand the development impact on the highway network. The proposed mitigation schemes and cost associated with delivering the transport infrastructure required to facilitate the planned demand is presented in **Section 5** and **6**.

In this assessment we have developed a comparative Do Minimum scenario to provide a useful proxy for what mitigation might be required regardless of the full Local Plan demand being delivered. This scenario is made up of forecast Do Minimum demand (background growth plus developments that are committed or very likely to be committed, in the future year) and a Reference Case highway network.

Figures 4.1 and **4.2** below show the delays results (in seconds) at nodes in the two peak periods in the Do Minimum from the assigned model.

Figure 4.1 – Map of total node delay (seconds) in AM Peak Do Minimum Scenario

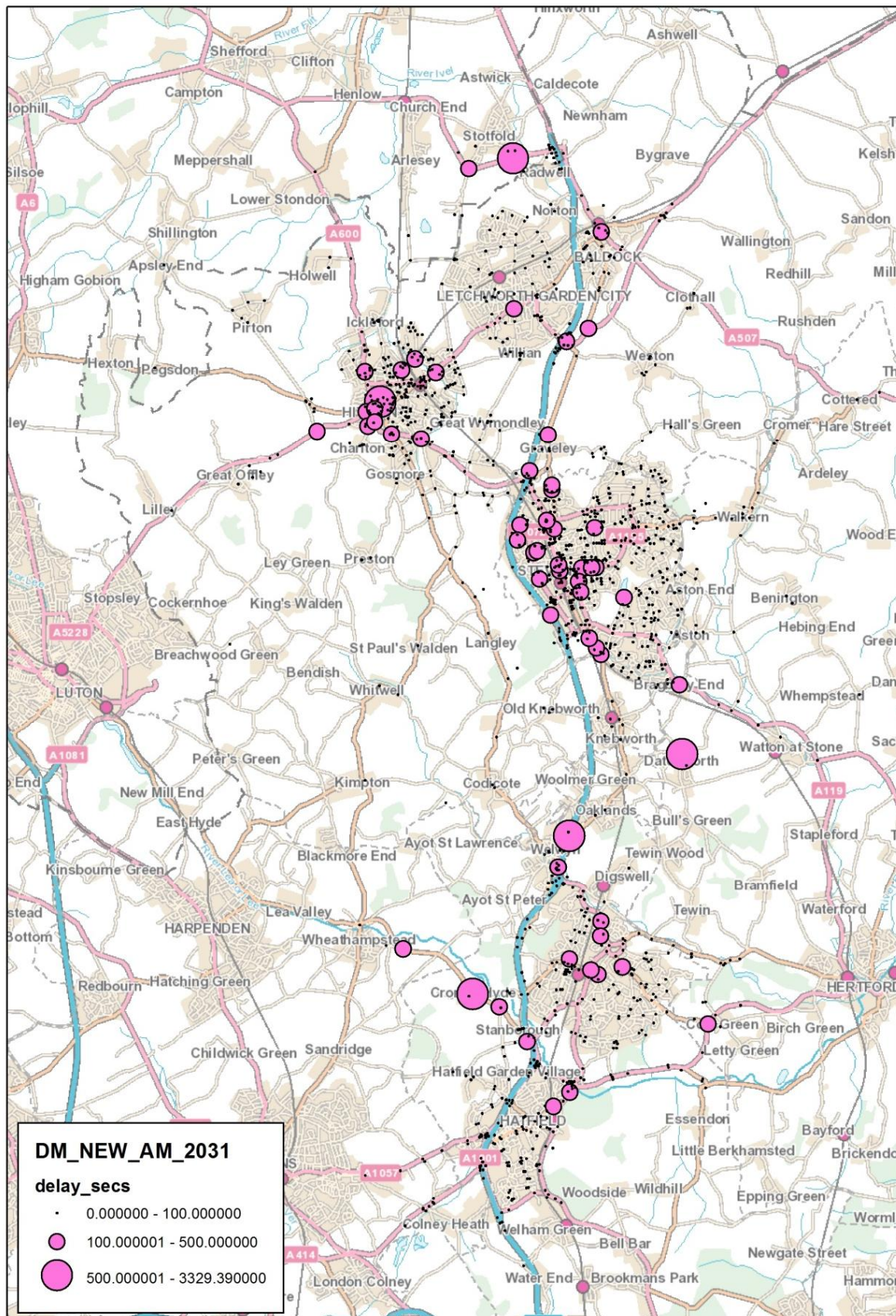
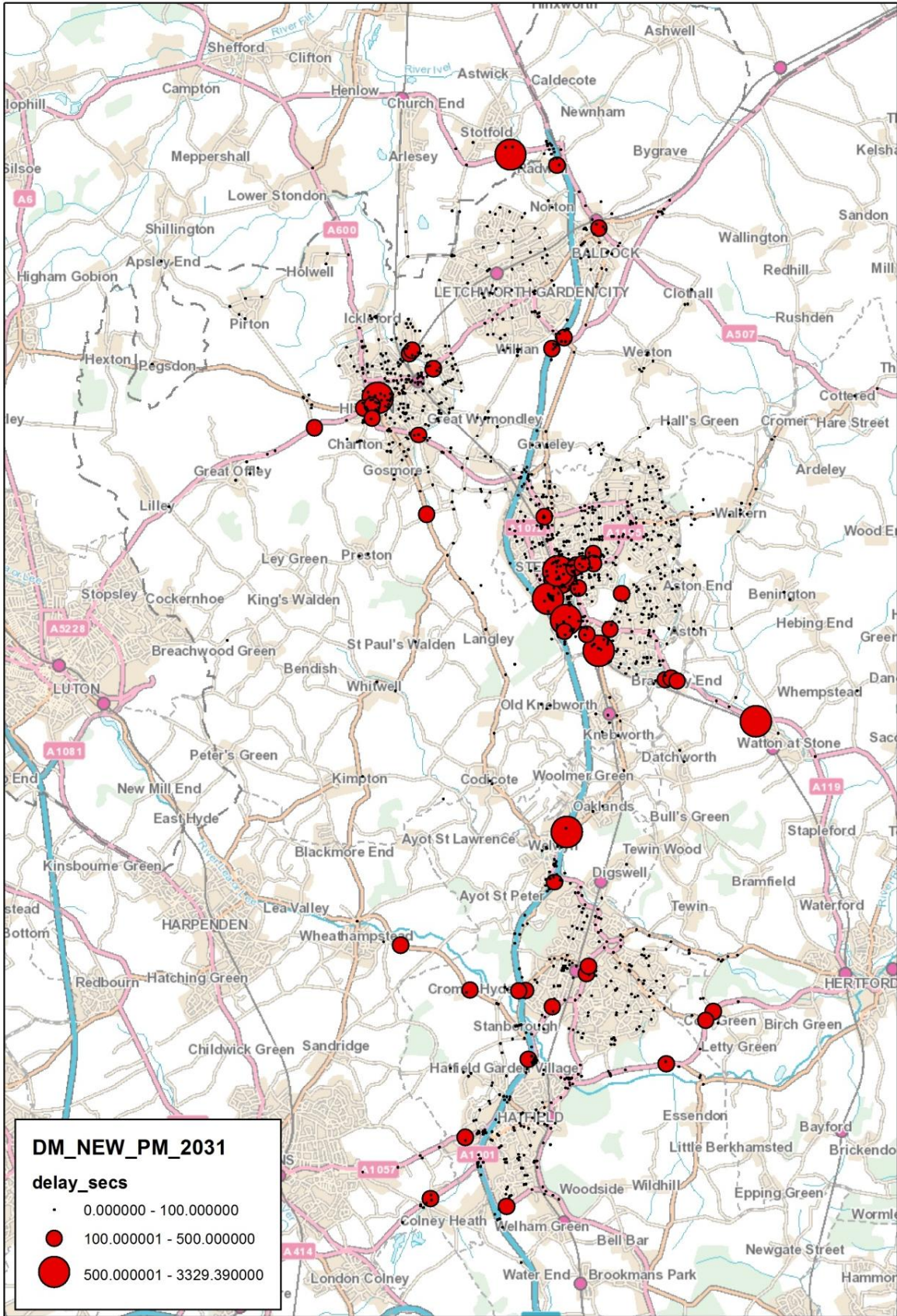


Figure 4.2 – Map of total node delay (seconds) in PM Peak Do Minimum Scenario



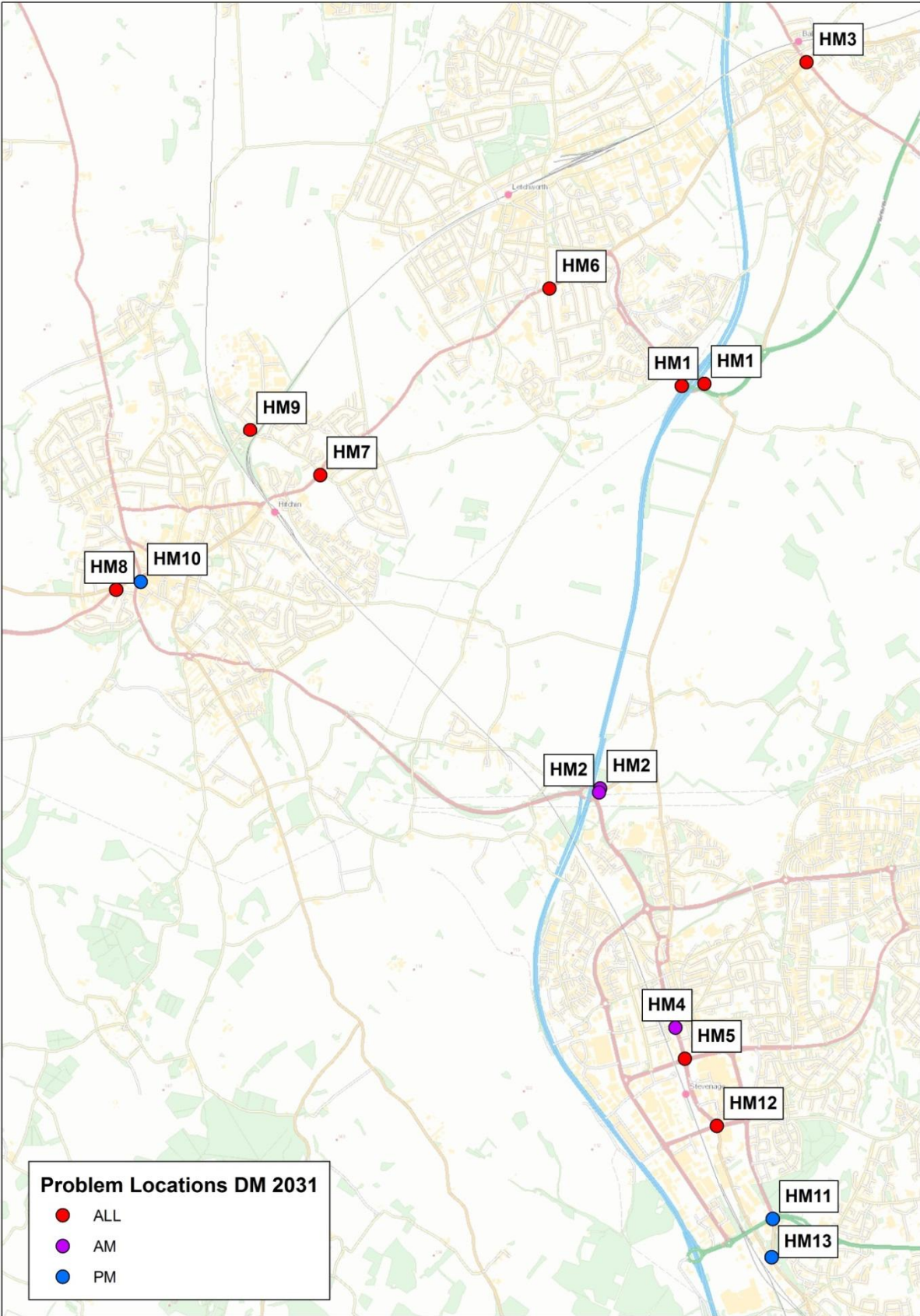
Thirteen network pinch points were identified in total across the area of interest as shown in **Table 4.1** and **Figure 4.3**. Two of the pinch points occur only in the AM peak and three in the PM peak.

A tabulation of the junction delays for the problem junctions are given in **Table 4.2** along with the 2013 base year and 2031 Do Something delays. It should however be noted that in the majority of cases the increase in junction delay has triggered the requirement for a mitigation scheme to be identified, but in some cases of operational issues or review of results within the model assignment were also considered.

Table 4.1 – Problem locations requiring some form of mitigation in Do Minimum Scenario

Ref.	Problem Location	Do Minimum 2031	Comments
HM1	A1M J9 / Letchworth Gate / A505	✓	Delays at the signalised junction of the roundabout
HM2	A1M J8 / A602	✓	Delays at the signalised junctions of the roundabout
HM3	Station Rd / Royston Rd / Clothall Rd	✓	Delays at the signalised junction
HM4	A602 / Trinity Rd	✓	Delays at the roundabout
HM5	A1155 / A602	✓	Delays at the roundabout
HM6	A505 / Norton Way	✓	Delays at the signalised junction
HM7	Woolgrove Rd / Cambridge Rd / Willian Rd	✓	Delays at the signalised junction
HM8	Pirton Rd / A505 / Upper Tilehouse St / Wratten Rd	✓	Delays at the roundabout
HM9	Cadwell Ln / Wilbury Way / Woolgrove Rd	✓	Delays at the signalised junction
HM10	Upper Tilehouse St / A602 / Paynes Park	✓	Delays at the roundabout
HM11	A602 / Monkwood Way	✓	Delays at the roundabout
HM12	Six Hills Way / A602	✓	Delays at the roundabout
HM13	London Rd / Monkwood Way	✓	Delays at the roundabout
	<i>Problem location in the morning peak only</i>		
✓	<i>Problem location in the evening peak only</i>		
✓	<i>Problem location in both morning and evening peak</i>		

Figure 4.3 – Map of problem locations in Do Minimum Scenario – no mitigation coded



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Table 4.2 – Comparison of Junction Delay (seconds) at problem locations

Ref.	Problem Location	AM Delay (seconds)				PM Delay (seconds)			
		2013 BY AM	2031 Reference Case	2031 DoMin	2031 DoSom	2013 BY Delay	2031 Reference Case	2031 DoMin	2031 DoSom
HM1	A1M J9 / Letchworth Gate / A505	144	170	193	131	241	279	181	192
HM2	A1M J8 / A602	68	127	25	1	32	14	12	14
HM3	Station Rd / Royston Rd / Clothall Rd	116	97	222	167	190	143	286	385
HM4	A602 / Trinity Rd	no significant delay	no significant delay	4	5	7	18	51	8
HM5	A1155 / A602	150	172	121	94	168	181	89	71
HM6	A505 / Norton Way	131	125	137	33	76	51	42	28
HM7	Wooglove Rd / Cambridge Rd / Willian Rd	353	400	371	137	368	348	434	58
HM8	Pirton Rd / A505 / Upper tilehouse St / Wratten Rd	88	193	257	71	215	364	429	112
HM9	Cadwell Ln / Wilbury Way / Woolgroove Rd	41	42	66	62	94	154	360	341
HM10	UpperTilehouse St / A602 / Paynes Park			249	181	185	235	215	187
HM11	A602 / Monkswood Way				0	357	419	0	0
HM12	Six Hills Way / A602	61	110	17	15	86	130	18	19

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HM13	London Rd / Monkswood Way				169	138	216	168	173
HM14	Hitchin Rd. / Arch Rd.	25	108	55	0	9	84	38	0
HM15	A602 / B656 / Gosmore Rd. / St. John's Rd	49	100	107	8	37	72	21	10
HM16	Six Hills Way / Homestead Moat	366	606	71	72	240	430	57	52
HM17	Clovelly Way / Gunnels Wood Rd	45	148	244	3	16	52	111	99
HM18	A602 / Corey's Mill Ln.	139	256	13	189	7	86	9	17
HM19	A1072 Martin's Way / Canterbury Way	96	289	25	3	14	97	9	5
HM20	B197 Graveley Rd / North Rd.	136	301	56	10	18	12	14	10

The Do Something scenario is made up of forecast Do Something demand (background growth, committed developments plus Local Plan growth) and a Reference Case highway network plus 13 DM mitigation schemes. **Figures 4.** and **4.5** below show delays results (in seconds) at nodes in the two peak periods.

Figure 4.4 – Map of total node delay (seconds) in AM Peak Do Something Scenario

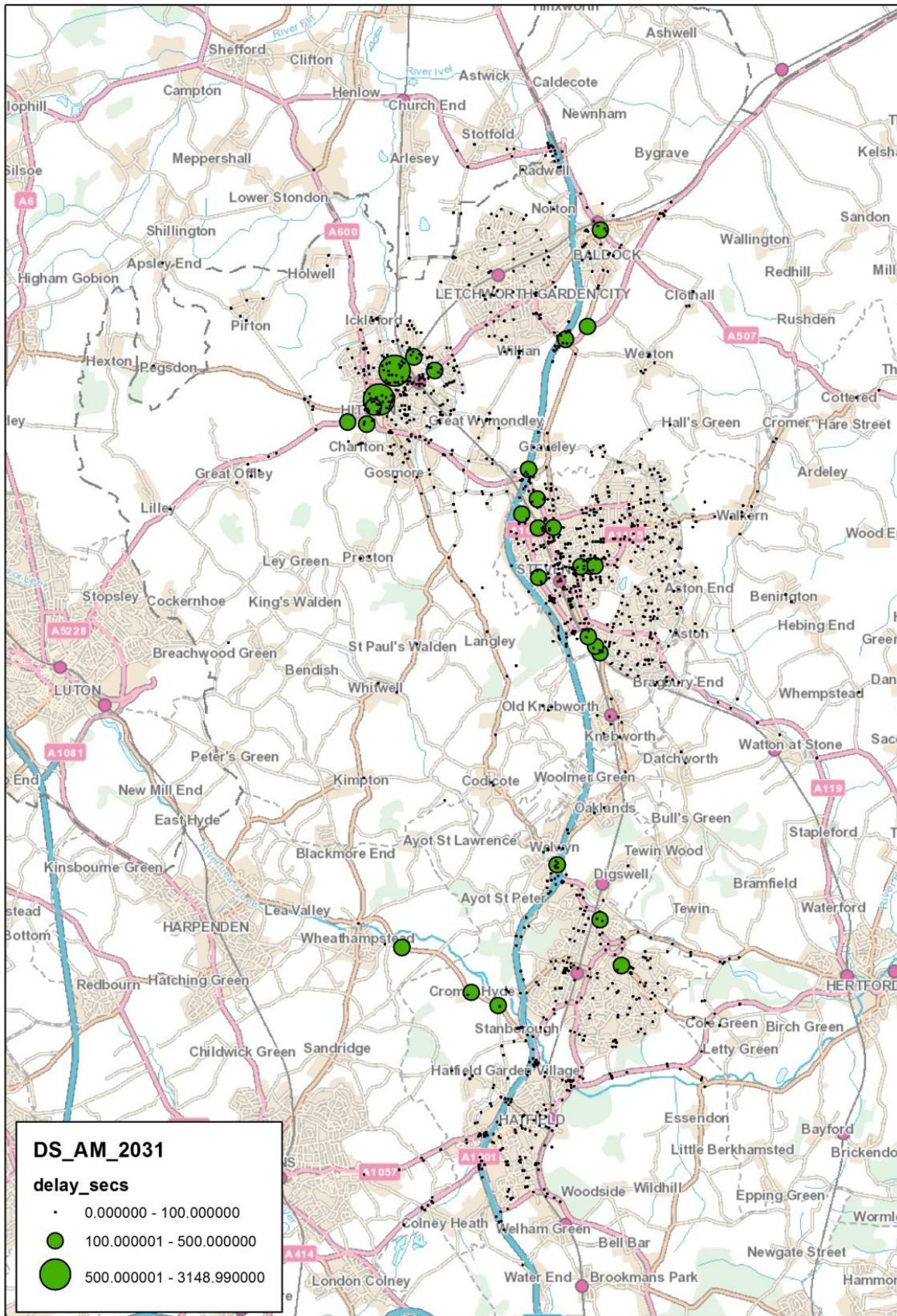
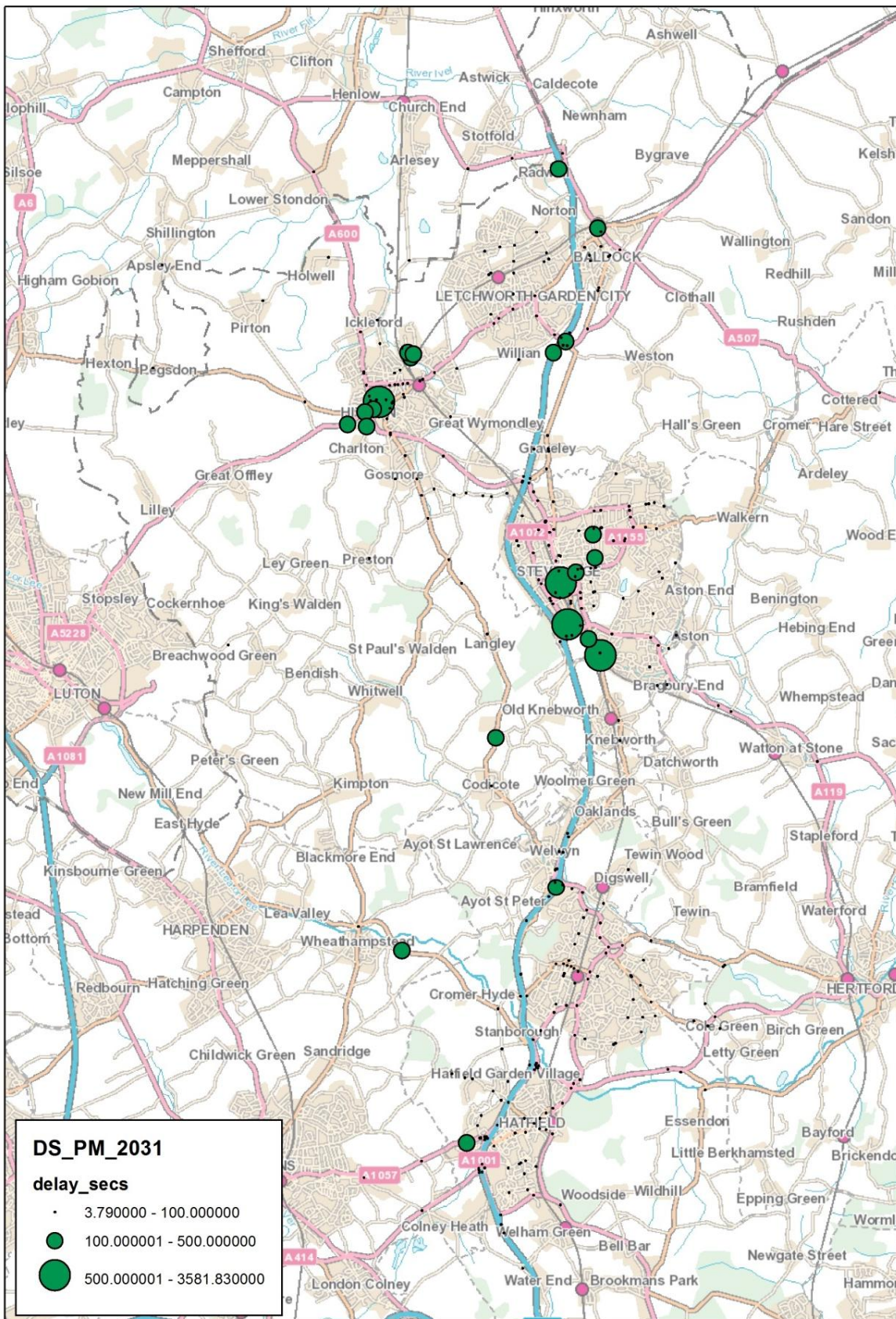


Figure 4.5 – Map of total node delay (seconds) in PM Peak Do Something Scenario



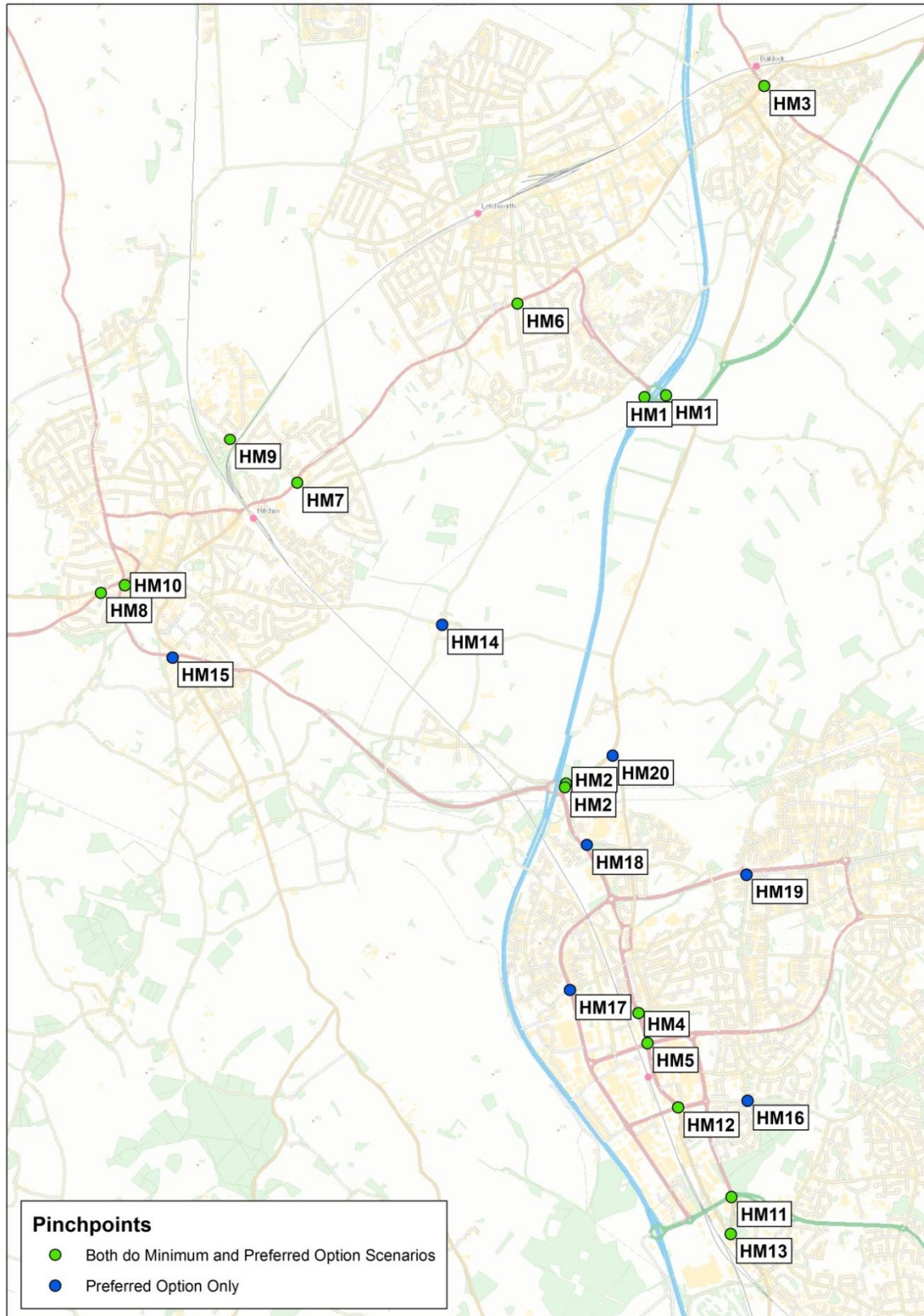
Seven additional network pinch points (HM14-20) were identified in the Do Something scenario as shown in Table 4.3 and Figure 4.6.

Table 4.3 – Problem locations requiring some form of mitigation in Do Minimum and Do Something

Ref.	Problem Location	Do Minimum 2031	Comments	Do Something 2031
HM1	A1M J9 / Letchworth Gate / A505	✓	Delays at the signalised junction of the roundabout	✓
HM2	A1M J8 / A602	✓	Delays at the signalised junctions of the roundabout	✓
HM3	Station Rd / Royston Rd / Clothall Rd	✓	Delays at the signalised junction	✓
HM4	A602 / Trinity Rd	✓	Delays at the roundabout	✓
HM5	A1155 / A602	✓	Delays at the roundabout	✓
HM6	A505 / Norton Way	✓	Delays at the signalised junction	✓
HM7	Woolgrove Rd / Cambridge Rd / Willian Rd	✓	Delays at the signalised junction	✓
HM8	Pirton Rd / A505 / Upper Tilehouse St / Wratten Rd	✓	Delays at the roundabout	✓
HM9	Cadwell Ln / Wilbury Way / Woolgrove Rd	✓	Delays at the signalised junction	✓
HM10	Upper Tilehouse St / A602 / Paynes Park	✓	Delays at the roundabout	✓
HM11	A602 / Monkswood Way	✓	Delays at the roundabout	✓
HM12	Six Hills Way / A602	✓	Delays at the roundabout	✓
HM13	London Rd / Monkswood Way	✓	Delays at the roundabout	✓
HM14	Hitchin Rd. / Arch Rd.	x	Delays at Arch Road southern approach and Hitchin Road	✓
HM15	A602 / B656 / Gosmore Rd. / St. John's Rd	x	Delays at the roundabout	✓
HM16	Six Hills Way / Homestead Moat	x	Delays at Six Hills Way arm	✓
HM17	Clovelly Way / Gunnels Wood / Bridge Rd W	x	Delays at the roundabout	✓
HM18	A602 / Corey's Mill Ln.	x	Delays at the roundabout	✓
HM19	A1072 Martin's Way / Canterbury Way	x	Delays at the roundabout	✓
HM20	B197 Graveley Rd / North Rd.	x	Delays at the major arms of the Priority junction	✓

✓	<i>Problem location in the morning peak only</i>
✓	<i>Problem location in the evening peak only</i>
✓	<i>Problem location in both morning and evening peak</i>

Figure 4.6 – Map of problem locations in Do Minimum and Do Something Scenario – no mitigation coded



4.2 NHDC Preferred Option Housing Assessment

In July 2014, NHDC requested a development assessment model test based on a Preferred Option set of development proposals as part of the scenario testing to inform the development of Core Strategy allocations. As in this assessment potential transport related issues that may arise as a result of the housing development proposals were identified and mitigation proposed. The majority of these previously identified problem locations and associated schemes occur in this latest assessment, but there are a few which are not. Most notable of these are around junction 7 of the A1(M) and to the north of Stevenage on the main roads into town from junction 8.

The Preferred Option assessment was undertaken on the SHUM model and unlike this latest assessment the previous assessment did not include the impact of the A1(M) junctions 6-8 Smart Motorway scheme and the towns of Letchworth and Baldock were on the periphery of the model area so were not modelled in detail. Equally, SHUM did not contain any of the network extension to encompass the Welwyn and Hatfield urban areas. Consequently the routing in the model will be somewhat different which results in small changes to where congestion is identified and which junctions may require the most significant interventions.

In addition to the network differences, the Preferred Option assessment problem locations were identified where there were still more than 100 vehicles queuing at a junction at the end of the AM or PM peak hour which, as discussed previously, is a different indicator to this assessment which examines node delay primarily. Therefore there are some differences in the problem junctions identified for mitigation between the two assessments.

4.3 COMET and PARAMICS Comparisons

A 'sense check' against the congestion hotspots identified from the COMET modelling of the whole of Hertfordshire and the PARAMICS modelling work of Stevenage town centre has been undertaken to ensure the results are sensible.

In comparison to the PARAMICS modelling (as documented in Stevenage Paramics Modelling Summary) there are no notable differences in the locations of the congestion. Pinch points were identified at Junction 8 of the A1(M) and local connecting roads such as Graveley High Street and North Road. The Fairlands Way / Lytton Way roundabout was also shown to be operating with large delays. Both of these areas have also been identified in this latest set of modelling.

Against COMET's congestion hotspots WHaSH generally shows congestion pinch points within the same areas e.g. around Stevenage town centre and on roads leading to A1(M) junctions 7 and 8. It is however acknowledged that the specific junctions do differ slightly, often being a few junctions up or downstream from each other. This congestion 'offset' is a consequence of the different levels of network detail between the two models, COMET being county wide and WHaSH more focused on the towns bordering the A1(M), impacts on traffic behaviour at the local level leading to small differences in where the network stress occurs.

On comparison of the two models results, it has also been noted that there are a few instances where COMET has identified hotspots in areas which have not been identified in WHaSH-BL. In particular, junction 7 of the A1(M) in COMET is identified but with no pinch points in WHaSH-BL (Appendix E) and overall COMET identifies a greater number of congestion hotspots than WHaSH-BL. The reason for these differences will be on account of the different criteria applied to determine whether a junction should be defined as a congestion hotspot/pinch point.

WHaSH-BL's criteria for a problem location is defined as a junction with node delays over 100 seconds in a peak hour. COMET's criteria is more complex, assessing a number of performance indicators, accounting for why many more congestion hotspots have been reported. The COMET criteria is

described below (See Appendix E for criteria footnotes), if the answer is yes to all of these then they should be defined as a congestion hotspot.

- 1) Are two or more links below the speed threshold, in the AM, PM or inter-peak periods?
- 2) Is the congestion caused by the relevant junction (and not a continuation of another congested junction)?
- 3) Are the associated delays of a certain length?
- 4) Are the delays not caused by engineering measures which are intended to control delay (such as traffic signals)?
- 5) Are the delays located on Primary, Main or Secondary distributor roads (and intended to facilitate traffic to primary or key destination settlements)?

The models can only be compared on the node delay results, where there are just four junctions identified in COMET that have delays over 100 seconds which WHaSH-BL has not identified which is close when considering the differences in model detail and coverage. All three in the AM peak part of the A1(M) and one in Stevenage (North Road) in the PM peak which is identified in WHaSH-BL but the delays are short of the criteria limit, but mitigation is suggested for the junction at the top of North Road.

5 Mitigation Testing

With the problem locations identified in 2031 for the Reference Case and Preferred Local Plan (Do Something) scenario, it is necessary to establish some mitigation proposals to address the problems and enable the growth to come forward. For each of the identified locations a mitigation proposal has been identified and tested within the model to establish whether it addresses the issues and does not create a problem elsewhere. For the majority of mitigation proposals, a scheme pro-forma has been developed to explain the issues that have been identified as a result of the growth and outline the mitigation proposals to address the problem.

The original mitigation proposals set out in the 2014 LDF Housing Assessment were re-tested to determine whether they were appropriate and updated if necessary as well as new schemes being identified.

The scheme pro-formas are all presented in **Appendix C**, but in summary they include the following proposals outlined in **Table 5.1**. All schemes have been tested within the WHaSH-BL model to ensure that they provide suitable mitigation and alleviate the issues brought about the proposed development.

Table 5.1 Summary of Mitigation Proposals

Ref.	Problem Location	Improvement
HM1	A1M J9 / Letchworth Gate / A505	Signalised entries to the roundabout and optimise the existing signalised entry points
HM2	A1M J8 / A602	Signalised entries to the roundabout and optimise the existing signalised entry point + flare design Hitchin Rd to the slip road
HM3	Station Rd / Royston Rd / Clothall Rd	Signal optimisation. Reduce the signal stages and adjust to the traffic conditions. Mini roundabout
HM4	A602 / Trinity Rd	Signalised the entry arm at Trinity Rd
HM5	A1155 / A602	Signalised the entry arms at A602 & A1155
HM6	A505 / Norton Way	Signal Optimisation: add extra stage for the movements from Willian Way
HM7	Woolgrove Rd / Cambridge Rd / Willian	Implement a MOVA signal controlled system at

Ref.	Problem Location	Improvement
	Rd	the junction, enabling the signals to respond and adjust according to traffic levels.
HM8	Pirton Rd / A505 / Upper Tilehouse St / Wratten Rd	Change to a signal controlled junction
HM9	Cadwell Ln / Wilbury Way / Woolgrove Rd	Connect Wilbury Way and Cadwell Lane to the north of the industrial area; Redesign Cadwell Lane junction movements
HM10	Upper Tilehouse St / A602 / Paynes Park	Change to a signal controlled junction
HM11	A602 / Monkswood Way	Implement a MOVA signal controlled system at the roundabout
HM12	Six Hills Way / A602	Signalise roundabout entries Six Hills Way, London Rd, A602
HM13	London Rd / Monkswood Way	Extend flared length on southern approach
HM14	Hitchin Rd. / Arch Rd.	Change the priority of the junction to make Arch Road southern approach and Hitchin Road the major arms and Arch Road north approach the minor arm.
HM15	A602 / B656 / Gosmore Rd. / St. John's Rd	Widen approach arms and signalise the St John's Road approach
HM16	Six Hills Way / Homestead Moat	Signalised T-junctions at staggered junctions, with the introduction of MOVA operated signals
HM17	Clovelly Way / Gunnels Wood / Bridge Rd W	Signalise roundabout entries A1072, Gunnels Wood Road
HM18	A602 / Corey's Mill Ln.	Signalise the roundabout entries: A602,Coreys Mill Ln, A602
HM19	A1072 Martin's Way / Canterbury Way	Signalise roundabout entries Canterbury Way, Grace Way
HM20	B197 Graveley Rd / North Rd.	Priority junction to Roundabout - 2 lanes circulatory, flared to 2 lanes on all approaches

6.0 Mitigation Scheme Cost Estimates

A costing exercise has been undertaken for the mitigation proposals, but these can only be considered as preliminary designs and estimates at this stage, suitable to inform the development of the Core Strategy and the associated Infrastructure Delivery Plan. We have included a caveat in association with these cost estimates which should be considered when interpreting the estimates, which can be found in **Appendix D**.

The costs associated with the mitigation proposals that have been identified are summarised in **Table 6.1**.

Table 6.1 Scheme Costing

Ref.	Mitigation Scheme Location	Cost
HM1	A1M J9 / Letchworth Gate / A505	£495,000
HM2	A1M J8 / A602	£799,000
HM3	Station Rd / Royston Rd / Clothall Rd	£666,000
HM4	A602 / Trinity Rd	£223,800

Ref.	Mitigation Scheme Location	Cost
HM5	A1155 / A602	£354,400
HM6	A505 / Norton Way	£666,000
HM7	Woolgrove Rd / Cambridge Rd / Willian Rd	£323,000
HM8	Pirton Rd / A505 / Upper Tilehouse St / Wratten Rd	£842,000
HM9	Cadwell Ln / Wilbury Way / Woolgrove Rd	£5,838,000
HM10	Upper Tilehouse St / A602 / Paynes Park	£1,485,000
HM11	A602 / Monkswood Way	£666,000
HM12	Six Hills Way / A602	£639,000
HM13	London Rd / Monkswood Way	£4,000
HM14	Hitchin Rd. / Arch Rd.	£18,800
HM15	A602 / B656 / Gosmore Rd. / St. John's Rd	£1,221,000
HM16	Six Hills Way / Homestead Moat	£852,500
HM17	Clovelly Way / Gunnels Wood / Bridge Rd W	£546,500
HM18	A602 / Corey's Mill Ln.	£431,700
HM19	A1072 Martin's Way / Canterbury Way	£428,000
HM20	B197 Graveley Rd / North Rd.	£906,000

From the information we have provided in **Table 6.1**, we have identified the costs associated with the Preferred Option housing development scenario. We have also included the cost associated with delivering the schemes that we had identified in the Do Minimum scenario. This only provides a means of comparison and gives an indication of the level of mitigation that might be required even if the full forecast level of Local Plan development does not go ahead. Mitigation schemes HM14 to HM20 are not required in the Do Minimum scenario, meaning that only an additional £4,404,500 would need to be spent for the mitigation scenarios associated with the Preferred Option scenario. It should however be stated that by providing the schemes as part of the Do Minimum means that additional capacity is available in the network which can be used by trips associated with the Preferred Option development.

Table 6.3 Summary of Cost per Land Use Scenario

Land Use Scenario	Total Cost (£)*
Do Minimum scenario - indicative	13,001,200
Preferred Option scenario	4,404,500

7.0 Summary

The assessment of the Preferred Option housing development scenario in 2031, highlights that there will be highway impacts across the network when the developments are in place. However, this assessment does not specifically identify the highways impacts that occur as a direct result of a particular development, or the dependency of a development on the provision of a transport intervention. This assessment provides a broad overview of potential problem locations identified in the future year of 2031, when a specific housing development scenario identified in North Herts is in place.

Analysis of an indicative Do Minimum scenario indicates that many of the schemes required for the Preferred Option scenario are also needed in the Do Minimum situation. Although this would imply that many of the schemes would be required regardless of the development, each of the developments does

have a significant impact at the locations and would use up the spare capacity available at these junctions so would need to contribute to their delivery.

Appendix A – TEMPRO Background Growth Factors

		VALUES							
		NO ASSUMPTIONS				WITH_ASSUMPTIONS			
2013_2031		AM	AM	PM	PM	AM	AM	PM	PM
CODE	AREA NAME	Origin	Dest	Origin	Dest	Origin	Dest	Origin	Dest
26UD8	Buntingford	1.078	1.059	1.074	1.092	0.909	1.077	1.046	0.937
26UF2	Welwyn/Codicote(part of)	1.142	1.133	1.155	1.160	0.899	1.020	0.996	0.921
26UF3	Letchworth	1.131	1.114	1.130	1.145	0.923	1.029	1.014	0.947
26UF5	Hitchin	1.137	1.121	1.136	1.150	0.912	1.025	1.008	0.935
26UF7	Knebworth	1.126	1.128	1.146	1.144	0.886	1.015	0.988	0.908
26UH1	Stevenage(main)	1.166	1.203	1.204	1.181	0.889	1.016	0.997	0.912
26UL4	Welwyn North	1.107	1.176	1.155	1.114	0.986	0.992	0.992	0.989
26UD0	Rural (East Hertfordshire)	1.051	1.058	1.069	1.067	0.959	1.048	1.037	0.980
26UD3	Stevenage (part of)	1.038	1.043	1.054	1.054	0.970	1.051	1.044	0.992
26UF0	Rural (North Hertfordshire)	1.152	1.128	1.150	1.167	0.943	1.044	1.030	0.966
26UF1	Stevenage (part of)2	1.226	1.204	1.239	1.242	0.902	1.029	0.999	0.922
26UF2	Welwyn / Codicote (part of)	1.142	1.133	1.155	1.160	0.938	1.040	1.023	0.960
26UF3	Letchworth	1.131	1.114	1.130	1.145	0.958	1.046	1.036	0.980
26UF5	Hitchin	1.137	1.121	1.136	1.150	0.949	1.045	1.033	0.972
26UF7	Knebworth	1.126	1.128	1.146	1.144	0.926	1.036	1.016	0.947
26UH1	Stevenage(main)	1.166	1.203	1.204	1.181	0.935	1.040	1.025	0.956
26UDO	Rural (East Hertfordshire)	1.051	1.058	1.069	1.067	0.959	1.048	1.037	0.980
26UG3	Hatfield (part of)	1.085	1.207	1.182	1.101	1.008	1.050	1.043	1.015
26ULO	Rural (Welwyn Hatfield)	1.114	1.184	1.172	1.126	1.033	1.058	1.053	1.038
26UL1	Hatfield (main)	1.128	1.184	1.171	1.134	1.049	1.058	1.054	1.049
26UL2	Welwyn Garden City	1.133	1.188	1.176	1.140	1.052	1.059	1.056	1.052
26UL3	Welwyn / Codicote (main)	1.115	1.183	1.167	1.123	1.040	1.058	1.054	1.044
26UL4	Welwyn North	1.107	1.176	1.155	1.114	1.036	1.058	1.053	1.040
26UL5	Potters Bar (part of)	1.118	1.177	1.160	1.125	1.050	1.061	1.058	1.053
26UL6	Cuffley	1.115	1.176	1.162	1.124	1.044	1.058	1.056	1.049
26UL7	Brookmans Park	1.105	1.177	1.159	1.114	1.035	1.057	1.053	1.040
09UC0	RURAL1	1.082	1.124	1.127	1.105	1.096	1.193	1.184	1.124
09UC4	Henlow/Shefford 09UC04	1.098	1.130	1.135	1.120	1.116	1.223	1.210	1.145
09UC6	Stotfold 09UC06	1.100	1.137	1.141	1.120	1.123	1.224	1.213	1.151
09UC9	Arlesey 09UC9	1.040	1.103	1.099	1.060	1.056	1.158	1.146	1.082
26UF4	Baldock	1.160	1.141	1.161	1.175	1.199	1.333	1.315	1.230
26UG0	RURAL2	1.061	1.197	1.172	1.079	1.034	1.089	1.080	1.043
26UG2	St Albans	1.066	1.198	1.172	1.081	1.039	1.087	1.078	1.045
26UG6	Wheathampstead	1.055	1.192	1.163	1.071	1.036	1.085	1.078	1.044
26UH0	Rural 3	1.269	1.303	1.314	1.286	1.338	1.565	1.531	1.381
26UL0	rural 4	1.114	1.184	1.172	1.126	1.089	1.122	1.115	1.095

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Appendix B – Preferred Option Development

PO	Address	Town	PDL	Easting	Northing	Area (ha)	Homes	Zones
Completions 1 April 2011 - 31 March 2015							1114	
	Permissions at 1 April 2015	Unspecified						
	Blackhorse Road	Letchworth				159		
	Site A, Land South of A505	Royston				124		
	Land East Of Luton Road	Offley				63		
	Ling Dynamic Systems Ltd	Royston				55		
	Garden Square Shopping Centre	Letchworth				45		
	Land at Ivy Farm	Royston				44		
	The Maltings, Green Drift	Royston				36		
	Land at John Barker Place	Hitchin				33		
	111 London Road	Knebworth				26		
	20-22 Station Road	Letchworth				25		
	Hitchin Delivery Office, 90 Hermitage Road	Hitchin				24		
	Site B, Land Off Thackeray Close	Royston				22		
	61 Station Road	Baldock				19		
	Block A, Latchmore Court	Hitchin				19		
	The North Star	Royston				18		
	The Node Conference And Training Centre	Codicote				16		
	Land adjacent to Walkdens, Ashwell Street	Ashwell				15		
	Bulwer Lytton House, Lytton Fields	Knebworth				13		
	80 Ickniel Way	Baldock				12		
	65 and land at 67 Codicote Road	Codicote				12		
	The Farmyard, Brickyard Lane	Reed				12		
	Land adjacent to Pollards Way	Pirton				11		
	Small sites (<10 units) - Baldock	Baldock				34		
	Small sites (<10 units) - Hitchin	Hitchin				65		
	Small sites (<10 units) - Letchworth	Letchworth				24		
	Small sites (<10 units) - Royston	Royston				34		
	Small sites (<10 units) - elsewhere	Unspecified				91		
	Additional permissions 1 April - 31 December 2015							
	Land Rear Of 117-151 High Street, Lloyd Way	Kimpton				31		
	Block B, Latchmore Court	Hitchin				23		
	Hitchin Hospital	Hitchin				18		
	Dorchester House, Station Parade	Letchworth				18		
	Kingsfield, Hadrian Way	Baldock				12		

	10 Burns Road, Royston, SG8 5PT	Royston					11	
	Small sites (<10 units) - Baldock	Baldock					9	
	Small sites (<10 units) - Hitchin	Hitchin					37	
	Small sites (<10 units) - Letchworth	Letchworth					24	
	Small sites (<10 units) - Royston	Royston					40	
	Small sites (<10 units) - elsewhere	Unspecified					85	
	Proposed local plan sites							
AS1	Land west of Claybush Road	Ashwell	Green	526780	239250	1.7	33	OUT OF MODELLED AREA
BA1	North of Baldock	Baldock	Green	525220	234870	142.4	2800	5308
BA2	Land off Clothall Road (Clothall parish)	Baldock	Green	525300	233300	6.8	200	1307
BA3	South of Clothall Common (Clothall parish)	Baldock	Green	525660	233810	13.3	200	1307
BA4	East of Clothall Common	Baldock	Green	525800	234320	3.9	95	1307
BA5	Land off Yeomanry Drive	Baldock	Green	525000	234100	0.7	25	5302
BA6	Land at Ickniel Way	Baldock	Brown	524260	234140	0.5	26	5301
BA7	Rear of Clare Crescent	Baldock	Green	524530	232720	1.0	20	5305
BA8	Works, Station Road / Adj Raban Court,						50	5302
BA9	Royston Road*	Baldock	Brown	524610	234150	0.4		
-	Deans Yard, South Road	Baldock	Brown	525110	233550	0.3	20	5306
BK1	Land off Cambridge Road	Barkway	Green	538490	236040	0.7	13	OUT OF MODELLED AREA
BK2	Land off Windmill Close	Barkway	Green	538200	236130	1.2	20	OUT OF MODELLED AREA
-	Land between Cambridge Road & Royston Road	Barkway	Green	538520	236230	7.8	140	OUT OF MODELLED AREA
CD1	Land south of Cowards Lane	Codicote	Green	521870	217810	3.6	73	1301
CD2	Codicote Garden Centre, High Street (south)	Codicote	Brown	521480	218820	2.7	54	1301
CD3	Land north east of The Close	Codicote	Green	522010	218290	2.4	48	1301
-	Land south of Heath Road	Codicote	Green	521240	217980	11.2	140	1301
GR1	Land at Milksey Lane (north)	Graveley	Green	523020	228240	1.9	8	3306
HT1	Highover Farm, Stotfold Road	Hitchin	Green	519980	231060	38.9	700	5203
HT2	Land north of Pound Farm, London Road (St Ippolyts parish)	Hitchin	Green	519250	227610	3.4	84	5208
HT3	Land south of Oughtonhead Lane	Hitchin	Green	517550	229630	1.9	46	5204
HT4	Land at Lucas Lane*	Hitchin	Green	517590	229460	1.3	27	5204
HT5	Land at junction of Grays Lane & Lucas Lane	Hitchin	Green	517500	229220	0.6	16	5204
HT6	Land at junction of Grays Lane and Crow	Hitchin	Green	517430	229110	2.1	53	3202

	Furlong							
HT8	Industrial area, Cooks Way	Hitchin	Brown	519340	230090	0.7	50	3234
HT9	Centre for the Arts, William Road*	Hitchin	Brown	519990	230120	1.0	85	3225
-	Priory Field	Hitchin	Green	518320	228190	16.2	300	5207
-	Former B&Q	Hitchin	Brown	519260	229760	0.7	60	3213
IC1	Land off Duncots Close	Ickleford	Green	518370	231520	0.4	9	3314
IC2	Burford Grange, Bedford Road	Ickleford	Green	517670	231070	2.4	40	3314
-	Arnolds Farm, Chambers Lane	Ickleford	Green	518190	231800	0.6	12	3314
-	Land at Ramerick	Ickleford	Green	516990	234950	7.1	120	3313
-	Land at Bedford Road	Ickleford	Green	517820	231720	9.6	150	3314
KM3	Land north of High Street	Kimpton	Green	516840	218170	0.7	13	OUT OF MODELLED AREA
KW1	Allotments west of The Heath, Breachwood Green	King's Walden	Green	514890	222440	0.8	16	2303
-	Allotments south of Colemans Road, Breachwood Green	King's Walden	Green	514940	222050	1.5	20	2303
KB1	Land at Deards End	Knebworth	Green	524380	220540	12.1	240	1303
KB2	Land at Gypsy Lane	Knebworth	Green	524410	219760	15.3	184	1303
-	Chas Lowe, London Road	Knebworth	Brown	525120	220170	0.4	14	1303
-	Land east of Knebworth	Knebworth	Green	525490	220190	19.3	200	1303
LG1	Letchworth North	Letchworth	Green	522020	234820	44.9	900	2311
LG3	Land east of Kristiansand Way	Letchworth	Green	523280	234100	5.3	120	2313
LG4	Land north of former Norton School, Norton Road	Letchworth	Green	522280	233920	1.9	68	5309
LG5	Land at Birds Hill	Letchworth	Brown	522390	233040	1.1	86	2310
LG6	Land off Radburn Way	Letchworth	Mixed	522860	232210	1.3	35	2308
LG8	Pixmore Centre, Pixmore Avenue,	Letchworth	Brown	522430	232950	1.0	80	2310
LG9	Former Lannock School	Letchworth	Mixed	523280	231600	1.8	45	2308
LG10	Former Norton School playing field, Croft Lane	Letchworth	Green	522570	234020	3.7	37	5309
-	Glebe Road industrial estate	Letchworth	Brown	522290	233370	0.3	10	2313
-	Nursery, Ickniel Way	Letchworth	Brown	521400	232780	0.4	8	2312
-	Garages, Ickniel Way	Letchworth	Brown	521230	232670	0.7	25	2312
-	Foundation House	Letchworth	Brown	522490	233390	0.8	47	2313
-	Hamonte	Letchworth	Brown	523090	231820	1.2	30	2308
-	Former Depot, Ickniel Way	Letchworth	Brown	522920	233410	0.9	55	2313
EL1	Luton East (west)	Luton (adjoining)	Green	513000	223040	69.3	1050	OUT OF MODELLED AREA
EL2	Luton East (east)	Luton (adjoining)	Green	513240	223440	15.1	350	OUT OF MODELLED AREA

EL3	Land north east of Luton	Luton (adjoining)	Green	512130	223390	33.8	700	OUT OF MODELLED AREA
PT1	Land east of Priors Hill (south)	Pirton	Green	514320	231730	3.8	58	2301
PT2	Holwell Turn, West Lane*	Pirton	Green	515120	231850	4.6	70	2301
PR1	Land east of Butchers Lane	Preston	Green	517740	224930	1.1	21	2303
RD1	Land at Blacksmiths Lane	Reed	Green	535790	236340	1.1	22	OUT OF MODELLED AREA
RY1	Land west of Ivy Farm, Baldock	Royston	Green	533990	240610	15.5	279	OUT OF MODELLED AREA
RY2	Land north of Newmarket Road (north)*	Royston	Green	536850	241220	11.3	330	OUT OF MODELLED AREA
RY4	Land north of Lindsay Close	Royston	Green	535400	242210	4.3	40	OUT OF MODELLED AREA
RY5	Agricultural supplier, Garden Walk	Royston	Brown	536220	241130	0.9	25	OUT OF MODELLED AREA
RY7	Anglian Business Park, Orchard Road	Royston	Brown	535060	241250	1.2	48	OUT OF MODELLED AREA
RY8	Land at Lumen Road	Royston	Brown	535680	241150	0.3	14	OUT OF MODELLED AREA
-	Land south of Newmarket Road	Royston	Green	536920	240650	14.3	300	OUT OF MODELLED AREA
SI1	Land south of Waterdell Lane (north)	St Ippolyts	Green	519260	226840	2.9	40	3305
SI2	Land south of Stevenage Road	St Ippolyts	Green	520090	226800	1.2	12	3304
SP1	Land south of, High Street, Whitwell	St Paul's Walden	Green	518630	220890	2.2	40	2304
-	Land between Horn Hill and Bendish Lane, Whitwell	St Paul's Walden	Green	517990	221020	5.9	41	2304
GA1	Stevenage North East (Roundwood)	Stevenage (adjoining)	Green	525160	227720	10.8	330	5106
GA2	Land off Mendip Way, Great Ashby	Stevenage (adjoining)	Green	526290	227820	49.1	600	5102
NS1	Stevenage North	Stevenage (adjoining)	Green	523660	227410	43.2	900	5107
TH1	Police Row (east)	Therfield	Green	533790	236950	1.3	12	OUT OF MODELLED

Appendix C – Scheme Proforma’s

Location	A1M Junction 9 / Letchworth Gate / A505
Reference	HM1

Description of Problem

The A1(M) junction 9 is a strategic junction for local traffic using the A1(M) motorway and for traffic travelling between Letchworth Garden City and Baldock. The junction is problematic as delays are seen to build on the northbound off-slip entry arm causing large queues and delays.

Mitigation Proposal Details

To mitigate against significant future delays at the motorway junction it is proposed that all arms of the roundabout be signalised and for the existing signalised entry point on the northbound off-slip to be optimised. The signal timings have been optimised based on fixed timings however there may be additional scope to implement demand responsive signals to respond to changes in demand during busy periods. This cannot be modelled because of software limitations but it would be expected to further enhance the operation and capacity of the junction.



Outline Cost Analysis

Please note the pre-tender designs are not fully detailed and they will need to be developed, revised and refined during the detailed design phase, and therefore, any quantity derived from such pre-designs will be indicative only.

The costs estimates are based on outline design drawings and any quantities shown are indicative only. Further scheme development is required to refine the cost estimate. The cost estimate for delivery excludes the following:

- Third party land acquisition costs and accommodation works costs
- Dedication of Land, Land to be passed over to the council as highway.
- Legal costs
- Landscaping design
- Statutory Undertakers design fees
- Statutory Undertakers diversion and or protection costs
- Ground Investigation cost
- Traffic Regulation Orders & any associated TRO consultation
- Contract documentation for appointment of the preferred contractor

- Tendering of the work

Initial costs for implementing this junction were based on a construction year of 2021 accounting for inflation, with the breakdown of the costs outlined in more detail.

Works Element	Estimated Cost	Notes
Construction Items	£186,000.00	
Allowances for Design Fees	£37,000.00	20% of the construction items
Allowances for Preliminaries	£28,000.00	15% of the construction items
Allowances for Traffic Management	£37,000.00	20% of the construction items
Allowances for Supervision	£19,000.00	10% of the construction items.
Allowances for Utilities / Electricals	£37,000.00	20% of the construction items.
Sub-Total for allowances and construction items	£344,000.00	
Optimism Bias	£151,000.00	44% of sub-total
Cost for Delivery	£495,000.00	2021 Construction Year

Location	A1M J8 / A602 / Graveley Road / Stevenage Road
Reference	HM2

Description of Problem

The A1(M) junction 8 is located to the north of Stevenage providing access to the motorway and is part of the main road (A602) that connects the towns of Hitchin and Stevenage. The junction has been identified as problematic as delays at the signalised arms are causing lengthy queues, particularly on Hitchin Road.

Mitigation Proposal Details

To minimise the impact of future year traffic growth at this junction it is proposed that the local road approaches of Stevenage Road and Graveley Road be signalised and for the existing signalised entry points of the A602 and motorway slip roads to be optimised. Signalising all entry arms and implementing demand responsive signals to respond to changes in demand during busy periods will ensure the whole roundabout works efficiently in response to future year demand.

An additional designated left turn flared lane on Hitchin Rd to the A1(M) southbound off slip has also been proposed to provide additional capacity on Hitchin Road.



Outline Cost Analysis

Please note the pre-tender designs are not fully detailed, that they will need to be developed, revised and refined during the detailed design phase, and therefore, any quantity derived from such pre-designs will be indicative only.

The costs estimates are based on outline design drawings and any quantities shown are indicative only. Further scheme development is required to refine the cost estimate. The cost estimate for delivery excludes the following:

- Third party land acquisition costs and accommodation works costs
- Dedication of Land, Land to be passed over to the council as highway.
- Legal costs
- Landscaping design

- Statutory Undertakers design fees
- Statutory Undertakers diversion and or protection costs
- Ground Investigation cost
- Traffic Regulation Orders & any associated TRO consultation
- Contract documentation for appointment of the preferred contractor
- Tendering of the work

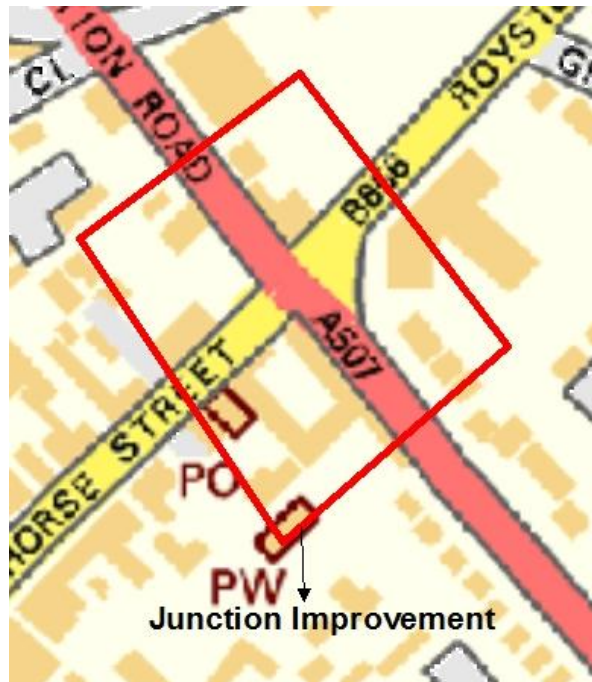
Initial costs for implementing this junction were based on a construction year of 2021 accounting for inflation, with the breakdown of the costs outlined in more detail.

Works Element	Estimated Cost	Notes
Construction Items	£300,000.00	
Allowances for Design Fees	£60.000.00	20% of the construction items
Allowances for Preliminaries	£45.000.00	15% of the construction items
Allowances for Traffic Management	£60.000.00	20% of the construction items
Allowances for Supervision	£30.000.00	10% of the construction items.
Allowances for Utilities / Electricals	£60.000.00	20% of the construction items.
Sub-Total for allowances and construction items	£555,000.00	
Optimism Bias	£244,000.00	44% of sub-total
Cost for Delivery	£799,000.00	2021 Construction Year

Location	A507 Station Rd / B656 Royston Rd / A507 Clothall Rd / B656 Whitehorse St
Reference	HM3

Description of Problem

The Station Rd / Royston Rd / Clothall Rd / Whitehorse St junction is located in the heart of Baldock where the two main through routes of the A507 and B656 meet. The junction is problematic as it produces significant delays on all approach arms as a result of restrictive signal timings in both the morning and evening peak periods. With the signals remaining unchanged, under future operating conditions, the junction would not be able to accommodate the future year level of growth expected in Baldock, especially considering its proximity to the large new development site to the east of the A507.



Mitigation Proposal Details

To provide sufficient network capacity to accommodate the future year level of demand, it is proposed that the junction will be improved by implementing MOVA traffic signals. The MOVA (Microprocessor Optimised Vehicle Actuation) signal control system is a more efficient form of control able to deliver substantially reduced delays without the need for regular re-setting of the signal timings.

MOVA is a sophisticated strategy using the computing power of microprocessors to assess the best signal timings, given the physical layout of the junction, the signal stages available and the traffic conditions at the time. The system will generate its own signal timings cycle-by-cycle, varying continuously with traffic conditions, both in the short term (hour to hour, day to day) and in the long term following annual trends and longer term traffic growth.

This junction would be an ideal candidate for MOVA control as it is forecast to be a site that would suffer from prolonged periods of congestion in the future. MOVA performs particularly well, and appears to give above average benefits at smaller heavily congested junctions, which this location is. This innovative method of signal control can reduce delays and accident levels. Evidence has shown that MOVA can reduce delays by an average of 13%, compared with conventional signal controls.

MOVA has two operational modes; the first deals with uncongested conditions, the second with situations when the junction becomes overloaded/congested with large queues on one or more approaches. This

form of operation would be suited to this junction location, when congestion occurs during the busy peak periods, and the junction is uncongested at other times.

Outline Cost Analysis

The costs estimates are based on outline design drawings and any quantities shown are indicative only. Further scheme development is required to refine the cost estimate. The cost estimate for delivery excludes the following:

- Third party land acquisition costs and accommodation works costs
- Dedication of Land, Land to be passed over to the council as highway.
- Legal costs
- Landscaping design
- Statutory Undertakers design fees
- Statutory Undertakers diversion and or protection costs
- Ground Investigation cost
- Traffic Regulation Orders & any associated TRO consultation
- Contract documentation for appointment of the preferred contractor
- Tendering of the work

Initial costs for implementing this junction were based on a construction year of 2021 accounting for inflation, with the breakdown of the costs outlined in more detail.

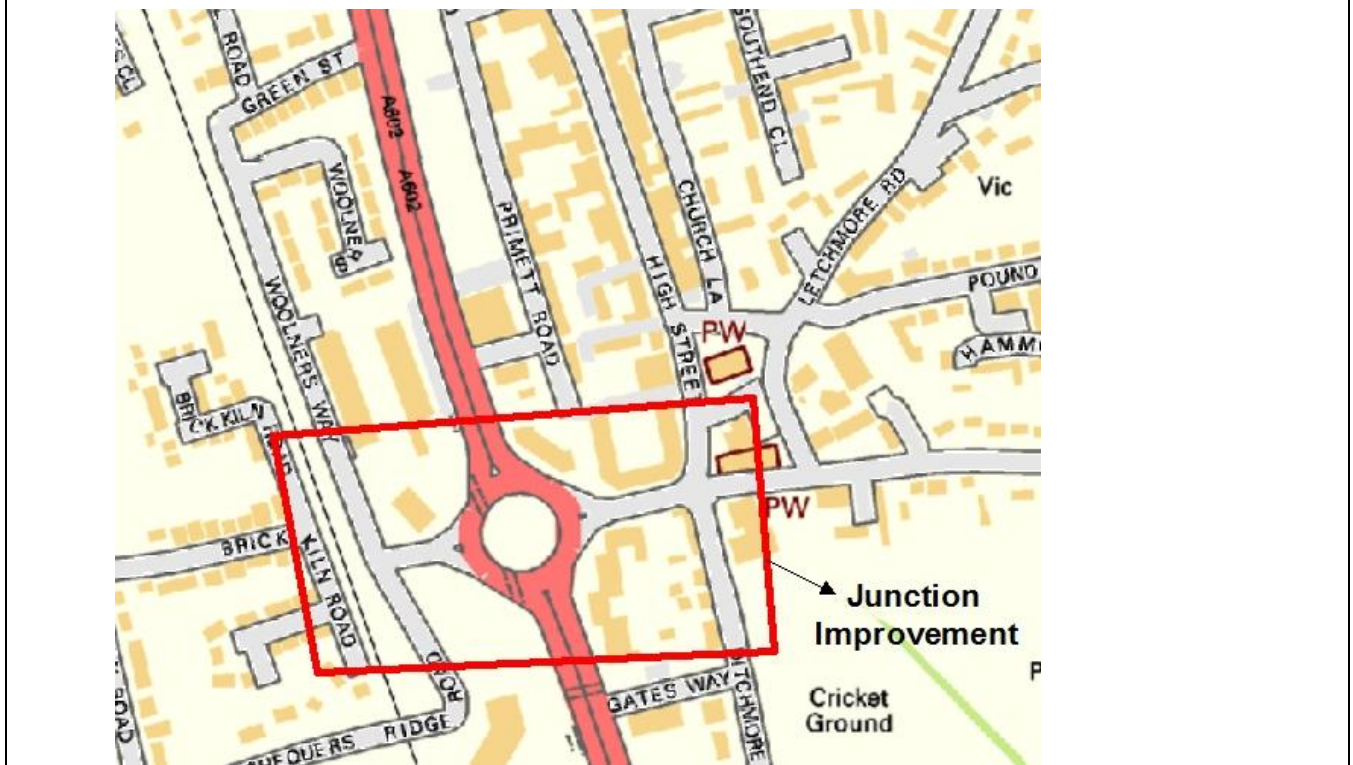
Works Element	Estimated Cost	Notes
Construction Items	£250,000	
Allowances for Design Fees	£50,000	20% of the construction items
Allowances for Preliminaries	£37,500	15% of the construction items
Allowances for Traffic Management	£50,000	20% of the construction items
Allowances for Supervision	£25,000	10% of the construction items
Allowances for Utilities / Electricals	£50,000	20% of the construction items
Sub-Total for allowances and construction items	£462,500	
Optimism Bias	£203,500	44% of sub-total
Cost for Delivery	£666,000	2021 Construction Year

Location	A602 Lytton Way / Trinity Rd
Reference	HM4

Description of Problem
 The A602 Lytton Way is one of the key north-south routes in Stevenage and intersected by a number of other strategic routes through the town. The A602 junction with Trinity Road is currently a non-signalised roundabout. Future year demand modelling has highlighted the junction does not have sufficient capacity to accommodate the future year level of growth, and becomes a problem junction for traffic travelling north-south from Stevenage in the AM peak. Large queues and delays occur on Trinity Road east approach to the junction due to traffic being held up by the large volume of traffic travelling south along Lytton Way.

Mitigation Proposal Details
 To provide sufficient network capacity to accommodate the future year level of demand, it is proposed that Trinity Road arm of the roundabout be signal controlled.

The signal timings for the arm have been optimised in the model based on fixed timings however there may be additional scope to implement demand responsive signals to respond to changes in demand during busy periods. This cannot be modelled because of software limitations but it would be expected to further enhance the operation and capacity of the junction.



Outline Cost Analysis
 Please note the pre-tender designs are not fully detailed, that they will need to be developed, revised and refined during the detailed design phase, and therefore, any quantity derived from such pre-designs will be indicative only.
 The costs estimates are based on outline design drawings and any quantities shown are indicative only. Further scheme development is required to refine the cost estimate. The cost estimate for delivery excludes the following:

- Third party land acquisition costs and accommodation works costs
- Dedication of Land, Land to be passed over to the council as highway.
- Legal costs
- Landscaping design
- Statutory Undertakers design fees
- Statutory Undertakers diversion and or protection costs
- Ground Investigation cost
- Traffic Regulation Orders & any associated TRO consultation
- Contract documentation for appointment of the preferred contractor
- Tendering of the work

Initial costs for implementing this junction were based on a construction year of 2021 accounting for inflation, with the breakdown of the costs outlined in more detail.

Works Element	Estimated Cost	Notes
Construction Items	£84,000.00	
Allowances for Design Fees	£16,800.00	20% of the construction items
Allowances for Preliminaries	£12,600.00	15% of the construction items
Allowances for Traffic Management	£16,800.00	20% of the construction items
Allowances for Supervision	£8,400.00	10% of the construction items.
Allowances for Utilities/Electricals	£16,800.00	20% of the construction items.
Sub-Total for allowances and construction items	£155,400.00	
Optimism Bias	£68,400.00	44% of sub-total
Cost for Delivery	£223,800.00	2021 Construction Year

Location	A1155 Fairlands Way/ A602 Lytton Way
Reference	HM5

Description of Problem
 The A602 Lytton Way / A1155 Fairlands Way junction is a large roundabout to the north of the town centre and one of the key north-south routes in Stevenage. The Fairlands Way/ Lytton Way junction is currently a non-signalised roundabout. Like other junctions up and downstream of it, future year demand modelling has highlighted that the junction does not have sufficient capacity to accommodate the future year level of growth, becoming a problem junction for Stevenage traffic in both peak periods. Large queues and delays occur on the north (Lytton Way) and east (Fairlands Way) approaches.

Mitigation Proposal Details
 To provide sufficient network capacity to accommodate the future year level of demand, it is proposed that the north (Lytton Way) and east (Fairlands Way) roundabout approaches be signal controlled. The signal timings have been optimised in the model with junction improvements based on fixed timings however there may be additional scope to implement demand responsive signals to respond to changes in demand during busy periods. This cannot be modelled because of software limitations but it would be expected to further enhance the operation and capacity of the junction.



Outline Cost Analysis
 Please note the pre-tender designs are not fully detailed, that they will need to be developed, revised and refined during the detailed design phase, and therefore, any quantity derived from such pre-designs will be indicative only.
 The costs estimates are based on outline design drawings and any quantities shown are indicative only. Further scheme development is required to refine the cost estimate. The cost estimate for delivery

excludes the following:

- Third party land acquisition costs and accommodation works costs
- Dedication of Land, Land to be passed over to the council as highway.
- Legal costs
- Landscaping design
- Statutory Undertakers design fees
- Statutory Undertakers diversion and or protection costs
- Ground Investigation cost
- Traffic Regulation Orders & any associated TRO consultation
- Contract documentation for appointment of the preferred contractor
- Tendering of the work

Initial costs for implementing this junction were based on a construction year of 2021 accounting for inflation, with the breakdown of the costs outlined in more detail.

Works Element	Estimated Cost	Notes
Construction Items	£133,000.00	
Allowances for Design Fees	£26,600.00	20% of the construction items
Allowances for Preliminaries	£20,000.00	15% of the construction items
Allowances for Traffic Management	£26,600.00	20% of the construction items
Allowances for Supervision	£13,300.00	10% of the construction items.
Allowances for Utilities/Electricals	£26,600.00	20% of the construction items.
Sub-Total for allowances and construction items	£246,100.00	
Optimism Bias	£108,300.00	44% of sub-total
Cost for Delivery	£354,400.00	2021 Construction Year

Location	A505 Baldock Rd / Norton Way/ Willian Way
Reference	HM6

Description of Problem

The Baldock Rd / Norton Way/ Willian Way junction is located along the key route way (A505) between the towns of Letchworth Garden City and Baldock. The junction has been identified as problematic as it produces significant delays at the junction, particularly on Willian Way (south arm). This is a result of inefficient signal stages and timings in both the morning and evening peak periods. With the signals remaining unchanged, under future operating conditions, the junction would not be able to accommodate future increases in demand.

Mitigation Proposal Details

To provide sufficient network capacity to accommodate the future year level of demand, it is proposed that the junction will be improved by implementing MOVA traffic signals and an extra stage added for the movements from Willian Way.

The MOVA (Microprocessor Optimised Vehicle Actuation) signal control system is a more efficient form of control able to deliver substantially reduced delays without the need for regular re-setting of the signal timings.

MOVA is a sophisticated strategy using the computing power of microprocessors to assess the best signal timings, given the physical layout of the junction, the signal stages available and the traffic conditions at the time. The system will generate its own signal timings cycle-by-cycle, varying continuously with traffic conditions, both in the short term (hour to hour, day to day) and in the long term following annual trends and longer term traffic growth.

This junction would be a good candidate for MOVA control as MOVA performs particularly well, and appears to give above average benefits at smaller heavily congested junctions, which this location is likely to become. This innovative method of signal control can reduce delays and accident levels. Evidence has shown that MOVA can reduce delays by an average of 13%, compared with conventional signal controls.

MOVA has two operational modes; the first deals with uncongested conditions, the second with situations when the junction becomes overloaded/congested with large queues on one or more approaches. This form of operation would be suited to this junction location, when congestion occurs during the busy peak periods, and the junction is uncongested at other times.

Location	A505 Cambridge Road / Woolgrove Road / Willian Road
Reference	HM7

Description of Problem

This signalised junction is location on the main route between Hitchin and Letchworth, and is a problem junction for traffic travelling west-east. It also provides access to and from the approach for the industrial area, so has conflicting turning movements.

As well as the location of the junction as a gateway to and from Hitchin and the industrial area, the junction is problematic as it does not have sufficient capacity to accommodate the future year level of growth. This causes delay and queuing on the approaches to and from Hitchin town centre and the industrial area. The model forecast that this junction will experience delay and congestion, under future operating conditions, with the increase in demand and pressure in and around the area, exacerbating the issue.

Mitigation Proposal Details

To provide sufficient network capacity to accommodate the future year level of demand, it is proposed that the junction of will be improved by changing the operation of the signal control system. The MOVA (Microprocessor Optimised Vehicle Actuation) signal control system is a more efficient form of control able to deliver substantially reduced delays without the need for regular re-setting of the signal timings.

MOVA is a sophisticated strategy using the computing power of microprocessors to assess the best signal timings, given the physical layout of the junction, the signal stages available and the traffic conditions at the time. The system will generate its own signal timings cycle-by-cycle, varying continuously with traffic conditions, both in the short term (hour to hour, day to day) and in the long term following annual trends and longer term traffic growth.

This junction would be an ideal candidate for MOVA control as it is forecast to be a site that would suffer from prolonged periods of congestion in the future. MOVA performs particularly, and appears to give above average benefits at smaller heavily congested junctions, which this location is. This innovative method of signal control can reduce delays and accident levels. Evidence has shown that MOVA can reduce delays by an average of 13%, compared with conventional signal controls.

MOVA has two operational modes; the first deals with uncongested conditions, the second with situations when the junction becomes overloaded/congested with large queues on one or more approaches. This form of operation would be suited to this junction location, when congestion occurs during the busy peak periods, and the junction is uncongested at other times.

It has been assumed that no widening is undertaken at the junction, as it is understood that there is no room to extend beyond the current highway boundary.

Outline Cost Analysis

The cost estimate for delivery excludes the following:

- Legal Costs
- Landscaping Design
- Statutory Undertakers design fee.
- Statutory Undertakers diversion and or protection costs.
- Third Party Ground Investigation costs. Trial Pits and Geotechnical surveying will be supplied by third parties.
- Traffic Regulation Orders & any associated consultation (TRO's).
- 3rd Party Land acquisition costs and accommodation works costs.

- Dedication of Land, Land to be passed over to the council as highway.
- Contract documentation for appointment of the preferred contractor, as this is being progressed by others.
- Tendering of the works
- Site support fees during the construction period, this will be included within a later fee proposal, if required.

Initial costs for implementing this junction have been estimated at £320,000. These costs were based on a construction year of 2021 accounting for inflation, with the breakdown of the costs outlined in more detail.

Works Element	Estimated Cost	Notes
Construction Items	£135,000	
Allowances for Design Fees	£27,000	20% of the construction items
Allowances for Preliminaries	£20,000	15% of the construction items
Allowances for Supervision	£14,000	10% of the construction items
Allowances for Utilities / Electricals	£27,000	20% of the construction items
<i>Sub-Total for allowances and construction items</i>	<i>£223,000</i>	
Optimism Bias	£100,000	45% of sub-total
Cost for Delivery	£323,000	2021 Construction Year

Location	A505 / B655 Pirton Road roundabout
Reference	HM8

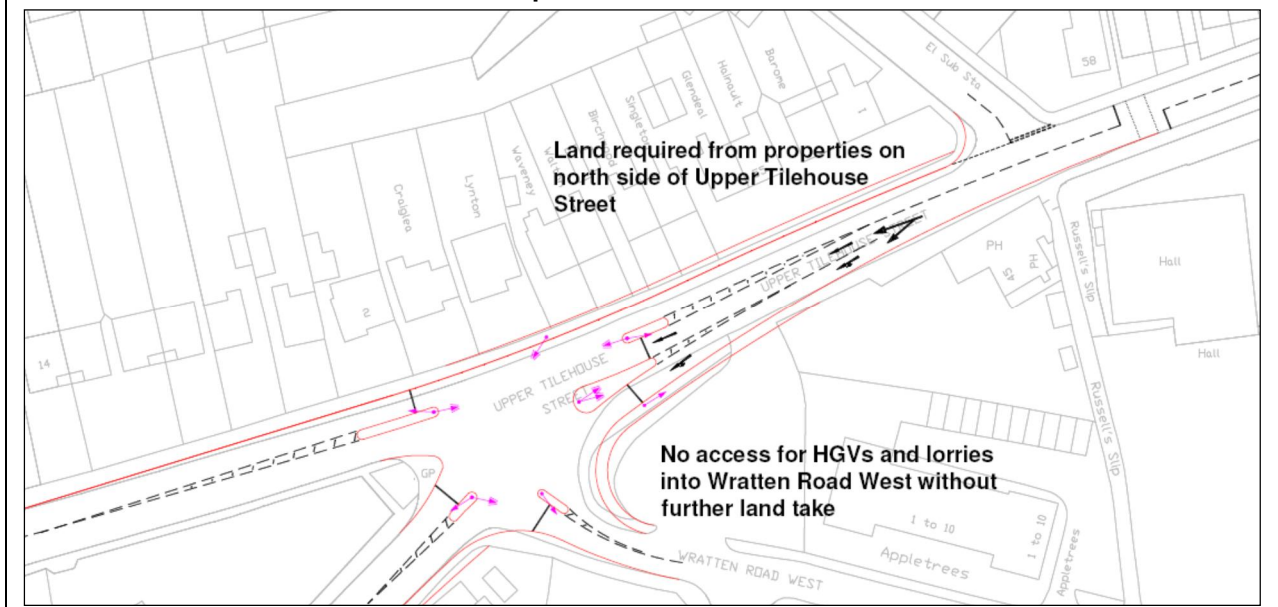
Description of Problem

As a result of the increase in traffic growth on the A505 / A602 corridor through Hitchin, the A505 / B655 Pirton Road roundabout will be under pressure and operating at or close to the design capacity.

Mitigation Proposal Details

The improvement to the A505 / B655 junction is to change the roundabout to a signal controlled junction. The signal timings have been optimised with junction improvement based on fixed timings however there may be additional scope to implement demand responsive signals to respond to changes in demand during busy periods. This cannot be modelled because of software limitations but it would be expected to further enhance the operation and capacity of the junction.

A505 / B655 Pirton Road Roundabout Improvement



Outline Cost Analysis

The cost estimate for delivery excludes the following:

- Legal Costs
- Landscaping Design
- Statutory Undertakers design fee.
- Statutory Undertakers diversion and or protection costs.
- Third Party Ground Investigation costs. Trial Pits and Geotechnical surveying will be supplied by third parties.
- Traffic Regulation Orders & any associated consultation (TRO's).
- 3rd Party Land acquisition costs and accommodation works costs.
- Dedication of Land, Land to be passed over to the council as highway.
- Contract documentation for appointment of the preferred contractor, as this is being progressed by others.
- Tendering of the works
- Site support fees during the construction period, this will be included within a later fee proposal, if required.

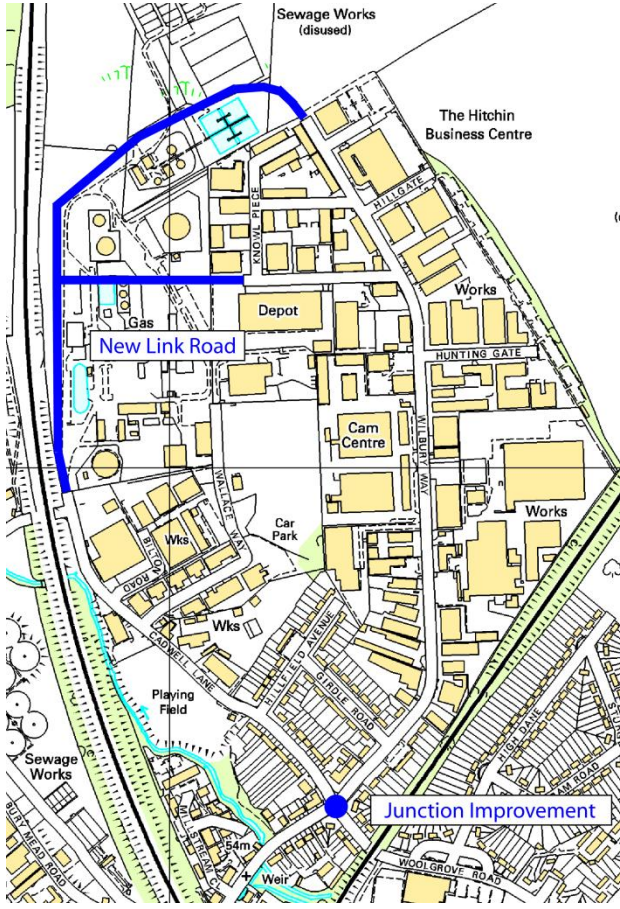
Initial costs for implementing this junction have been estimated at £850,000. These costs were based on a construction year of 2021 accounting for inflation, with the breakdown of the costs outlined in more detail.

Works Element	Estimated Cost	Notes
Construction Items	£232,000	
Allowances for Design Fees	£47,000	20% of the construction items
Allowances for Preliminaries	£232,000	100% of the construction
Allowances for Supervision	£70,000	30% of the construction items
<i>Sub-Total for construction items and allowances</i>	<i>£581,000</i>	
Optimism Bias	£261,000	45% of sub-total
Cost for Delivery	£842,000	2021 Construction Year

Location	Hitchin Industrial Area – Cadwell Lane/Grove Road/Wilbury Way/Woolgrove Road Junction
Reference	HM9

Description of Problem
 The Cadwell Lane signalised junction at the entry to the industrial area is problematic as it does not have sufficient capacity to accommodate the future year level of growth, causing delay and queuing on the approaches to and from the industrial area. This junction currently experiences delay and congestion, under current operating conditions, with the increase in demand in and around the area, exacerbating the issue.

Mitigation Proposal Details



To provide sufficient network capacity to accommodate the future year level of demand, it is proposed that the highway network in the industrial area should be connected at the northern end to provide relief within the industrial area and balance the demand on the approaches to the Cadwell Lane junction. It is proposed that Wilbury Way is connected to Cadwell Lane to the north of the industrial area, along with extending Knowl Piece to provide a road link to Cadwell Lane.

In addition to connecting the industrial area, the junction of Cadwell Lane / Grove Road will be improved. The improvement consists of reallocating lanes to maximise capacity whilst banning right turning movements from Grove Road to Woolgrove Road and also from Wilbury Way to Cadwell Lane where there is no current demand. It has been assumed that no widening is undertaken, however, observations indicate that increasing the radius and widening the turn from Grove Road into Cadwell Lane would enable traffic to travel through the junction at a slightly increased speed and therefore improve the capacity of the junction by increasing the potential throughput of traffic. It is not expected that this would have any detrimental impact on safety at the junction but this will need to be assessed fully during any detailed design phase of scheme development.

The link road would lie to the south of a new rail curve which runs just north of the map area. It is not expected that this would have any detrimental impact on the deliverability of the link road.

Although the junction model does not represent the behaviour, it is also anticipated that improvements would be derived by:

- Introducing demand responsive pedestrian phases.
- Operating the junction under a MOVA signal control system.
- Providing minimal widening to improve the amount of non-blocking right turn storage from Cadwell Lane and to improve the radius for vehicles turning into Cadwell Lane.

Outline Cost Analysis

The cost estimate for delivery excludes the following:

- Legal Costs
- Landscaping Design
- Statutory Undertakers design fee.
- Statutory Undertakers diversion and or protection costs.
- Third Party Ground Investigation costs. Trial Pits and Geotechnical surveying will be supplied by third parties.
- Traffic Regulation Orders & any associated consultation (TRO's).
- 3rd Party Land acquisition costs and accommodation works costs.
- Dedication of Land, Land to be passed over to the council as highway.
- Contract documentation for appointment of the preferred contractor, as this is being progressed by others.
- Tendering of the works
- Site support fees during the construction period, this will be included within a later fee proposal, if required.

Initial costs for implementing this junction have been estimated at £5.8 million. These costs were based on a construction year of 2021 accounting for inflation, with the breakdown of the costs outlined in more detail.

Works Element	Estimated Cost	Notes
Construction Items	£2,440,000	
Allowances for Design Fees	£488,000	20% of the construction items
Allowances for Preliminaries	£366,000	15% of the construction items
Allowances for Supervision	£244,000	10% of the construction items
Allowances for Utilities / Electricals	£488,000	20% of the construction items
<i>Sub-Total for allowances and construction items</i>	<i>£4,026,000</i>	
Optimism Bias	£1,812,000	45% of sub-total
Cost for Delivery	£5,838,000	2021 Construction Year

Location	A505 Payne's Park / Upper Tilehouse Street Roundabout
Reference	HM10

Description of Problem

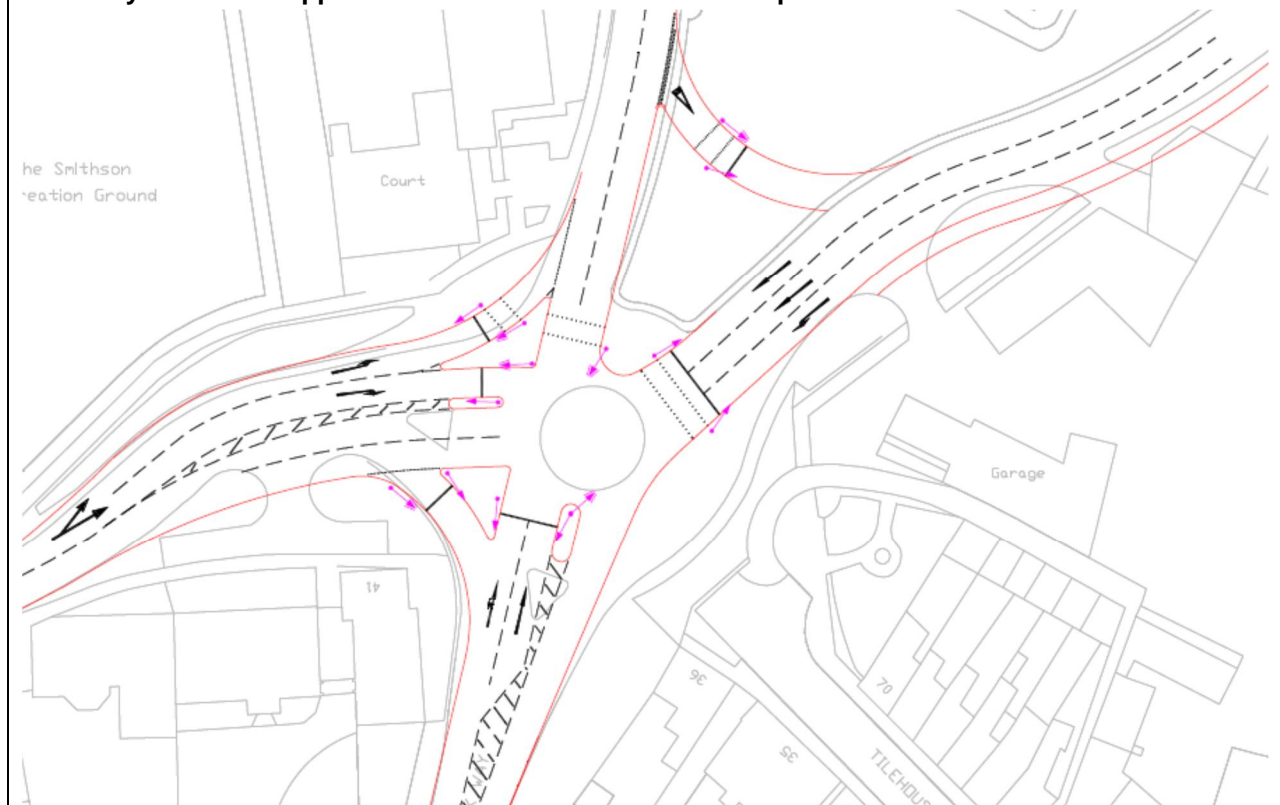
The A505 / A602 through Hitchin, which provides a link between Luton and Stevenage / A1(M), has been identified as a key route which is susceptible to a lack of capacity. There is insufficient capacity at the A505 Payne's Park roundabout, which causes congestion on this main corridor during the busy PM peak periods, with queuing on Payne's Park and Upper Tilehouse Street.

Mitigation Proposal Details

Convert the existing roundabout into a signalised junction with localised widening by:

- Using land in front of the library and museum for right turn movements from Payne's Park to Old Park Road.
- Take land from the court building to install a signalised dedicated left turn from Upper Tilehouse Street to Old Park Road.

A505 Payne's Park / Upper Tilehouse Street Roundabout Improvement



Outline Cost Analysis

The cost estimate for delivery excludes the following:

- Legal Costs
- Landscaping Design
- Statutory Undertakers design fee.
- Statutory Undertakers diversion and or protection costs.
- Third Party Ground Investigation costs. Trial Pits and Geotechnical surveying will be supplied by third parties.
- Traffic Regulation Orders & any associated consultation (TRO's).

- 3rd Party Land acquisition costs and accommodation works costs.
- Dedication of Land, Land to be passed over to the council as highway.
- Contract documentation for appointment of the preferred contractor, as this is being progressed by others.
- Tendering of the works
- Site support fees during the construction period, this will be included within a later fee proposal, if required.

Initial costs for implementing this junction have been estimated at £1.5 million. These costs were based on a construction year of 2021 accounting for inflation, with the breakdown of the costs outlined in more detail.

Works Element	Estimated Cost	Notes
Construction Items	£330,000	
Allowances for Design Fees	£66,000	20% of the construction items
Allowances for Preliminaries	£330,000	100% of the construction items
Allowances for Supervision	£33,000	10% of the construction items
Allowances for Utilities / Electricals	£66,000	20% of the construction items
<i>Sub-Total for allowances and construction items</i>	<i>£825,000</i>	
Optimism Bias	£660,000	80% of sub-total
Cost for Delivery	£1,485,000	2021 Construction Year

Location	A602 / Monkswood Way
Reference	HM11

Description of Problem

The A602/Monkswood Way roundabout is located to the south of central Stevenage and is a key roundabout linking southeast Stevenage to the A1(M) at junction 7, and is a problem junction for traffic travelling east-west. The junction is problematic as it does not have sufficient capacity to accommodate the future year level of growth. This causes large delays and queues on the westbound approach. The model forecasts that this junction will experience further delay and congestion, under future operating conditions, with the increase in demand exacerbating the issue.

Mitigation Proposal Details

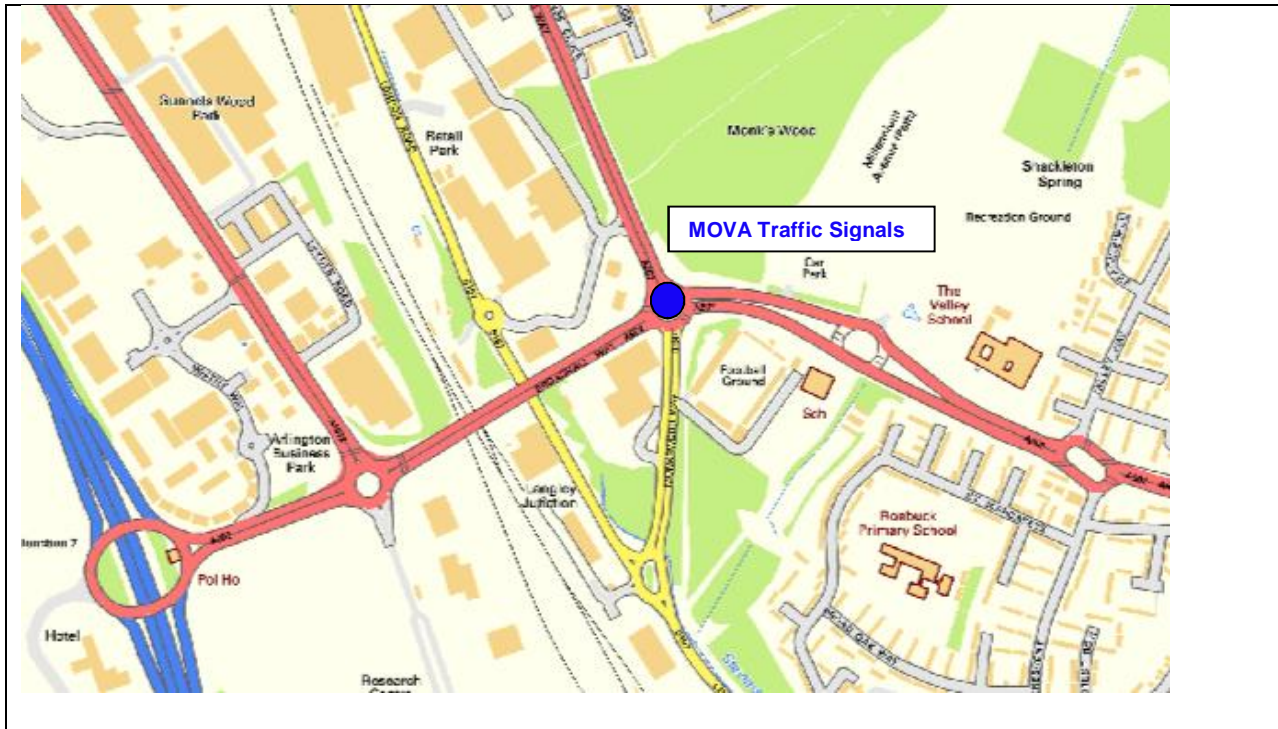
To provide sufficient network capacity to accommodate the future year level of demand, it is proposed that the junction will be improved by implementing MOVA traffic signals. The MOVA (Microprocessor Optimised Vehicle Actuation) signal control system is a more efficient form of control able to deliver substantially reduced delays without the need for regular re-setting of the signal timings.

MOVA is a sophisticated strategy using the computing power of microprocessors to assess the best signal timings, given the physical layout of the junction, the signal stages available and the traffic conditions at the time. The system will generate its own signal timings cycle-by-cycle, varying continuously with traffic conditions, both in the short term (hour to hour, day to day) and in the long term following annual trends and longer term traffic growth.

This junction would be an ideal candidate for MOVA control as it is forecast to be a site that would suffer from prolonged periods of congestion in the future. MOVA performs particularly well, and appears to give above average benefits at smaller heavily congested junctions, which this location is. This innovative method of signal control can reduce delays and accident levels. Evidence has shown that MOVA can reduce delays by an average of 13%, compared with conventional signal controls.

MOVA has two operational modes; the first deals with uncongested conditions, the second with situations when the junction becomes overloaded/congested with large queues on one or more approaches. This form of operation would be suited to this junction location, when congestion occurs during the busy peak periods, and the junction is uncongested at other times.

It has been assumed that no widening is undertaken at the junction, as it is understood that there is no room to extend beyond the current highway boundary.



Outline Cost Analysis

The costs estimates are based on outline design drawings and any quantities shown are indicative only. Further scheme development is required to refine the cost estimate. The cost estimate for delivery excludes the following:

- Third party land acquisition costs and accommodation works costs
- Dedication of Land, Land to be passed over to the council as highway.
- Legal costs
- Landscaping design
- Statutory Undertakers design fees
- Statutory Undertakers diversion and or protection costs
- Ground Investigation cost
- Traffic Regulation Orders & any associated TRO consultation
- Contract documentation for appointment of the preferred contractor
- Tendering of the work

Initial costs for implementing this junction were based on a construction year of 2021 accounting for inflation, with the breakdown of the costs outlined in more detail.

Works Element	Estimated Cost	Notes
Construction Items	£250,000	
Allowances for Design Fees	£50,000	20% of the construction items
Allowances for Preliminaries	£37,500	15% of the construction items
Allowances for Traffic Management	£50,000	20% of the construction items
Allowances for Supervision	£25,000	10% of the construction items
Allowances for Utilities / Electricals	£50,000	20% of the construction items
Sub-Total for allowances and construction items	£462,500	
Optimism Bias	£203,500	44% of sub-total

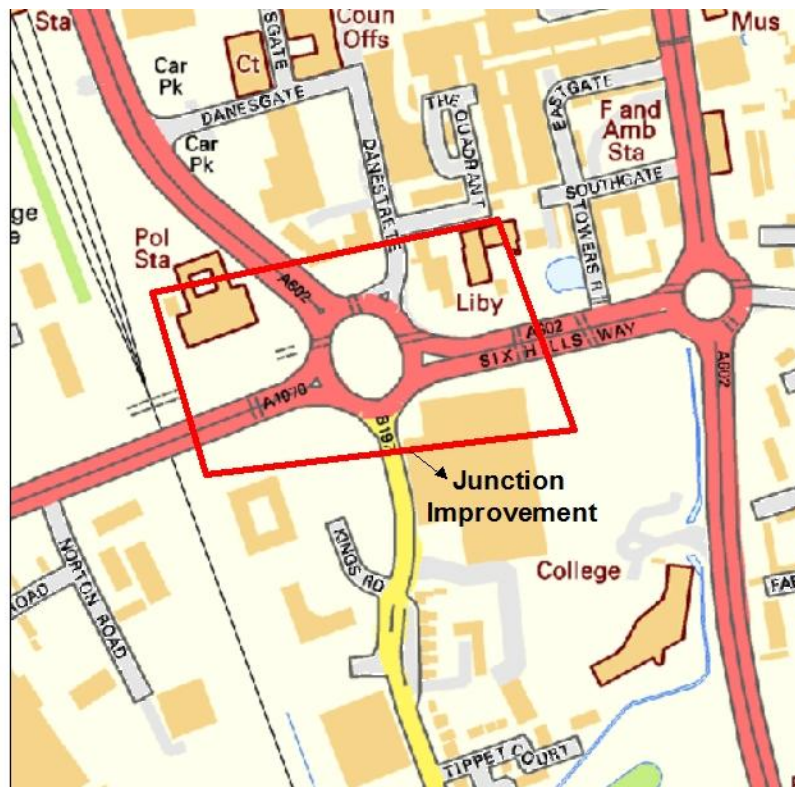
Cost for Delivery	£666,000	2021 Construction Year

Location	A602 Lytton Way / A602 Six Hills Way / London Road
Reference	HM12

Description of Problem
 The Lytton Way / Six Hills Way / London Road roundabout is one of four large roundabouts that surround the town centre and provides direct road access to the centre from the south. The junction is also one of Stevenage's main east-west connecting route ways. As a result, the roundabout receives a very high volume of traffic on all approach arms. The junction is problematic as it does not have sufficient capacity to accommodate the future year level of growth producing large queues and delays in both peak periods.

Mitigation Proposal Details
 To accommodate the forecast levels of growth expected at the junction, it is proposed that the junction becomes signal controlled.

The signal timings have been optimised with junction improvement based on fixed timings however there may be additional scope to implement demand responsive signals to respond to changes in demand during busy periods. This cannot be modelled because of software limitations but it would be expected to further enhance the operation and capacity of the junction.



Outline Cost Analysis
 Please note the pre-tender designs are not fully detailed, that they will need to be developed, revised and refined during the detailed design phase, and therefore, any quantity derived from such pre-designs will be indicative only.
 The costs estimates are based on outline design drawings and any quantities shown are indicative only. Further scheme development is required to refine the cost estimate. The cost estimate for delivery excludes the following:

- Third party land acquisition costs and accommodation works costs
- Dedication of Land, Land to be passed over to the council as highway.
- Legal costs
- Landscaping design
- Statutory Undertakers design fees
- Statutory Undertakers diversion and or protection costs
- Ground Investigation cost
- Traffic Regulation Orders & any associated TRO consultation
- Contract documentation for appointment of the preferred contractor
- Tendering of the work

Initial costs for implementing this junction were based on a construction year of 2021 accounting for inflation, with the breakdown of the costs outlined in more detail.

Works Element	Estimated Cost	Notes
Construction Items	£240,000.00	
Allowances for Design Fees	£48,000.00	20% of the construction items
Allowances for Preliminaries	£36,000.00	15% of the construction items
Allowances for Traffic Management	£48,000.00	20% of the construction items
Allowances for Supervision	£24,000.00	10% of the construction items.
Allowances for Utilities/Electricals	£48,000.00	20% of the construction items.
Sub-Total for allowances and construction items	£444,000.00	
Optimism Bias	£195,000.00	44% of sub-total
Cost for Delivery	£639,000.00	2021 Construction Year

Location	B197 London Road / Monkswood Way
Reference	HM13

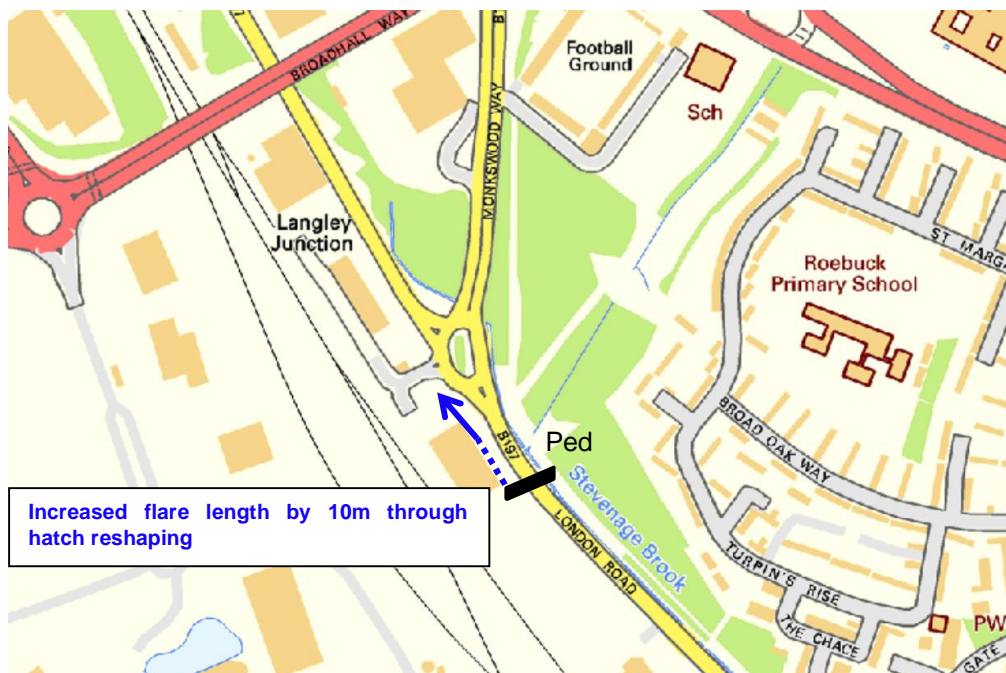
Description of Problem

The B197 London Road/ Monkswood Way junction is located to the South of central Stevenage and is a key junction for traffic from the south entering central Stevenage, and is a problem junction for traffic travelling south-north. The junction is problematic as it does not have sufficient capacity to accommodate the future year level of growth. This causes large delays and queues on the northbound approach. The model forecast that this junction will experience further delay and congestion, under future operating conditions, with the increase in demand exacerbating the issue.

Mitigation Proposal Details

To provide sufficient network capacity to accommodate the future year level of demand, it is proposed that the junction will be improved by extending the flare length on the northbound approach by 10m, allowing vehicles to queue in two lanes on the approach to the junction for a longer distance, thus reducing current capacity constraints.

It is proposed that the flare will be extended through reshaping the current hatching on the approach to the junction, with new hatching alignment from the pedestrian crossing onwards to the junction.



Increased flare length by 10m through hatching reshaping

Outline Cost Analysis

The costs estimates are based on outline design drawings and any quantities shown are indicative only. Further scheme development is required to refine the cost estimate. The cost estimate for delivery excludes the following:

- Third party land acquisition costs and accommodation works costs
- Dedication of Land, Land to be passed over to the council as highway.
- Legal costs
- Landscaping design
- Statutory Undertakers design fees

- Statutory Undertakers diversion and or protection costs
- Ground Investigation cost
- Traffic Regulation Orders & any associated TRO consultation
- Contract documentation for appointment of the preferred contractor
- Tendering of the work

Initial costs for implementing this junction were based on a construction year of 2021 accounting for inflation, with the breakdown of the costs outlined in more detail.

Works Element	Estimated Cost	Notes
Construction Items	£1,500	
Allowances for Design Fees	£300	20% of the construction items
Allowances for Preliminaries	£225	15% of the construction items
Allowances for Traffic Management	£300	20% of the construction items
Allowances for Supervision	£150	10% of the construction items
Allowances for Utilities / Electricals	£300	20% of the construction items
Sub-Total for allowances and construction items	£2,775	
Optimism Bias	£1,225	44% of sub-total
Cost for Delivery	£4,000	2021 Construction Year

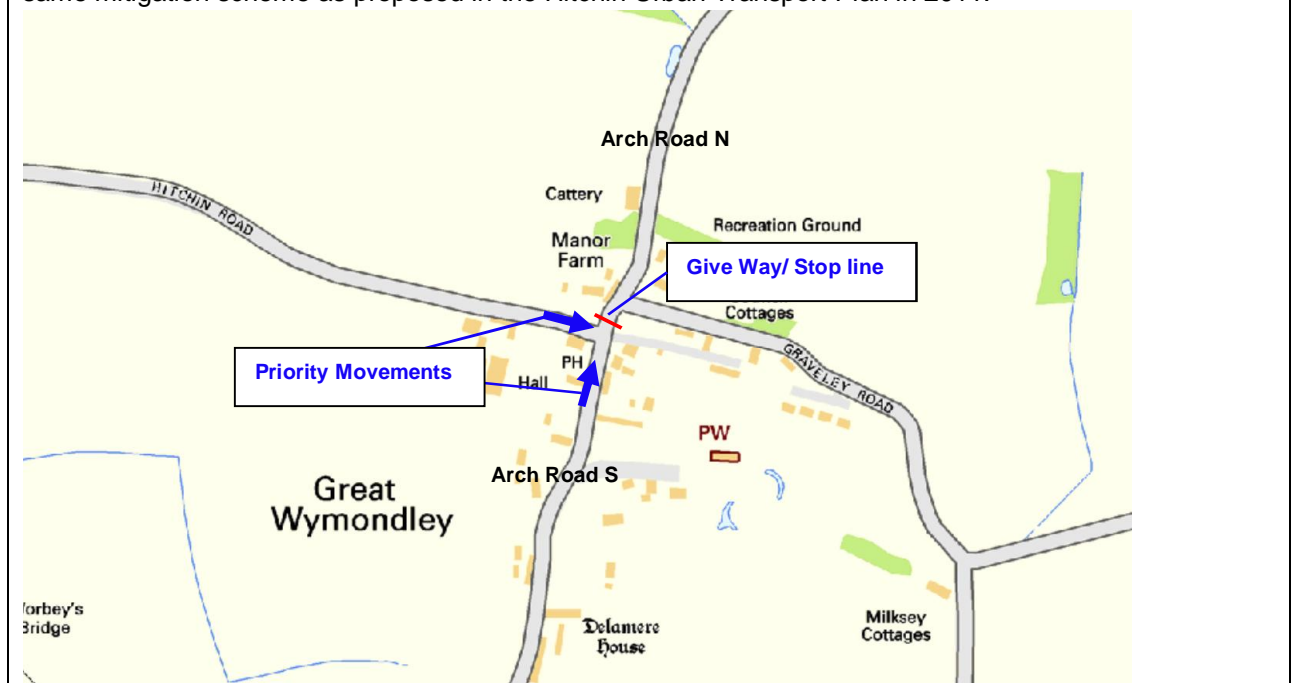
Location	Arch Road/Hitchin Road junction
Reference	HM14

Description of Problem

The Arch Road/Hitchin Road junction is located in the centre of Great Wymondley village, west of A1(M) junction 8. The priority junction is operating over capacity with delays and long queues on the Hitchin Road approach (west arm). Hitchin Road is a shared single lane and there is a large volume of right turning traffic into Arch Road which is creating delays and restricting the straight on movement.

Mitigation Proposal Details

To provide sufficient network capacity to accommodate the future year level of demand, it is proposed that the priority movements are changed at the junction, so that Arch Road south and Hitchin Road are the major arm movements and Arch Road north becomes the minor arm with give way priority. This is the same mitigation scheme as proposed in the Hitchin Urban Transport Plan in 2011.



Outline Cost Analysis

The costs estimates are based on outline design drawings and any quantities shown are indicative only. Further scheme development is required to refine the cost estimate. The cost estimate for delivery excludes the following:

- Third party land acquisition costs and accommodation works costs
- Dedication of Land, Land to be passed over to the council as highway.
- Legal costs
- Landscaping design
- Statutory Undertakers design fees
- Statutory Undertakers diversion and or protection costs
- Ground Investigation cost
- Traffic Regulation Orders & any associated TRO consultation
- Contract documentation for appointment of the preferred contractor
- Tendering of the work

Initial costs for implementing this junction were based on a construction year of 2021 accounting for inflation, with the breakdown of the costs outlined in more detail.

Works Element	Estimated Cost	Notes
Construction Items	£7,000	
Allowances for Design Fees	£1,400	20% of the construction items
Allowances for Preliminaries	£1,100	15% of the construction items
Allowances for Traffic Management	£1,400	20% of the construction items
Allowances for Supervision	£700	10% of the construction items
Allowances for Utilities / Electricals	£1,400	20% of the construction items
Sub-Total for allowances and construction items	£13,000	
Optimism Bias	£5,800	44% of sub-total
Cost for Delivery	£18,800	2021 Construction Year

Location	A602 / B656 Hitchin Hill Roundabout
Reference	HM15

Description of Problem

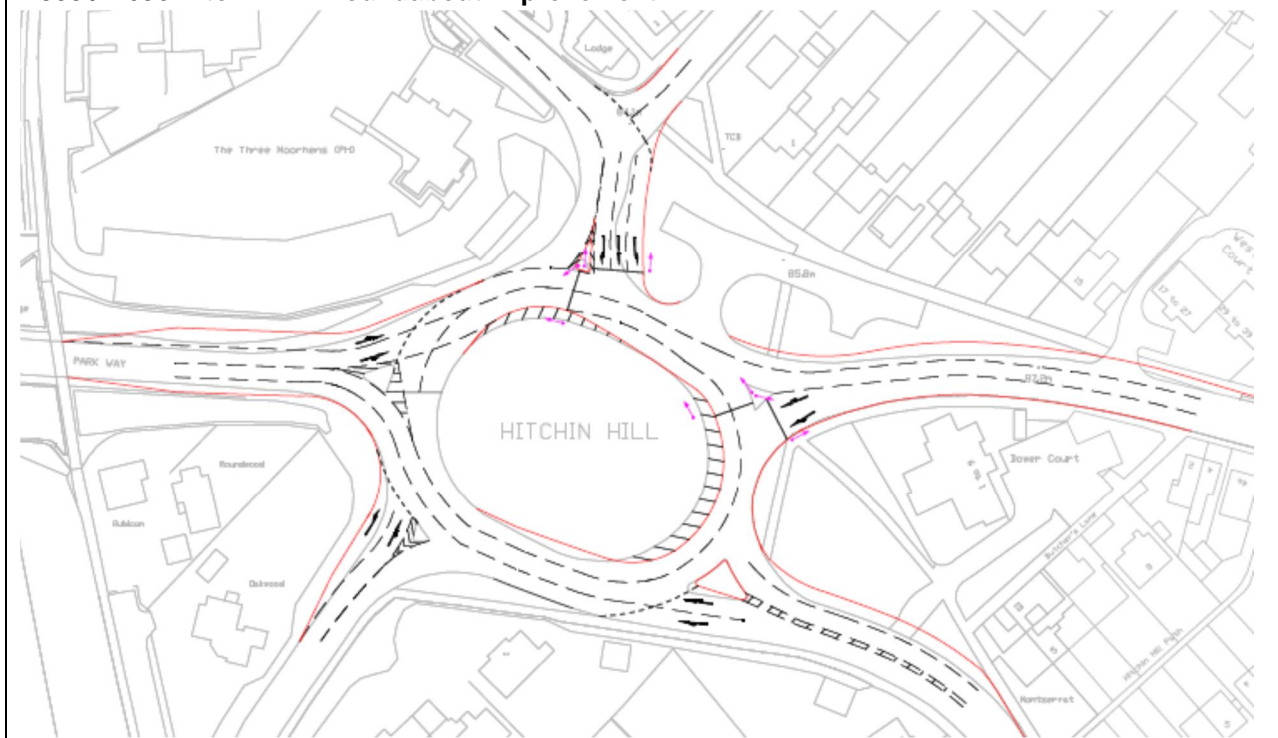
The A505 / A602 through Hitchin, which provides a link between Luton and Stevenage/ A1(M) has been identified as a key route which is susceptible to a lack of capacity. There is insufficient capacity at the A602 / B656 Hitchin Hill roundabout, which causes congestion on this main corridor during the busy AM and PM peak periods, with queuing on the A602 and St John's Road from the B656 Hitchin Hill approach despite a 'keep clear' sign in place.

Mitigation Proposal Details

Increase the roundabout capacity and improve the movement of traffic by widening some approaches and partially signalise the A602 / B656 arm of the existing roundabout.

- Widen St John's to a three lane entry.
- Widen Stevenage Road, London Road, Gosmore Road and Park Way to extend the existing two lane approaches.
- Provide two lane exits on St John's, Stevenage Road, London Road and Park Way with a single exit on to Gosmore Road.
- Install signals on St John's Road approach.

A505 / B656 Hitchin Hill Roundabout Improvement



Outline Cost Analysis

The cost estimate for delivery excludes the following:

- Legal Costs
- Landscaping Design
- Statutory Undertakers design fee.
- Statutory Undertakers diversion and or protection costs.
- Third Party Ground Investigation costs. Trial Pits and Geotechnical surveying will be supplied by

third parties.

- Traffic Regulation Orders & any associated consultation (TRO's).
- 3rd Party Land acquisition costs and accommodation works costs.
- Dedication of Land, Land to be passed over to the council as highway.
- Contract documentation for appointment of the preferred contractor, as this is being progressed by others.
- Tendering of the works
- Site support fees during the construction period, this will be included within a later fee proposal, if required.

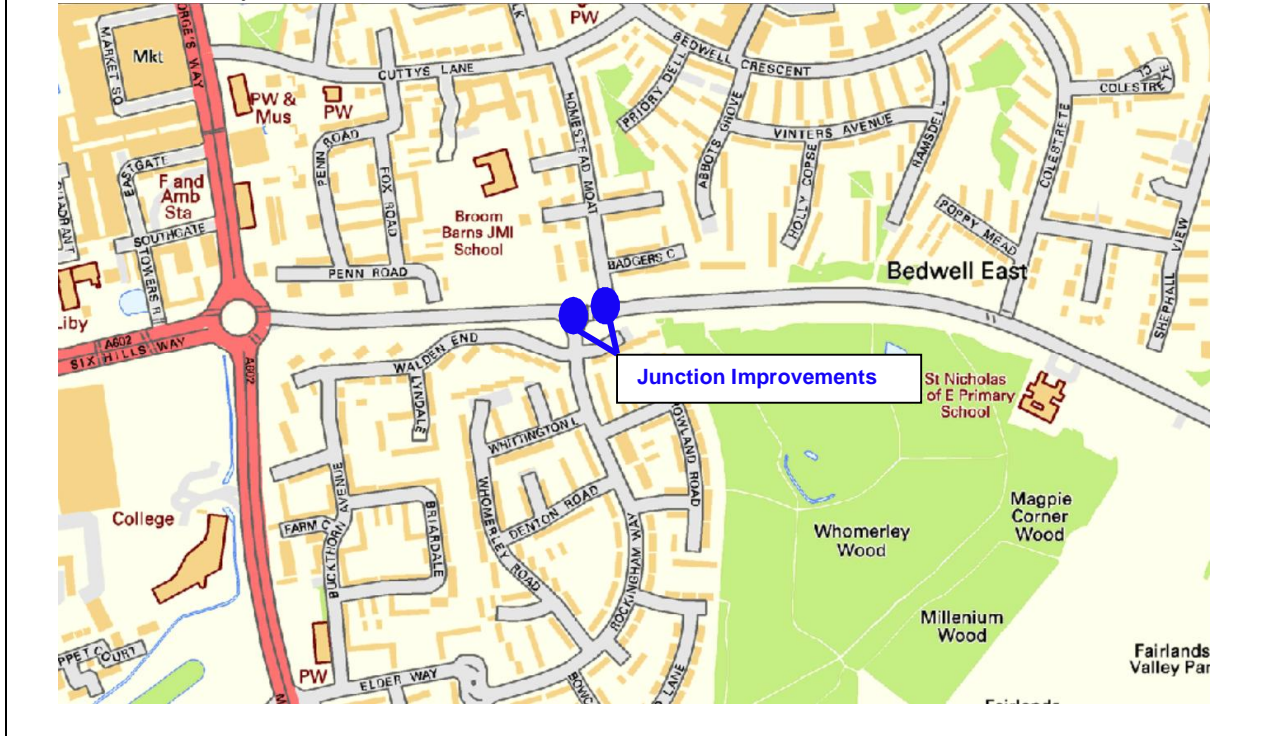
Initial costs for implementing this junction have been estimated at £1.2 million. These costs were based on a construction year of 2021 accounting for inflation, with the breakdown of the costs outlined in more detail.

Works Element	Estimated Cost	Notes
Construction Items	£337,000	
Allowances for Design Fees	£67,000	20% of the construction items
Allowances for Preliminaries	£337,000	100% of the construction items
Allowances for Supervision	£34,000	10% of the construction items
Allowances for Utilities / Electricals	£67,000	20% of the construction items
<i>Sub-Total for allowances and construction items</i>	<i>£842,000</i>	
Optimism Bias	£379,000	45% of sub-total
Cost for Delivery	£1,221,000	2021 Construction Year

Location	Six Hills Way / Homestead Moat
Reference	HM16

Description of Problem
 The Six Hills Way / Homestead Moat roundabout has been identified as a key route which is susceptible to a lack of capacity and is a problem junction for traffic travelling east-west. The junction is problematic as it does not have sufficient capacity to accommodate the future level of growth. This causes delay and queuing on the westbound approach to the junction. The westbound approach from Six Hills Way is also affected by the close proximity of the Six Hills Way/ Rockingham Way roundabout, which is located 15m to the west of the junction.

Mitigation Proposal Details
 To provide sufficient network capacity to accommodate the future year level of demand, it is proposed that the Six Hills Way/ Homestead Moat and the Six Hills Way / Rockingham Way roundabouts be converted into two signalised T-junctions, with demand responsive signals. This allows controlled stacking on the approach to the A602 / Monkwood Way junction to the west, and enables the Six Hills Way / Homestead Moat and Six Hills Way / Rockingham Way junctions to operate in sync with one another, ensuring that the westbound Six Hills Way approach, which has the predominant demand, can flow between both junctions with ease.



Outline Cost Analysis
 The costs estimates are based on outline design drawings and any quantities shown are indicative only. Further scheme development is required to refine the cost estimate. The cost estimate for delivery excludes the following:

- Third party land acquisition costs and accommodation works costs
- Dedication of Land, Land to be passed over to the council as highway.
- Legal costs
- Landscaping design
- Statutory Undertakers design fees
- Statutory Undertakers diversion and or protection costs
- Ground Investigation cost

- Traffic Regulation Orders & any associated TRO consultation
- Contract documentation for appointment of the preferred contractor
- Tendering of the work

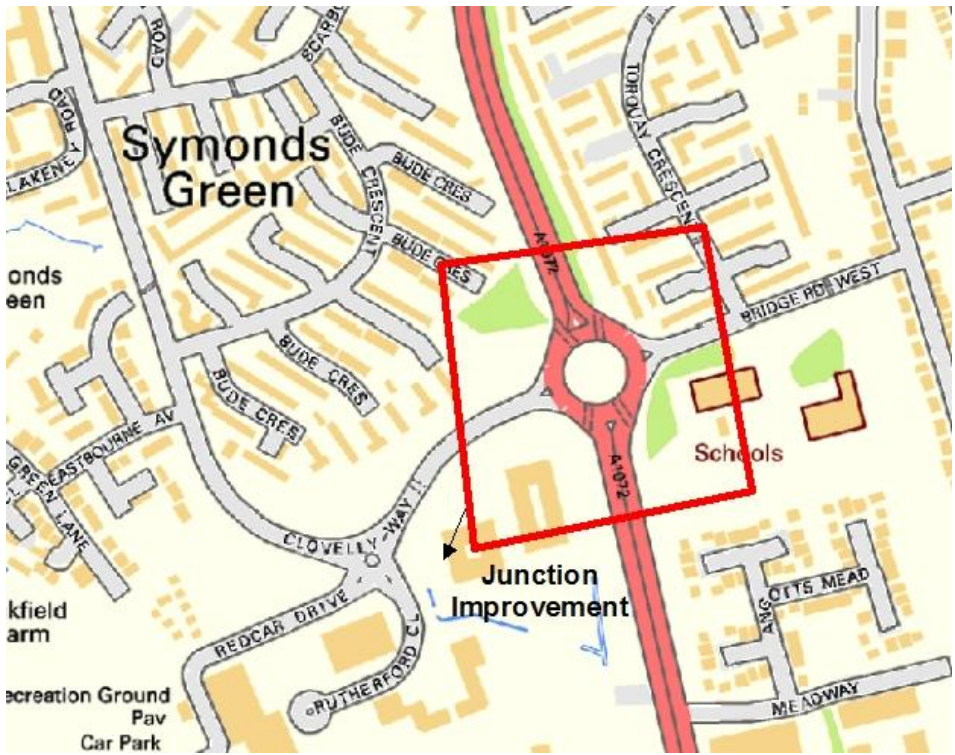
Initial costs for implementing this junction were based on a construction year of 2021 accounting for inflation, with the breakdown of the costs outlined in more detail.

Works Element	Estimated Cost	Notes
Construction Items	£320,000	
Allowances for Design Fees	£64,000	20% of the construction items
Allowances for Preliminaries	£48,000	15% of the construction items
Allowances for Traffic Management	£64,000	20% of the construction items
Allowances for Supervision	£32,000	10% of the construction items
Allowances for Utilities / Electricals	£64,000	20% of the construction items
Sub-Total for allowances and construction items	£592,000	
Optimism Bias	£260,500	44% of sub-total
Cost for Delivery	£852,500	2021 Construction Year

Location	Clovelly Way / A1072 Gunnels Wood Rd
Reference	HM17

Description of Problem
 The A1072 Gunnels Wood Road is a key local route that runs to the west of Stevenage providing a connection to the A1(M) junctions 7 to the south and junction 8 to the north. It is also the main access road to Stevenage's business park's and industrial areas that lie to the east of the A1(M). The Gunnels Wood Road / Clovelly Way roundabout is situated just north of the industrial area. The junction is currently a non-signalised roundabout and future year demand modelling has highlighted large queues and delays at the roundabout indicating that the junction does not have sufficient capacity to accommodate forecast future year demand.

Mitigation Proposal Details
 To mitigate the impact of future increases in traffic demand at the junction, it is proposed that the Gunnels Wood Road approach arms (north and south arms) be signal controlled to better control the flow of traffic in peak periods.
 The signal timings have been optimised in the model based on fixed timings however there may be additional scope to implement demand responsive signals to respond to changes in demand during busy periods. This cannot be modelled because of software limitations but it would be expected to further enhance the operation and capacity of the junction.



Outline Cost Analysis
 Please note the pre-tender designs are not fully detailed, that they will need to be developed, revised and refined during the detailed design phase, and therefore, any quantity derived from such pre-designs will be indicative only.
 The costs estimates are based on outline design drawings and any quantities shown are indicative

only. Further scheme development is required to refine the cost estimate. The cost estimate for delivery excludes the following:

- Third party land acquisition costs and accommodation works costs
- Dedication of Land, Land to be passed over to the council as highway.
- Legal costs
- Landscaping design
- Statutory Undertakers design fees
- Statutory Undertakers diversion and or protection costs
- Ground Investigation cost
- Traffic Regulation Orders & any associated TRO consultation
- Contract documentation for appointment of the preferred contractor
- Tendering of the work

Initial costs for implementing this junction were based on a construction year of 2021 accounting for inflation, with the breakdown of the costs outlined in more detail.

Works Element	Estimated Cost	Notes
Construction Items	£205,000.00	
Allowances for Design Fees	£41,000.00	20% of the construction items
Allowances for Preliminaries	£31,000.00	15% of the construction items
Allowances for Traffic Management	£41,000.00	20% of the construction items
Allowances for Supervision	£20,500.00	10% of the construction items.
Allowances for Utilities/Electricals	£41,000.00	20% of the construction items.
Sub-Total for allowances and construction items	£379,500.00	
Optimism Bias	£167,000.00	44% of sub-total
Cost for Delivery	£546,500.00	2021 Construction Year

Location	A602 Hitchin Rd/ Coreys Mill Ln.
Reference	HM18

Description of Problem

The Hitchin Road/ Coreys Mill Lane roundabout is the first major junction into Stevenage from the A1(M) junction 8 receiving the majority of traffic travelling into and out of Stevenage from the motorway and from the neighbouring towns of Hitchin and Letchworth Garden City. The junction has been identified as problematic as it generates large queues and junction delay in the forecast years due to insufficient capacity to accommodate an increased volume of traffic.

Mitigation Proposal Details

To accommodate the forecast future year level of demand, it is proposed that the junction become signal controlled.

The signal timings have been optimised based on fixed timings however there may be additional scope to implement demand responsive signals to respond to changes in demand during busy periods. This cannot be modelled because of software limitations but it would be expected to further enhance the operation and capacity of the junction.



Outline Cost Analysis

Please note the pre-tender designs are not fully detailed, that they will need to be developed, revised and refined during the detailed design phase, and therefore, any quantity derived from such pre-designs will be indicative only.

The costs estimates are based on outline design drawings and any quantities shown are indicative only. Further scheme development is required to refine the cost estimate. The cost estimate for delivery excludes the following:

- Third party land acquisition costs and accommodation works costs
- Dedication of Land, Land to be passed over to the council as highway.
- Legal costs
- Landscaping design

- Statutory Undertakers design fees
- Statutory Undertakers diversion and or protection costs
- Ground Investigation cost
- Traffic Regulation Orders & any associated TRO consultation
- Contract documentation for appointment of the preferred contractor
- Tendering of the work

Initial costs for implementing this junction were based on a construction year of 2021 accounting for inflation, with the breakdown of the costs outlined in more detail.

Works Element	Estimated Cost	Notes
Construction Items	£162,000.00	
Allowances for Design Fees	£32,400.00	20% of the construction items
Allowances for Preliminaries	£24,300.00	15% of the construction items
Allowances for Traffic Management	£32,400.00	20% of the construction items
Allowances for Supervision	£16,200.00	10% of the construction items.
Allowances for Utilities/Electricals	£32,400.00	20% of the construction items.
Sub-Total for allowances and construction items	£299,700.00	
Optimism Bias	£132,000.00	44% of sub-total
Cost for Delivery	£431,700.00	2021 Construction Year

Location	A1072 Martin's Way / Canterbury Way / Grace Way
Reference	HM19

Description of Problem
 The Martin's Way / Canterbury Way / Grace Way junction is a large roundabout to the north of Stevenage. Future year demand modelling has highlighted the junction does not have sufficient capacity to accommodate the future year level of growth, becoming a congested junction for Stevenage traffic in both peak periods. Large queues and delays occur on the minor arms; the north (Canterbury Way) and south (Grace Way) approaches.

Mitigation Proposal Details
 To mitigate the impact of future year traffic it is proposed that the north (Canterbury Way) and south (Grace Way) approaches become signal controlled. The signal timings have been optimised in the model with junction improvement based on fixed timings however there may be additional scope to implement demand responsive signals to respond to changes in demand during busy periods. This cannot be modelled because of software limitations but it would be expected to further enhance the operation and capacity of the junction.



Outline Cost Analysis
 Please note the pre-tender designs are not fully detailed, that they will need to be developed, revised and refined during the detailed design phase, and therefore, any quantity derived from such pre-designs will be indicative only.
 The costs estimates are based on outline design drawings and any quantities shown are indicative only. Further scheme development is required to refine the cost estimate. The cost estimate for delivery excludes the following:

- Third party land acquisition costs and accommodation works costs
- Dedication of Land, Land to be passed over to the council as highway.

- Legal costs
- Landscaping design
- Statutory Undertakers design fees
- Statutory Undertakers diversion and or protection costs
- Ground Investigation cost
- Traffic Regulation Orders & any associated TRO consultation
- Contract documentation for appointment of the preferred contractor
- Tendering of the work

Initial costs for implementing this junction were based on a construction year of 2021 accounting for inflation, with the breakdown of the costs outlined in more detail.

Works Element	Estimated Cost	Notes
Construction Items	£161,000.00	
Allowances for Design Fees	£32,000.00	20% of the construction items
Allowances for Preliminaries	£24,000.00	15% of the construction items
Allowances for Traffic Management	£32,000.00	20% of the construction items
Allowances for Supervision	£16,000.00	10% of the construction items.
Allowances for Utilities/Electricals	£32,000.00	20% of the construction items.
Sub-Total for allowances and construction items	£297,000.00	
Optimism Bias	£131,000.00	44% of sub-total
Cost for Delivery	£428,000.00	2021 Construction Year

Location	B197 Graveley Rd / B197 High St / North Rd.
Reference	HM20

Description of Problem

The B197 is the main road linking Stevenage, A1(M) junction 8 and Baldock. The priority junction has been identified as problematic in the AM peak as large queues and delays occur on the junction approaches and North Road traffic is opposed by large volumes of traffic using the A197.

Mitigation Proposal Details

To provide sufficient network capacity to accommodate the future year level of demand, it is proposed that the junction be converted to a roundabout with 2 lane flared entry on all arms to help traffic exit North Road.

Access to a proposed development north of Stevenage may be located near to this junction. This mitigation scheme may therefore be superseded by / addressed by access arrangements for any future development scheme.



Outline Cost Analysis

Please note the pre-tender designs are not fully detailed, that they will need to be developed, revised and refined during the detailed design phase, and therefore, any quantity derived from such pre-designs will be indicative only.

The costs estimates are based on outline design drawings and any quantities shown are indicative only. Further scheme development is required to refine the cost estimate. The cost estimate for delivery excludes the following:

- Third party land acquisition costs and accommodation works costs
- Dedication of Land, Land to be passed over to the council as highway.
- Legal costs
- Landscaping design
- Statutory Undertakers design fees
- Statutory Undertakers diversion and or protection costs
- Ground Investigation cost

- Traffic Regulation Orders & any associated TRO consultation
- Contract documentation for appointment of the preferred contractor
- Tendering of the work

Initial costs for implementing this junction were based on a construction year of 2021 accounting for inflation, with the breakdown of the costs outlined in more detail.

Works Element	Estimated Cost	Notes
Construction Items	£340,000.00	
Allowances for Design Fees	£68.000.00	20% of the construction items
Allowances for Preliminaries	£51.000.00	15% of the construction items
Allowances for Traffic Management	£68.000.00	20% of the construction items
Allowances for Supervision	£34.000.00	10% of the construction items.
Allowances for Utilities/Electricals	£68.000.00	20% of the construction items.
Sub-Total for allowances and construction items	£629,000.00	
Optimism Bias	£277,000.00	44% of sub-total
Cost for Delivery	£906,000.00	2021 Construction Year

Appendix D – Caveat associated with scheme costing

Cost estimates, and preliminary designs, are fruitful grounds for disputes, AECOM has included in its Delegations of Authority the requirement for a Risk Assessment and prior AECOM approval to contract where pre-tender design is to be used for quantity take off and/or relied upon by the developer/contractor for finance/tender pricing unless there is an indemnity or waiver obviating AECOM from liability in respect of such quantities/reliance.

Accordingly, in any appointment where we are required to provide a cost estimate or to produce a preliminary/initial design that will be used for cost purposes it needs to be made clear that the pre-tender designs [and estimates] are not fully detailed, that they will need to be developed, revised and refined during the detailed design phase, and, therefore, any quantity [or value] shown or included in or derived from such pre-designs are indicative only.

Where such caveats and express exclusion cannot be incorporated a decision needs to be carefully made, in the first instance, as to whether AECOM can commit to the obligation/risk and the appropriate approval needs to be obtained from AECOM in accordance with the Delegations of Authority prior to contract.

Appendix E – COMET 2031 Hotspots

E1: COMET Congestion Map

E2: COMET 2031 AM Peak Node Delay

E3: COMET 2031 PM Peak Node Delay

E4: Hotspot Methodology

Methodology to define a congestion hotspot

The criteria listed below should be applied as a checklist to determine whether a junction should be identified as a congestion hotspot. If the answer is yes to all of these then they should be defined as such.

1. Are two or more links below the speed threshold, in the AM, PM or inter-peak periods?¹
2. Is the congestion caused by the relevant junction (and not a continuation of another congested junction)?
3. Are the associated delays of a certain length?²
4. Are the delays not caused by engineering measures which are intended to control delay (such as traffic signals)?³
5. Are the delays located on Primary, Main or Secondary distributor roads (and intended to facilitate traffic to primary or key destination settlements)?⁴

This process can act as guidance when reviewing this information annually and assist decision making when deciding to either remove or add to the existing list of locations.

¹ Threshold data is based on Traffic Master data in the peak am hour (8 to 9) or the pm peak hour (5 – 6). The peak hour is based on the usual peak hour, to aid consistency.

The speed threshold information is where:

- 20 mph speed limit where the actual speed is 7mph or below
- 30 mph speed limit where the actual speed is 15mph or below
- 40 mph speed limit where the actual speed is 25mph or below
- 50 mph speed limit where the actual speed is 35mph or below
- 60 mph speed limit where the actual speed is 40mph or below
- 70 mph speed limit where the actual speed is 50mph or below

² 'Certain length' should use the broad assumption that this is where there is a queue of 5 PCUs (passenger car units) or more, totalling at least 28.75 meters.

³ It may be that additional, unintended and significant delays are caused by traffic signals, which could still be identified as hotspots.

⁴ Aligned to the Highways Paper which helps inform the decision making process for how road classifications and re-classifications are made.