Cheshire West and Chester

CHESTER TRANSPORT STRATEGY – PHASE TWO

A4: CONGESTION RELIEF – PINCH POINTS

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Document Checking

Prepared by: 

Alistair Johnson

Senior Consultant

Checked by: 

Phil Gibbon

Senior Consultant

Approved by: 

Adam Leary

Associate Director

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AECOM, Exchange Court, 1 Dale Street, Liverpool, L2 2ET

Telephone: 0151 331 8900 Website: http://www.aecom.com

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1. INTRODUCTION

1.1 Chester Transport Strategy Phase One – Baseline Report

1.1.1 In 2013, AECOM completed a baseline analysis to ascertain the challenges associated with Chester's existing transport, access and movement characteristics. The report recognised the remarkable number of assets associated with Chester's heritage and history, but also more recent interventions such as the recently implemented cycle infrastructure and improved levels of cycling service provision from the rail station into the City Centre. However, the report also highlighted the necessity to overcome inherited constraints from a historic transport network and take the city from its previous Transport Plan from 1997 into the 21st century and through to the end of the period covered by the 'One City Plan' in the mid-2020s.

1.1.2 The report recognised that the advent of new technology, ideas and thinking, surrounding transport planning and strategies would have a big impact on the shape of the plan, and that there was a need to keep a firm eye on the latest innovations and predictions relating to travel patterns provided by industry experts. The baseline report outlines the fact that a visioning workshop formed part of the evidence base to help mould the strategy and ensure it is all encompassing. Equally as important, the baseline report highlights the necessity for a flexible strategy to accommodate, adapt to and embrace unexpected change in the socio-economic conditions as well as changes towards technology and behavioural change. The baseline report also highlights a number of issues associated under the following headings which the transport strategy should aim to address / accommodate:

- Policy factors;
- Tourism related factors;
- Highways;
- Car parking;
- Rail and bus services;
- Cycling and walking;
- Waterways;
- Servicing; and
- Air quality.

1.1.3 Following the baseline evidence report, consultation events and stakeholder engagement, a long list of transport schemes could be formulated in response to the findings from the above.

1.2 Chester Transport Strategy Phase One – Options and Assessment Report

1.2.1 Following on from the Chester Transport Strategy Baseline Report, the options and assessment report provided information on the various alternatives available to the Council and its partners in terms of addressing the comprehensive list of issues identified in the previous work and the comprehensive Stakeholder Engagement and Consultation. This included the successful and well received 'One City Plan' for Chester – a development and policy guidance document providing a framework for the future development of the city centre, a final version of which was released in early 2012; and the subsequent bus and parking related studies undertaken in its wake. The report addresses comments and concerns expressed during early stakeholder engagement on the Transport Strategy Baseline findings and their instrumental role in establishing the list of transportation issues experienced within the Chester area and their wider sphere of influence.

1.2.2 The Options and Assessment report also outlines the methodology used to develop and appraise a long list of schemes for the Chester Transport Strategy, which aim to tackle the key findings drawn from the baseline report.

1.2.3 The Baseline findings, alongside the findings from previous public consultation events and an initial period of stakeholder engagement throughout January and February 2013, provided the basis for the long list of strategy measures identified in the report. The measures were, in turn, drawn from a wide pool of schemes used in the transport strategies of other local authorities and represented some new advances in innovation and use of intelligent technology.

1.2.4 The Options report notes the set of key emerging issues as identified by the baseline and consultation work. It then presents the long list of schemes linked to these issues in order to better appreciate the rationale behind their selection. The appraisal process is then explained with a commentary on the criteria used and the scoring system that decides whether a scheme is considered beneficial enough to proceed to the packaging stage.

1.2.5 The report concludes by stating the short list of measures and packages according to zone of influence, timescale and theme. Completed proformas for each key scheme are also included to provide a greater degree of detail and some initial ideas in relation to each shortlisted scheme.

1.2.6 1.2.6 The proposed programme for Junctions / Key Links (Pinch Points) Capacity Enhancements is included in this section along with the completed proforma. The proforma outlines the initial proposals for the programme and provides information on how the programme will help to address the issues identified by the evidence base such as; rising congestion levels and congestion hotspots, the lack of quality gateways into Chester, air quality management issues on some of the key strategic routes into the City, confusion and inefficiency at key junctions, conflicts between cars, cyclists and pedestrians and varying accessibility to jobs and services

1.2.7 Additionally, the proforma indicates the possible benefits of the programme which include the following; addressing traffic congestion and journey time delay at hotspots and pinch points on the local highway network, improving access to jobs and employment, more reliable public transport journey times and reducing issues associated with air quality.

1.2.8 As well as the benefits of the scheme, the report highlights the potential impacts associated with the scheme as well as any key actions required for the scheme to progress.

1.3 Chester Transport Strategy Phase One – Recommendations Report

1.3.1 The Recommendations Report is the final of three documents under the Chester Transport Strategy Phase One. The report contains the recommendations of the Transport Strategy and the results of the public consultation, noting which schemes found most approval amongst the general public and which were not generally supported. This included the proposed program of schemes to tackle congestion at 'Key Pinch Points'.

1.3.2 The proposed programme of schemes was placed second with regards to the priority of the schemes as 60% of respondents felt the delivery of this programme was of 'high' or 'very high' priority. Furthermore, the Key Pinch Points programme of schemes was ranked joint 4th when respondents were asked to rank the schemes they felt were important to Chester.

1.3.3 The consultation process also highlighted the need to reduce congestion and also consider opening up development / housing sites and improving access to employment.

1.3.4 Written comments relating to the programme were generally supportive, whilst the Chester Civic Trust noted the proposed improvements were "easier said than done". The Chester Cycle Campaign felt that any new junction designs needed to accommodate cyclists within the design.

1.3.5 Following public consultation, a series of scheme changes listed below were proposed:

- Undertake detailed modelling to better define the need and requirement for congestion relief around the borough and across its border; and
- Make use of funding opportunities from the Local Pinch Point fund to design and construct junction improvements.

1.3.6 As a consequence of the above, the amended scheme proforma with recommendations was produced; this is included in **Appendix A**. In short, the final recommendations relating to the congestion relief element included in the Recommendations Report were as follows:

- Identify, design and deliver junction improvement schemes to address current and future traffic congestion and pinch-point problems; and

- Identify and improve highway capacity through the introduction of signalisation, Urban Traffic Control, Active Traffic Management and Variable Message Signing schemes where appropriate including Air Quality Management Areas.

1.3.7 Further recommendations relating to the Chester Western Relief Road were also included within this proforma. However, due to the complexity and scale of the scheme, it has been addressed separately in Phase Two of the Strategy as part of Task A5. The two elements are currently considered independently of each other.

1.3.8 Following this, the recommendations report outlines the key transport and wider economic benefits of the proposed programme. The report also provides indicative scheme costs and a 'high level' phasing and implementation plan for scheme progression.

1.4 Chester Transport Strategy Phase Two

1.4.1 Having identified the highly important role that 'Pinch Point Congestion Relief' has to play in achieving the overarching objectives of the Chester Transport Strategy, it is of paramount importance that a short list of priority locations are identified to ascertain the existing operation at each of the key junctions / routes.

1.4.2 This report follows on from the work produced by AECOM as part of Phase One and seeks to provide a shortlist of potential junction / highway improvement schemes at key locations identified through discussions with CW&C and the outputs from the SATURN model produced by Atkins on behalf of Cheshire West and Chester Council (CW&C).

1.5 Report Structure

1.5.1 The following sections covered by this report are outlined in the chapter headings listed below:

- **Chapter 2 – Identification of Locations**
- **Chapter 3 – Issues and Opportunities**
- **Chapter 4 – Proposed Schemes**
- **Chapter 5 – Summary and Next Steps**

2. IDENTIFICATION OF LOCATIONS

2.1 Introduction

2.1.1 In order to identify locations of potential 'Pinch Points' i.e points of congestion on the network, the existing Chester SATURN model developed by ATKINS, combined with additional analysis undertaken by AECOM has been utilised. This section will detail the methodology undertaken and identify the locations which currently are constrained and are also forecast to become constraints on the existing highway network.

2.2 Methodology

2.2.1 The methodology used by AECOM to identify the potential pinch point locations utilised the Base Year and Future Year Do Nothing (2030) SATURN model outputs of vehicle delay and traffic flow.

2.2.2 The process is detailed in full as part of **Appendix B** of this report. In summary, informed by the model outputs a score for each junction was produced which could be ranked in order to identify the worst performing junctions, i.e pinch points.

2.2.3 The process produced two lists:

- Potential Pinch Point locations identified for further investigation; and
- Potential Pinch Point locations not requiring further action.

2.2.4 The locations identified as warranting further investigation totalled 12 whilst those identified as not requiring any further action totalled just 5. Both lists of schemes were presented to CW&C for review and approval.

2.3 Discussions with Cheshire West and Chester Council

2.3.1 Following discussions between AECOM and CW&C officers on 15th May 2015 a 'Top 10' list of locations was identified, with these locations taken forward for developing concept schemes for potential inclusion in an overall outline business case. Further details are provided in the technical note titled 'Task A4 Pinch Point Scheme Identification – Top 10' included as **Appendix B** as part of this report.

2.3.2 Through continued discussions the 'Top 10' list evolved from that first presented as part of the aforementioned technical note. The main changes have been the inclusion of the following locations within the 'Top 10' which have been included as requested by CW&C;

- Hoole Road Corridor – Hamilton Street to Faulkner Street;

- A41/A5116 Moston Junction;
- A54 / A51 Tarvin Roundabout; and
- Four arm signalised roundabout of Liverpool Road / A5268 / Northgate Street, known locally as the Fountains Roundabout.

2.3.3 The requests from CW&C for the inclusions of the aforementioned schemes are informed by local knowledge of the highway network and problems which consistently arise day to day resulting in pinch points on the network which might not necessarily be identified as part of the strategic level SATURN modelling. The Hoole Road Corridor forms a perfect example of this where the interaction between pedestrian crossings, parked vehicles and volume of traffic delays the flow of traffic into the centre of Chester, a fact identified within the SATURN model but due to the number of different variables is worse in reality than forecast. The adopted methodology would not identify any of the individual junctions as “pinch point”, but it is acknowledged that link capacity is an issue.

2.4 Final List of Locations

2.4.1 The final agreed list of locations to be taken forward as a concept scheme including the date of inclusion are presented below in Table 2.1.below and shown in Figure 2.1 on the following page.

TABLE 2-1: FINAL LIST OF PINCH POINT LOCATIONS

Location	Modelling	Modelling	CW&C Request
	2010 Base	2030 Scenario	
Overleigh Roundabout/Curzon Park North/Hough Green/Lache Lane/Wrexham Road/Grosvenor Road (Lache Lane Node)		No 8/14	20.05.15
Sealand Road / Deva Link		No. 3/4/5	20.05.15 21.05.15
Sealand Road / B&Q access			
Sealand Road / Greyhound Park Road			
Hoole Road Corridor – Hamilton St to Faulkner St			15.05.15
A51 / A54 Tarvin Roundabout			28.05.15
Fountains Roundabout			20.05.15
A41/ A5116 Moston Junction			04.08.15
Tarvin Road / Barrow Lane		No. 1	
Liverpool Road / Vivienne Smith Lane (Hospital Access Junction)		No. 7	
Union Street/Love Street	No. 5	No. 12	
Green Lane/ A41 Ring Road	No. 8	No. 11	

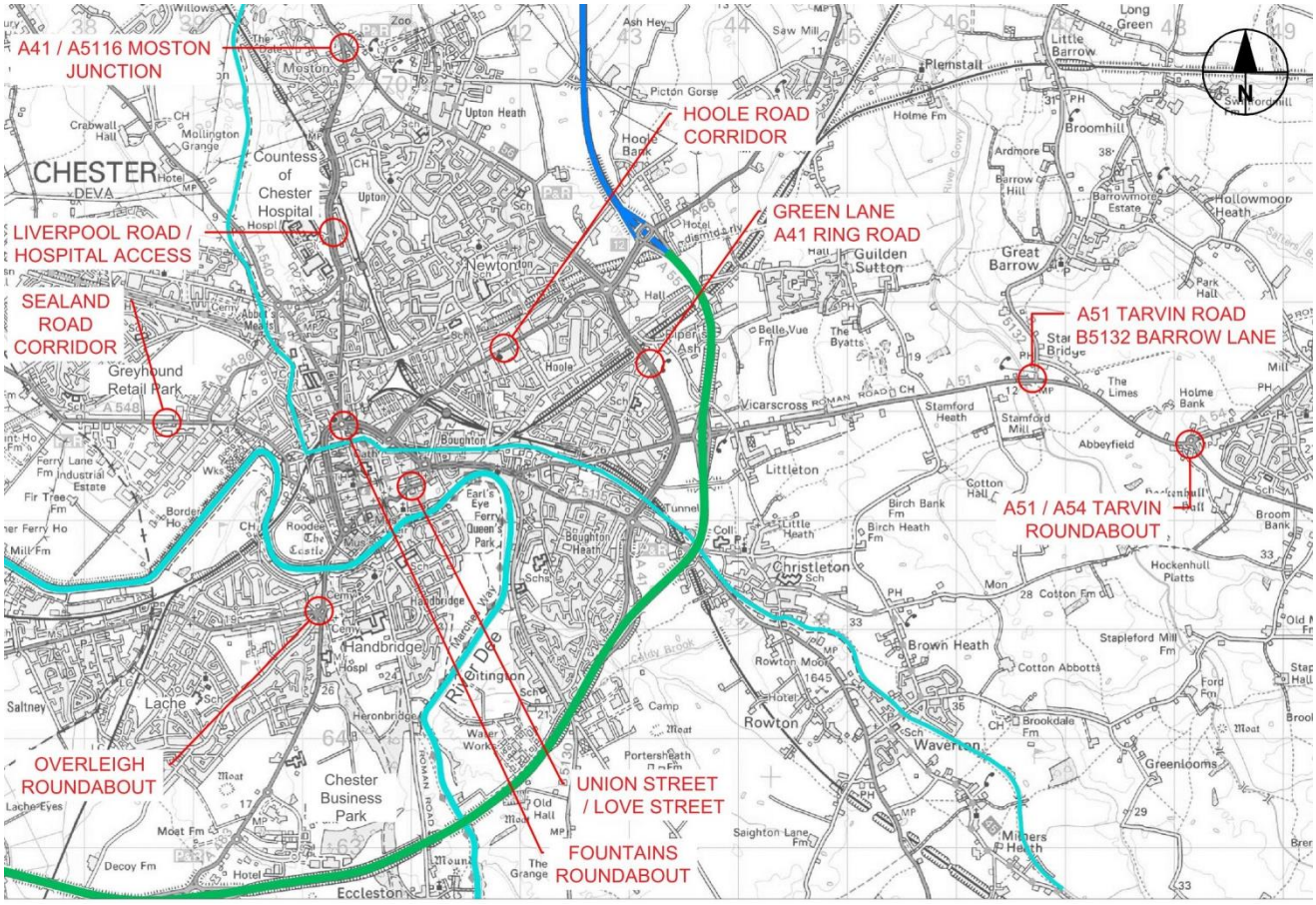


FIGURE 2-1: LOCATION OF PINCH POINT SCHEMES

3. ISSUES AND OPPORTUNITIES

3.1 Introduction

3.1.1 In order to address each of the ten pinch point locations a scheme design has been developed informed by observations of the existing operation of each location, further analysis of the SATURN model outputs and consideration of site limitations. This section will provide an overview of the process and provide a rationale for the proposed schemes which follow in Chapter 4.

3.2 Site Visits, Investigations and Model Outputs

3.2.1 AECOM undertook a series of site audits on the Tuesday 23rd, Monday 29th June and Thursday 2nd July 2015 during the peak hour periods to ascertain how each of the identified locations currently operate. Understanding how each of the junction locations operate helps provide an understanding of how best to address existing concerns. In addition, as part of the site visits any constraints to delivery, i.e. potential land ownership issues, structures or environmental restrictions were identified.

3.2.2 Further analysis of the 2030 SATURN Model forecasts has also been completed to inform how existing problems may change and also what issues are likely at each of the ten locations in the future.

3.2.3 For each pinch point location the key observations made during site visits conclusions from the future year model outputs is presented in this chapter.

OVERLEIGH ROUNDABOUT

Site Audit – Observed Issues:

- Heavy queue lengths / delays observed on all approaches except Curzon Park North and Overleigh Road during the AM Peak hour. Particular concerns were Lache Lane, Hough Green and the A483 Southbound as traffic was observed to back up to the Grosvenor Roundabout to the north; and
- A number of vehicles, approximately 3 in 30 minutes, were observed to make a right turn at the ahead only exit lane to Overleigh Road.

Site Audit – Observed Constraints and Opportunities

- Limited land availability in the vicinity of the roundabout due to potentially historical wall structures bordering the roundabout;
- Bus lane reduces general traffic capacity on Hough Green approach;

- Large number of trees adjacent to the roundabout, could be protected by preservation orders; and
- Historic bridge over the River Dee located to the north of the junction is likely to be a listed structure.

PHOTOSET 1: OVERLEIGH ROUNDABOUT

Issues identified following further analysis of the future year SATURN model forecasts are detailed below, a summary of the outputs is provided in **Appendix C, Figure 1**.

- The A5104 Hough Green Eastbound approach and corresponding circulatory stop line are forecast to be over capacity during the AM peak period, specifically the ahead movement to the A483 Grosvenor Road which is forecast to experience 240 seconds of delay;
- The Lache Lane approach and corresponding circulatory stop line are forecast to be over capacity during the AM peak period, Lache Lane is forecast to experience high levels of delay;
- The ahead movement on the A483 Grosvenor Road northbound exit (pedestrian crossing stop line) is forecast to be over capacity during the AM peak; and
- The A483 Grosvenor Road is forecast to be approaching capacity during the PM peak.

A548 SEALAND ROAD CORRIDOR

Site Audit – Observed Issues

- Several vehicles travelling westbound along the A548 Sealand Road turned right onto Deva Link when the right turn signals displayed a red suggesting confusion for drivers of existing arrangement;
- Short right turn give-way facility located along left turn slipway onto Bumper's Lane from Sealand Road is not used and could have safety implications if traffic flows increase;
- Several buses were observed to ignore the bus gate at the B&Q junction whilst travelling eastbound along the A548 Sealand Road;
- Signal timing / synchronisation issues between the B&Q access junction and the Greyhound Park Road junction. Vehicles turning right from Greyhound Park Road were held at the B&Q junction resulting in vehicles queueing backing to the Greyhound Junction; and
- Within the heart of the B&Q access junction, vehicles from residential properties on the Northern side of A548 Sealand Road are forced to pull out into the centre of the junction whilst exiting their properties to join the carriageway.

Site Audit – Observed Constraints and Opportunities

- Frontages of car showrooms reduce the opportunity for land take as they are outside Cheshire West and Chester ownership.
- Narrow grass verge between the junction of the B&Q access and Greyhound Park Road; and
- Sealand Road corridor forms a popular cycle route into Chester.

PHOTOSET 2: SEALAND ROAD

Model Outputs

Issues identified following further analysis of the future year SATURN model forecasts are detailed below, a summary of the outputs is provided in **Appendix C, Figure 2**.

- The right turn from Greyhound Park Road is forecast to operate over capacity with delays of up to 193 seconds during the AM peak;
- The right turn from Bumper's Lane during both peak periods is forecast to experience significant delays and operate over capacity;
- The ahead movement from Deva Link to Bumper's Lane is forecast to operate overcapacity during the AM peak with delays of 294 seconds;
- The left turn merge from the A548 Sealand Road to Bumper's Lane is forecast to operate over capacity during the AM peak with delays of 183 seconds;
- The ahead movement from Bumper's Lane is forecast to experience a delay of 125 seconds and operate over capacity in the PM peak; and

- The westbound A548 Sealand Road approach to the B&Q junction is forecast to experience significant delay totalling 258 seconds resulting in queuing back to the Greyhound Park Junction.

A51 / A54 TARVIN ROUNDABOUT

Site Audit – Observed Issues

- The positioning of vehicles along the A54 westbound arm was observed to be poor due to absence of lane markings. Consequently, vehicles were positioned in a more central area rather than to the left or the right and therefore the available carriageway width was poorly utilised;
- The Grosvenor Road arm which provides access to residential dwellings has the potential to be abused by 'rat runners' wishing to avoid queues along the A54 westbound arm; and
- Large queues build and dissipate quickly throughout the peak period.

Site Audit – Observed Constraints and Opportunities

- Power lines for residential properties in close proximity of the junction; and
- Access to residential properties provided a short distance to the west of the junction and could result in problems if additional merge lanes are provided on the A54 towards Chester.

PHOTOSET 4: A51/A54 TARVIN ROUNDABOUT

Model Outputs

Within the original SATURN model the junction is only represented as part of the buffer network not the simulation network; i.e the model original model did not provide details of operational performance. The junction was included at request by CW&C officers therefore the SATURN model was updated to include the junction within the simulation network, as detailed within **Appendix E**.

Issues identified following further analysis of the future year SATURN model forecasts are detailed below, a summary of the outputs is provided in **Appendix C, Figure 4**.

- A54 Holme Street westbound is forecast to be approaching capacity during the 2030 PM peak.

A41 TARVIN ROAD / BARROW LANE

Site Audit – Observed Issues

- Heavy traffic flows on the A51 Tarvin Road in both directions resulting in large queues when Barrow Lane flow is called.

Site Audit – Observed Constraints and Opportunities

- Road bridge to the west of the junction across the River Gowy may be a constraint to any potential carriageway widening;
- Layby used by HGV's and the BP garage access located immediately west of the road bridge over the River Gowy to the west of the junction would need to be considered in any improvement proposal;
- Land ownership issues, particular at the northwest corner of the junction; and
- Site boarded by grass verges and agricultural lane which may present an opportunity if additional land is required.

PHOTOSET 7: TARVIN ROAD / BARROW LANE

Model Outputs

Issues identified following further analysis of the future year SATURN model forecasts are detailed below, a summary of the outputs is provided in **Appendix C, Figure 7**.

- Westbound A51 Tarvin Road ahead movement is forecast to operate above capacity during both peak periods in 2030 with delays of up to 150 seconds;
- The right turn movement into the B5132 Barrow Lane from the A51 is forecast to operate significantly over capacity and experience delays of approximately 583 seconds during the PM peak;
- The left turn movement from the B5132 Barrow Lane during the PM peak is forecast to operate over capacity with delays of up to 384 seconds; and
- The eastbound A51 Tarvin Road ahead movement is forecast to operate close to capacity during both peak periods with delays up to 34 seconds.

A5116/ A41 MOSTON ROAD JUNCTION

Site Audit – Observed Issues

- High number of vehicles queueing to complete the right turn from the A41 to the A5116 on during the AM peak; and
- The tight right turn from the A5116 Liverpool Road into the A41 Moston Road results in very slow moving vehicles in the heart of the junction, particularly HGV movements.

Site Audit – Observed Constraints and Opportunities

- There are opportunities to widen the carriageway albeit with use of 3rd party land. In general, the existing road marking and are in poor condition and the carriageway surfacing needs repair in some locations.

PHOTOSET 6: A41/A5116 MOSTON JUNCTION

Model Outputs

Issues identified following further analysis of the future year SATURN model forecasts are detailed below, a summary of the outputs is provided in **Appendix C, Figure 6**.

- The southbound right turn from the A41 to the A5116 Moston Road is forecast to experience a significant queue of 72 PCUs and operate with a Volume to Capacity ratio of 111% during the AM peak. The same movement during the PM peak is forecast to experience up to an average 105 seconds delay per PCU; and
- The straight ahead northbound movements from the A41 Moston are forecast to approach capacity during the PM peak with a Volume ot Capcity ratio of 96% and an average delay of 72 seconds per PCU.

A5116 LIVERPOOL ROAD / HOSPITAL ACCESS JUNCTION

Site Audit – Observed Issues

- Significant internal queues within the hospital site experienced by those wishing to exit via the Liverpool Road Junction. Observations suggest this is as a result of the roundabout junction layout which leads to large gaps in traffic approaching the Hospital exit stop line. This reduces the efficiency of the signalised junction reducing the throughput at the stop line increasing delay to vehicles exiting the hospital.
- A high number of left turners accessing the hospital site from the A5116 Liverpool Road resulted in the dedicated left turn lane queueing back into the main carriageway delaying ahead movements.

Site Audit – Observed Constraints and Opportunities

- Residential dwellings located along the eastern carriageway of the A5116 Liverpool Road requiring 24hr access;
- Un-adopted highway (Vivienne Smith Lane and Valley Drive); and
- Land ownership implications for carriageway widening.

PHOTOSET 8: A5116 LIVERPOOL ROAD/ HOSPITAL ACCESS JUNCTION

Model Outputs

Issues identified following further analysis of the future year SATURN model forecasts are detailed below, a summary of the outputs is provided in **Appendix C, Figure 8**.

- A5116 Liverpool Road northbound approach is forecast to operate over capacity during the PM peak with delays of up to 71 seconds;

FOUNTAINS ROUNDABOUT

Site Audit – Observed Issues

- High number of vehicles queueing on all signalised approaches during the PM peak;
- The tight left turn into Delamere Street and stationary cars result in traffic backing up onto the roundabout causing delays to circulatory flows; and
- The subway allows pedestrians to cross separate to traffic. However, the subways were observed to be in poor condition and not particularly attractive to pedestrians.

Site Audit – Observed Constraints and Opportunities

- The significant difference in levels within the vicinity of the junction and the access points to the subway system significantly impact on the availability of land surrounding the junction. Therefore opportunities for carriageway widening are limited without major works.

PHOTOSET 5: FOUNTAINS ROUNDABOUT

Model Outputs

Issues identified following further analysis of the future year SATURN model forecasts are detailed below, a summary of the outputs is provided in **Appendix C, Figure 5**.

- The left turn movement from the A5268 eastbound to Liverpool Road is forecast to operate over capacity during both peak periods experiencing approximately 80 seconds of delay;
- The right and ahead turn from the A5268 westbound are forecast to operate over capacity during the 2030 AM peak period experiencing approximately 76 seconds of delay; and
- The left turn movement from the Liverpool Road approach is forecast to operate over capacity during the AM peak.

HOOLE ROAD CORRIDOR – HAMILTON STREET TO FAULKNER STREET

Site Audit – Observed Issues

- On street parking causes congestion along the corridor route as carriageway width is limited and vehicles must slow down to negotiate their way past. This issue is further exacerbated when buses have move out into the middle of the road to pass parked vehicles effectively stopping traffic in the opposite direction;
- A number of bus stops along the route cause congestion in a similar way to the parked cars identified above;
- Signalised pedestrian crossing facilities are regularly called, thus contributing to delay and queueing within the corridor;
- Right turn manoeuvres into Faulkner Street can stop traffic travelling eastbound along the corridor. Faulkner Street benefits from shops and local amenities and vehicles completing a right turn are regular; and
- Cracked flags along pedestrian footways adjacent to the carriageways suggest vehicles pull onto kerbs and park illegally resulting in possible delay to vehicles. As a result of the number of Hotels and Restaurants and bars along the Hoole Road corridor, it is reasonable to assume that this occurs when people are being picked up / dropped off.

Site Audit – Observed Constraints and Opportunities

- Narrow carriageway;
- Local amenities and on street parking facilities;
- Availability of land either side of the carriageway due to close proximity of properties; and

- The Hoole Road corridor forms a main bus route into and out of Chester from the east of the city.

PHOTOSET 3: HOOLE ROAD CORRIDOR

Model Outputs

Issues identified following further analysis of the future year SATURN model forecasts are detailed below, a summary of the outputs is provided in **Appendix C, Figure 3**.

- The right turn movement from Westminster Road is forecast to be approaching capacity in both the AM and PM peak periods;
- The westbound ahead movement at the pedestrian crossing adjacent to Faulkner Street is forecast to be approaching capacity with delays of 37 seconds during the AM peak period; and
- Both turning movements from Newton Lane are forecast to operate at or slightly over capacity during the PM peak with forecast delays of approximately 82 seconds.

A5268 UNION STREET / A5268 LOVE STREET

Site Audit – Observed Issues

- Foregate Street / Love Street signalised junction does not appear to be co-ordinated with the left turn movement onto Love Street from Union Street, resulting in large queues of vehicles along Love Street back from its junction with Foregate Street observed during the AM peak;
- The carriageway for the turn from the A5268 Union Street eastbound to the A5268 Love Street is too narrow to allow two way flow of buses resulting in the need for a shuttle operation; and
- Tight layout of the junction reduces vehicle speeds significantly when turning left or right into the A5268 Love Street.

Site Audit – Observed Constraints and Opportunities

- Limited space available due to narrow footways and proximity of Grosvenor Park south of the junction.

PHOTOSET 9: A5286 UNION STREET / A5268 LOVE STREET

Model Outputs

Issues identified following further analysis of the future year SATURN model forecasts are detailed below, a summary of the outputs is provided in **Appendix C**, **Figure 9**.

- All exiting movements from the A5268 Union Street Eastbound are forecast to experience significant delays of 121 and 237 seconds in both the AM and PM peaks respectively;

- Peak queues for the junction are forecast to be experienced on the A5268 Union Street Eastbound approach of 40 PCUs; and
- The right turn movement from the A5268 Union Street westbound is forecast to operate over capacity during the PM peak experiencing an average delay of 360 seconds.

GREEN LANE / A41 RING ROAD

Site Audit – Observed Issues

- Vehicles performing u-turns using the southbound right hand turn pocked conflicted with vehicles travelling left out of Green Lane;
- Drivers fail to fully utilise the full slipway provided for left turn movements from Green Lane onto A41; and
- Poor road markings in the central island results in the right turn movements into Green Lane blocking those wishing to complete the right turn from Green Lane

Site Audit – Observed Constraints and Opportunities

- Some vehicle speeds were noted as being significantly higher than the average of most cars indicating potential safety issues;
- Large grass verges suggesting availability of space if widening is required; and
- Trees within vicinity of the junction may have preservation orders.

PHOTOSET 10: GREEN LANE / A41 RING ROAD

Model Outputs

Issues identified following further analysis of the future year SATURN model forecasts are detailed below, a summary of the outputs is provided in **Appendix C**, **Figure 10**.

- All movements from the A41 Greenfield Lane eastbound are forecast to experience significant delay of 515 seconds during the AM peak; and
- The right turn movement from the A56 southbound is forecast to operate over capacity during both peak periods experiencing delays of approximately 211 seconds.

4. PROPOSED SCHEMES

4.1 Introduction

4.1.1 Based on the issues and opportunities identified in the previous chapter, AECOM have developed a concept scheme for each location. This chapter identifies the proposed concept scheme and provides a description, review of the scheme benefits, consideration of key risks and issues.

4.1.2 The concept schemes have been developed through an iterative process of design and capacity testing and are based on information known at this early stage of the project.

4.1.3 Draft concept designs for all of the pinch point locations were included in the AECOM draft report *Congestion Relief – Pinch Points* issued on 25th September 2015 to CW&C officers for initial comment and input. Comments from CW&C officers pertaining to the concept designs were received on 30th September 2015 and the concept designs were revised as appropriate.

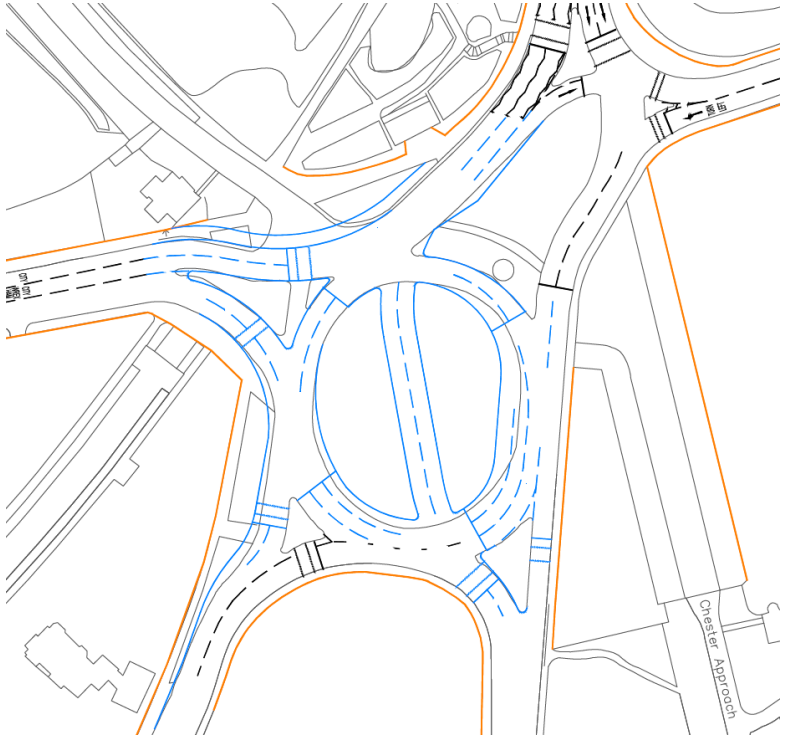
4.1.4 As detailed further in this chapter, a workshop with AECOM and CW&C officers was held on 23rd October 2015 to understand each of the schemes at a local level, within a wider context and a strategic level.

4.2 Proformas

4.2.1 A two page proforma has been developed for each scheme location. The scheme proforma includes the concept design, a brief description, outline benefits, key risks and issues. A high level cost estimate is also provided which is included at this stage to provide an order of magnitude. Further costings work will be required. It is important to note key risks such as but not limited to; the draft schemes are based on OS mapping, locations of statutory undertakers equipment is unknown, drainage assessments are not available, 3rd party land costs are unassessed.

4.2.2 Full plans of each proposed concept scheme are presented within **Appendix D** of this report.

4.2.3 The junction modelling results are discussed after the proformas.

OVERLEIGH ROUNDABOUT	DESCRIPTION	BENEFITS	KEY RISKS/ ISSUES
 Indicative, for further development See Drawing Number 60334355_P_SK001	The concept scheme proposes to close the Curzon Park North arm to provide additional capacity. An additional internal link and circulatory lanes are provided for extra capacity. Concept scheme designed to complement existing roundabout layout by providing additional capacity at a reasonable costs/benefit, within existing site constraints, compared to other discounted schemes.	Simplification of northbound movements into Chester. Complements existing highway network. Increase in capacity for circulatory lanes. Delays / interruptions to traffic during construction period would be kept to a minimum in comparison to other discounted schemes (See Technical Note in **Appendix E**).	Requirement for 3rd party land. Design based on OS Data. Scheme subject to further design iterations, capacity assessments, checks and road safety audits. Impact to statutory undertakers equipment unknown. High level costings (with a number of items such as drainage / stats / earthworks excluded) only at this stage based on certain assumptions and subject to further refinement. Possible Tree Protection Orders. Further consideration to be given to Curzon Park North access requirements and potential for left turn out left turn in arrangement for overall capacity improvements. Potential archaeological constraints. See also Appendix D
High Level Cost Estimate: £910,000 - £1,700,000 *See key assumptions and exclusions / further assessment required			

SITE LOCATION PLAN

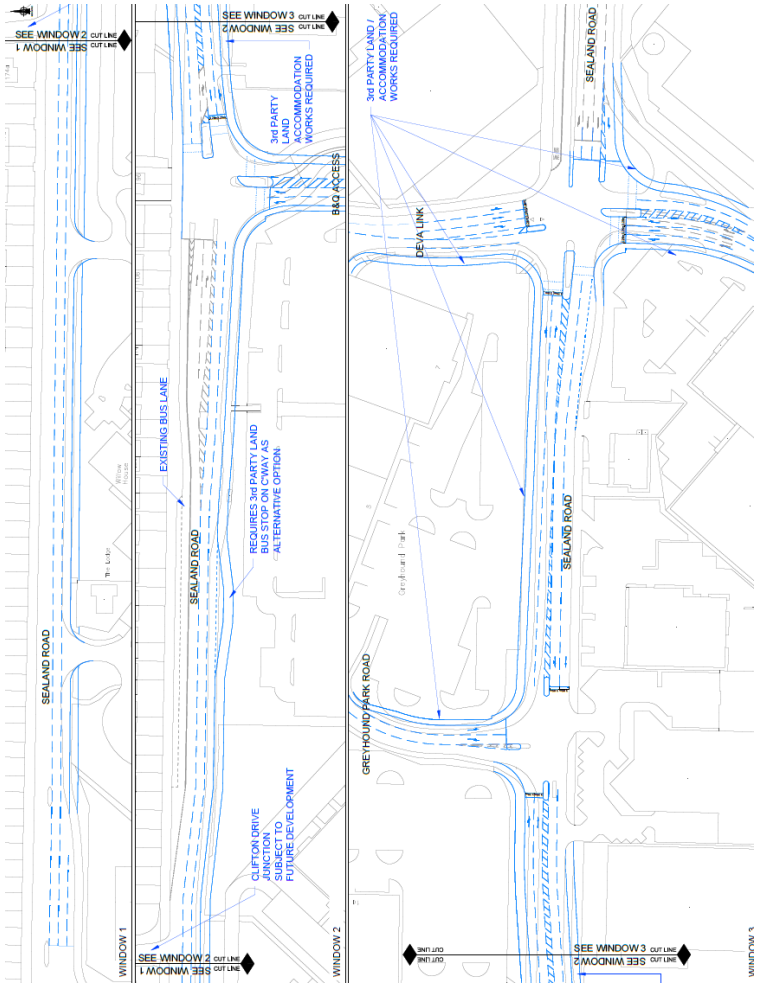
LOOKING SOUTH FROM GROSVENOR ROAD APPROACH

LOOKING SOUTH FROM LACHE LANE EXIT

LOOKING WEST TOWARDS HOUGH GREEN

LOOKING SOUTH TOWARDS WREXHAM ROAD

LOOKING SOUTH TOWARDS WREXHAM ROAD

SEALAND ROAD	DESCRIPTION	BENEFITS	KEY RISKS / ISSUES
 Indicative, for further development See Drawing Number 60334355_P_SK002	Concept scheme proposes carriageway widening to Sealand Road allowing for two lanes westbound from Bumper's Lane through to Sovereign Way and two lanes eastbound from B&Q Access to Bumper's Lane. Increase in left turn and right turn capacity on Deva Link, Greyhound Park Road, Bumpers Lane and B&Q access also provided. Scheme proposes to upgrade facilities for pedestrians and cyclists throughout.	Scheme aims to increase capacity at this section of Sealand Road therefore reducing delay and improving noise and air quality within the area. Improvements to cycle and pedestrian facilities and connectivity. Opportunities to integrate and future proof scheme for possible Chester Western Relief Road (CWRR). Potential to upgrade bus priority measures along the corridor.	Design based on OS Data. Requires 3rd Party Land. Design subject to potential CWRR requirements, junction arrangements and traffic flows at the Sealand Road / Deva Link junction. no consideration has been given to future proofing the junction at this time if CWRR is realised. Scheme subject to further design iterations, capacity assessments, checks and road safety audits. Impact to statutory undertakers equipment unknown and likely to have significant costs. High level costings only (with a number of items such as drainage / stats / earthworks excluded) at this stage based on certain assumptions and subject to further refinement. Further consideration needs to be given to likely accommodation works, private business access arrangements and associated impacts/costs. See also Appendix D
High Level Cost Estimate: £2,225,000 - £4,500,000 *See key assumptions and exclusions / further assessment required			

SITE LOCATION PLAN

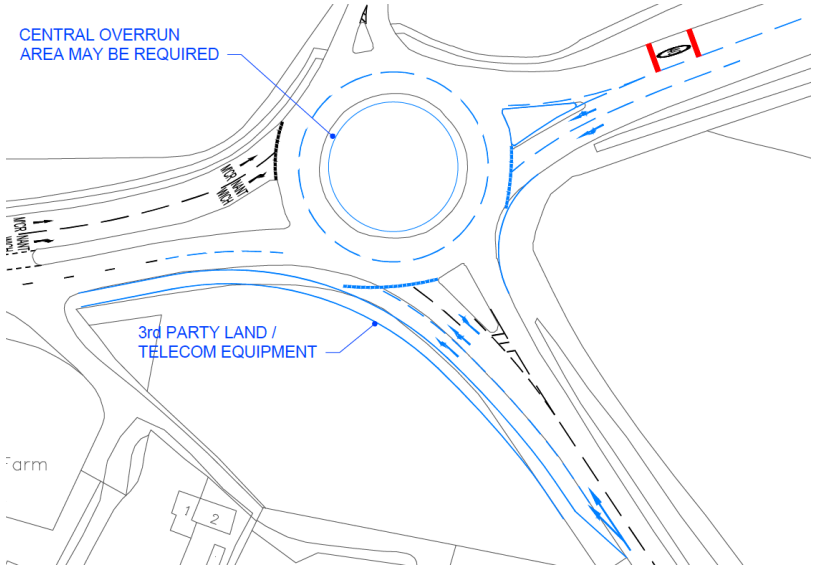
LOOKING EAST FROM GREYHOUND PARK ROAD / SEALAND ROAD JUNCTION

LOOKING NORTH TOWARDS GREYHOUND PARK ROAD

LOOKING WEST FROM SEALAND ROAD / B&Q JUNCTION

LOOKING WEST FROM SEALAND ROAD / DEVA LINK JUNCTION

LOOKING NORTH FROM GREYHOUND PARK ROAD / SEALAND ROAD

A51 / A54 TARVIN ROUNDABOUT	DESCRIPTION	BENEFITS	KEY RISKS / ISSUES
 Indicative, for further development See Drawing Number 60334355_P_SK012	Concept scheme shows a minor works option for capacity improvements at the existing roundabout junction. The southern arm is widened to provide three entry lanes. Two lanes are provided at eastern entry arm.	Scheme proposed is aimed at reducing existing queues and delays in the peak hours whilst maintaining free flow in the inter peak periods.	Design based on OS Data. Requires 3rd Party Land. Scheme subject to further design iterations, capacity assessments, checks and road safety audits. Impact to statutory undertakers equipment unknown. High level costings only (with a number of items such as drainage / stats / earthworks excluded) at this stage based on certain assumptions and subject to further refinement. See also Appendix D
High Level Cost Estimate: £465,500 to £865,000 *See key assumptions and exclusions / further assessment required			

SITE LOCATION PLAN

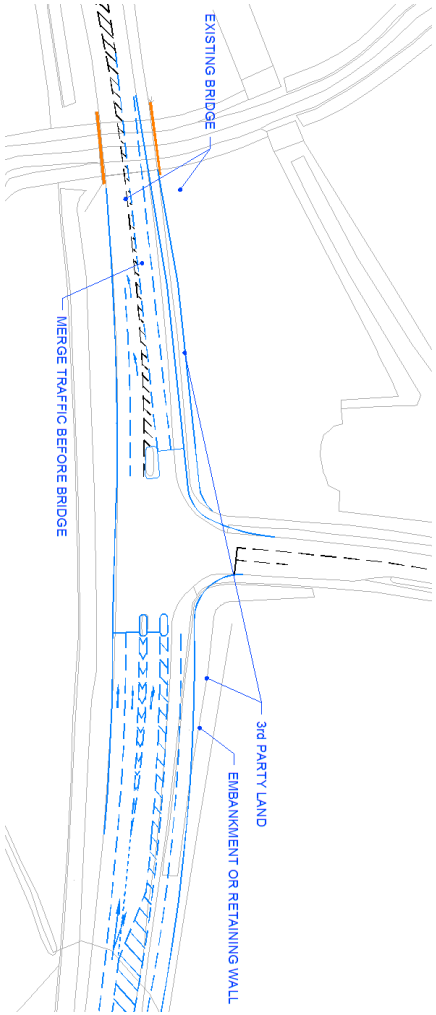
LOOKING SOUTH-EAST TOWARDS A51 APPROACH

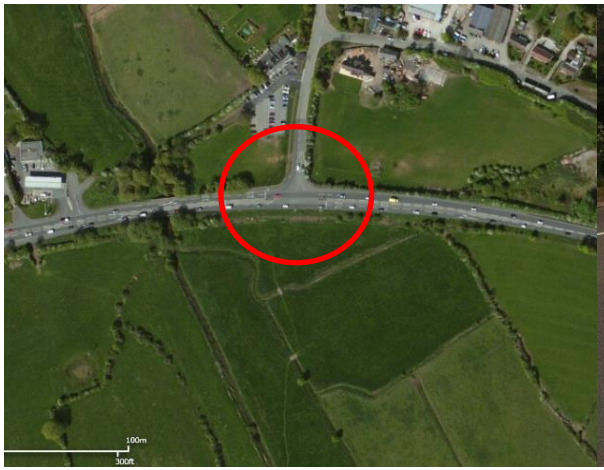
LOOKING EAST FROM A54 EASTBOUND APPROACH

LOOKING NORTH-WEST FROM A51 APPROACH

LOOKING WEST TOWARDS A54 EASTBOUND APPROACH

LOOKING WEST FROM A54 WESTBOUND APPROACH

A51 TARVIN ROAD / B5132 BARROW LANE	DESCRIPTION	BENEFITS	KEY RISKS / ISSUES
 Indicative, for further development See Drawing Number 60334355_P_SK007 and 011	The concept scheme aims to provide further capacity at this junction via additional lanes provided by carriageway widening into 3rd party land. On Tarvin Road westbound there are two ahead only lanes provided which merge into one lane prior to the existing bridge and one dedicated right turn only lane provided. On Tarvin Road eastbound the existing left turn lane becomes ahead and left and the existing carriageway beyond the junction is widened to provide two eastbound lanes.	The scheme provides additional lanes in order to improve capacity and reduce delay in the peak periods.	Based on OS Data. Requirement for 3rd party land. Merge lengths are below DMRB recommended length of 100m as a consequence of existing bridge. Proposed embankment or retaining wall extents unknown. Scheme subject to further design iterations, capacity assessments, checks and road safety audits. Impact to statutory undertakers equipment unknown. However utilities are known to be within the land adjacent to the A51 High level costings only (with a number of items such as drainage / stats / earthworks excluded) at this stage based on certain assumptions and subject to further refinement. See also Appendix D
High Level Cost Estimate: £920,000 to £1,705,000 *See key assumptions and exclusions / further assessment required			



SITE LOCATION PLAN

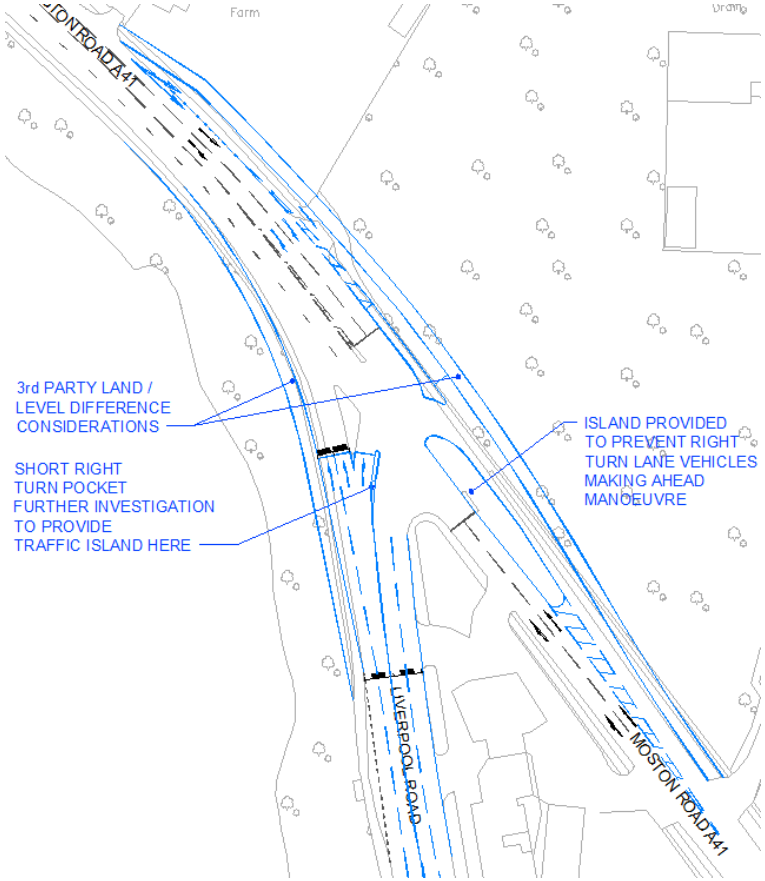
LOOKING SOUTH FROM BARROW LANE

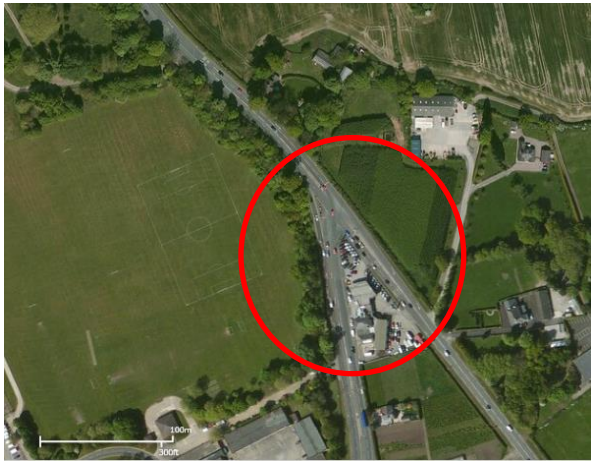
LOOKING WEST TOWARDS A51 EASTBOUND APPROACH

LOOKING EAST TOWARDS A51 EASTBOUND APPROACH

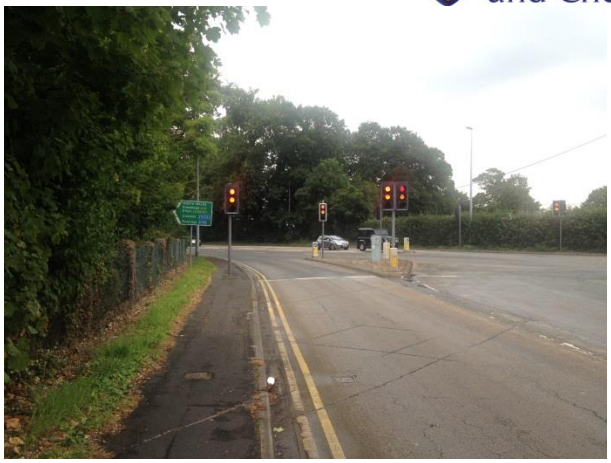
LOOKING NORTH TOWARDS BARROW LANE APPROACH

LOOKING EAST FROM A51 EASTBOUND APPROACH

A41 / A5116 MOSTON ROAD JUNCTION	DESCRIPTION	BENEFITS	KEY RISKS / ISSUES
 Indicative, for further development See Drawing Number 60334355_P_SK006	The concept scheme proposes to provide two southbound right turn lanes and one southbound ahead only lane only on Moston Road. This is provided via carriageway widening into the adjacent land. Two northbound lanes on Liverpool Road are also provided. Islands are provided as additional safety measures.	The concept scheme provides capacity improvements at the junction reducing delays and queues at the A41 right turn on Liverpool Road in the AM peak. Improvement in noise and air quality as a consequence of reduced delays. Proposed improvement to existing pedestrian facilities.	Requirement for 3rd party land believed to be MOD or Chester Zoo. Based on OS Data. Scheme subject to further design iterations, capacity assessments, checks and road safety audits. Impact to statutory undertakers equipment unknown. High level costings only (with a number of items such as drainage / stats / earthworks excluded) at this stage based on certain assumptions and subject to further refinement. See also Appendix D
High Level Cost Estimate: £825,000 to £1,535,000 *See key assumptions and exclusions / further assessment required			



SITE LOCATION PLAN



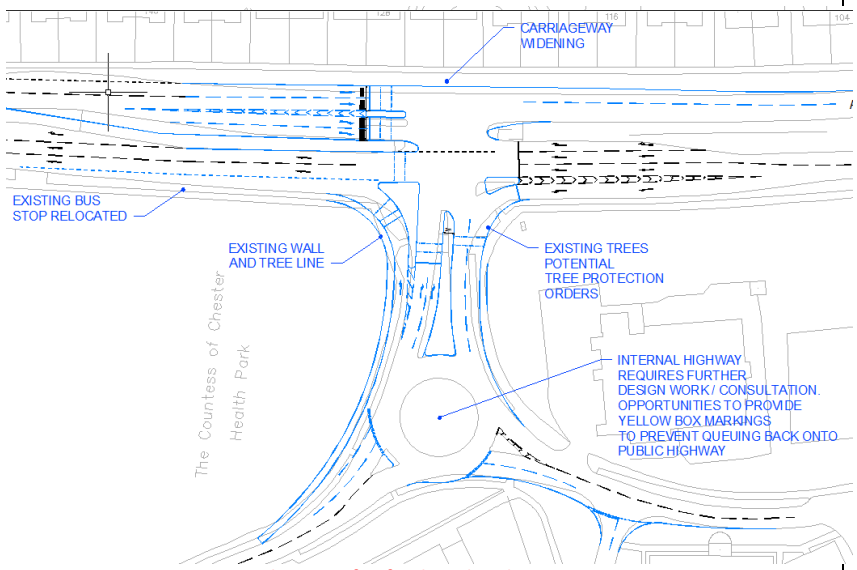
LOOKING NORTHBOUND ALONG LIVERPOOL ROAD

LOOKING SOUTH TOWARDS MOSTON ROAD

LOOKING SOUTH ON LIVERPOOL ROAD

LOOKING NORTH TOWARDS MOSTON ROAD

LOOKING NORTH TOWARDS MOSTON ROAD

LIVERPOOL ROAD / VIVIENNE SMITH STREET	DESCRIPTION	BENEFITS	KEY RISKS / ISSUES
 Indicative, for further development See Drawing Number 60334355_P_SK008	On Liverpool Road eastbound an additional right turn lane is proposed by way of existing central reservations narrowing. Liverpool Road westbound carriageway is widened to provide two lanes. The carriageway widening is proposed on the Hospital access arm in order to improve capacity. Two dedicated right turn lanes are proposed and one left turn lane onto Liverpool Road. The Pedestrian refuge island is amended to become 3m wide with controlled crossing points. The internal roundabout is amended and approaches are widened to improve capacity.	Additional right turn lane on Liverpool Road eastbound and carriageway widening at hospital access arm will provide improved capacity and reduced delay at the junction. Improved pedestrian crossing facilities.	Based on OS Data. Hospital land required Impact on existing trees. Proposed internal roundabout layout subject to further capacity test and designs. Scheme subject to further design iterations, capacity assessments, checks and road safety audits. Impact to statutory undertakers equipment unknown. High level costings only (with a number of items such as drainage / stats / earthworks excluded) at this stage based on certain assumptions and subject to further refinement. Roundabout outside of adopted highway boundary and further consultation required with 3rd parties. See also Appendix D
High Level Cost Estimate: £995,000 to £1,850,000 *See key assumptions and exclusions / further assessment required			

SITE LOCATION PLAN

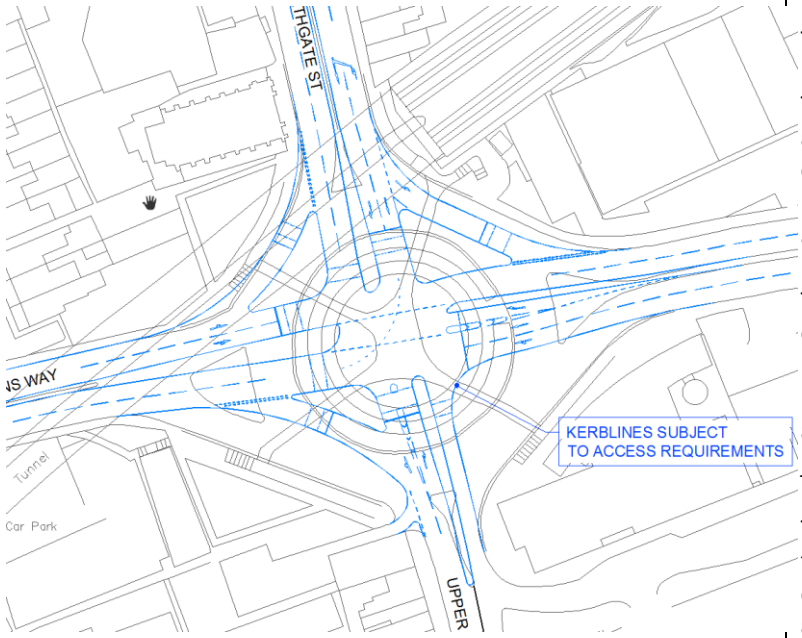
LOOKING NORTH TOWARDS LIVERPOOL ROAD SOUTHBOUND APPROACH

LOOKING WEST TOWARDS HOSPITAL ACCESS

LOOKING SOUTH-WEST TOWARDS LIVERPOOL ROAD NORTH BOUND APPROACH

LOOKING NORTH TOWARDS LIVERPOOL ROAD SOUTHBOUND APPROACH

LOOKING SOUTH ALONG LIVERPOOL ROAD SOUTHBOUND

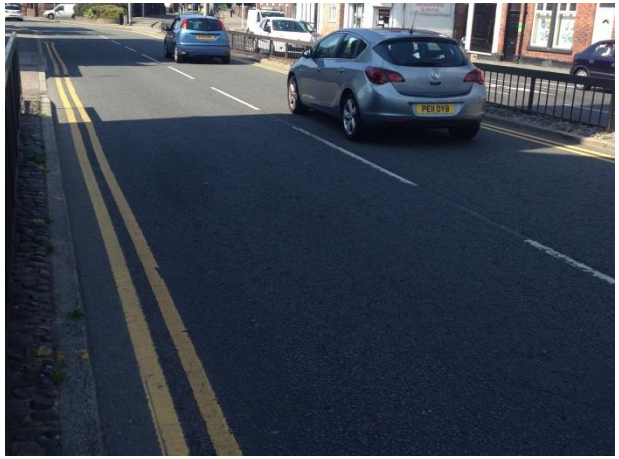
FOUNTAINS ROUNDABOUT	DESCRIPTION	BENEFITS	KEY RISKS / ISSUES
 Indicative, for further development See Drawing Number 60334355_P_SK005	The scheme, as originally proposed in the Chester Transport Strategy, seeks to address issues of road congestion, air quality and pedestrian and cycle safety at this location. The existing signal controlled roundabout is redesigned to provide a restricted movement four arm signal controlled junction. The existing subway facilities for pedestrians and cyclists would be removed and at grade crossing points would be provided.	Significant improvements to pedestrian and cycle route connectivity. Reduction in delay and congestion potentially leading to a reduction in pollution and improvements to air quality. Improvement to existing pedestrian crossing facilities. Conversion of roundabout to signal controlled crossroads releases land for public realm and streetscape improvements.	High profile scheme. Scheme subject to further design iterations, capacity assessments, checks and road safety audits. Impact to statutory undertakers equipment unknown. As noted in the Chester Transport Strategy, key inter-dependencies are Northgate development and Gorse Stacks Interchange, pedestrianisation schemes and resultant vehicle movements and Western relief road. Potential archaeological constraints. Buildibility and costs. As currently modelled, the design does not improve capacity for general traffic.
Not costed			

SITE LOCATION PLAN

LOOKING WEST TOWARDS ST MARTIN'S WAY

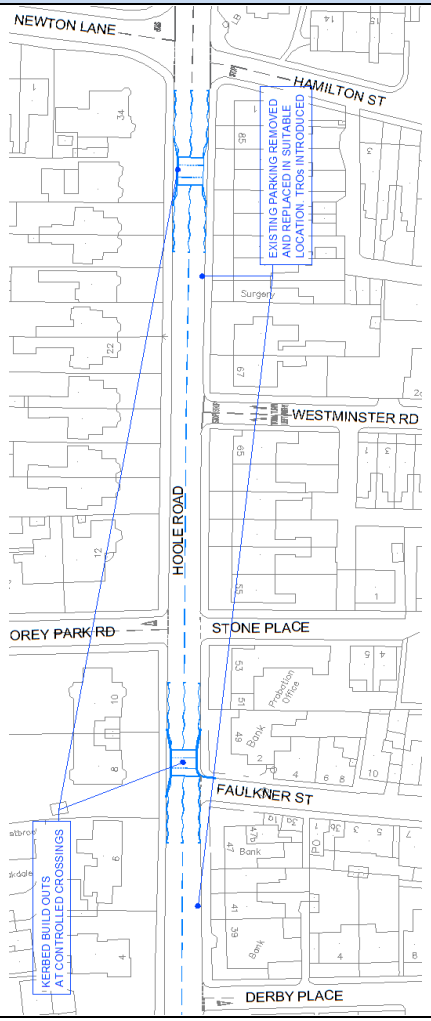
LOOKING EAST FROM UPPER NORTHGATE STREET APPROACH

LOOKING SOUTH FROM LIVERPOOL ROAD APPROACH



LOOKING NORTH FROM OUTSIDE NORTHGATE CHURCH

LOOKING EAST TOWARDS NORTHGATE ARENA

HOOLE ROAD CORRIDOR	DESCRIPTION	BENEFITS	KEY RISKS / ISSUES
	The proposed scheme consists of basic improvements and upgrades to existing pedestrian facilities. Removal of existing on street parking bays and introduction of Traffic Regulation Orders (TROs)	Upgrade to existing pedestrian facilities, enhancements to street scene. Potential for improved traffic flow on Hoole Road.	Removal of on street parking and amendments to existing TROs. Further consideration to be given to revising movements on existing streets in order to reduce right turn movements (which cause delay) on Hoole Road. Public / local business objections to proposals unless clear benefits can be demonstrated. Interaction and opportunities exist with potential fifth P&R site at northern end of Hoole Road and wider NE Gateway proposals See also Appendix D
High Level Cost Estimate: £87,500 to £162,500 *2 x puffin crossings			

SITE LOCATION PLAN

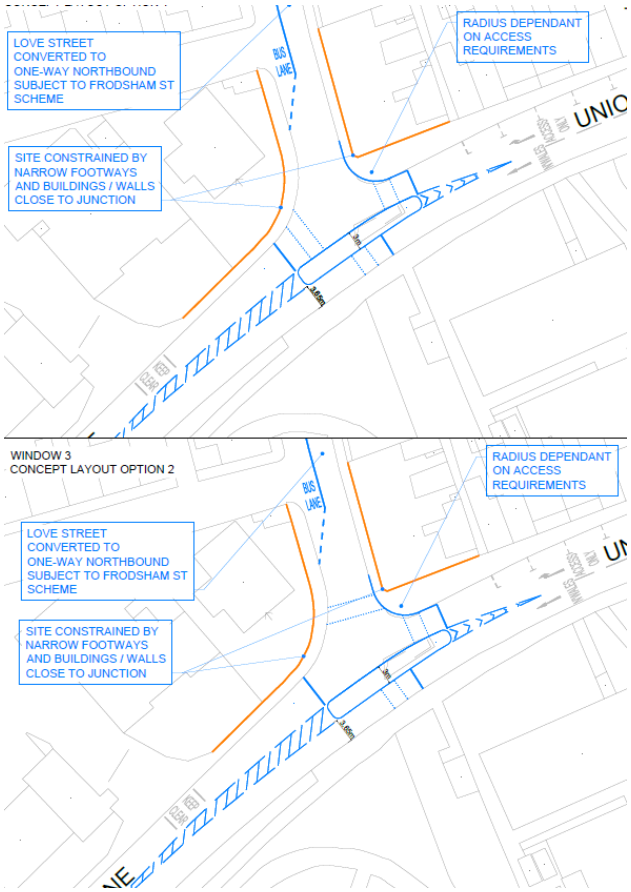
LOOKING SOUTH-WEST ALONG HOOLE ROAD FROM NEWTON LANE

LOOKING SOUTH-WEST ALONG HOOLE ROAD TOWARDS FAULKNER STREET

LOOKING NORTH-EAST ALONG HOOLE ROAD

LOOKING SOUTH-WEST TOWARDS WESTMINSTER ROAD

LOOKING SOUTH-WEST TOWARDS WESTMINSTER ROAD

UNION STREET / LOVE STREET	DESCRIPTION	BENEFITS	KEY RISKS / ISSUES
 Indicative, for further development See Drawing Number 60334355_P_SK009	Two schemes designed on the basis of Love Street becoming one-way northbound in the future. Amendments to the existing pedestrian refuge island on Union Street with Option 1 removing the crossing point on Love Street.	Pedestrian safety improved. Reduction in vehicular approaches to junction improves capacity. Pedestrian facilities upgraded and extended / wider pedestrian refuge island proposed. Additional bus facilities can be provided on Love Street.	Based on OS Data. Reliant on implementation of one-way northbound scheme on Love Street. Dependant of future of Foregate Street Topographical survey required to confirm lane widths can be achieved. Scheme subject to further design iterations, checks and road safety audits. Impact to statutory undertakers equipment unknown. High level costings only (with a number of items such as drainage / stats / earthworks excluded) at this stage based on certain assumptions and subject to further refinement. See also Appendix D
High Level Cost Estimate: £135,000 - £250,000 *See key assumptions and exclusions / further assessment required			

SITE LOCATION PLAN

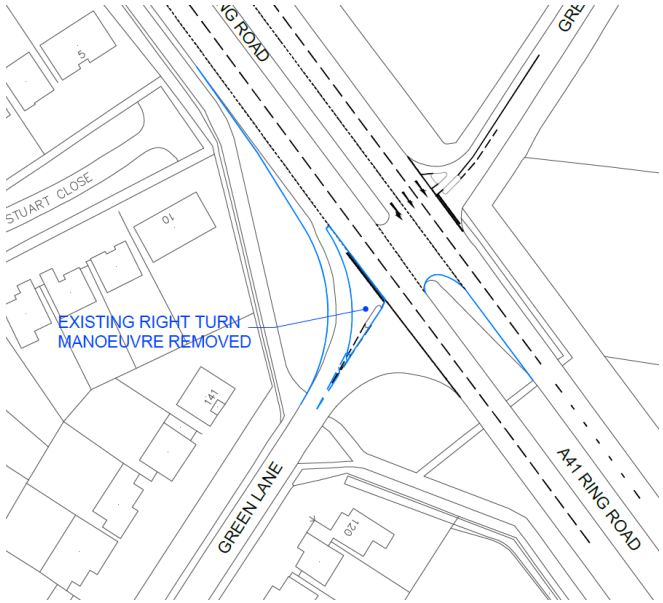
LOOKING NORTH EAST ALONG VICARS LANE

LOOKING NORTH TOWARDS LOVE STREET S/B APPROACH

LOOKING EAST TOWARDS UNION STREET APPROACH

VEHICLE DETECTION LOOPS

LOOKING SOUTH-EAST TOWARDS VICARS LANE APPROACH

GREEN LANE / A41 RING ROAD	DESCRIPTION	BENEFITS	KEY RISKS / ISSUES
 Indicative, for further development See Drawing Number 60334355_P_SK010	Existing Green Lane (south) right turn onto A41 Ring Road removed.	Reduction in potential road traffic collisions. Short term implementation.	Based on OS Data. Scheme subject to further design iterations, checks and road safety audits. Impact to statutory undertaker's equipment unknown. High level costings only (with a number of items such as drainage / stats / earthworks excluded) at this stage based on certain assumptions and subject to further refinement. See also Appendix D.
High Level Cost Estimate: £60,000 - £111,000 *See key assumptions and exclusions / further assessment required			

SITE LOCATION PLAN

LOOKING NORTH-EAST FROM GREEN LANE

LOOKING SOUTH-WEST TOWARDS GREEN LANE

LOOKING NORTH ALONG A41 SOUTHBOUND APPROACH

LOOKING NORTH ALONG A41 NORTHBOUND FROM GREEN LANE

LOOKING SOUTH ALONG A41 SOUTHBOUND APPROACH TOWARDS JUNCTION

4.3 Further Discussions with Cheshire West and Chester Council

4.3.1 As part of the project development, further discussions were held with CW&C officers on the 23rd October 2015 to discuss the outcomes of the final traffic model outputs. As a result of these discussions the following locations were, at CW&C request, removed from the final list of schemes.

FOUNTAINS ROUNDABOUT

Initial traffic modelling highlighted the current junction provided the optimum junction layout as any proposed scheme significantly reduced capacity at the junction. Additionally the likely impact of traffic associated with the Northgate development, which will have a significant impact upon the levels / routing of traffic on Chester's Ring Road means any schemes developed as part of these works would almost certainly be superseded before any further detailed design works could be completed. This will be examined as part of a Transport Assessment accompanying the planning application for the project.

HOOLE ROAD CORRIDOR

Assessment of the proposed scheme on the Hoole Road corridor identified the existing residential nature of Hoole Road which does did not allow increases in capacity without significant costs. Furthermore, even if the proposed schemes were developed the ultimate pinch point along the corridor, Hoole Road Bridge, would result in a significant delay along the corridor weakening the case for any further works. For this reason alone and given the capacity constraints caused by Hoole Road Bridge the Hoole Road Corridor was removed from this study. It is also understood that the Hoole Road corridor is likely to be assessed as part of the wider access strategy to support development opportunities for what is known ast the 'North Eastern Gateway' with plans likely to come forward in 2016.

GREEN LANE / RING ROAD

The ultimate aim of this scheme is to reduce the potential accident risk at a large junction which is forecast to experience a significant increase in traffic volumes and potential conflicts as it currently allows all vehicular movements. Following junction capacity tests it was concluded that the proposed scheme at Green Lane offered minimal improvements in capacity and therefore the decision was made to remove it from this study.

4.3.2 In addition to removing the three aforementioned schemes from the final list of Pinch Point locations to be taken forward, a number of improvements, sense checks, clarifications and ultimately approval of the final schemes were obtained from CW&C representatives at the meeting.

4.3.3 Whilst the next section of this chapter presents a summary of the final model outputs for a single scheme at each identified location (minus the schemes identified above), in reality several

schemes have been developed for each location. This point is of particular relevance at Overleigh Roundabout, which due to a number of constraining and forecast operational issues resulted in a significant number of schemes being developed and discounted.

4.3.4 Therefore, given the strategic importance of Overleigh roundabout and to inform future schemes / works as part of potential planning applications **Appendix E** presents a technical note detailing the discounted schemes and how the final scheme has been derived. This also demonstrates the level of design developing work undertaken by AECOM before arriving at a preferred scheme design. The Technical Note also presents points of detail on the modelling to ensure any future works are fully informed.

4.3.5 Further details of all elements of the traffic modelling completed at any of the identified locations are available on request, but have not been included in this paper.

4.4 2030 Do Nothing vs 2030 Do Something Modelling

MODELLING METHODOLOGY

4.4.1 In order to quantify the capacity benefits of the proposed pinch point schemes each scheme has been assessed within the appropriate standalone traffic modelling software for a Do-Nothing and Do-Something Scenario. In addition to identifying the forecast benefits of the proposed schemes in 2030 this approach also forecasts what traffic conditions at each of the locations will be like if no schemes are delivered.

4.4.2 All measurements and Geometries for the Do-Nothing scenarios have been informed by OS mapping data obtained from CW&C. The various pinch point schemes have been developed based on the OS mapping data to ensure measurements are realistic and as accurate as possible.

4.4.3 At request from CW&C all schemes have been developed and assessed independent of any benefits which will be provided by the newly installed UTC system. Therefore each scheme will provide additional capacity to the existing network and not rely on the UTC system. This system is being introduced to a number of locations across Chester, and the benefits the system can bring to performance is still to be determined in practice, and should be closely monitored.

4.4.4 All traffic flows for the standalone junction modelling have been taken from CW&Cs strategic SATURN model. An initial sense check of the SATURN model identified due to the strategic nature of the SATURN model two locations were not as well represented within the model as would be required for the providing turn counts for the Pinch Point Standalone Modelling. These locations were as follows;

- *A548 Sealand Road / B&Q Junction* - The B&Q junction was represented within the model as a signalised junction in order to replicate delay along the corridor. However, traffic flows from or to B&Q were included within the Industrial Estate zone, therefore no turning count information at the junction was available.
- *Tarvin Roundabout* – the junction was located within the buffer network of the existing SATURN model. Therefore, no turn count information could be extracted from the model.

4.4.5 To provide the most representative traffic flows for the assessment of the pinch point schemes the SATURN model was updated in order to address the aforementioned points. **Appendix E** of this report presents a Technical Note detailing the update of the SATURN model and how the two points were addressed.

OVERLEIGH ROUNDABOUT

4.4.6 Analysis of the junction has been undertaken using the LinSig V3 computer programme which is used for forecasting capacities, queue lengths, delays and signal timings at signalised junctions. The main indicator of performance within LinSig is the Practical Reserve Capacity (PRC) value, this value is a measure of how much additional traffic could pass through a junction whilst maintaining a Maximum Degree of Saturation (MoS) of 90% on all lanes. A value closer to 0% indicates the junction is approaching or operating at capacity, however within some busy urban networks negative vales can be considered acceptable. In addition to the PRC value the Mean Maximum Queue (MMQ) is an important indicator of performance. A summary of the model outputs for scheme 1 are presented in Table 4.1 below.

TABLE 4-1: SUMMARY OF MODEL OUTPUTS FOR OVERLEIGH ROUNDABOUT

		Practical Reserve Capacity (PRC)	Total Delay Over All Lanes (pcu/hrs)	Highest Mean Max Queues (PCUs) at Arm:	
AM	2030 Do-Nothing	-309.4%	401.66	Lache Lane	300.8
	2030 With-Scheme	-0.6%	57.45	A483 Chester Westbound	25.8
	Benefit	308.08%	344.21		
PM	2030 Do-Nothing	-130.62%	386.53	Wrexham Road Ahead	168.9
	2030 With-Scheme	-0.9%	53.73	A483 Chester Westbound	28.0
	Benefit	129.72%	332.80		

4.4.7 If Overleigh Roundabout corridor was to remain as per the existing layout the PRC of the three junctions in 2030 is forecast to be -309.4% in the AM peak hour and -130.62% in the PM peak

hour. The proposed scheme is forecast to deliver significant improvements in PRC values with an increase of 308.8% to -0.6% and an increase of 129.72% to -4.2% in the PM peak.

4.4.8 The 2030 Do-Nothing scenario is forecast to experience a total delay of 401 hours in the AM peak hour and 386 in the PM peak hour. The proposed scheme is forecast to reduce total delay across all lanes during the AM peak a decrease of 344 hours to 57 hours. The PM peak is also forecast to experience a reduction in total delay a reduction of 53 hours.

4.4.9 The location of highest mean max queues are forecast to change within both peak periods as the proposed scheme is forecast to reduce the queue lengths on all approaches and so change the location of the highest MMQ. Queue lengths in the both the AM and PM peak would impact on adjacent junctions and may even alter drivers route choices across Chester network. Importantly the highest MMQ is forecast to reduce by 275 PCUs in the AM peak and 141 PCUs during the PM peak. The forecast queue lengths with the scheme could be accommodated on the highway network without impact further delay on adjacent junctions.

4.4.10 In summary whilst the PRC values are forecast to remain negative the reductions in delay and queueing are significant and are forecast to offer real improvements at the junction. Importantly the improvements would reduce the possibility of the existing junction impacting further delays on the wider network.

SEALAND ROAD

4.4.11 A summary of the model outputs for scheme 2 are presented in Table 4.2 below. If the Sealand Road corridor was to remain as per the existing layout the PRC of the three junctions in 2030 is forecast to be -311.1% in the AM peak hour and -29.2% in the PM peak hour. The proposed scheme is forecast to deliver significant improvements in PRC values with an increase of 308.4% to -2.7% and an increase of 25% to -4.2% in the PM peak.

TABLE 4-2: SUMMARY OF MODEL OUTPUTS FOR SEALAND ROAD

		Practical Reserve Capacity (PRC)	Total Delay Over All Lanes (pcu/hrs)	Highest Mean Max Queues (PCUs)	
AM	**2030 Do-Nothing**	-311.1	525.04	Deva Link southbound Ahead and Left Turn	271.5
	2030 With-Scheme	-2.7%	69.52	A548 Sealand Road Westbound approach to Deva Link ahead right	18.1
	Benefit	308.4	455.52		
PM	**2030 Do-Nothing**	-29.2%	149.02	Bumper's Lane ahead right	83.6
	2030 With-Scheme	-4.2%	68.31	Bumper's Lane ahead right	25.3
	Benefit	25%	80.71		

4.4.12 The 2030 Do-Nothing scenario is forecast to experience a total delay of 525 hours in the AM peak hour and 149.02 in the PM peak hour. The proposed scheme is forecast to reduce total delay across all lanes during the AM peak a decrease of 455.52 hours to 69.52 hours. The PM peak is also forecast to experience a reduction in total delay a reduction of 69.98 hours.

4.4.13 The location of highest mean max queues are forecast to change within the AM peak as the proposed scheme is forecast to reduce the queue lengths on all approaches and so shift the location of the highest MMQ. During the PM peak the LinSig model forecasts a significant reduction in the actual MMQ but Bumper's Lane still experiences the highest MMQ.

4.4.14 In summary the proposed scheme along Sealand Road is forecast to significantly increase the capacity of each junction improving the overall operation of the corridor reducing delays and queues on all junction approaches.

TARVIN ROUNDABOUT

4.4.15 Analysis of the existing junction arrangement has been undertaken using the ARCADY 8 computer program which contains an ARCADY module within the program. The ARCADY module is used for predicting capacities, queue lengths, delays at roundabout junctions. The main indicator of performance in ARCADY is the RFC value, this value is ratio of demand to capacity for the junction. A value of 0.85 is generally considered to represent capacity rather than a value of 1. This is to allow for daily and seasonal traffic variations which may occur. The RFC value is not always the best indicator of performance at a junction and therefore both the Delay Per Passenger Car Unit (PCU) and Queue length will be analysed when discussing junction performance. A summary of the model outputs for scheme 4 are presented in Table 4.3 below.

TABLE 4-3: SUMMARY OF MODEL OUTPUTS FOR TARVIN ROUNDABOUT

		MAX (RFC)	Max Delay (s)	Max Queues (PCUs)	
AM	2030 Do-Nothing	1.34	542.66	A51 Tarporley Road Northbound	110.8
	2030 With-Scheme	0.71	8.53	A54 Holme Street	2.4
	Benefit	0.63			
PM	2030 Do-Nothing	1.44	691.23	A51 Tarporley Road Northbound	125.28
	2030 With-Scheme	0.85	16.99	A54 Holme Street	5.26
	Benefit	0.59			

4.4.16 If Tarvin Roundabout remained unchanged the standalone junction model forecasts by 2030 the junction will operate significantly over capacity with an RFC of 1.34 during the AM peak 1.44 during the PM peak hour. The proposed scheme is forecast to deliver significant improvements in the RFC values with the revised junction operating within capacity during both AM and PM peaks.

4.4.17 The 2030 Do-Nothing scenario is forecast to experience a maximum delay per PCU of approximately 9 minutes during the AM peak and 11.5 minutes during the PM peak for the left turn movement from the A51 Tarporley Road to A51 westbound. The proposed scheme is forecast to significantly reduce average delay per PCU during both peak periods.

4.4.18 The maximum queue on approach to the roundabout is forecast to significantly reduce as a result of the proposed scheme within both peak periods. The reduction in queues on the A54 results in the A54 Holme Street being forecast as experiencing the highest queue. The maximum queue

forecast with the scheme is no greater than approximately 6 PCUs. A queue of such magnitude on the A54 Holme Street approach to the junction would be considered acceptable.

4.4.19 In summary the proposed scheme at Tarvin Roundabout is forecast to significantly increase the capacity of the roundabout junction and reduce delays and queues. The proposed scheme is forecast to experience an RFC of 0.85 which is considered capacity, however the low max queue and average delay per PCU ensure the proposed junction would operate significantly better than the existing layout.

TARVIN ROAD & BARROW LANE

4.4.20 Table 4.5 below presents a summary of the 2030 forecast year Do-Minimum and without scheme model outputs. Under the Do-Nothing approach i.e. no changes are made to the junction the PRC is forecast to be -4.2% in the AM peak and -73.6% in the PM peak. The implementation of the proposed scheme is forecast to increase the PRC in the AM peak by 22.7% to +18.5%. In the PM peak the proposed scheme is forecast to increase the PRC by 57.9% to the -15.7%.

TABLE 4-4: SUMMARY OF MODEL OUTPUTS FOR TARVIN ROAD AND BARROW LANE

		Practical Reserve Capacity (PRC)	Total Delay Over All Lanes (pcu/hrs)	Highest Mean Max Queues (PCUs) at Arm:	
AM	2030 Do-Nothing	-4.2	17	Tarvin Road westbound right ahead	49.1
	2030 With-Scheme	18.5	10.05	Tarvin Road westbound right ahead	8.8
	Benefit	22.7	6.95		40.3
PM	2030 Do-Nothing	-73.6	141	Tarvin Road westbound right ahead	113.2
	2030 With-Scheme	-15.7	35.98	Tarvin Road eastbound right ahead	57.8
	Benefit	57.9	105.02		55.4

4.4.21 Total delays in a Do Nothing scenario is observed to peak during the PM peak at 141 hours. The AM Do-Nothing scenario is forecast to experience a total delay of 17 hours. The proposed scheme is forecast to significantly reduce Total Delay during the PM peak by 109 hours to 32 hours. The AM peak is forecast to result in a reduction in total delay a reduction of just 8 hours. However, whilst the forecast reduction is smaller than the PM peak but equates to just under a 50% reduction.

4.4.22 The highest mean max queue is forecast for Tarvin Road westbound right ahead in both the AM and PM peak hours, in the Do Nothing scenario. Tarvin Road westbound approach is forecast to still experience the highest MMQ during both the AM and PM peaks if the proposed scheme was implemented. However, during both peaks the scheme is forecast to reduce the MMQ significantly by up to 55.4 PCUs during the PM peak.

4.4.23 In summary the proposed scheme is forecast to significantly reduce queue lengths and delays at the signalised junction which lies on a key arterial route into Chester.

A41/A516 MOSTON JUNCTION

4.4.24 A summary of the model outputs for scheme 6 are presented in Table 4.4 below. If the A41 / A516 Moston Road junction was to remain changed the PRC in 2030 is forecast to be -22.9% in the AM peak hour and 8.3% in the PM peak hour. The proposed scheme is forecast to deliver significant improvements in PRC with an increase of 67.4% to -44.5% and an increase of 59.6% to 67.9% in the PM peak.

TABLE 4-5: SUMMARY OF MODEL OUTPUTS FOR A41/ A516 MOSTON JUNCTION

		Practical Reserve Capacity (PRC)	Total Delay Over All Lanes (pcu/hrs)	Highest Mean Max Queues (PCUs) at Arm:	
AM	2030 Do-Nothing	-22.9	130	Moston Road southbound ahead	108
	2030 With-Scheme	44.5	19.22	Moston Road southbound ahead	14.4
	Benefit	67.4	110.78		93.6
PM	2030 Do-Nothing	8.3	25	A5116 Liverpool Road Ahead	24.7
	2030 With-Scheme	67.9	18.34	A5116 Liverpool Road Ahead	10.9
	Benefit	59.6	6.66		13.8

4.4.25 The 2030 Do-Nothing scenario is forecast to experience a total delay of 130 hours in the AM peak hour and 25 hours in the PM peak hour. The proposed scheme is forecast to reduce total delay across all lanes during the AM peak, a decrease of 110.78 hours to 19.22 hours. The PM peak is also forecast to experience a reduction in total delay by 6.66 hours.

4.4.26 MMQ are forecast to benefit from significant reductions in length during both peak periods. The largest decrease in queue length is forecast during the AM peak for movements into Chester, a significant reduction of approximately 94 PCUs.

4.4.27 In summary the proposed scheme at the A41 / A516 Moston Road is forecast to significantly increase the capacity of the junction improving a key route into and out of Chester.

LIVERPOOL ROAD AND VIVIENNE SMITH STREET / HOSPITAL ACCESS

4.4.28 A summary of the model outputs for the Liverpool Road / Vivienne Smith Street junction are displayed in Table 4.6 above. During the 2030 future year the junction is forecast to operate within capacity during both peak periods with a positive PRC valve. Implementation of the proposed scheme is forecast to increase the PRC of the junction during both peak periods by up to 43%.

TABLE 4-6: SUMMARY OF MODEL OUTPUTS FOR LIVERPOOL ROAD / VIVIENNE STREET

		Practical Reserve Capacity (PRC)	Total Delay Over All Lanes (hrs)	Highest Mean Max Queues (PCUs) at Arm:	
AM	2030 Do-Nothing	18.2	25	A5116 southbound ahead right	18.2
	2030 With-Scheme	32.5	18	A5116 southbound ahead	12.3
	Benefit	14.3	7		5.5
PM	2030 Do-Nothing	23	30	A5116 southbound ahead	19.1
	2030 With-Scheme	66.0	17	A5116 southbound ahead	12.7
	Benefit	43	13		6.4

4.4.29 Total delays during the 2030 Do Nothing scenario are forecast to peak during the PM peak at 30hours delay across all lanes. The AM peak is forecast to experience 25 total hours delay across all lanes during the Do nothing scenario. With the introduction of the proposed scheme Total Delay is forecast to reduce by approximately 6 hours during the AM peak and 8 hours during the PM peak.

4.4.30 The highest mean maximum queue is observed to occur on the A5116 southbound ahead right in the AM peak and the A5116 ahead in the PM peak hour, if a do nothing approach is adopted. The AM peak is observed to have a queue of 18.2 PCUs, whilst the PM peak has a queue of 19.1 PCUs. If the proposed scheme were to be adopted the AM peak queue would be reduced to 12.3 PCUs on the A5116 southbound ahead right, whilst the PM peak would also be reduced on the A5116 southbound ahead to 12.7 PCUs.

4.4.31 The proposed scheme will deliver additional capacity, reduced delay and queueing in both peak hours periods. The benefits at the junction are less significant than some of the other locations identified. However, the junction provides access to a key piece of infrastructure within Chester,

the main Accident and Emergency department increasing the importance of improving capacity at the junction.

UNION STREET & LOVE STREET

TABLE 4-7: SUMMARY OF MODEL OUTPUTS FOR UNION STREET & LOVE STREET

		Practical Reserve Capacity (PRC)	Total Delay Over All Lanes (hrs)	Highest Mean Max Queues (PCUs) at Arm:	
AM	2030 Do-Nothing	22.9	8	A5268 Union Street left	14.4
	2030 With-Scheme	48.6	5	A5268 Union Street left	7.1
	Benefit	25.7	3		7.3
PM	2030 Do-Nothing	-10.3	26	A5268 Union Street left	32.8
	2030 With-Scheme	8.9	11	A5268 Union Street left	14.7
	Benefit	19.2	15		18.1

4.4.32 The summary of model outputs for the Union Street / Love Street Junction presented in Table 4.7 above identifies adopting a Do Nothing approach forecasts the junction will operate over capacity during the 2030 PM peak with a PRC of -10.3%. The AM peak is forecast to remain operating within capacity with a PRC of 22.9%. With the implementation of the proposed scheme the PRC would increase by 25.75% in the AM peak to 48.6%. However it is the PM peak which experiences the most significant benefit with an increase in PRC of 19.2% to ensure the junction operates within capacity at 8.9%.

4.4.33 Total delays over all lanes are forecast to be 8 hours during AM peak and 26 hours during the PM peak. The proposed scheme is forecast to reduce Total Delays across all lanes over the Do Nothing scenario, a reduction of up to 15 hours during the PM peak.

4.4.34 The highest MMQ is forecast to occur on the A5268 Union Street left turn approach in the AM and PM peak hours if the junction remains as per existing. The AM peak is forecast to experience a queue of 14.4 PCUs and 32.8 PCUs during the PM peak. If the proposed scheme were to be implemented, the MMQ AM peak on the A5268 Union Street left turn approach would be reduced to 7.1 PCUs whilst the PM peak is also forecast to experience a 50% decrease in MMQ.

4.4.35 The proposed scheme is forecast to offer significant benefits during 2030 ensuring the junction will continue to operate within capacity. Significantly forecast queues on Chester Ring Road on approach to the junction are forecast to reduce by up to 50% improving the operation of the junction but reducing the possibility of stationary traffic.

5. SCHEME PRIORITY

5.1.1 In order to prioritise the aforementioned schemes, a scoring matrix has been developed which is based on the following factors;

1) The Total Delay (all lanes pcu/hrs) - 2030 Do Nothing Scenario;
2) The Total Delay (all lanes pcu/hrs) – 2030 With Scheme Scenario;
3) The Total Delay Reduction (all lanes pcu/hrs); and
4) The Strategic importance of the site based on considered professional opinion taking into account location, strategic access, and the need to help enable future housing and employment allocations to come forward.

The score for each of the above factors is between 1 (being the lowest) and 6 (being the highest), the total score informs the schemes priority as presented in Table 1.2 below.

5.1.2 The following schemes shown in Table 5.1 below have been discounted from the priority matrix;

Scheme	Comments
FOUNTAINS ROUNDABOUT	Design solution for an increase in capacity would be of significant scale and cost and modelling for such would be superseded by likely impact of traffic associated with Northgate scheme. Junction to be assessed as part of Northgate Scheme.
HOOLE ROAD CORRIDOR	Likely to be assessed as part of wider access strategy to support development opportunities for the NE Gateway plans. Initial design proposals would not provide significant improvements in capacity.
GREEN LANE / A41 RING ROAD	Scheme aimed at safety improvement rather than capacity benefit.
UNION STREET / LOVE STREET	Scheme subject to further investigation on gyratory system and Foregate Scheme.

TABLE 5-1: DISCOUNTED SCHEMES

5.1.3 Table 5.2 below presents the results of the scoring matrix.

Scheme	2030 Delay Do nothing (pcu/hrs)	Score	2030 Delay with scheme (pcu/hrs)	Score	Delay reduction (pcu/hrs)	Score	Strategic Importance	Total Score	Priority
OVERLEIGH ROUNDABOUT	788	6	111	5	677	6	6	23	1
SEALAND ROAD CORRIDOR	674	5	138	6	536	5	5	21	2
A51 / A41 TARVIN R'ABOUT	189	4	15	1	174	4	4	13	4
A51 TARVIN RD / BARROW LN	158	3	46	4	112	2	4	13	4
A41 / A5116 MOSTON JCT	155	2	38	3	117	3	4	12	5
LIVERPOOL RD / HOSPITAL	55	1	35	2	20	1	4	8	6

TABLE 5-2: PRIORITY MATRIX

5.1.4 As can be seen from **Table 5.2**, Overleigh Roundabout and Sealand Road are the top two schemes in the priority matrix. The A51 / A41 Tarvin Roundabout and A51 Tarvin Road / Barrow Lane are equal at third and fourth priority with A41 / A5116 Moston Junction being fifth priority and Liverpool Road / Hospital access being the sixth and final scheme in the priority matrix.

6. SUMMARY AND NEXT STEPS

6.1 Summary

6.1.1 This Pinch Points report forms a key workstream within the overall Chester Transport Strategy. Whilst this report has been produced in isolation to the other workstreams, effectively running the assumption that other improvements within the Strategy may not be delivered, some elements within that Strategy, most notably the Chester Western Relief Road, would have significant implications in terms of identifying priority locations. For example, implementation of the Chester Western Relief Road would significantly reduce demand along the A483 Wrexham Road corridor. This would significantly reduce the demand through Overleigh roundabout, this location subsequently becoming less of a priority for intervention. By contrast, Sealand Road corridor improvements would need to be accelerated, as this corridor ties in directly to the proposed alignment for the Chester Western Relief Road.

6.1.2 Implementation of other workstreams included within the overall Chester Transport Strategy have the potential to impact upon traffic routing and demand across the City. For example, extending the vehicle restriction zone in the Centre (particularly if this extends along Upper Northgate Street to the North Gate itself) may lead to a general reduction in the number of cars travelling into Chester City Centre. It should be noted that the current proposals do not extend the core hours for the vehicle restriction zone, so any notion of future traffic reduction in the AM and PM peak periods is somewhat speculative.

6.1.3 CW&C are investing in improvements to the existing Park and Ride provision across the four existing sites, and the Chester Transport Strategy has identified that there is likely to be justification for developing a fifth site (along the A56 Hoole Road corridor) in the future. With a new service contract commencing in Summer 2016, and improved design and infrastructure into Park and Ride sites and the bus services themselves, it is hoped that this will contribute towards mode shift and reducing the need to travel by car into Central Chester. This in turn will have implications for routing and demand of traffic on key routes.

6.1.4 The iterative process completed as part of these works has identified pinch point schemes at various locations across Chester's highway network which will provide a significant improvement over the existing highway network in response to forecast increases in traffic flows.

6.1.5 This exercise has also forecast that the level of delay which will be experienced if no improvement works are completed, will be of significance. Given that the pinch point schemes are at strategically important locations on Chester's highway network with at least one proposed scheme located on each of the main arteries into the city centre it can be concluded that future growth

within the Chester area will be dependent upon the delivery of one or more of the following list of schemes;

Scheme	Indicative Cost
OVERLEIGH ROUNDABOUT	£910k - £1.7m
SEALAND ROAD CORRIDOR	£2.2m - £4.5m
A51 / A5116 TARVIN ROUNDABOUT	£465k - £865k
A51 TARVIN ROAD / BARROW LANE	£920k – £1.705m
A41 / A5116 MOSTON JUNCTION	£825k - £1.535m
LIVERPOOL RD / HOSPITAL ACCESS	£995k - £1.85m

TABLE 6.1: SCHEME LIST AND INDICATIVE COSTS

6.1.6 As discussed with CW&C officers it is unlikely the schemes would be delivered as one package and in light of development pressures it is possible some schemes may be partly or fully funded through private developments as they may form key mitigation to enable delivery of such schemes.

6.1.7 To this end, development proposals may influence the priority of the schemes and inform the order of which they are delivered. They could even reduce the burden on CW&C to deliver schemes from the public purse. What is clear from this study is that if improvement schemes are not delivered at the aforementioned locations then the highway network will begin to constrain the future housing and employment allocations and overall growth ambitions of CW&C.

6.2 Next Steps

6.2.1 The next steps will, in part, be dictated by the availability of funding or the immediacy of forthcoming developments. Assuming all schemes are delivered through publically available funding streams, this report and its appendices should be used as part of the initial evidence base to support and inform the reasoning and rationale behind the identification of the various schemes. Once available funding is identified the following steps should be;

- ***Scheme prioritisation*** – refinement of initial priority matrix based on further information on amount or type of funding available and what developments have been completed / are to be complete at that time;
- ***Scheme Validation*** – Initial concept designs completed as part of these works have been developed utilising traffic flows taken from an updated version of 2030 SATURN model. To ensure the concept schemes remain valid, provide benefits and are affordable, the traffic modelling and concept designs completed as part of this work should be supported by up to date traffic counts. Dependent on timescales / type of funding it may be necessary to revisit the strategic SATURN model.

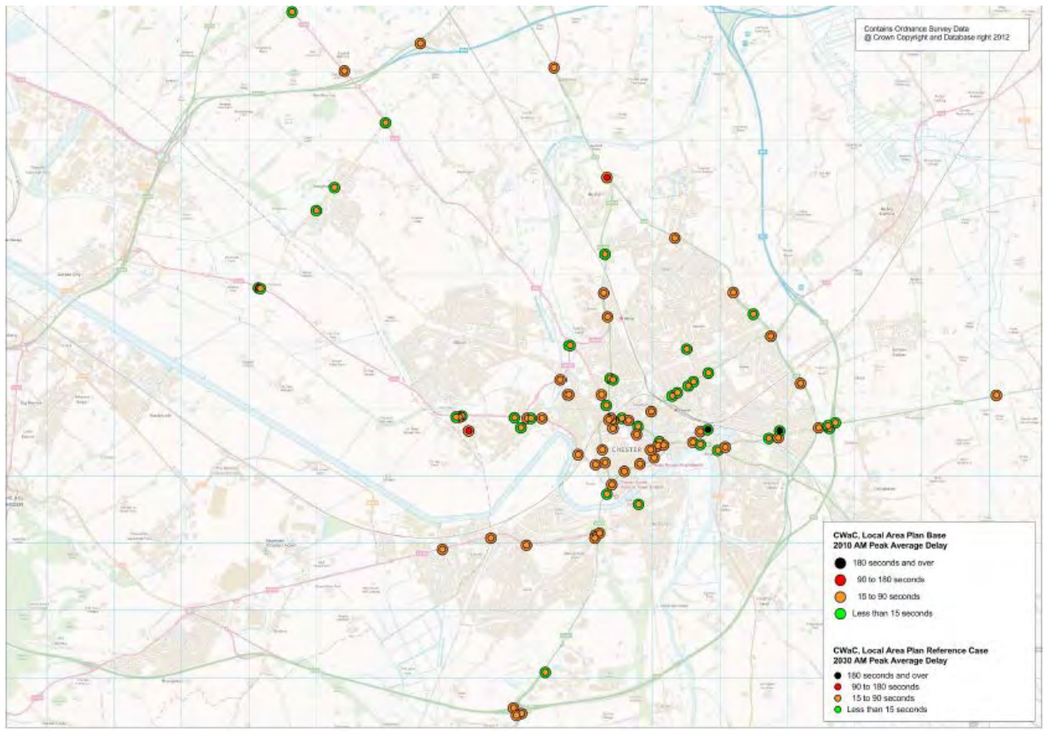
- ***Scheme Costing*** - A high level costing exercise has been undertaken with key exclusions to provide an order of magnitude and inform future strategy A more in-depth costing exercise based on further detailed design, statutory undertaker's equipment, earthworks and drainage and 3rd party land information will be required.
- ***Business Case Development*** – dependent upon what fund streams become available, whether it be pinch point funding or another source, the appropriate supporting business case should be developed supported by the updated traffic modelling.

6.2.2 This report has sought to identify critical locations where intervention would be needed assuming a 'Do Nothing' scenario in terms of transport improvements, but assuming the development aspirations for Chester are realised. Concept options have been developed to mitigate against the traffic impact of strategic development, recognising that individual developments will need to undertake further investigatory work to demonstrate the impacts of their individual schemes once further details of development quantum and composition are known. The concept designs that have been developed provide a starting point for CW&C in terms of identifying possible design solutions. Indicative, high level costings have also been provided which are intended only to be used as a guide as to the relative cost differences between options.

6.2.3 Whilst it is assumed the pinch point schemes will be delivered through the public purse, this work can also be used to inform and support discussions with potential developers whose development plans may have a detrimental impact upon the operation of Chester's highway network.

APPENDIX A

Chester Transport Strategy: ***Junctions / Key Links Capacity Enhancements***



A55 / A483 / B5445 Junction

Sealand Road (A548)

Boughton Hamburger Junction

Key Transport Issues to Address

The scheme will help to address the following issues identified in the evidence base:

No.	Issue (As presented in the Option & Assessment Report)
43.	Rising congestion levels
45.	Congestion hotspots
47	Lack of quality gateways into Chester (by road and also rail).
48.	Air quality management issues (A51 Tarvin Road / A5115 Christleton Road (existing AQMA) and A540 Parkgate Road / A5116 Liverpool Road (Potential AQMA).
49	Confusion and inefficiency at A41 / A5115 'hamburger' roundabout.
71.	Conflict between cars, cyclists and pedestrians.
72.	Varying accessibility to jobs and services

Scheme Description

This package aims to tackle key congestion and queuing at pinchpoints on the local highway network, which in some cases may be triggered by future housing growth and development. Schemes that come forward will combine opportunities for junction remodelling and capacity improvements along with opportunities to improve signalisation and Urban Traffic Control (UTC) to improve traffic flows and reduce queues.

Owing to potential development on Wrexham Road, it is likely that capacity enhancements will be required at the Overleigh Roundabout. This forms the confluence of two major routes into Chester City Centre, namely A5104 Hough Green and the A483 Wrexham Road and also represents the main access / egress to/from Handbridge.

The likely focus also includes some or all of:

- Liverpool Road / Moston Road (A41) / Liverpool Road (A5116);
- Vicars Cross Road / Tarvin Road (A51);
- Hoole Road (A56);
- Vicars Cross / Tarvin Road (A51) / A55 / Ring Road (A41) Junctions;
- Whitchurch Road (A41/A5115) / Ring Road (A55) / Caldy Valley Road;
- Boughton / Tarvin Road (A51) / Christleton Road (A5115) – *Existing AQMA*; and
- Sealand Road / New Crane Street (A548).

Improvement work at the A483 / A55 is currently programmed as part of the Highways Agency's £100 million Pinch Point Fund and due to be completed by 2015. The Transport Strategy for Chester supports this wholeheartedly, since it addresses capacity issues at the large roundabout junction of the A483 Wrexham Road, and the A55 North Wales Expressway, and at the smaller (but no less problematic) junctions further south. The scheme includes additional traffic lanes on the eastern approach to the junction and on the circulating carriageway, and importantly capacity relief at the key congested meeting of the B5445 Wrexham Road with the A483. This includes partial signalisation and new carriageway space.

Benefits of Scheme

The main benefits predicted from this package are as follows:

- Address traffic congestion and journey time delay at hotspots and pinch points on the local highway network;
- Improve access to jobs and employment;
- More reliable public transport journey times; and
- Reducing issues associated with air quality.

Potential Impacts

The main impacts predicted from this package of schemes are:

- Support economic growth;
- Support longer-term housing growth and development aspirations in the city; and
- Enhance viability of the city centre.

Scheme Inter-Dependencies

The package of measures would need to be closely aligned with proposals to enhance Active Traffic Management and public transport services (including Park & Ride) and more widely with any cross-border proposals, Chester Western Relief Road.

Way Forward / Key Actions

The key initial actions are:

- Undertake additional modelling and individual scheme assessment.
- Scheme Feasibility and Detailed Design.
- Develop Business Cases for more expensive schemes and consider funding opportunities (e.g. Local Pinch Point Fund).

Timeframe

0-5 years

Studies and Design

5-10 years

Delivery

Cheshire West and Chester

Spatial Dimension

C

Chester Transport Strategy
Proforma 11: Junctions / Key Links Capacity Enhancements

AECOM

APPENDIX B

Technical Note

Project:	**Chester Transport Strategy Phase Two**	Job No:	**60334355**
Subject:	**Congestion Relief: Pinch Points – Progress Report and Methodology Update**		
Prepared by:	**Alistair Johnson**	Date:	**16/07/2015**
Checked by:	**Oliver Baldwin / Neil Soper**	Date:	**17/07/2015**
Approved by:	**Adam Leary**	Date:	**24/07/2015**

Introduction

As part of the complete package of works to deliver the Chester Transport Strategy Phase Two, AECOM have progressed Task A4 – Congestion Relief: Pinch Points up to Phase 1 and made an initial start on Phase 2. During the course of this task a small number of points / issues requiring clarification have arisen which may have an impact upon the original methodology and ultimately overall programme. This Technical Note details current progress against the original methodology and outline where and what issues have arisen, which ultimately may require review / amendments to the original proposal submitted to Cheshire West and Chester Council (CWaC).

Progress Report

This section will refer back to the original sub headings contained within the original proposal document titled "*Chester Transport Strategy Phase 2, Proposal, September 2014*" and detail progress to date.

Phase 1 (Q3/Q4 2014/2015)

Task	***Progress to date and Comment***
Task 1: Inception Meeting and Document Review	*Task Complete*
Task 2: Base Model Review	*Task Complete*
Task 3: Future Year Modelling (SATURN)	*Task Complete*
Task 4: PARAMICS Model Update	*In order to provide best value and avoid abortive works, the update of the Paramics model was postponed dependent upon the location of the final Pinch Point Schemes. If the schemes fell outside the scope of the Paramics model area then it would negate the requirement to use the Paramics model which covers just the inner ring road of Chester.*
Task 5: Future Year Do Minimum (DM) Conditions	*Task Complete*
Task 6: Scheme Identification (Long List)	*Task Complete – detailed in Technical Note Task A4 Pinch Point Scheme Identification – SATURN model assessment dated: 19/02/2005 (**Appendix A** of this Note)*
Task 7: Scheme Prioritisation	*Task Complete – detailed in Technical Note Task A4 Pinch Point Scheme Identification – Top 10 dated 20/05/2015 (**Appendix B** of this Note) and further emails between AECOM and CWaC included in **Appendix C** of this Technical Note.*
Task 8: Reporting & Meetings	*Task Part Complete – whilst no formal reporting of Phase One has been issued, a number of*

	meetings and discussions have been conducted. The final list of top ten schemes has developed through an iterative process and at request of CWaC changed from that identified as part of Task 7. The final top ten list was presented to and agreed by CWaC on the 08/06/15 and is presented in ***Appendix C*** *of this Note.*

Phase 2 (Q1/Q2 2015/2016)

Task	***Progress to date***
Task 9: Inception & Stakeholder Workshop & Consultation	*Task Complete - following a meeting between CWaCs Head of Highways and AECOM on 13.07.15 the agreed list of ten pinch point schemes was discussed at length and a number of actions, including the requirement for additional data identified.*
Task 10: Scheme Design	*Task ongoing – As a direct result of Task 9 a number of points have arisen which may have an impact upon the methodology and timescales for delivery, please see discussion below. Detailed junction models are currently being constructed to assess impact of each proposed scheme.*
Task 11: Preferred Package Modelling	*Not yet Complete*
Task 12: Business Case Development	*Not yet Complete*

Discussion

Following discussions with CWaC on the 13.07.15, a number of junction improvements were identified and dismissed at each of the agreed ten pinch point locations, including the exclusion of one site; Handbridge. However, a number of points which may have an impact on the pinch point works were raised as part of the discussions, these were;

- The junction of Tarvin Roundabout (A51 / A54) is not fully represented within the SATURN model, meaning no traffic flow data is available. Included at the request of CWaC, any improvements at this junction would not be quantifiable using currently available data. In order to robustly assess the impacts of the proposed improvements (and thereby the business case for the scheme) additional traffic counts and enhancements to the SATURN model would be required.
- The junction of the A548 Sealand Road / B&Q access is modelled within the SATURN model to capture the signal timings / delays. However, due to the strategic nature of SATURN as a strategic modelling tool, the traffic demand from the B&Q access is not fully replicated within the model. Ultimately this means no traffic flows entering or exiting the network via the B&Q arm are readily available in order to robustly assess the impact of any schemes.
- CWaC would like AECOM to produce a prioritisation list by ranking the schemes in order of importance of delivery.

Given the points raised above AECOM feel it prudent to advise CWaC of how these may impact upon the proposed methodology and potentially offer improvements to address each issue. AECOM proposes two options for moving forward as follows;

- Continue with existing data set
- Collect additional data

Continue with Existing Data Set

This option will seek to address the lack of data at both the A51 / A54 Tarvin Road roundabout and B&Q access utilising free, immediately available data from a number of sources.

The A51 / A54 Tarvin Roundabout is contained within the buffer network in the SATURN model so link counts approaching / exiting the roundabout from the western A54 arm are available. Using the readily available Department for Transport (DfT) count point data, AECOM will calculate turning proportions at the roundabout so counts can be taken forward into the detailed junction models. This will ensure the improvements at the roundabout can be quantified initially.

AECOM propose to use the TRICs database to estimate the likely demand entering and exiting the B&Q access arm. TRICS is a database of trip rates for various developments which allows the user to search for similar sites to that being assessed in order to obtain an estimate of the likely trip rate. This methodology is standard practice when assessing new developments, and will estimate the likely demand for the B&Q access. This will then be included within the detailed junction models to demonstrate the benefits the proposed schemes may have along the A548 Sealand Road Corridor.

In addition, AECOM will update the SATURN model to include the A51 / A54 Tarvin Roundabout node and B&Q access within the simulation network and so capture the full impact of the junction within the SATURN model. Once updated, a checking exercise to ensure the inclusion of the A51/A54 Tarvin Roundabout does not have a significant impact on the distribution of traffic within the SATURN model to demonstrate the model remains fit for purpose and does not trigger the need for a revalidation of the strategic base model to be undertaken. If it is identified that the inclusion of the Tarvin Road roundabout and the B&Q access result in a significant impact on the redistribution of traffic within the SATURN model (at this stage it is not envisaged they will), there may be a need to revisit the proposed methodology which may require additional works.

Whilst this option will provide an overview of the likely benefits of the proposed scheme, it will rely on a number of assumptions which will need to be addressed, by the collection of additional data, before any funding submission takes place.

Collect Additional Data

The second option will seek to address the data shortfall by collecting additional data in the neutral month of September 2015 for the A51 / A54 Tarvin Roundabout and B&Q access. This count information will then be used to update the SATURN and detailed models utilising the following methodology;

- Taking the new 2015 count data, using long term observed data if available, factor back the new count data to 2010 to ensure it is comparable with the 2010 base model counts;
- Applying the same level of growth to that applied between the 2010 to 2030 SATURN model, which ensures background growth and developments are accounted for, the newly adjusted 2010 counts will be growthed to provide a forecast of the 2030 future year traffic flows at Tarvin roundabout;
- The node, which represents Tarvin roundabout within SATURN, will be updated too simulation network. AECOM will then apply the proportional changes in traffic flows (up or down) to account for any changes in traffic flows as a result of the new count – assuming minimal reassignment due to the changes
- The SATURN model will then be ran, including the update of the B&Q access demand, and a flow difference plot produced to evidence if there have been no significant changes or rerouting of traffic as a result of the update.

If it is identified the new traffic counts, once factored to 2010, differ significantly to the counts within the existing 2010 base model or the inclusion of the Tarvin Road roundabout and the B&Q access does have a significant impact resulting in the redistribution of traffic within the SATURN model, at this stage it is envisaged they will not, there may be a need to revisit the proposed methodology and/or revisit the 2010 base model which may require additional works to the original commission.

This option negates the need to collect further traffic count data at these locations as part of a funding submission providing a cost and time saving at a later date and ensures the modelling is informed by the most accurate of data sources.

Prioritisation Plan

As per the original proposals the pinch point works detailed in the document "*Chester Transport Strategy Phase 2, Proposal, September 2014*", will, unless otherwise instructed, assume all ten schemes will be delivered as part of one business case submission from one funding source, i.e pinch point funding.

As instructed by CWaC, AECOM will consult with Paul Parry regards the likely delivery phasing of each scheme. At this point AECOM will ensure the schemes are ranked in order of benefits delivered (reduction in delay) and the likely impact upon Chester's highway network. This will provide CWaC with a prioritised list of schemes which will enable them to identify the most appropriate timescales for delivery.

Moving forward

Following agreement of the agreed approach with CW&C, AECOM will finalise the proposed schemes in liaison with CW&C Highways, and complete the task using a two-iteration modelling approach. This will allow schemes to be assessed using stand-alone junction models to ensure they deliver a benefit locally, at the same time using the strategic SATURN model to account for wider redistribution of traffic flows. This will follow the following approach:

- Do Minimum SATURN model flows extracted for input into detailed modelling;
- 1st iteration - Detailed modelling via LINSIG, based on traffic flows extracted from SATURN;
- On completion of the detailed modelling, the Do Minimum SATURN model will be updated to incorporate all schemes, with signal timings input from the detailed traffic modelling, where appropriate.
- 2nd iteration detailed modelling - The output traffic flows from the SATURN model will then be input into the detailed models for further refinement of the detailed modelling tools. This approach ensures CWaC can use either the SATURN model or detailed models to inform the business case submission.

At this stage, we do not anticipate using the Chester PARAMICs model. The Fountains roundabout and the Vicar's Lane/Love Street junctions are the only locations included within the PARAMICs model, and it is proposed that undertaking detailed modelling using LINSIG provides a more robust and Value for Money approach to quantifying the impacts and benefits of proposed schemes in these locations.

Should the with scheme strategic modelling outputs identify significant redistribution of traffic within the city centre and inner ring road due to the identified pinch point schemes, further review of the need for the PARAMICS modelling will be considered.

Appendix A - *Task A4 Pinch Point Scheme Identification – SATURN model assessment dated: 19/02/2005*

Technical Note

Project:	**Chester Transport Strategy Phase 2**	Job No:	**60334355**
Subject:	**Task A4 Pinch Point Scheme Identification – SATURN model assessment**		
Prepared by:	**Spencer Pritchard / Oliver Baldwin**	Date:	**10/02/2015**
Checked by:	**Neil Soper**	Date:	**18/02/2015**
Approved by:	**Adam Leary**	Date:	**19/02/2015**

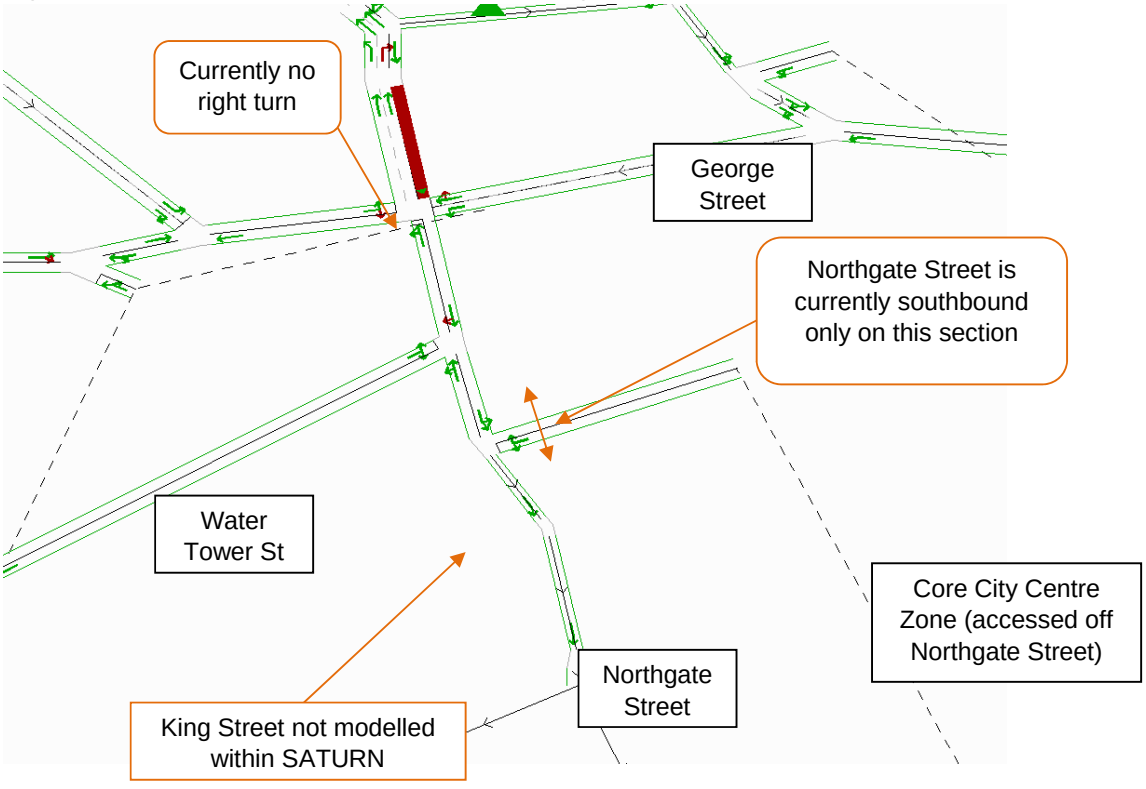
1 Introduction

The Chester SATURN model has been used by AECOM to undertake an initial assessment of potential future pinch points on the highway network in Chester and the surrounding strategic road network. The analysis has included the comparison of changes in junction delay between the 2010 Base year SATURN and a 2030 future year scenario which includes committed transport schemes, background traffic growth, and known developments.

2 Model Analysis

The model analysis has identified that the majority of pinch points on the network are located on key radials, inner routes, and other core routes within Chester. Our analysis also identified the junction of Northgate Street / George Street as a possible future pinch point on the network. However, during a review, it was noticed that the model coding within the very centre of the city, in particular along Northgate Street is too strategic in nature to allow a robust assessment. Not all local network and model parking locations within Chester City Centre are explicitly represented within the SATURN model. As a result a simplified representation of the highway network has been modelled in this location. The figure below shows the local network on Northgate Street, identifying the variations to the network from existing.

Figure 1 – SATURN model local network – Northgate Street



As shown in Figure 1, the network modelled within the Chester SATURN model does not reflect existing conditions on Northgate Street. Also, the model zone to the east of Northgate Street has considerable demand accessing and egressing during the AM & PM Peak. It is likely that this demand represents access and parking within the wider area in and around Northgate Street.

To model this area of the network in detail, further modifications to the SATURN model would be required, together with a model validation exercise which could increase costs and extend the overall programme significantly. In the future year, it would also be necessary to consider the emerging proposals for the area being steered by the proposed Northgate scheme (a final design for which is still unavailable at the time of this note) and the extended pedestrian area being developed by AECOM within the Chester Transport Strategy.

Whilst these changes are likely to affect local routing of traffic within the Northgate area, this is not expected to have a significant material impact on the wider highway network. Also, these impacts on the local network are not expected to impact on the Chester Relief Road task within the Transport Strategy, which is largely expected to impact flows outside the city centre and on the ring road.

Prior to undertaking further modelling work, we wish to confirm agreement from Cheshire West and Chester Council that our work to identify potential pinch point locations can proceed on the basis of the current model. We therefore wanted to identify these variations in coding with CWaC.

3 Identification of Pinch Points

Output data from the base and 2030 SATURN models have been compared to identify possible pinch points on the network. A review of the locations was proposed as follows:

$$\textit{Priority Score} = \textit{Route Score} \times [\ (\blacktriangle \textit{Delay} \times \text{FY } \textit{Flow})^{\text{turn 1}} + (\blacktriangle \textit{Delay} \times \text{FY } \textit{Flow})^{\text{turn 2}} + \text{etc...}\ ]$$

where:

- *Route Score* = a relative score based on the journey time per km and total link flow of the route where the junction is located. This will allow us to factor up junctions that in isolation may not be critical but could be key for overall journey times.
- ▲*Delay = change in turning movement delay between 2010 Base Model and 2030 Future Year Model*
- *Flow = 2030 Future Year turning flow*

By focusing on the change in delay, factored by the Future Year flow, the scoring is intended to prioritise junctions which will be a constraint to future growth. Junctions where the Volume/Capacity remains below 100% in the Future Year model will not be identified.

For the purposes of the initial assessment the route score has not been included at this stage until further discussions have taken place.

The locations identified are provided in the following appendices which are provided for discussion.

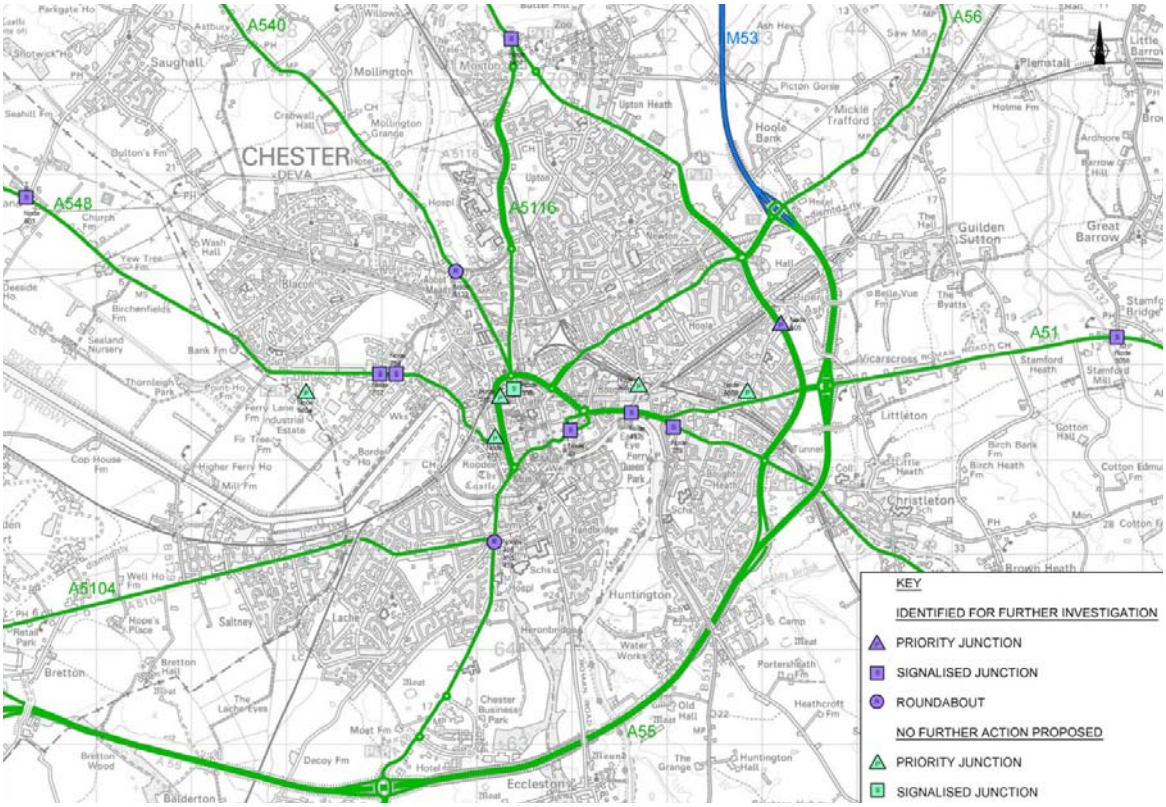
Appendix A: Potential Pinch Points – identified for further investigation
Appendix B: Potential Pinch Points – no further action proposed

After a desktop review of each location, those listed in Appendix A are considered to be suffering a material deterioration between the base and future years and warrant further investigation. Those listed in Appendix B are being flagged using the methodology above, but upon review do not, in our

considered opinion, justify further investigation. A number of locations in Appendix B appear to be suffering delays due to downstream issues rather than a capacity issue at the location itself. Others are at locations adjacent to zone connectors where additional development traffic is being applied to the network. In reality this traffic will be generated over a wider area and not concentrated at a single point. As a result it is unlikely that these types of locations would in reality be a pinch point.

For reference, **Figure 2** below, provides a location plan.

Figure 2 – Locations of Identified Pinch Points



4 Next Steps

It is noted that due to the strategic nature of the SATURN model and the precise methodology chosen a number of pinch point locations that may be locally known as an issue may not have been identified. For instance it is noted that no locations have been identified along the Hoole Road corridor. A meeting is therefore proposed with CWaC including highway representatives to discuss the potential locations listed and flag any other locations to be considered. Once an agreed list of potential pinch points has been identified further desktop and on-site review can take place to determine appropriate conceptual schemes.

APPENDICES

Priority Score (excludes route score)	Node	Location	Comments
887,506	3056	Tarvin Road/Barrow Lane	Signal controlled junction inc. central hatching. Base figures AM minor delays (58s) getting out of Barrow Lane. 2030AM similar delays out of Barrow Lane but increase westbound (150s) Tarvin Road towards Chester. PM max delays on Barrow Lane in base (104s) which reduces in 2030 due to reduced flow. 2030 max delays Tarvin Road westbound (150s)
481,922	492	Hoole Lane/Tarvin Road	Signal controlled junction. Base flows show max delay of 54s leaving Hoole Lane. 2030 AM and PM show delays westbound and ahead (283s and 18s respectively) and right turning traffic 427s and 51s respectively).
325,317	61	Union Street/Love Street	Signal Controlled junction with restricted movements. Love Street towards junction is just bus and cycles and right turn only. Union Street is one-way resulting in vehicles entering junction from Vicar's only being able to turn left.
287,575	5122	Parkgate Road/Countess Way/Blacon Ave/A5480	Roundabout (5 arms) 2030 PM max delay occurs on A5480 north east bound approach with 121s and also on Blacon Ave at a max of 102s. On the other 3 arms delay max is 23s.
285,883	754	Bumper's Lane/Deva Link/Sealand Road	Signal controlled 4 arm junction. Max delays AM occur on Deva Link ahead movement (294s) and Bumper's Lane right turn (198s) suggest all other movements reasonable with max. delay of 64s. PM max delay occurs on Bumper's Lane ahead and right being 125s and 222s respectively.
221,180	505	Green Lane/Ring Road	Priority junction. Road opposite Green Lane is no entry so exiting traffic only. A41 is a two lane dual carriageway with national speed limit. Hence difficulty in egressing from Green Lane. Central reserve opening to allow right turn movement. Heavy ahead flows on the dual carriageway makes the two right turns difficult to complete. Right turn from north into Green Lane consistent AM and PM with delays of 195s and 202s respectively. Right turn out of Green Lane AM peak significantly high delay at 523s but only 81 in PM. Left turn appears to work as a slip entry onto A41 but lacks appropriate markings.
195,329	1457	Liverpool Road/Moston Road	Signalised junction. AM right turn from Liverpool Road (southbound) into Liverpool Road has largest flows and greatest delays with Base 120s rising to 261s at 2030. Max on other arms is 66s. PM max delays at 2030 is 62s on Moston Road northbound. Dedicated right turn lane is signed well in advance of junction and appears long.
189,425	803	Sealand Road/Seahill Road (West)	This junction is made up of 3 nodes with this node being the left slip from Sealand Road into Seahill Road. Delays experienced on ahead eastbound and left turn due to queuing upstream at node 804 (which only shows delay of 89s in same period). Delays experienced only in AM 2030 of 151s
137,014	273	Chistleton Road/Tarvin Road	Dual carriageway splits around buildings to form gyratory from this node. Any conflicting movements are priority controlled. Base flows show no issues with only the right in and left out of Spital Walk having a delay of up to 50s. 2030 in addition to right into Spital Walk the only delays are ahead (102 and 92s AM and PM respectively) from Christleton into Tarvin, due only to congestion ahead.
139,132	702	Sealand Road (Opposite B&Q)	Delays westbound in PM with 91s and 258s in base and 2030 scenarios respectively.
129,384	456	Overleigh Roundabout/Curzon Park North/Hough Green/Lache Lane/Wrexham Road/Grosvenor Road (Lache Lane Node)	5/6 arm signalised roundabout. Max delay in AM 2030 of 243s from Lache Lane.
111,962	458	Overleigh Roundabout/Curzon Park North/Hough Green/Lache Lane/Wrexham Road/Grosvenor Road (Overleigh/Grosvenor Road Node)	5/6 arm signalised roundabout. No delays above 43s with exception of AM 2030 of 102s from roundabout left into Grosvenor Road. Delays upstream were identified here.

Appendix B - Potential Pinch Points - no further action proposed

Priority Score (excludes route score)	Node	Location	Comments
5,593,257	365	Charter Hall Drive/Westminster Road	Priority junction. Westminster Road is one way northbound (with contra flow cycles) at its junction with Charter Hall Road. Significant increase in flows into Charter Hall Drive in AM peak but delays negligible, 4s. Unusual drop in ahead flows from 326 to 52 given there are no opposing turns. PM results in significant delays exiting Charter Hall Drive with 3030s.
1,072,452	9059	Green Lane/Melrose Avenue	Priority junction. Suggest junction is only experiencing delays due to node 505 to the north (Green Lane/Ring road). The area feeding in from the side road is a closed residential estate with little increase. AM left turn out of side road reduces to zero and right turn increases, increasing delay to 3301s. This shift stacks up with node 505 experiencing significant delays.

882,776	356	Canal Street/Upper Northgate Street	Signal Controlled junction with restricted access/movements. George Street is one way out. Northgate southbound approach is bus and cycle lane, nothing preventing right turn but nothing attributed. Canal Street is prescribed left turn out (although there are significant flows turning right shown). Northgate south side of junction is restricted access 9am -6pm to access and cycles. This doesn't seem to stop substantial flows entering. Base flows AM and PM no real issue max delays 98s leaving Canal Street in AM. 2030 AM delays only increased on right turn from George Street from 39s to 81s. PM shows increase in delays on east west approaches. Canal Street rises to 235s and George Street 935s. Drop in ahead flows from George Street from 133 to 0 why when increase in left and right turns?
564,249	213	St Martin's Way/Stanley Street	Priority junction into Watergate which has signals a short distance either side of junction. Max delays occur on Stanley Street in PM with 260s and 1035s in the base and 2030 scenarios respectively. Ahead and eastbound on Watergate has delays of 53s and 146s respectively but up stream delays are also identified here.
174,926	9804	Sovereign Way/Minerva Avenue	Priority junction on an industrial/business park. The predominant flow is showing right in and left out with zero or very little undertaking other movements. Max delay 2030 AM right in to Minerva with 170s. 2030 PM max delay left out of Minerva with 113s. Zonal traffic looks to be distributed oddly it is considered that the turning figures are not actual at this junction.
166,657	216	St Martin's Way/King Street	Priority junction with a dual carriageway, without any opening. King Street has an all vehicles prohibited except for cycles and access Mon – Sat between 8am and 6pm effective from access points.

Appendix B - *Task A4 Pinch Point Scheme Identification – Top 10 dated 20/05/2015*

Technical Note

AECOM

Project:	**Chester Transport Strategy Phase 2**	Job No:	**60334355**
Subject:	**Task A4 Pinch Point Scheme Identification – Top 10**		
Prepared by:	**Phil Gibbon**	Date:	**20/05/2015**
Checked by:	**Oli Baldwin**	Date:	**20/05/2015**
Approved by:	**Adam Leary**	Date:	**20/05/2015**

1. INTRODUCTION

Following a meeting held between AECOM (Adam Leary) and Chester West and Chester (Jamie Matthews) on 15th May 2015 and the Chester Transport Strategy Phase 2 – Pinch Point Scheme identification and SATURN model analysis,' this note has been produced in order to agree a 'TOP 10' list of schemes which are to be developed to concept schemes and included in the overall outline business case document.

2. SATURN MODELLING

Reference should be made to AECOMS Technical Note 'Task A4 Pinch Point Scheme Identification – SATURN model assessment' dated 19th Feb 2015 for specific methodology in determining pinch point locations. In short, SATURN analysis has been carried out in order to determine pinch points for 2 scenarios;

1) Base Scenario
2) 2030 Scenario

3. BASE SCENARIO

Table 1.1 below includes the base scenario top 14 pinch points highlighted in the SATURN model analysis along with comments relating to suitability for the overall 'Top 10' list.

No	Node	Location	Comments / Recommendations
1	4110	Handbridge	Bridge over River Dee, one way signal controlled flows, model predicts significant congestion and V/Cs of over 100% in the base year. CWaC to provide actual signal timigs
2	213	St Martin's Way/Stanley Street	SATURN model over simplified in this location. CWaC to advise whether further investigation appropriate.
3	9470	Shotwick Ln/A540	Unlikely problem
4	1457	Liverpool Road/Moston Road	Also in 2030 Scenario
5	61	Union Street/Love Street	Also in 2030 Scenario
6	862	Chester Road East/Mancot Lane	Located in Wales
7	863	B5125/Wood Ln	Located in Wales
8	505	Green Lane/Ring Road	Also in 2030 Scenario
9	9800	Bumper's Ln/Hartford Way	Covered in 2030 – Sealand Road Corridor
10	9405	Welsh Road/Parkgate Road	CWaC to advised whether further investigation appropriate.
11	9437	Warrington Rd/Ince Ln/A56	Not aware of current issues
12	733	Mercury Ct/Sovereign Way	Not aware of current issues
13	464	Pepper St/Bridge St	Not aware of current issues
14	477	Hoole Lane/Westminster Road	CWaC to advise whether further investigation appropriate.

4. 2030 SCENARIO

Tabel 1.2 below includes the 2030 scenario top 14 pinch points highlighted in the SATURN model analysis.

No	Node	Location	Comments / Recommendations
1	3056	Tarvin Road / Barrow Lane	
2	-	A55 / A51 Roundabout Junction	
3	754	Sealand Road / Deva Link	
4	702	Sealand Road / B&Q access	
5	-	Sealand Road / Greyhound Park Road	
6	1457	Liverpool Road / Moston Road	Occurs in base scenario also
7	-	Liverpool Road / Vivienne Smith Lane (Hospital Access Junction)	
8	456	Overleigh Roundabout/Curzon Park North/Hough Green/Lache Lane/Wrexham Road/Grosvenor Road (Lache Lane Node)	
9	492	Hoole Lane/Tarvin Road	
10	5122	Parkgate Road/Countess Way/Blacon Ave/A5480	
11	505	Green Lane/Ring Road	
12	61	Union Street/Love Street	
13	273	Chistleton Road/Tarvin Road	
14	458	Overleigh Roundabout/Curzon Park North/Hough Green/Lache Lane/Wrexham Road/Grosvenor Road (Overleigh/Grosvenor Road Node)	

5. SUGGESTED 'TOP 10' PINCH POINT SCHEMES

Table 1.3 contains the suggested 'Top 10' pinch points schemes which are to be taken forward for schematic design and outline business case documentation.

No	Node	Location	Comments
1	3056	Tarvin Road / Barrow Lane	No.1 in 2030
2	-	A55 / A51 Roundabout Junction	No. 2 in 2030
3	754	Sealand Road / Deva Link	No. 3 in 2030
4	702	Sealand Road / B&Q access	No. 4 in 2030
5	-	Sealand Road / Greyhound Park Road	No. 5 in 2030
6	-	Liverpool Road / Vivienne Smith Lane (Hospital Access Junction)	No. 7 in 2030
7	1457	Liverpool Road/Moston Road	Contained in base and 2030
8	505	Green Lane/Ring Road	Contained in base and 2030
9	61	Union Street/Love Street	Contained in base and 2030
10	-	Hoole Road Corridor – Hamilton St to Faulkner St	CWaC known issue

Appendix C – *Final Agreed Top Ten*

Leary, Adam

From: MATTHEWS, Jamie <Jamie.Matthews@cheshirewestandchester.gov.uk>
Sent: 11 June 2015 13:27
To: Leary, Adam
Cc: Gibbon, Phil; Soper, Neil J.; Baldwin, Oliver
Subject: RE: Pinch Points

Adam
That's fine – I look forward to hearing how work progresses. David Saville will be contacting you shortly to fix a date for a Chester Transport Strategy meeting in late June / early July in order to review the various papers and work strands we have discussed in previous correspondence.

Regards

Jamie

From: Leary, Adam [mailto:Adam.Leary@aecom.com]
Sent: 08 June 2015 13:17
To: MATTHEWS, Jamie
Cc: Gibbon, Phil; Soper, Neil J.; Baldwin, Oliver
Subject: RE: Pinch Points

Jamie

Following a fair bit of recent correspondence and discussion with regards to pinch point locations, the table below shows the informed Top 10. This is derived using 3 criterion, as follows:

1) Outputs from the 2010 Base Model
2) Outputs from the 2030 Future Year Model
3) Request from CWaC Officers

Pinch Points - Top 10 - 08.06.15				
No	Location	Modelling 2010 Base	Modelling 2030 Scenario	CWaC Request
1	Overleigh Roundabout/Curzon Park North/Hough Green/Lache Lane/Wrexham Road/Grosvenor Road (Lache Lane Node)		No 8/14	20.05.15
2	Sealand Road / Deva Link Sealand Road / B&Q access Sealand Road / Greyhound Park Road		No. 3/4/5	20.05.15 21.05.15
3	Hoole Road Corridor – Hamilton St to Faulkner St			Meeting 15.05.15
4	A51 / A54 at Tarvin			28.05.15
5	Fountains Roundabout			20.05.15
6	Handbridge	No.1		20.05.15
7	Tarvin Road / Barrow Lane		No. 1	
8	Liverpool Road / Vivienne Smith		No. 7	

	Lane (Hospital Access Junction)			
9	Union Street/Love Street	No. 5	No. 12	
10	Green Lane/ A41 Ring Road	No. 8	No. 11	

I propose that we progress with these locations, and I trust you are happy with that approach. Unless informed otherwise, we will proceed with peak period site visits/concept scheme design/outline business case documentation.

Regards,

Adam

From: MATTHEWS, Jamie [mailto:Jamie.Matthews@cheshirewestandchester.gov.uk]
Sent: 28 May 2015 16:18
To: Leary, Adam
Subject: Pinch Points

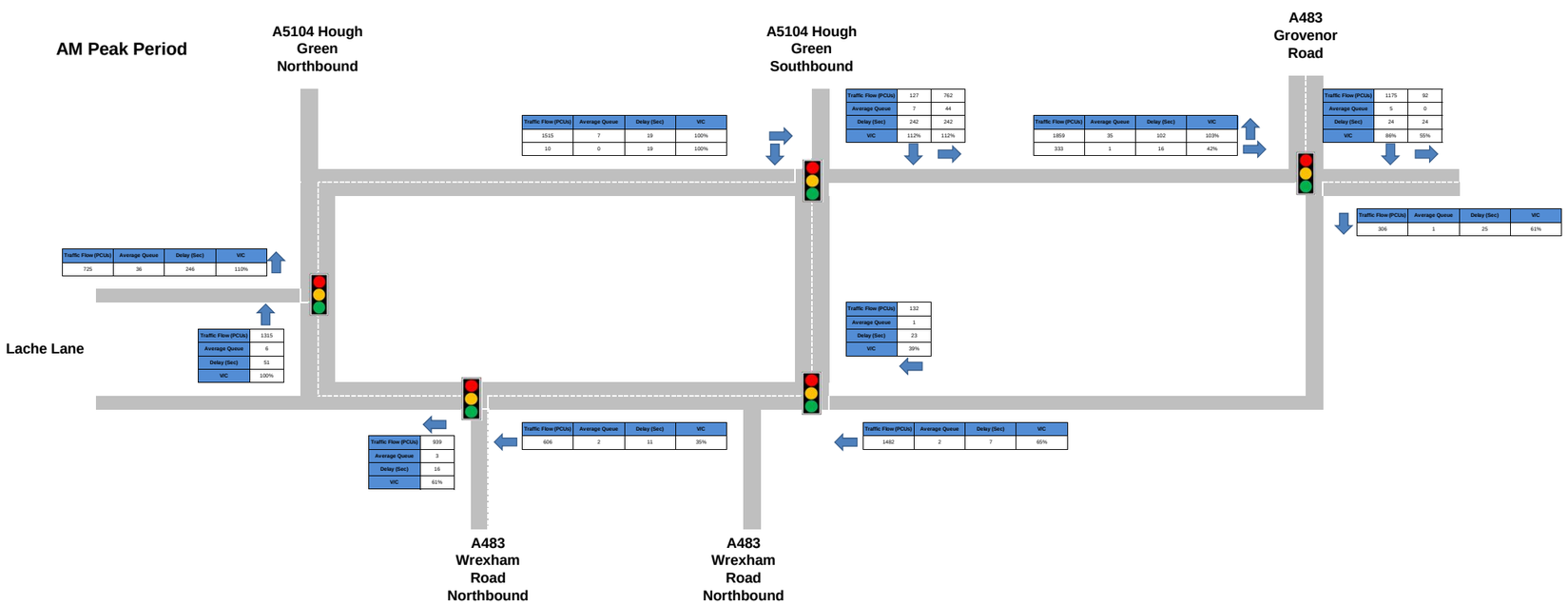
Hi Adam,

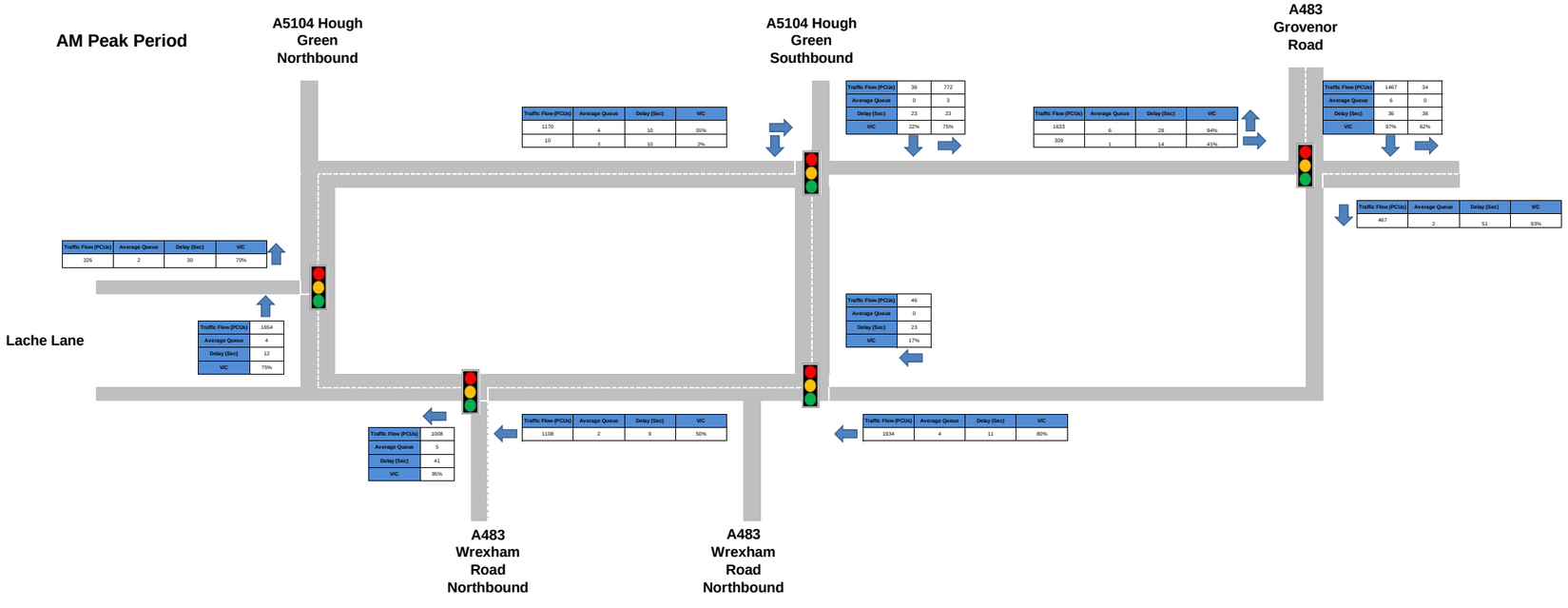
An additional observation on pinch points has been suggested. This is to extend the current A51 investigation and also include the junction of the A51 and A54 at Tarvin. Has the model shown any issues here as there is a fairly significant problem of queuing traffic at peak times on the A51 approaching this junction (heading towards Chester. Immediately after the junction there is a short stretch of dualled road and part of the queuing also occurs as traffic has to merge again after a few hundred metres.

Any observations would be welcomed.

Jamie

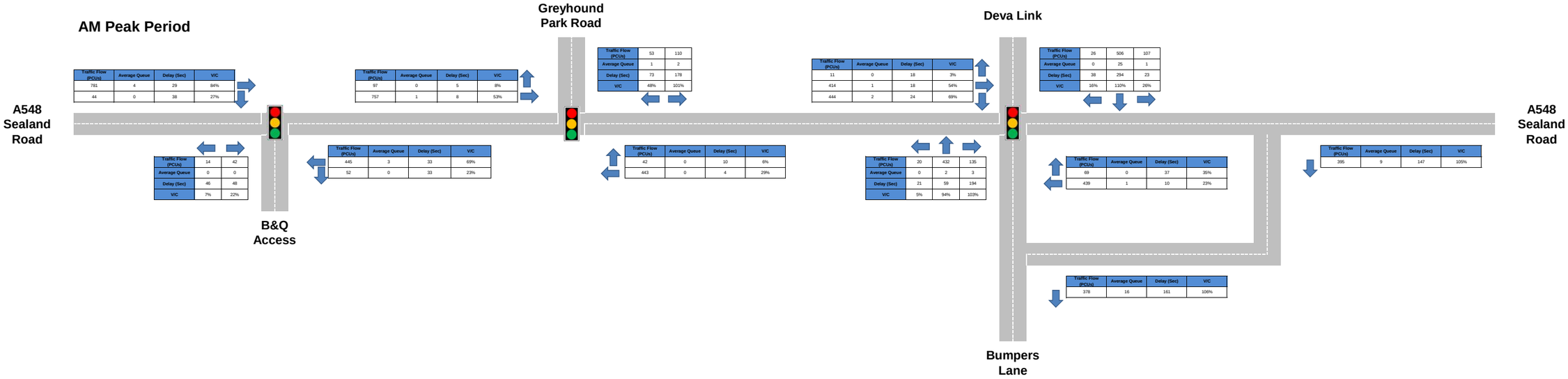
APPENDIX C



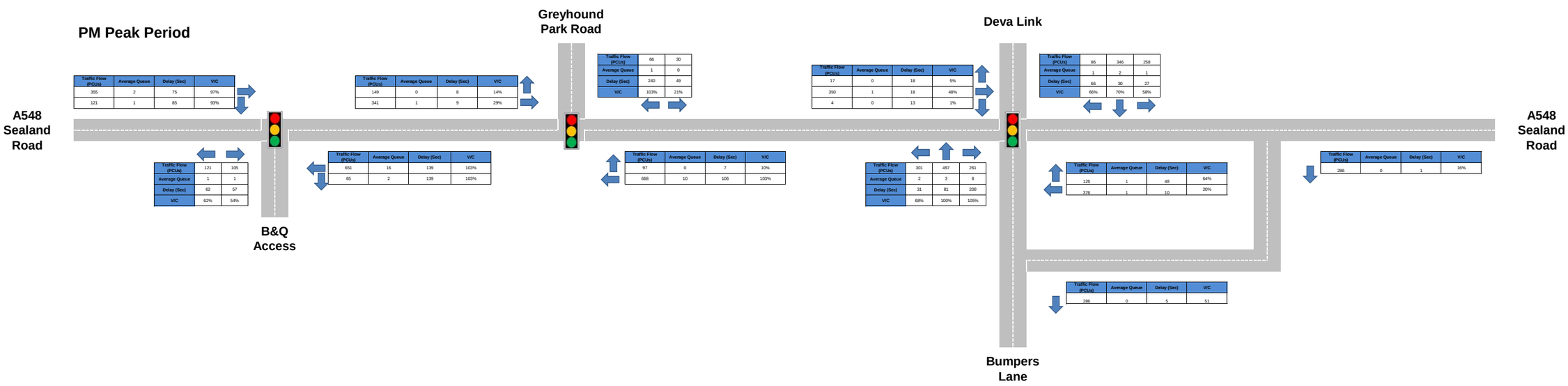


Prepared by:	Client:	Project:	Title:	Drawing no:	Rev:
AECOM	Cheshire West & Chester Council	Chester Transport Strategy - Phase Two A4:Congestion Relief - Pinch Point	Network Performance Indicators Overleigh Roundabout 2030 Do Nothing	Appendix C, Figure 1	A

AM Peak Period

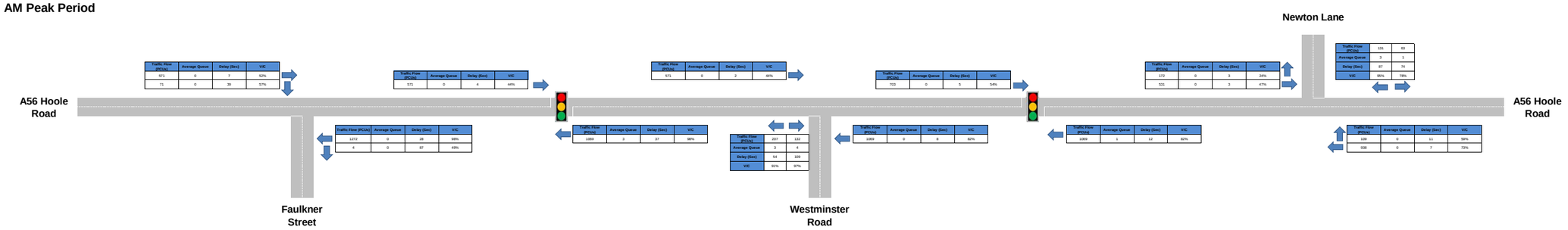


PM Peak Period

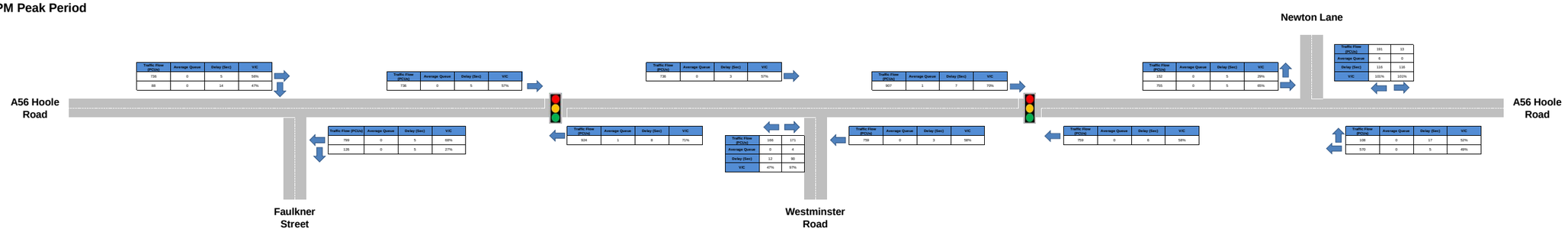


Prepared by:	Client:	Project:	Title:	Drawing no:	Rev:
AECOM	Cheshire West & Chester Council	Chester Transport Strategy - Phase Two A4:Congestion Relief - Pinch Point 2	Network Performance Indicators Sealand Road Corridor 2030 Do Nothing	Appendix C, Figure 2	A

AM Peak Period



PM Peak Period



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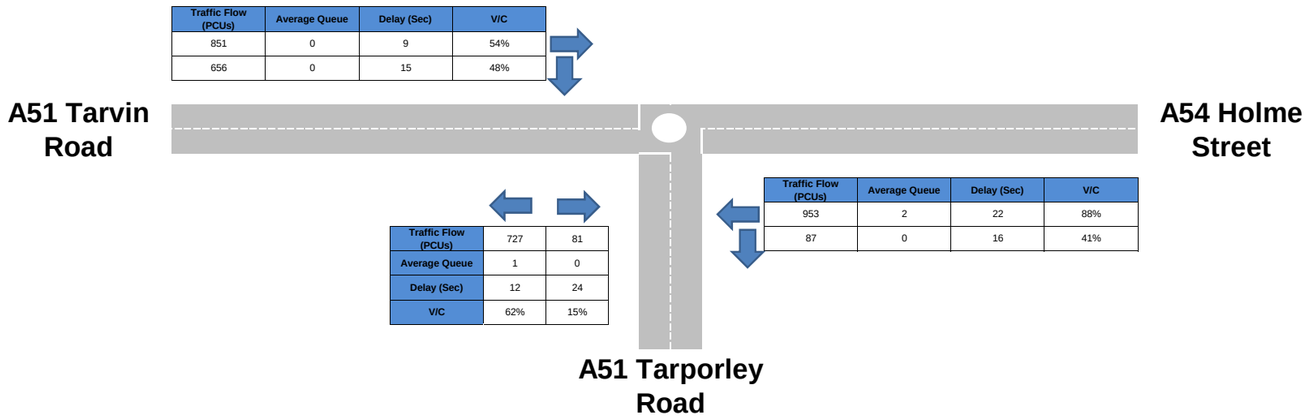
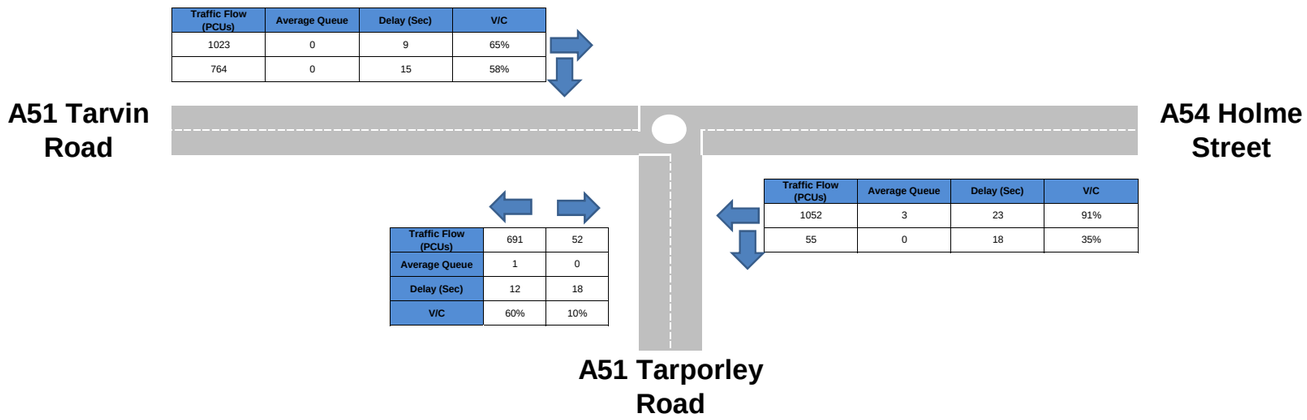
AECOM	Cheshire West & Chester Council	Chester Transport Strategy - Phase Two A4:Congestion Relief - Pinch Point	Network Performance Indicators Hoole Road Corridor 2030 Do Nothing	Appendix C, Figure 3	A

AM Peak Period



PM Peak Period



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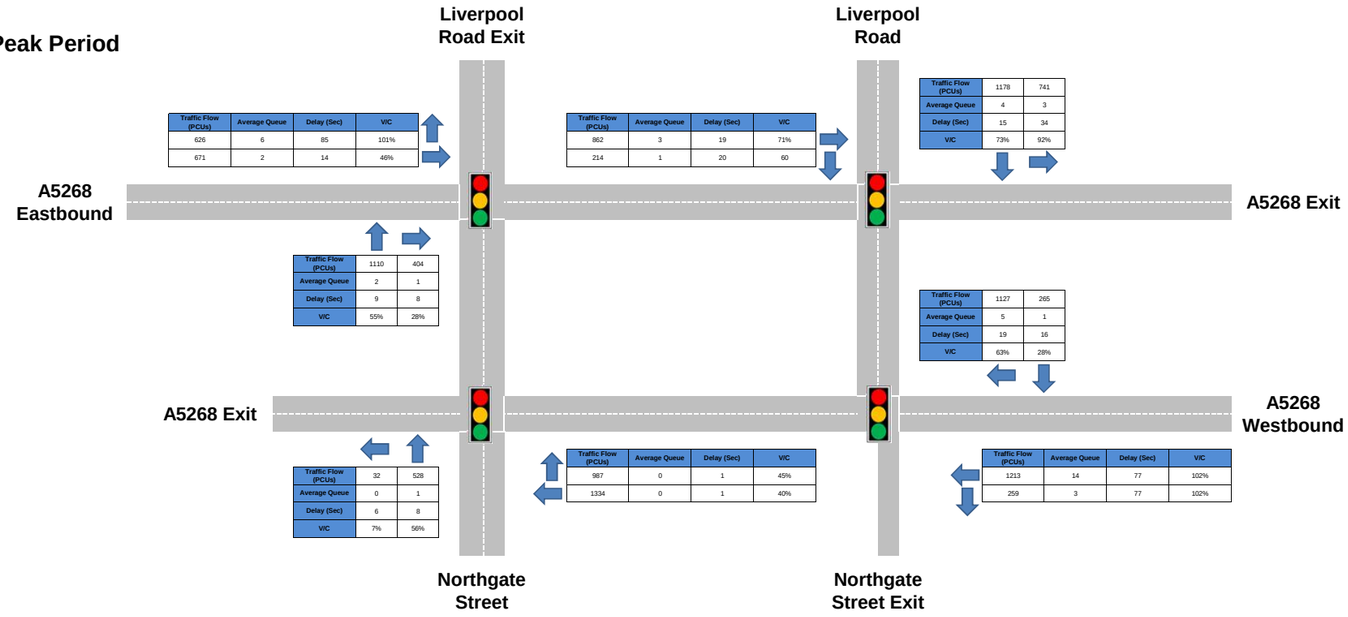
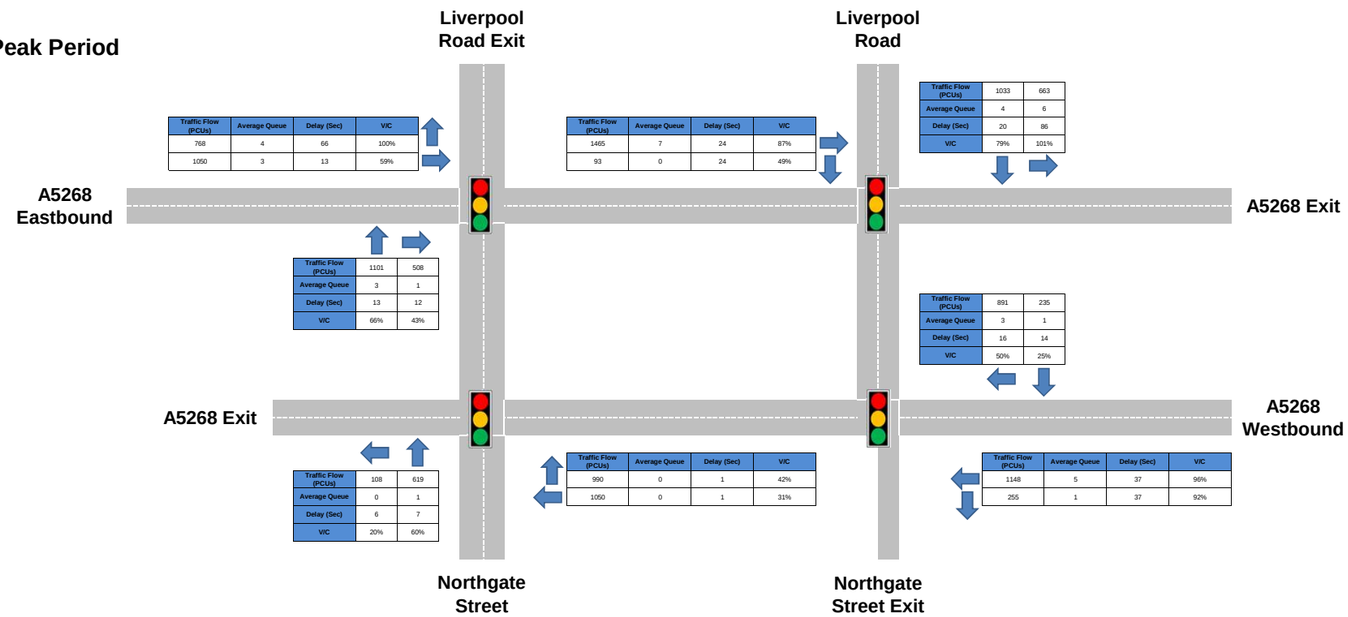
AECOM	Cheshire West & Chester Council	Chester Transport Strategy - Phase Two A4:Congestion Relief - Pinch Point	Network Performance Indicators Tarvin Roundabout 2030 Do Nothing	Appendix C, Figure 4	A

AM Peak Period

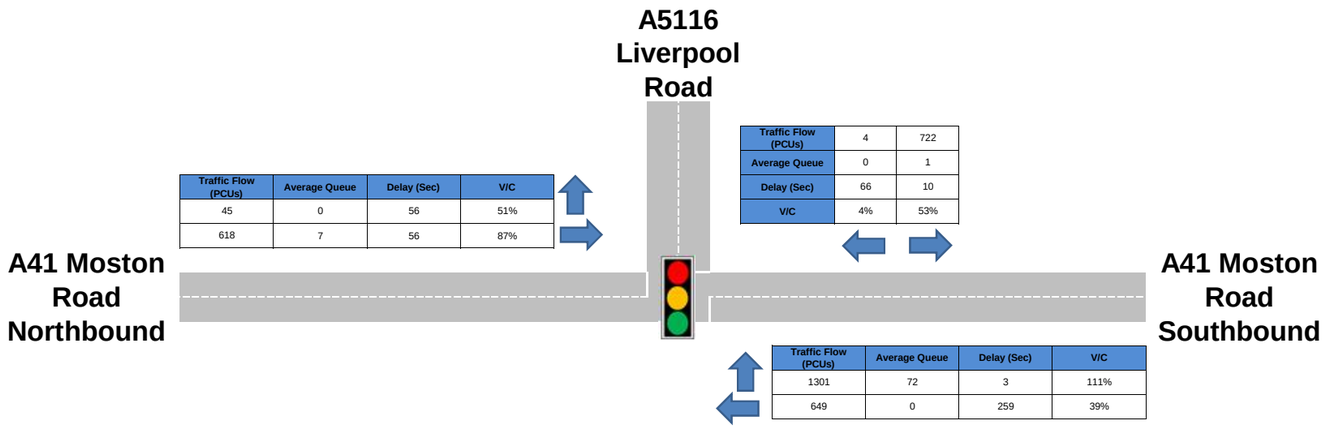


PM Peak Period



Prepared by:	Client:	Project:	Title:	Drawing no:	Rev:
AECOM	Cheshire West & Chester Council	Chester Transport Strategy - Phase Two A4:Congestion Relief - Pinch Point	Network Performance Indicators Fountains Roundabout 2030 Do Nothing	Appendix C, Figure 5	**A**

AM Peak Period

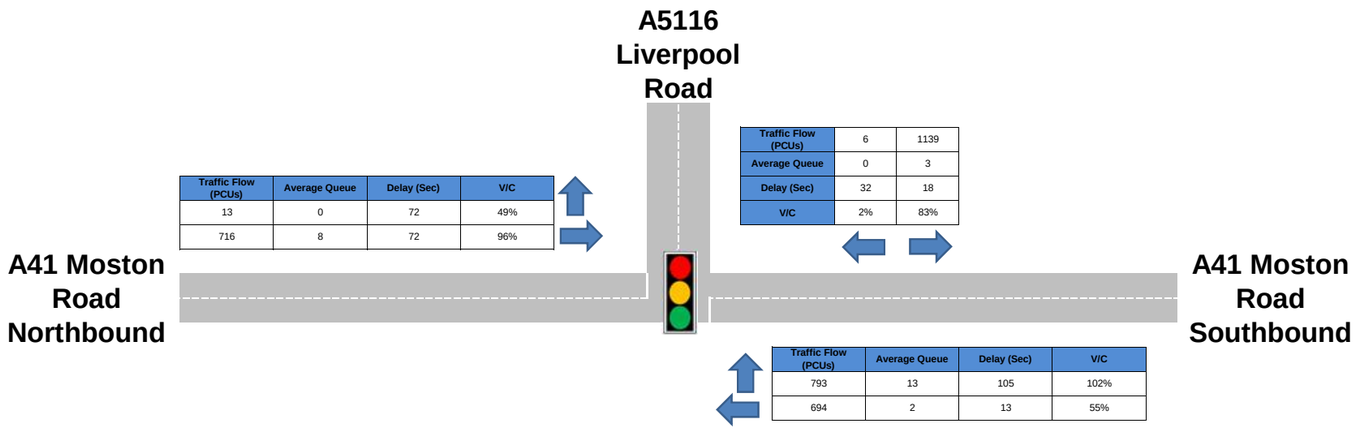


Traffic Flow (PCUs)	Average Queue	Delay (Sec)	V/C
45	0	56	51%
618	7	56	87%

Traffic Flow (PCUs)	4	722
Average Queue	0	1
Delay (Sec)	66	10
V/C	4%	53%

Traffic Flow (PCUs)	Average Queue	Delay (Sec)	V/C
1301	72	3	111%
649	0	259	39%

PM Peak Period



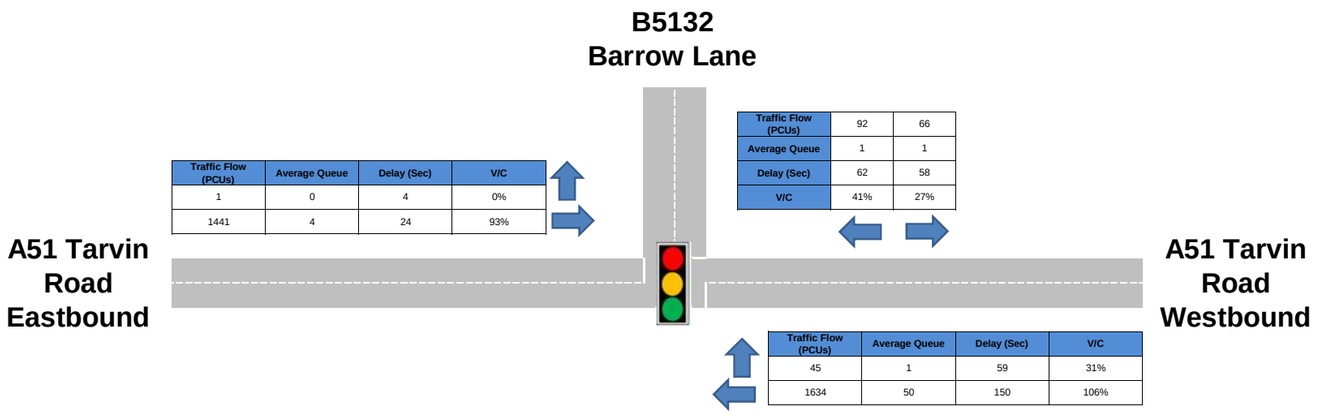
Traffic Flow (PCUs)	Average Queue	Delay (Sec)	V/C
13	0	72	49%
716	8	72	96%

Traffic Flow (PCUs)	6	1139
Average Queue	0	3
Delay (Sec)	32	18
V/C	2%	83%

Traffic Flow (PCUs)	Average Queue	Delay (Sec)	V/C
793	13	105	102%
694	2	13	55%

Prepared by:	Client:	Project:	Title:	Drawing no:	Rev:
AECOM	Cheshire West & Chester Council	Chester Transport Strategy - Phase Two A4:Congestion Relief - Pinch Point	Network Performance Indicators Moston Road / Liverpool Road 2030 Do Nothing	Appendix C, Figure 6	A

AM Peak Period

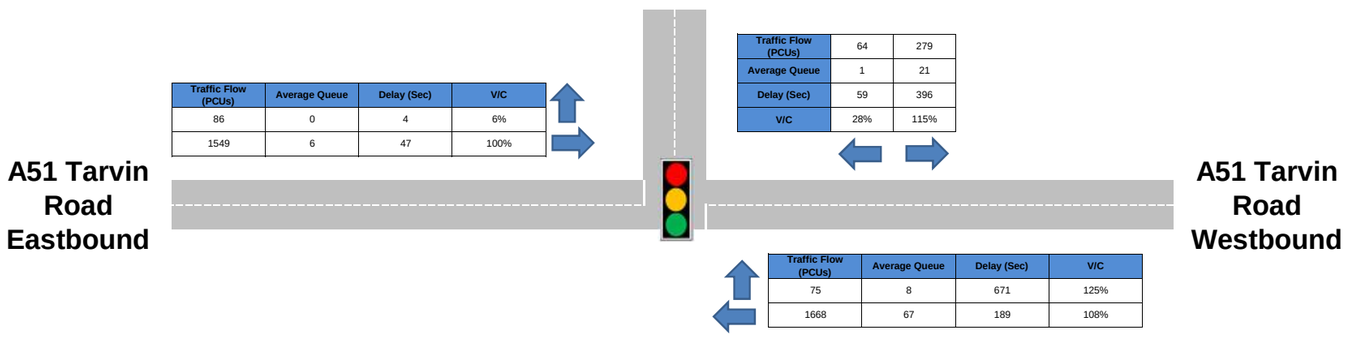


Traffic Flow (PCUs)	Average Queue	Delay (Sec)	V/C
1	0	4	0%
1441	4	24	93%

Traffic Flow (PCUs)	92	66
Average Queue	1	1
Delay (Sec)	62	58
V/C	41%	27%

Traffic Flow (PCUs)	Average Queue	Delay (Sec)	V/C
45	1	59	31%
1634	50	150	106%

PM Peak Period



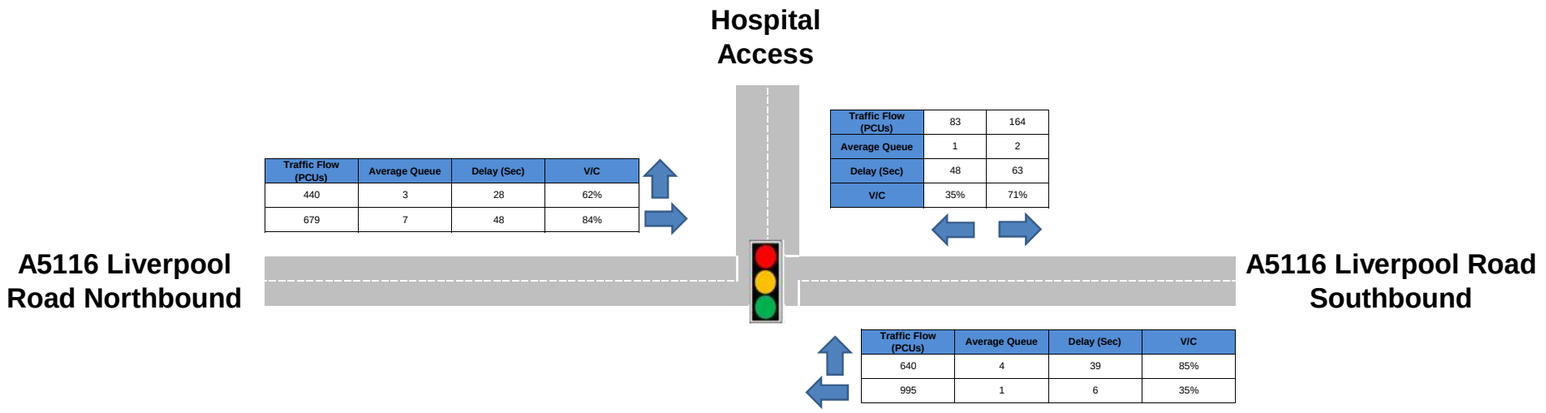
Traffic Flow (PCUs)	Average Queue	Delay (Sec)	V/C
86	0	4	6%
1549	6	47	100%

Traffic Flow (PCUs)	64	279
Average Queue	1	21
Delay (Sec)	59	396
V/C	28%	115%

Traffic Flow (PCUs)	Average Queue	Delay (Sec)	V/C
75	8	671	125%
1668	67	189	108%

Prepared by:	Client:	Project:	Title:	Drawing no:	Rev:
AECOM	Cheshire West & Chester Council	Chester Transport Strategy - Phase Two A4:Congestion Relief - Pinch Point	Network Performance Indicators Tarvin Road / Barlow Lane 2030 Do Nothing	Appendix C, Figure 7	A

AM Peak Period

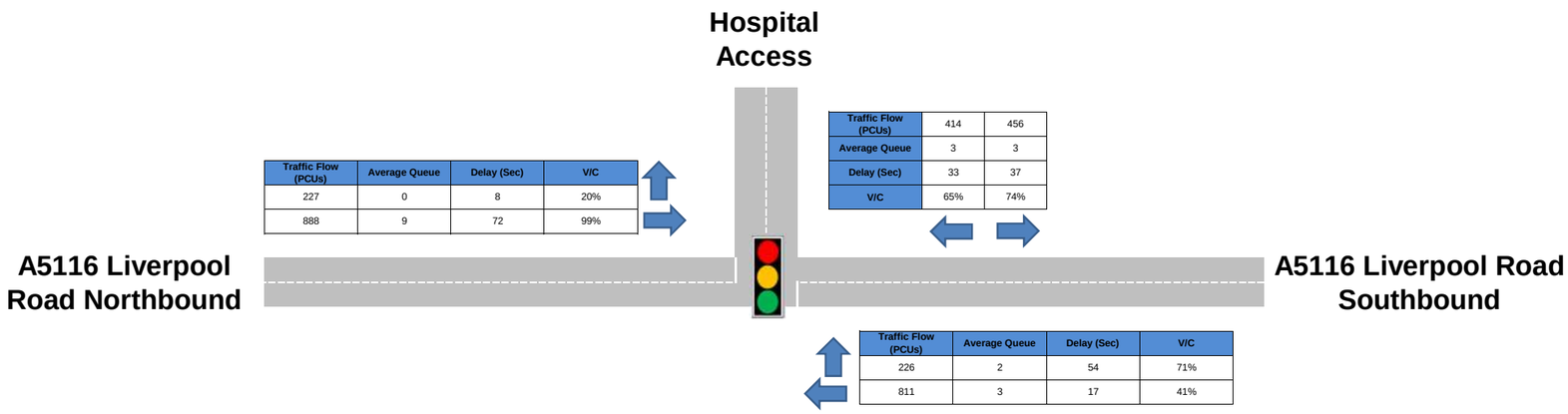


Traffic Flow (PCUs)	Average Queue	Delay (Sec)	V/C
440	3	28	62%
679	7	48	84%

Traffic Flow (PCUs)		
Average Queue	1	2
Delay (Sec)	48	63
V/C	35%	71%

Traffic Flow (PCUs)	Average Queue	Delay (Sec)	V/C
640	4	39	85%
995	1	6	35%

PM Peak Period



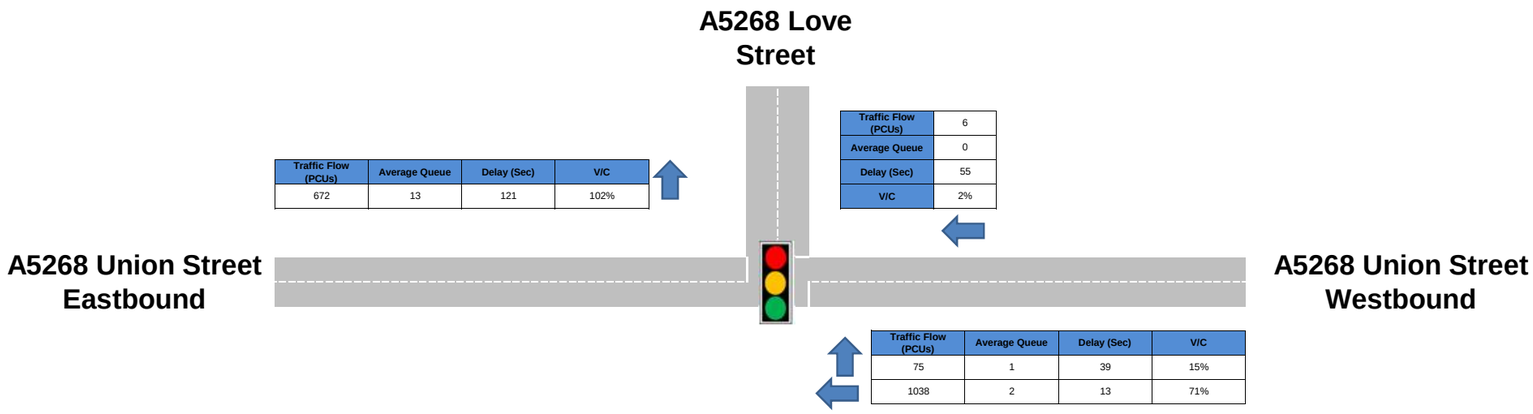
Traffic Flow (PCUs)	Average Queue	Delay (Sec)	V/C
227	0	8	20%
888	9	72	99%

Traffic Flow (PCUs)		
Average Queue	3	3
Delay (Sec)	33	37
V/C	65%	74%

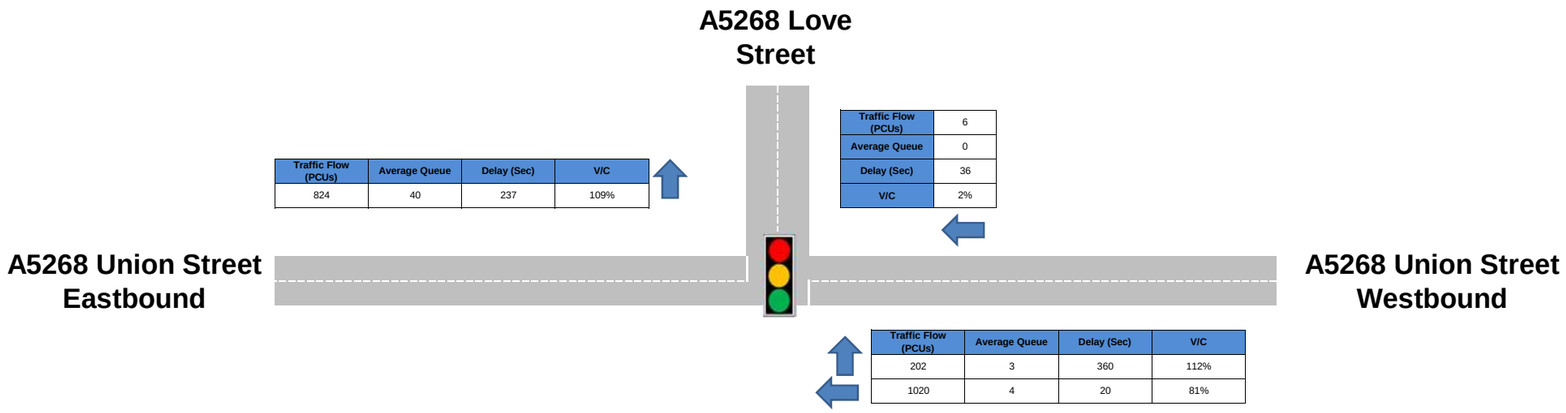
Traffic Flow (PCUs)	Average Queue	Delay (Sec)	V/C
226	2	54	71%
811	3	17	41%

Prepared by:	Client:	Project:	Title:	Drawing no:	Rev:
AECOM	Cheshire West & Chester Council	Chester Transport Strategy - Phase Two A4:Congestion Relief - Pinch Point	Network Performance Indicators Liverpool Vienne 2030 Do Nothing	Appendix C, Figure 8	A

AM Peak Period

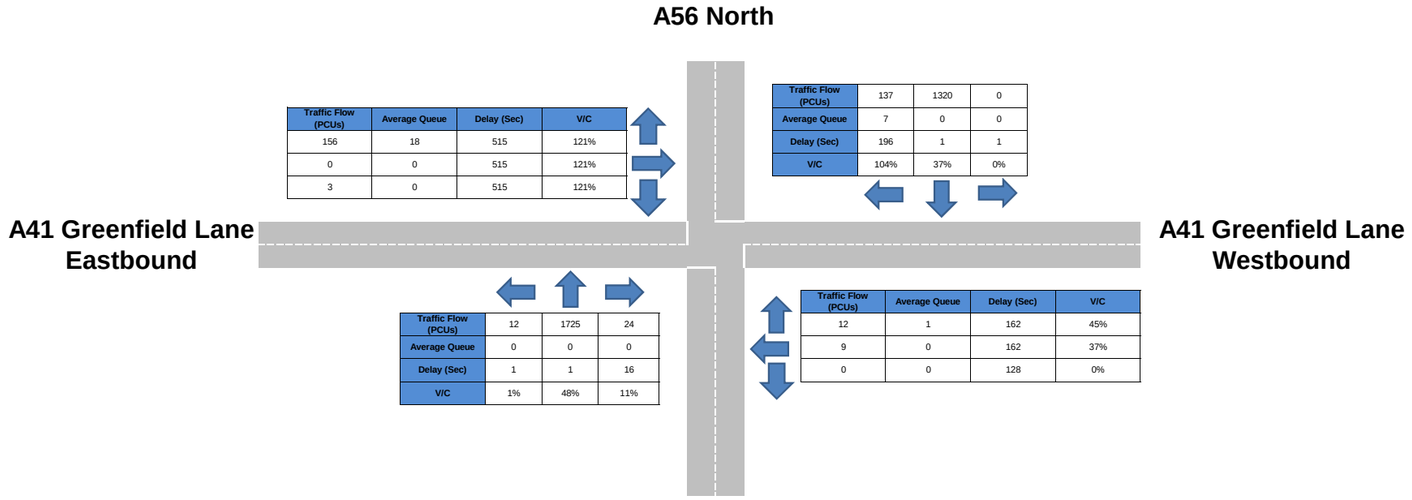


PM Peak Period



Prepared by:	Client:	Project:	Title:	Drawing no:	Rev:
AECOM	Cheshire West & Chester Council	Chester Transport Strategy - Phase Two A4:Congestion Relief - Pinch Point	Network Performance Indicators Union Street / Love Street 2030 Do Nothing	Appendix C, Figure 9	A

AM Peak Period



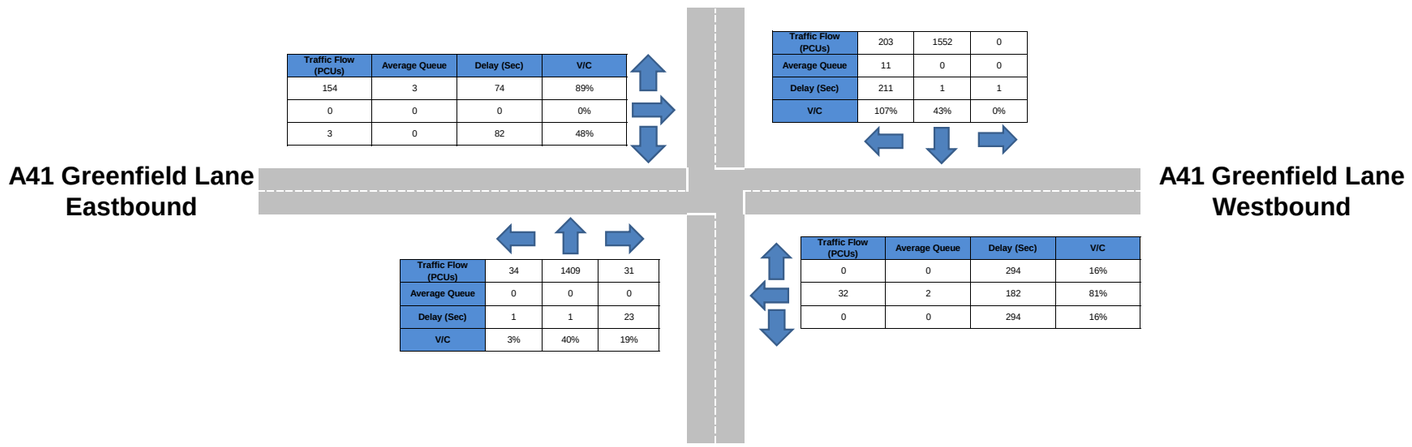
Traffic Flow (PCUs)	Average Queue	Delay (Sec)	V/C
156	18	515	121%
0	0	515	121%
3	0	515	121%

Traffic Flow (PCUs)	137	1320	0
Average Queue	7	0	0
Delay (Sec)	196	1	1
V/C	104%	37%	0%

Traffic Flow (PCUs)	12	1725	24
Average Queue	0	0	0
Delay (Sec)	1	1	16
V/C	1%	48%	11%

Traffic Flow (PCUs)	Average Queue	Delay (Sec)	V/C
12	1	162	45%
9	0	162	37%
0	0	128	0%

PM Peak Period



Traffic Flow (PCUs)	Average Queue	Delay (Sec)	V/C
154	3	74	89%
0	0	0	0%
3	0	82	48%

Traffic Flow (PCUs)	203	1552	0
Average Queue	11	0	0
Delay (Sec)	211	1	1
V/C	107%	43%	0%

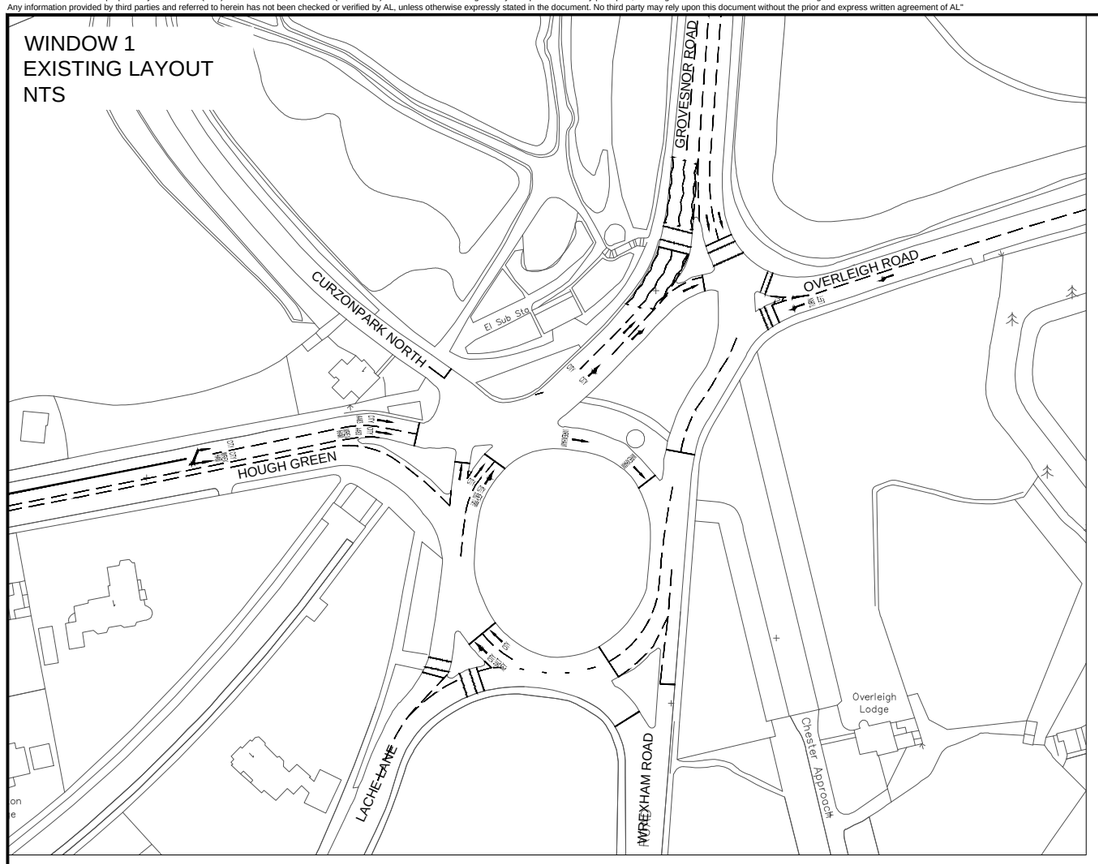
Traffic Flow (PCUs)	34	1409	31
Average Queue	0	0	0
Delay (Sec)	1	1	23
V/C	3%	40%	19%

Traffic Flow (PCUs)	Average Queue	Delay (Sec)	V/C
0	0	294	16%
32	2	182	81%
0	0	294	16%

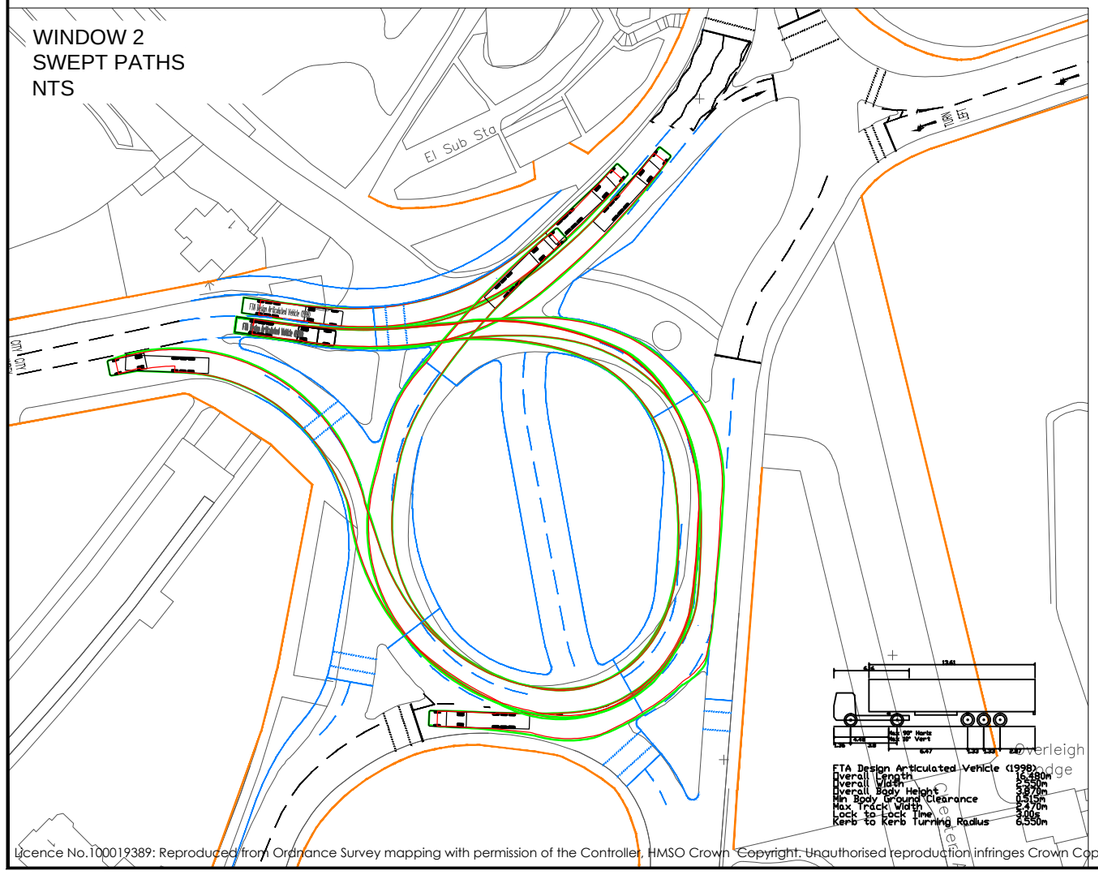
Prepared by:	Client:	Project:	Title:	Drawing no:	Rev:
AECOM	Cheshire West & Chester Council	Chester Transport Strategy - Phase Two A4:Congestion Relief - Pinch Point	Network Performance Indicators Green Lane / A41 Ring Road 2030 Do Nothing	Appendix C, Figure 10	A

APPENDIX D

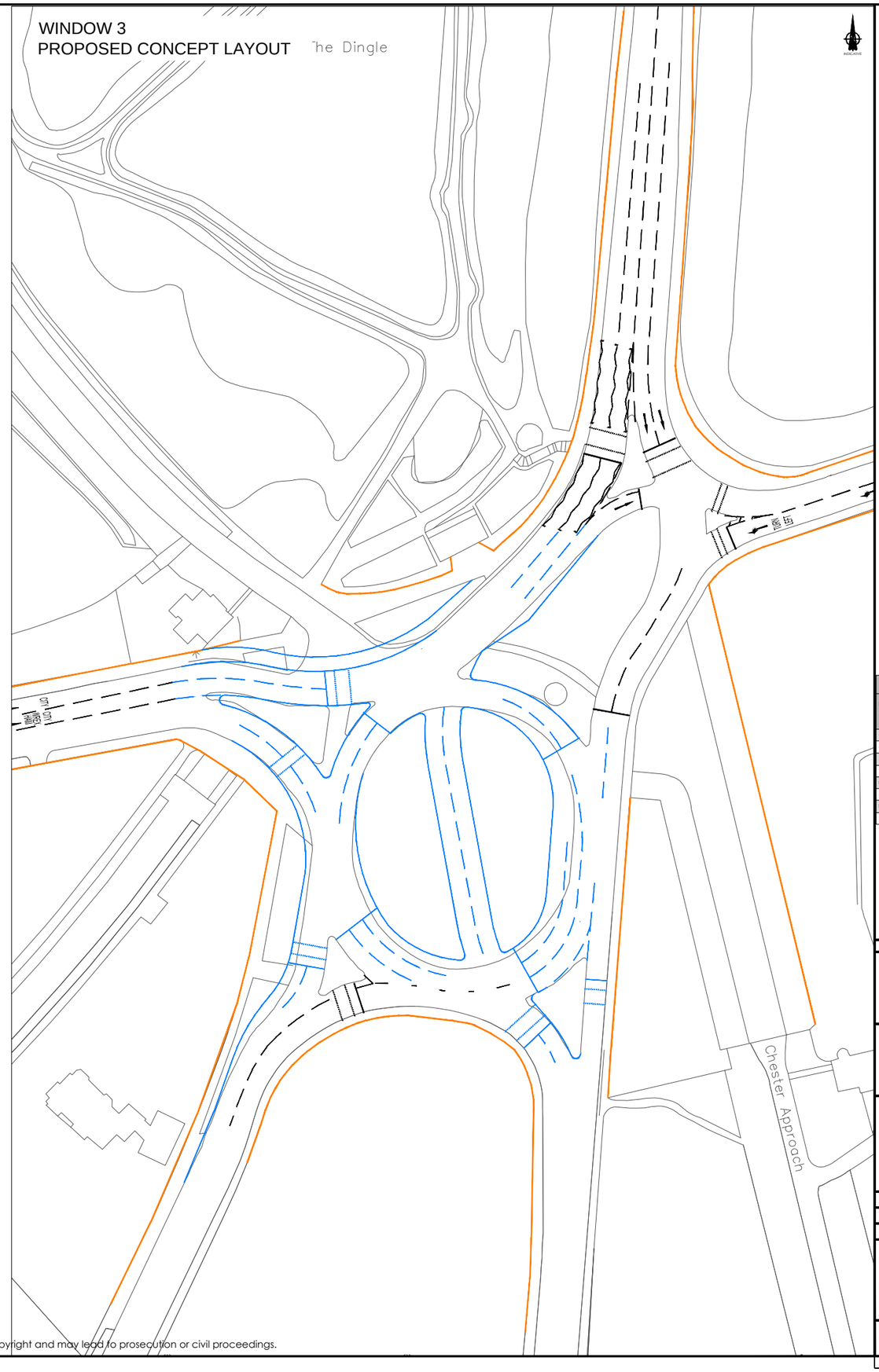
WINDOW 1
EXISTING LAYOUT
NTS



WINDOW 2
SWEPT PATHS
NTS



WINDOW 3
PROPOSED CONCEPT LAYOUT



NOTES

1. ALL DIMENSIONS IN METRES UNLESS OTHERWISE STATED
2. ANY DESIGN DISCREPANCIES TO BE BROUGHT TO THE ATTENTION OF AECOM
3. CONCEPT DESIGN ONLY TO AID JUNCTION MODELLING AND FURTHER DESIGN DEVELOPMENT

KEY

- PROPOSED CONCEPT SCHEME
- EXISTING CONSTRAINTS

DRAFT

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following specific residual risks (Reference shall also be made to the design hazard log).

Construction	
Conflict with buried and overhead services/utilities.	
Maintenance / Cleaning	
Working around live traffic. Working at height.	
Use	
None	
Decommissioning / Demolition	
None	

Rev	Date	Detail	Made	Chk'd	App'd

Client: Cheshire West and Chester

Project:
CHESTER TRANSPORT STRATEGY
PHASE TWO

Title:
SITE 1
OVERLEIGH ROUNDABOUT
CONCEPT SCHEME

Design: MH	CAD: MH
Chk'd: PG	App'd: APL
Date: AUG 2015	**Scale:** 1:500 @ A1 1:1000 @A3

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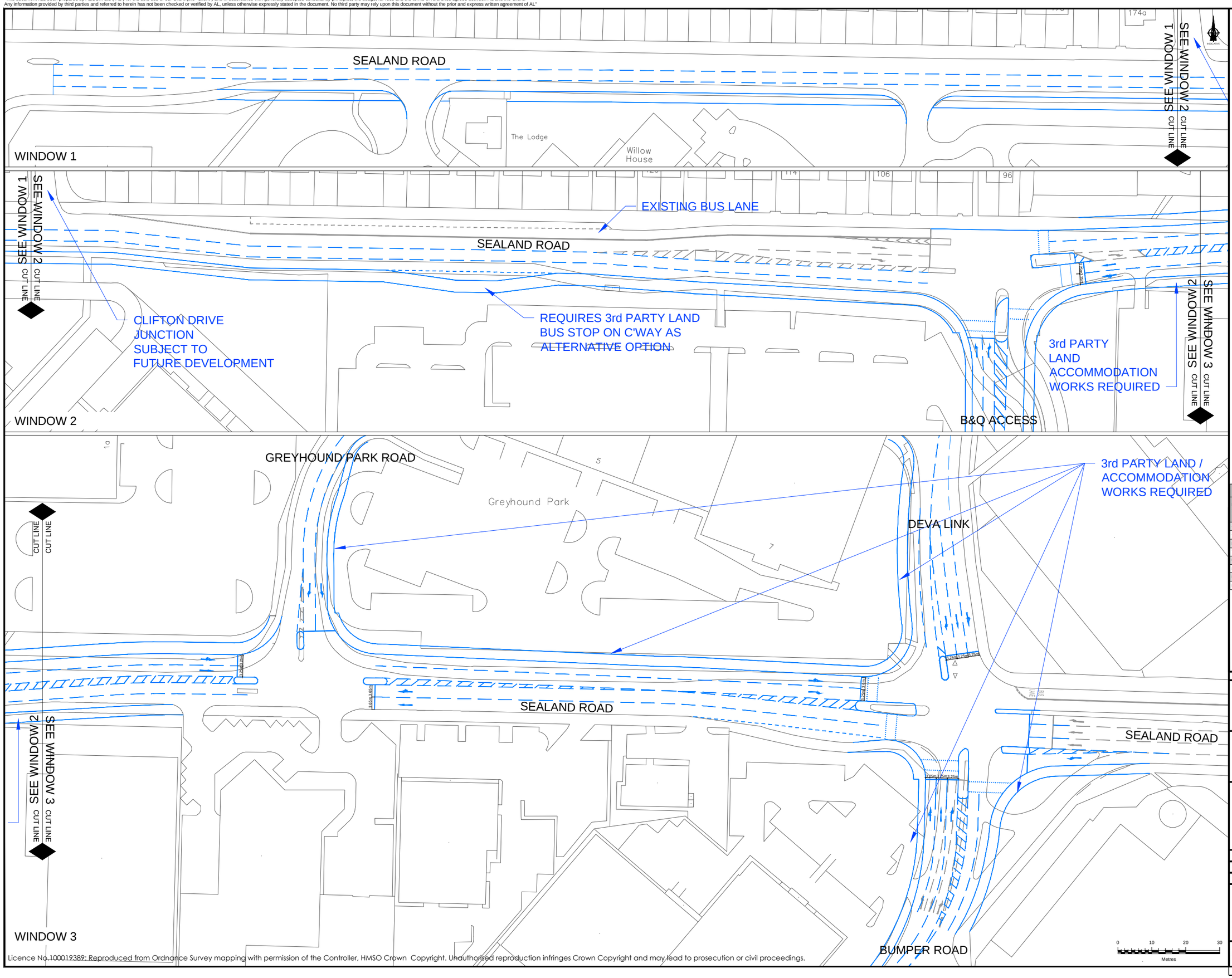
A1



NOTES

1. ALL DIMENSIONS IN METRES UNLESS OTHERWISE STATED
2. ANY DESIGN DISCREPANCIES TO BE BROUGHT TO THE ATTENTION OF AECOM
3. CONCEPT DESIGN ONLY TO AID JUNCTION MODELLING AND FURTHER DESIGN DEVELOPMENT
4. SCHEME REQUIRES 3RD PARTY LAND

KEY

— PROPOSED CONCEPT SCHEME

DRAFT

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following specific residual risks (Reference shall also be made to the design hazard log).
Construction
Conflict with buried and overhead services/utilities.
Maintenance / Cleaning
Working around live traffic. Working at height.
Use
None
Decommissioning / Demolition
None

Rev	Date	Detail	Made	Chk'd	App'd
A	26.11.15	Notes added	PG	MF	APL

Client: Cheshire West and Chester

Project: CHESTER TRANSPORT STRATEGY PHASE TWO

Title: SITE 2 SEALAND ROAD CORRIDOR DEVA LINK / B&Q ACCESS / GREYHOUND PARK ROAD CONCEPT OPTION

Design: MH	CAD: MH
Chk'd: PG	App'd: APL
Date: AUG 2015	Scale: 1:500 @ A1 1:1000@A3

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A1

WINDOW 1
EXISTING SITE LAYOUT

KERBED BUILD OUTS
AT CONTROLLED CROSSINGS

EXISTING PARKING REMOVED
AND REPLACED IN SUITABLE
LOCATION. TROs INTRODUCED

KILMOREY PARK RD

NEWTON LANE

HOOLE ROAD

DERBY PLACE

FAULKNER ST

STONE PLACE

WESTMINSTER RD

HAMILTON ST

STOP STOP

TURN LEFT TURN RIGHT

INDICATIVE

NOTES

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2. ANY DESIGN DISCREPANCIES TO BE BROUGHT TO THE ATTENTION OF AECOM
3. CONCEPT DESIGN ONLY TO AID JUNCTION MODELLING AND FURTHER DESIGN DEVELOPMENT

KEY

PROPOSED CONCEPT SCHEME

DRAFT

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following specific residual risks (Reference shall also be made to the design hazard log).
Construction
Conflict with buried and overhead services/utilities.
Maintenance / Cleaning
Working around live traffic. Working at height.
Use
None
Decommissioning / Demolition
None

Rev	Date	Detail	Made	Chk'd	App'd

Client: Cheshire West and Chester

Project:
CHESTER TRANSPORT STRATEGY
PHASE TWO

Title:
SITE 3
HOOLE ROAD
FAULKNER ST TO HAMILTON ST
CONCEPT OPTION

Design: MH	CAD: MH
Chk'd: PG	App'd: APL
Date: AUG 2015	Scale: NTS

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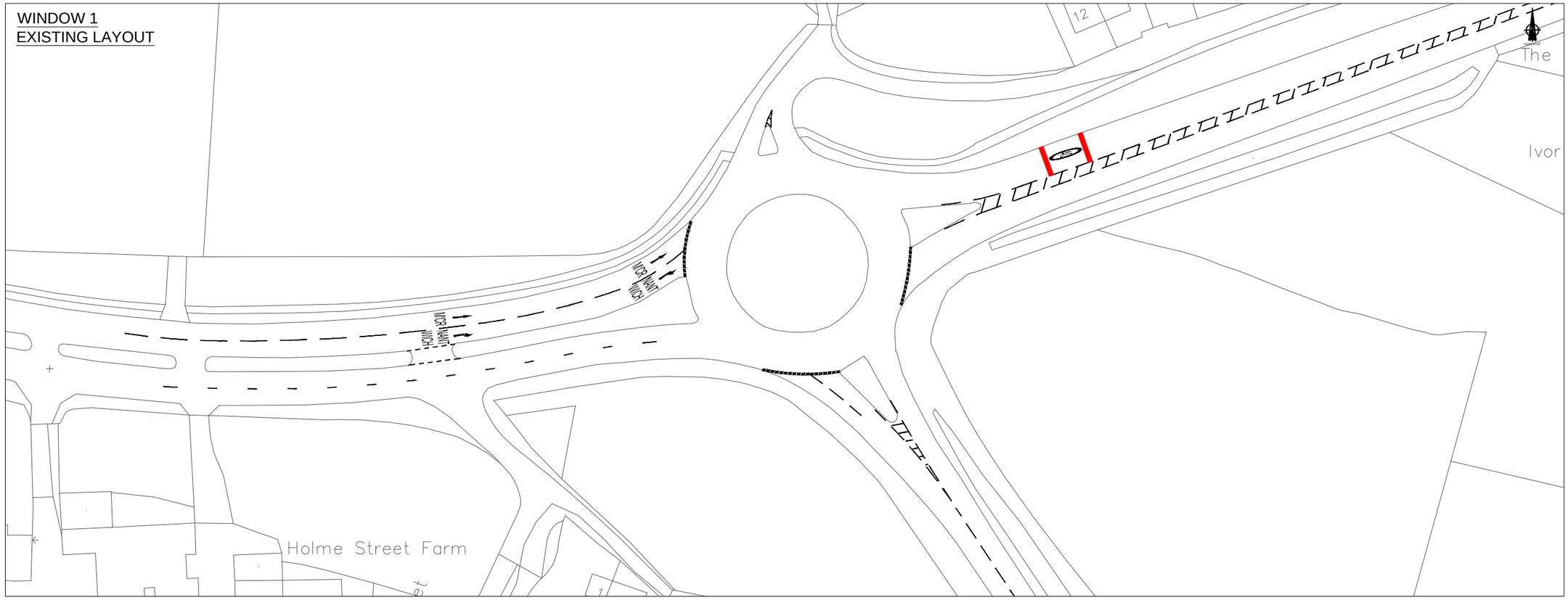
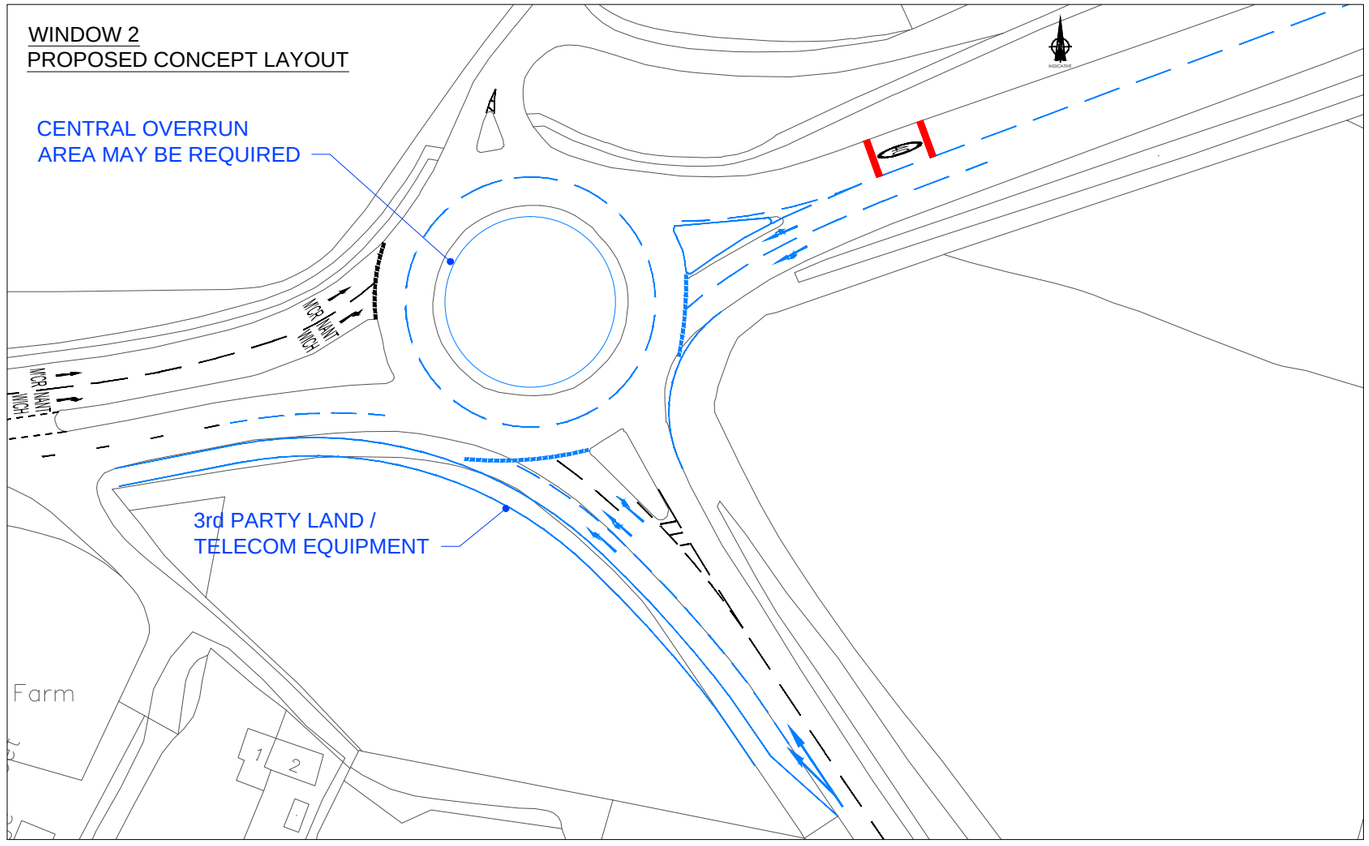
A1

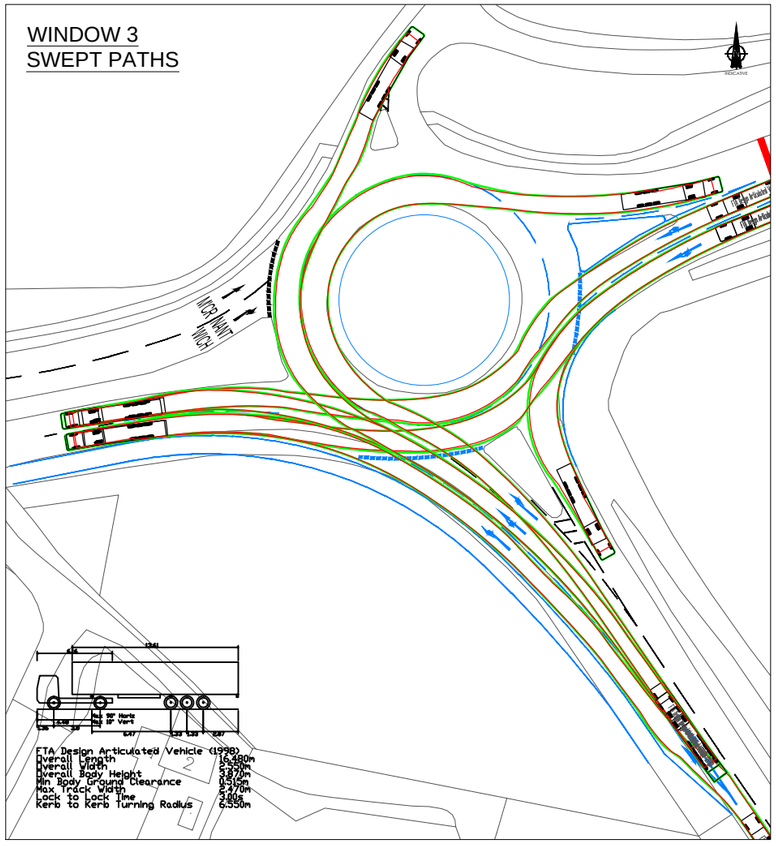
WINDOW 1
EXISTING LAYOUT



WINDOW 2
PROPOSED CONCEPT LAYOUT



WINDOW 3
SWEPT PATHS



NOTES

1. ALL DIMENSIONS IN METRES UNLESS OTHERWISE STATED
2. ANY DESIGN DISCREPANCIES TO BE BROUGHT TO THE ATTENTION OF AECOM
3. CONCEPT DESIGN ONLY TO AID JUNCTION MODELLING AND FURTHER DESIGN DEVELOPMENT
4. SCHEME REQUIRES 3RD PARTY LAND

KEY

— PROPOSED CONCEPT SCHEME

DRAFT

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following specific residual risks (Reference shall also be made to the design hazard log).

Construction
Conflict with buried and overhead services/utilities.
Maintenance / Cleaning
Working around live traffic. Working at height.
Use
None
Decommissioning / Demolition
None

Rev	Date	Detail	Made	Chk'd	App'd

Client: Cheshire West and Chester

Project: CHESTER TRANSPORT STRATEGY PHASE TWO

Title: SITE 4
A51 / A54 TARVIN ROUNDABOUT
CONCEPT OPTION 1

Design: MH	CAD: MH
Chk'd: PG	App'd: APL
Date: AUG 2015	**Scale**: 1:500 @ A1 1:1000@A3

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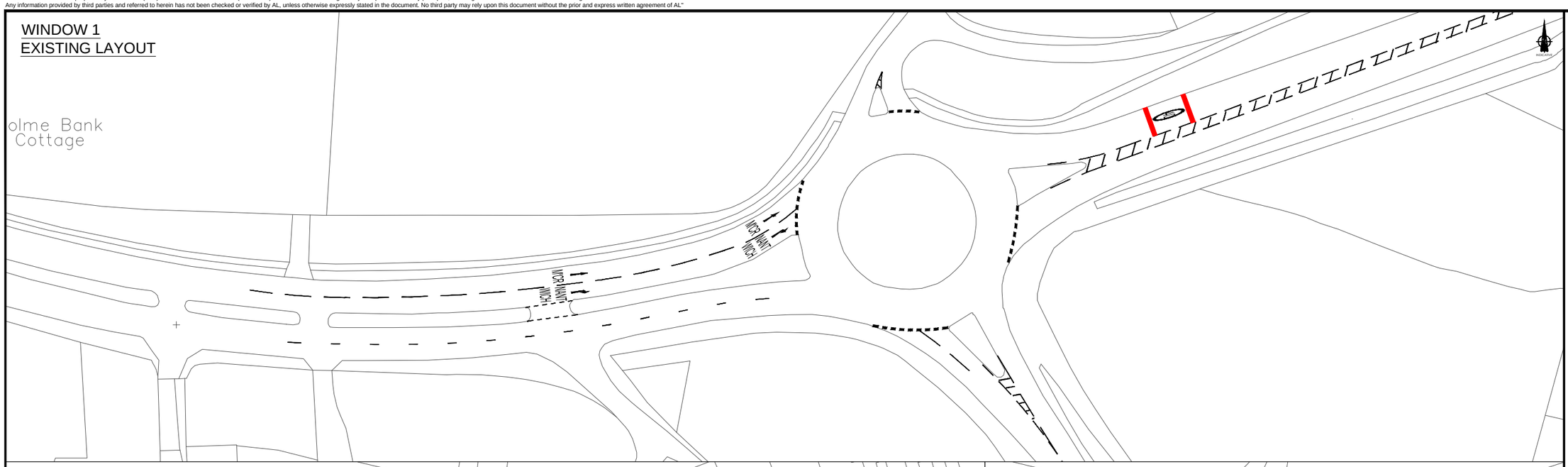
60334355_P_SK012 Rev:

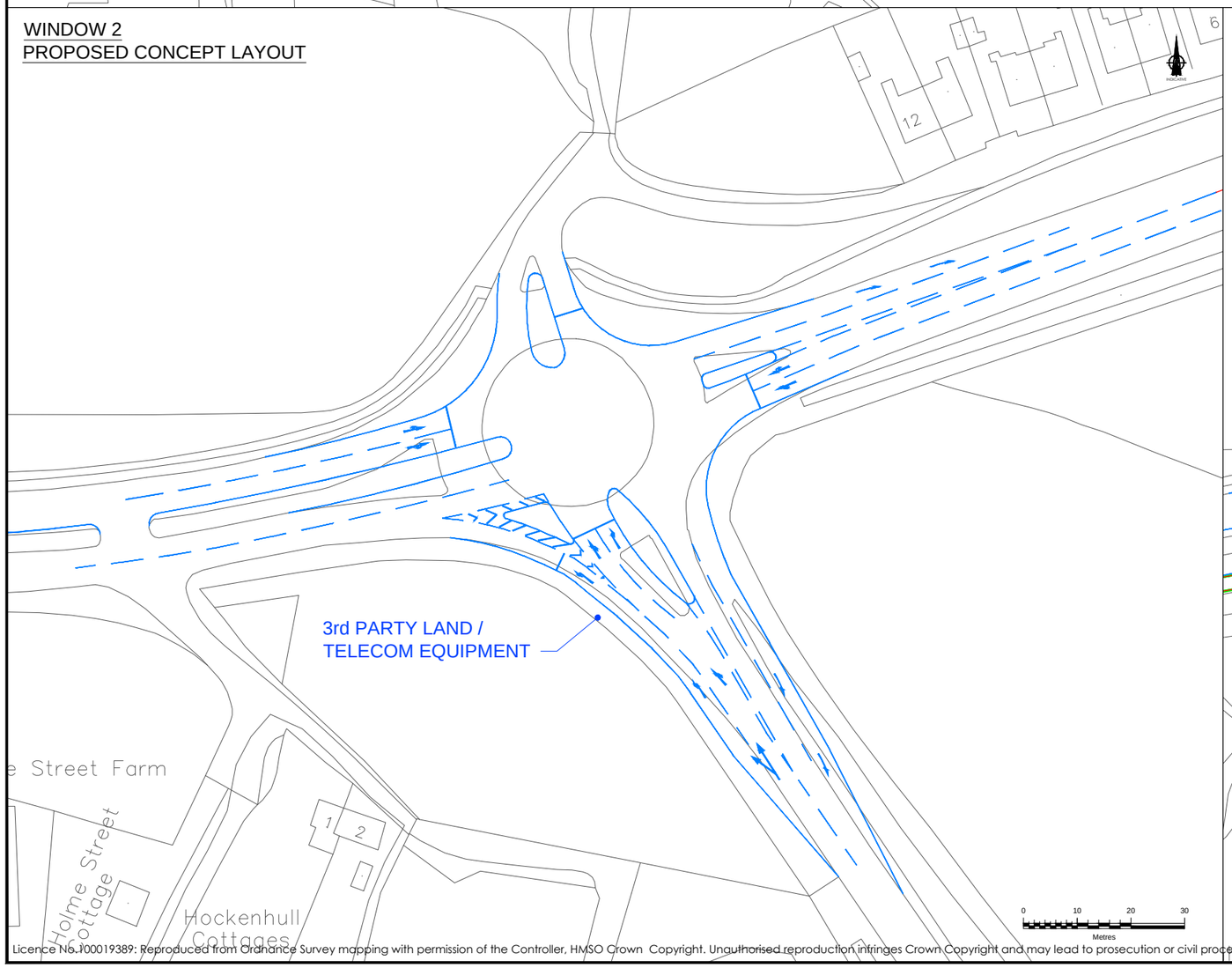
A1

cm

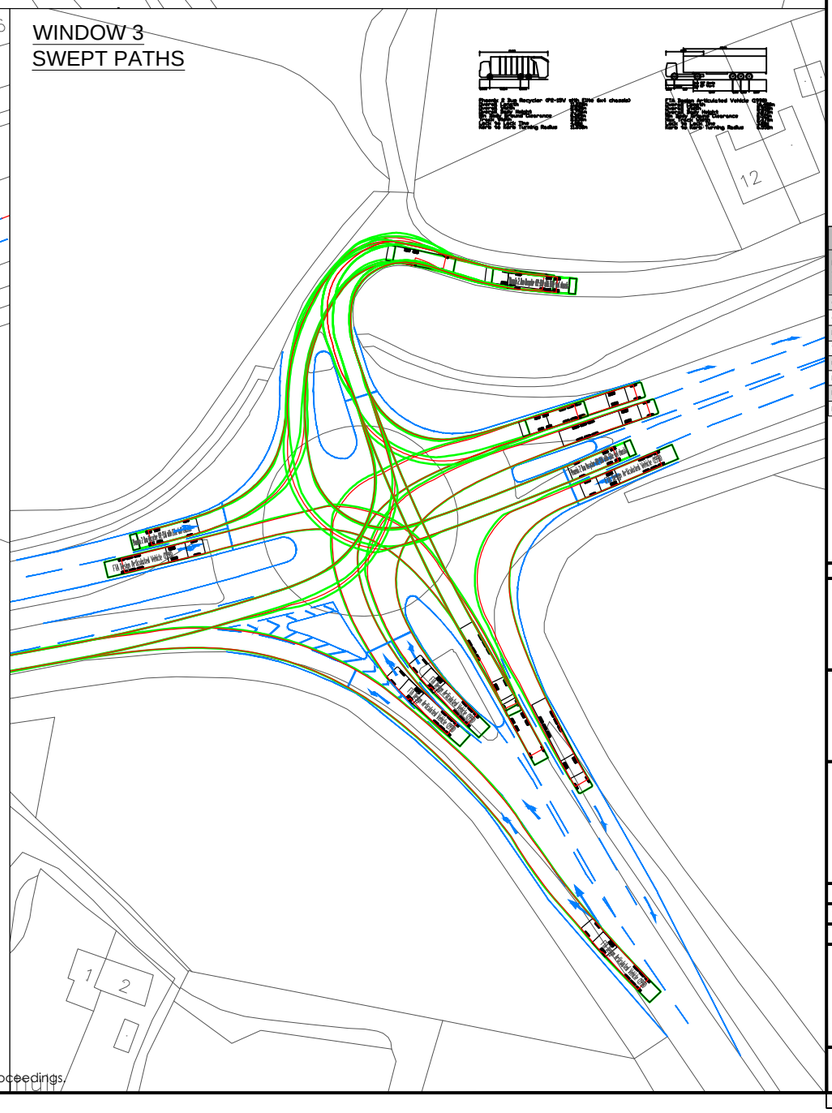
WINDOW 1
EXISTING LAYOUT



WINDOW 2
PROPOSED CONCEPT LAYOUT



WINDOW 3
SWEPT PATHS



NOTES

1. ALL DIMENSIONS IN METRES UNLESS OTHERWISE STATED
2. ANY DESIGN DISCREPANCIES TO BE BROUGHT TO THE ATTENTION OF AECOM
3. CONCEPT DESIGN ONLY TO AID JUNCTION MODELLING AND FURTHER DESIGN DEVELOPMENT
4. SCHEME REQUIRES 3RD PARTY LAND

KEY

— PROPOSED CONCEPT SCHEME

DRAFT

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following specific residual risks (Reference shall also be made to the design hazard log).
Construction
Conflict with buried and overhead services/utilities.
Maintenance / Cleaning
Working around live traffic. Working at height.
Use
None
Decommissioning / Demolition
None

Rev	Date	Detail	Made	Chk'd	App'd

Client: Cheshire West and Chester

Project:
CHESTER TRANSPORT STRATEGY
PHASE TWO

Title:
SITE 4
A51 / A54 TARVIN ROUNDABOUT
CONCEPT OPTION 2

Design: MH	CAD: MH
Chk'd: PG	App'd: APL
Date: AUG 2015	**Scale:** 1:500 @ A1 1:1000@A3

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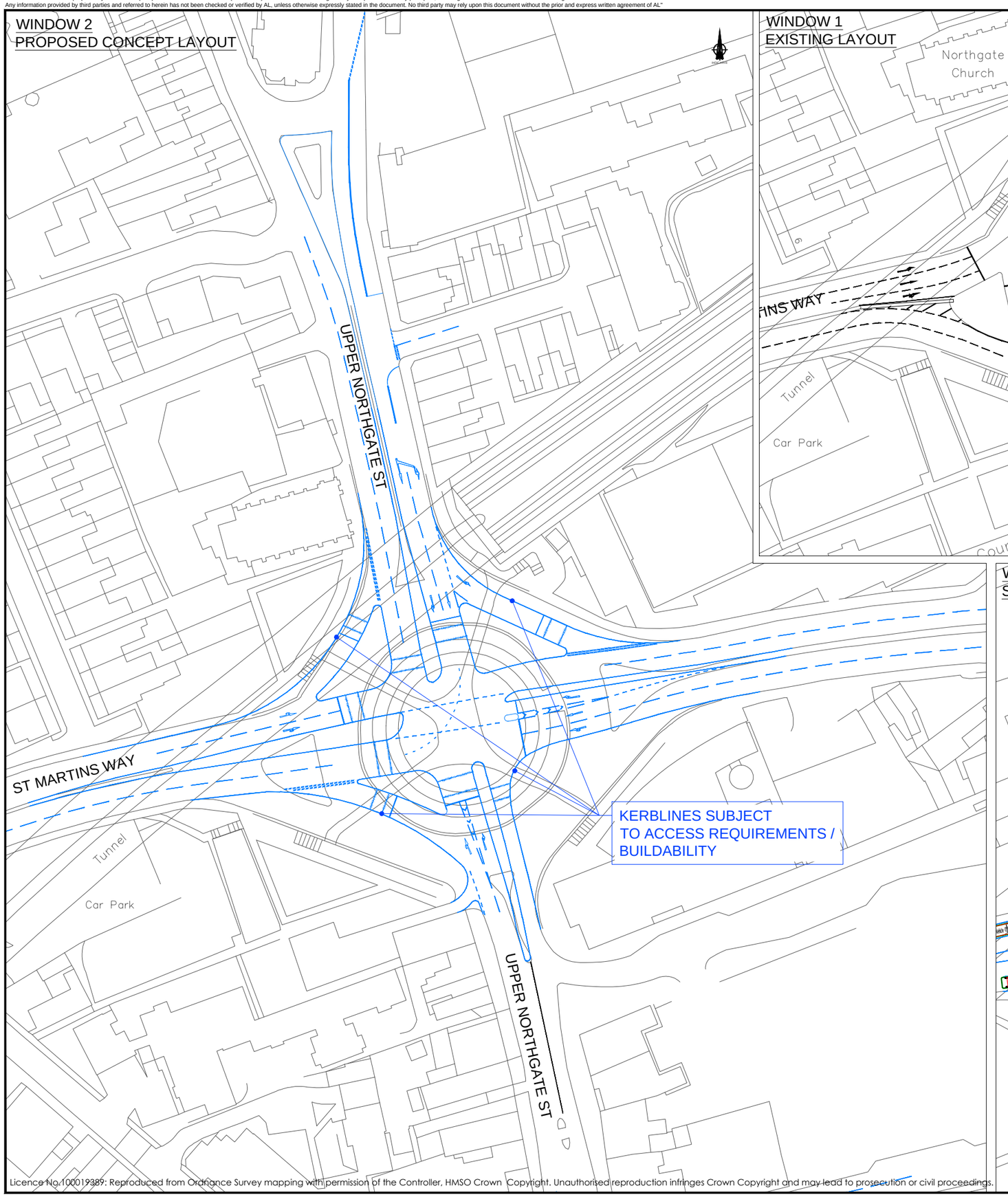
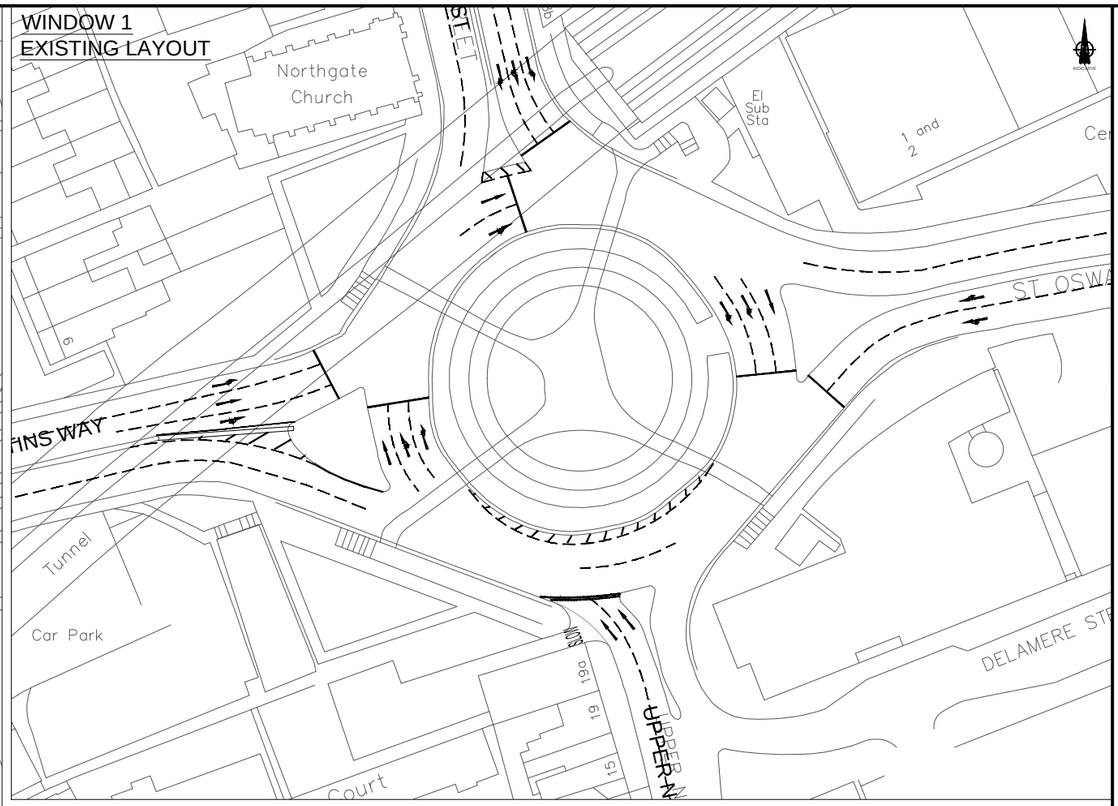
60334355_P_SK004 Rev:

A1

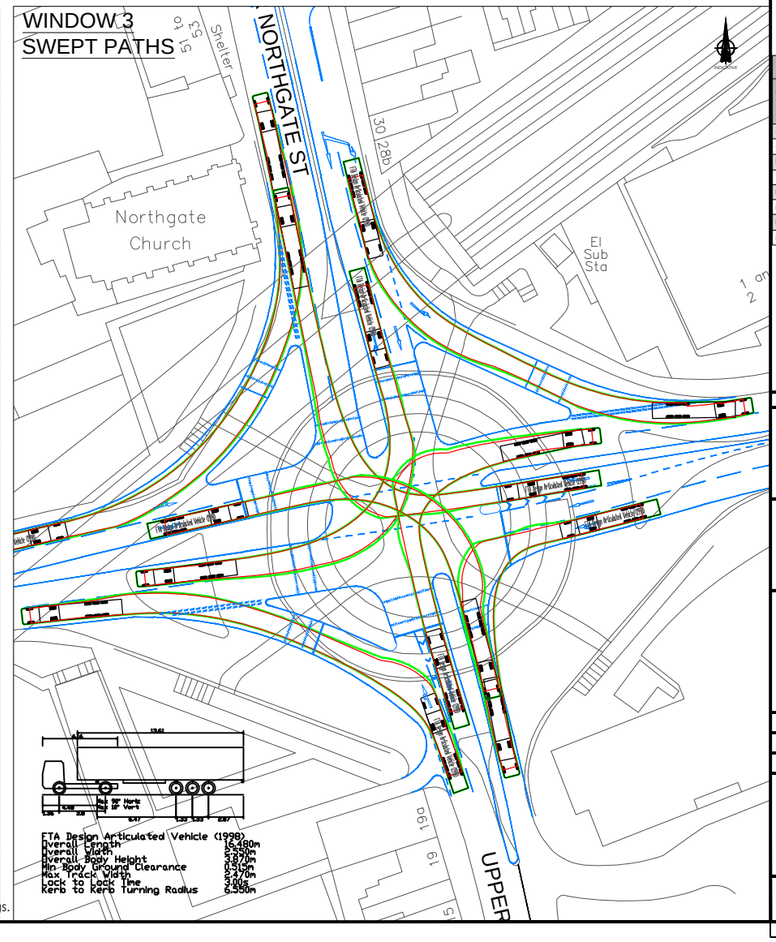
WINDOW 2
PROPOSED CONCEPT LAYOUT



WINDOW 1
EXISTING LAYOUT



WINDOW 3
SWEPT PATHS



NOTES

1. ALL DIMENSIONS IN METRES UNLESS OTHERWISE STATED
2. ANY DESIGN DISCREPANCIES TO BE BROUGHT TO THE ATTENTION OF AECOM
3. CONCEPT DESIGN ONLY TO AID JUNCTION MODELLING AND FURTHER DESIGN DEVELOPMENT

KEY

— PROPOSED CONCEPT SCHEME

DRAFT

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following specific residual risks (Reference shall also be made to the design hazard log).
Construction
Conflict with buried and overhead services/utilities.
Maintenance / Cleaning
Working around live traffic. Working at height.
Use
None
Decommissioning / Demolition
None

Rev	Date	Detail	Made	Chk'd	App'd

Client: Cheshire West and Chester

Project: CHESTER TRANSPORT STRATEGY PHASE TWO

Title: SITE 5 FOUNDTAINS ROUNDABOUT CONCEPT OPTION

Design: MH	CAD: MH
Chk'd: PG	App'd: APL
Date: AUG 2015	**Scale:** 1:500 @ A1 1:1000@A3

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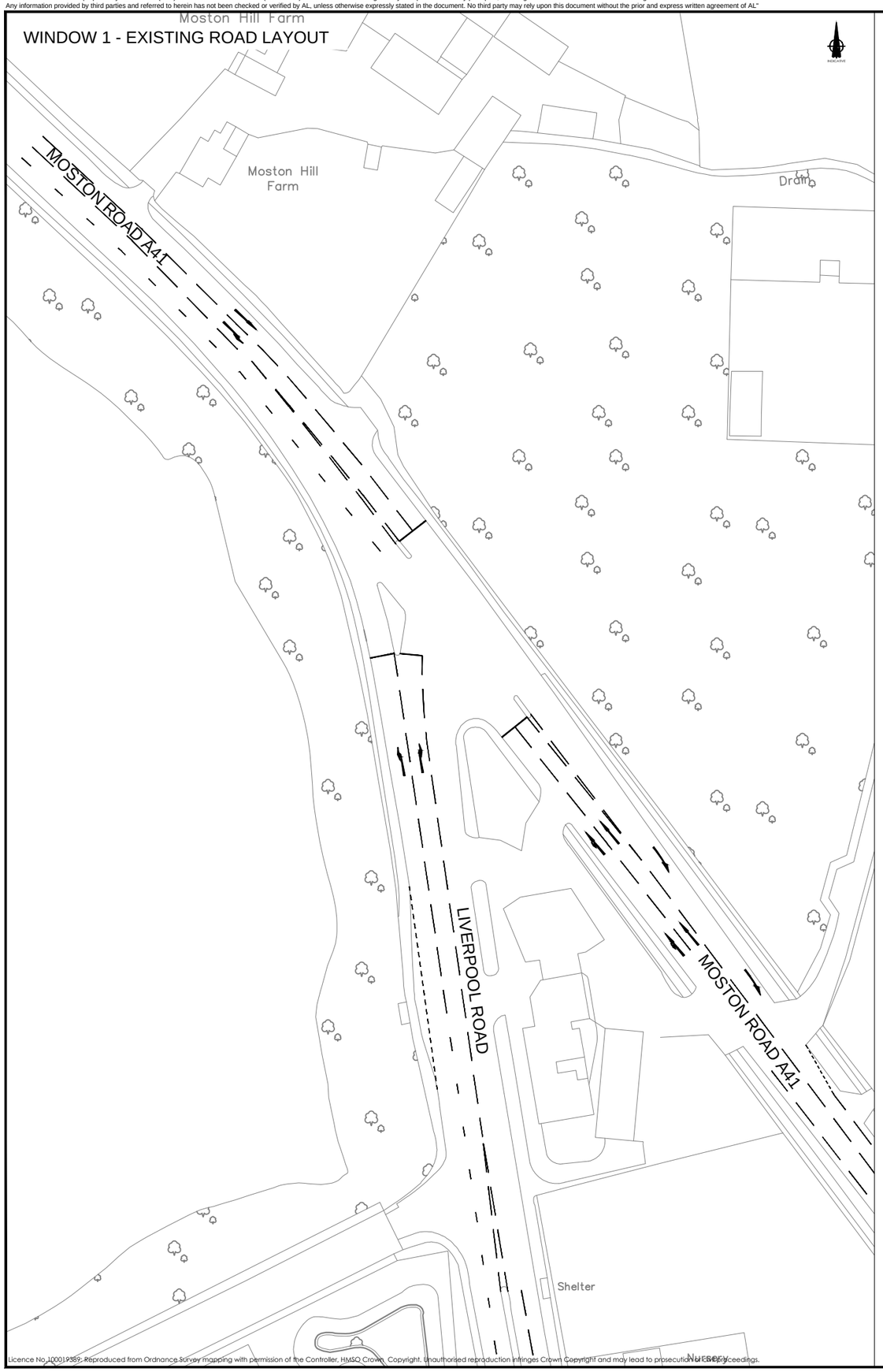
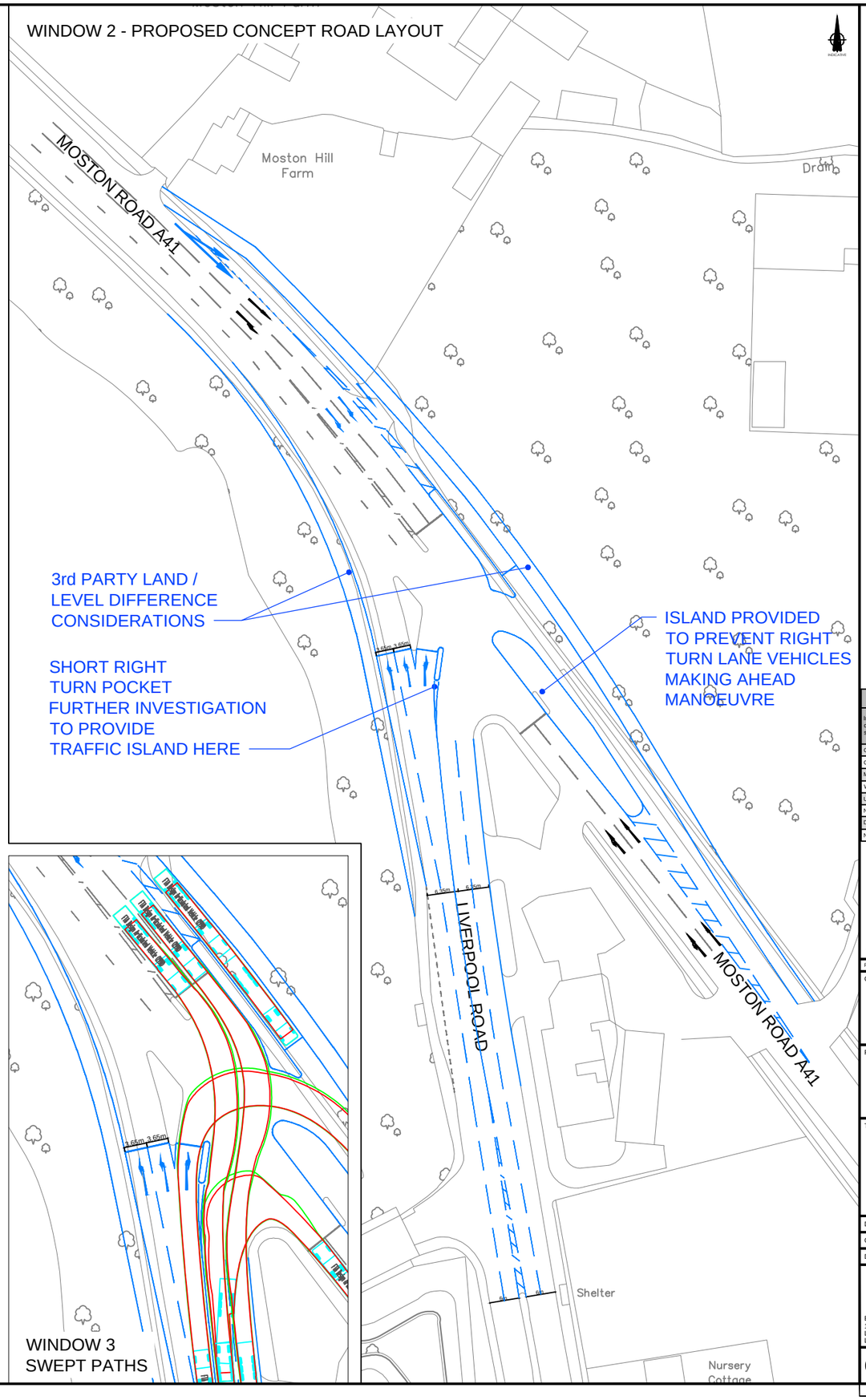
60334355_P_SK005 Rev:

A1

WINDOW 1 - EXISTING ROAD LAYOUT



WINDOW 2 - PROPOSED CONCEPT ROAD LAYOUT



WINDOW 3 SWEPT PATHS

NOTES

1. ALL DIMENSIONS IN METRES UNLESS OTHERWISE STATED
2. ANY DESIGN DISCREPANCIES TO BE BROUGHT TO THE ATTENTION OF AECOM
3. CONCEPT DESIGN ONLY TO AID JUNCTION MODELLING AND FURTHER DESIGN DEVELOPMENT
4. SCHEME REQUIRES 3RD PARTY LAND

KEY

— PROPOSED CONCEPT SCHEME

DRAFT

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following specific residual risks (Reference shall also be made to the design hazard log).
Construction
Conflict with buried and overhead services/utilities.
Maintenance / Cleaning
Working around live traffic. Working at height.
Use
None
Decommissioning / Demolition
None

Rev	Date	Detail	Made	Chk'd	App'd
A	03.11.15	Additional ahead land added	PG		

Client:

Project:

CHESTER TRANSPORT STRATEGY
PHASE TWO

Title:

SITE 6
A41 / A5116 MOSTON JUNCTION
CONCEPT OPTION

Design: MH	CAD: MH
Chk'd: PG	App'd: APL
Date: AUG 2015	Scale: 1:500 @ A1 1:1000@A3

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Exchange Court,
1 Dale Street,
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60334355_P_SK006 Rev: A

A1

WINDOW 1
EXISTING LAYOUT

WINDOW 2
SWEPT PATHS

WINDOW 3
PROPOSED CONCEPT LAYOUT

B5132 BARROW L

A51 TARVIN ROAD

A51 TARVIN ROAD

nford Bridge Inn

Brookdale

EXISTING BRIDGE

3rd PARTY LAND

MERGE TRAFFIC BEFORE BRIDGE

3rd PARTY LAND

EMBANKMENT OR RETAINING WALL

NOTES

1. ALL DIMENSIONS IN METRES UNLESS OTHERWISE STATED
2. ANY DESIGN DISCREPANCIES TO BE BROUGHT TO THE ATTENTION OF AECOM
3. CONCEPT DESIGN ONLY TO AID JUNCTION MODELLING AND FURTHER DESIGN DEVELOPMENT
4. SCHEME REQUIRES 3RD PARTY LAND

KEY

PROPOSED CONCEPT SCHEME

DRAFT

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following specific residual risks (Reference shall also be made to the design hazard log).

Construction
Conflict with buried and overhead services/utilities.
Maintenance / Cleaning
Working around live traffic. Working at height.
Use
None
Decommissioning / Demolition
None

Rev	Date	Detail	Made	Chk'd	App'd
A	25.11.15	Kerbline and ahead lane edits	MF	PG	APL

Client: Cheshire West and Chester

Project:
CHESTER TRANSPORT STRATEGY
PHASE TWO

Title:
SITE 7
TARVIN ROAD / BARROW LANE
SCHEME OPTION 1

Design: MH	CAD: MH
Chk'd: PG	App'd: APL
Date: AUG 2015	**Scale:** 1:500 @ A1 1:1000@A3

AECOM
Exchange Court,
1 Dale Street,
Liverpool,
L2 2ET
Tel: +44 (0) 151 331 8900
Fax: +44 (0) 151 331 8999
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60334355_P_SK007 Rev: A

A1

WINDOW 1
EXISTING LAYOUT

WINDOW 2
SWEPT PATHS

WINDOW 3
PROPOSED CONCEPT LAYOUT

B5132 BARROW L

A51 TARVIN ROAD

A51 TARVIN ROAD

ord Bridge Inn

Brookdale

WIDENING OF
EXISTING BRIDGE

EMBANKMENT OR RETAINING WALL

3rd PARTY LAND

NOTES

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3. CONCEPT DESIGN ONLY TO AID JUNCTION MODELLING AND FURTHER DESIGN DEVELOPMENT
4. SCHEME REQUIRES 3RD PARTY LAND

KEY

PROPOSED CONCEPT SCHEME

DRAFT

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Construction
Conflict with buried and overhead services/utilities.
Maintenance / Cleaning
Working around live traffic. Working at height.
Use
None
Decommissioning / Demolition
None

Rev	Date	Detail	Made	Chk'd	App'd

Client:
Cheshire West and Chester

Project:
CHESTER TRANSPORT STRATEGY
PHASE TWO

Title:
SITE 7
TARVIN ROAD / BARROW LANE
CONCEPT OPTION 2

Design: PG	CAD: PG
Chk'd: MF	App'd: APL
Date: NOV 2015	**Scale:** 1:500 @ A1 1:1000@A3

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A1

WINDOW 1
EXISTING LAYOUT

A5116 LIVERPOOL ROAD

A5116 LIVERPOOL ROAD

WINDOW 2
PROPOSED CONCEPT LAYOUT

CARRIAGEWAY
WIDENING

A5116 LIVERPOOL ROAD

A5116 LIVERPOOL ROAD

EXISTING BUS
STOP RELOCATED

EXISTING WALL
AND TREE LINE

EXISTING TREES
POTENTIAL
TREE PROTECTION
ORDERS

INTERNAL HIGHWAY
REQUIRES FURTHER
DESIGN WORK / CONSULTATION.
OPPORTUNITIES TO PROVIDE
YELLOW BOX MARKINGS
TO PREVENT QUEUING BACK ONTO
PUBLIC HIGHWAY

WINDOW 3
SWEPT PATHS

Metres

NOTES

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3. CONCEPT DESIGN ONLY TO AID JUNCTION MODELLING AND FURTHER DESIGN DEVELOPMENT
4. SCHEME REQUIRES 3RD PARTY LAND

KEY

PROPOSED CONCEPT SCHEME

DRAFT

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following specific residual risks (Reference shall also be made to the design hazard log).

Construction
Conflict with buried and overhead services/utilities.
Maintenance / Cleaning
Working around live traffic. Working at height.
Use
None
Decommissioning / Demolition
None

Rev	Date	Detail	Made	Chk'd	App'd
A	02.11.15	Junction lane provision and crossings amended	PG	MF	AL

Client: Cheshire West and Chester

Project: CHESTER TRANSPORT STRATEGY PHASE TWO

Title: SITE 8 LIVERPOOL ROAD / VIVIENNE SMITH LANE CONCEPT OPTION

Design: MH	CAD: MH
Chk'd: PG	App'd: APL
Date: AUG 2015	Scale: 1:500 @ A1 1:1000 @ A3

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Exchange Court,
1 Dale Street,
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L2 2ET
Tel: +44 (0) 151 331 8900
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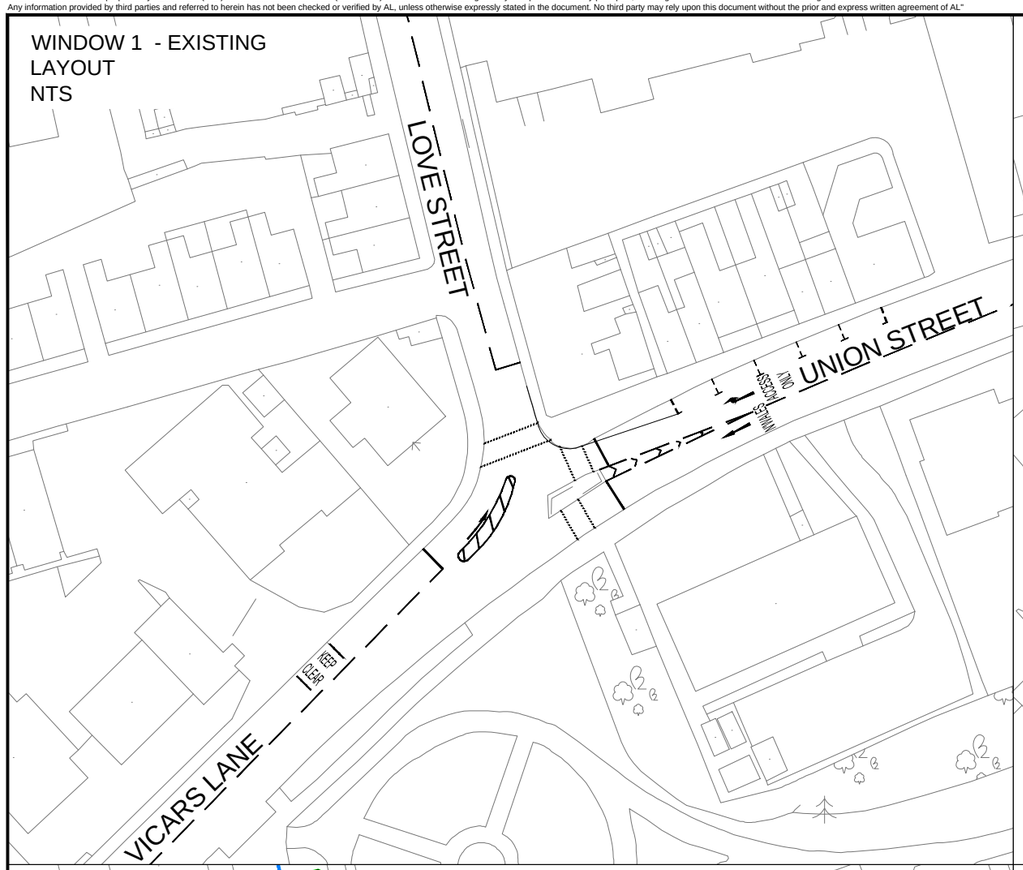
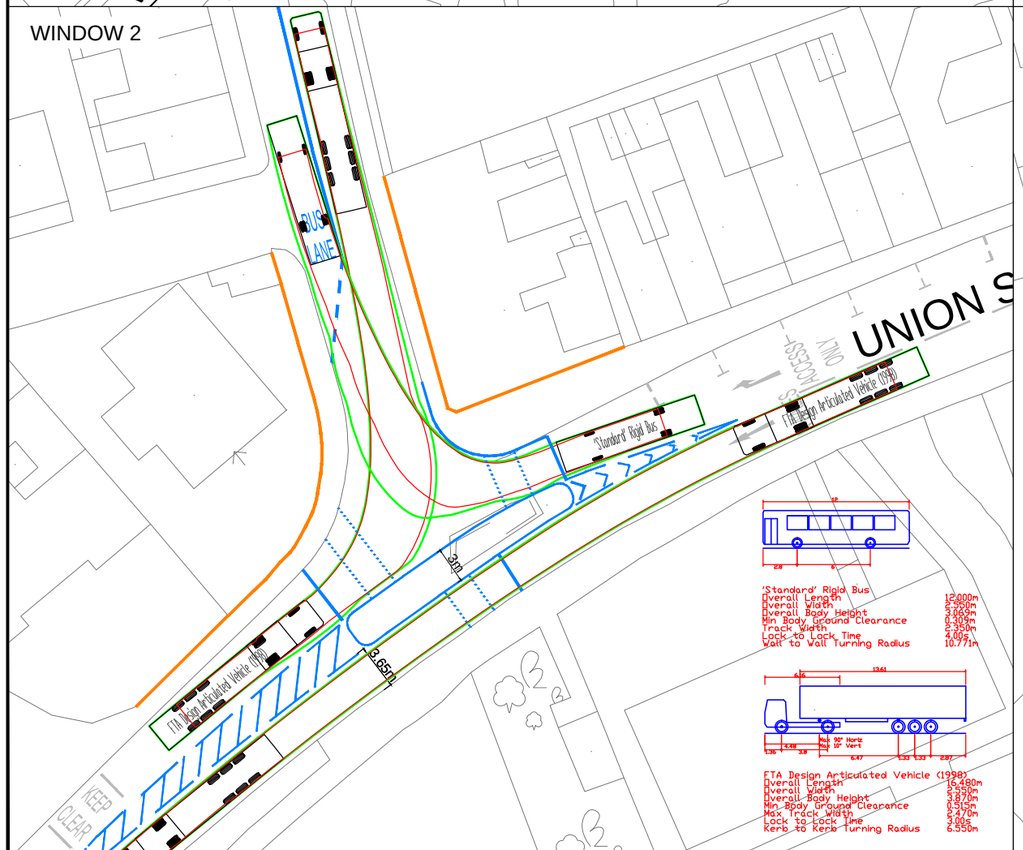
A1

WINDOW 1 - EXISTING LAYOUT
NTS



WINDOW 2



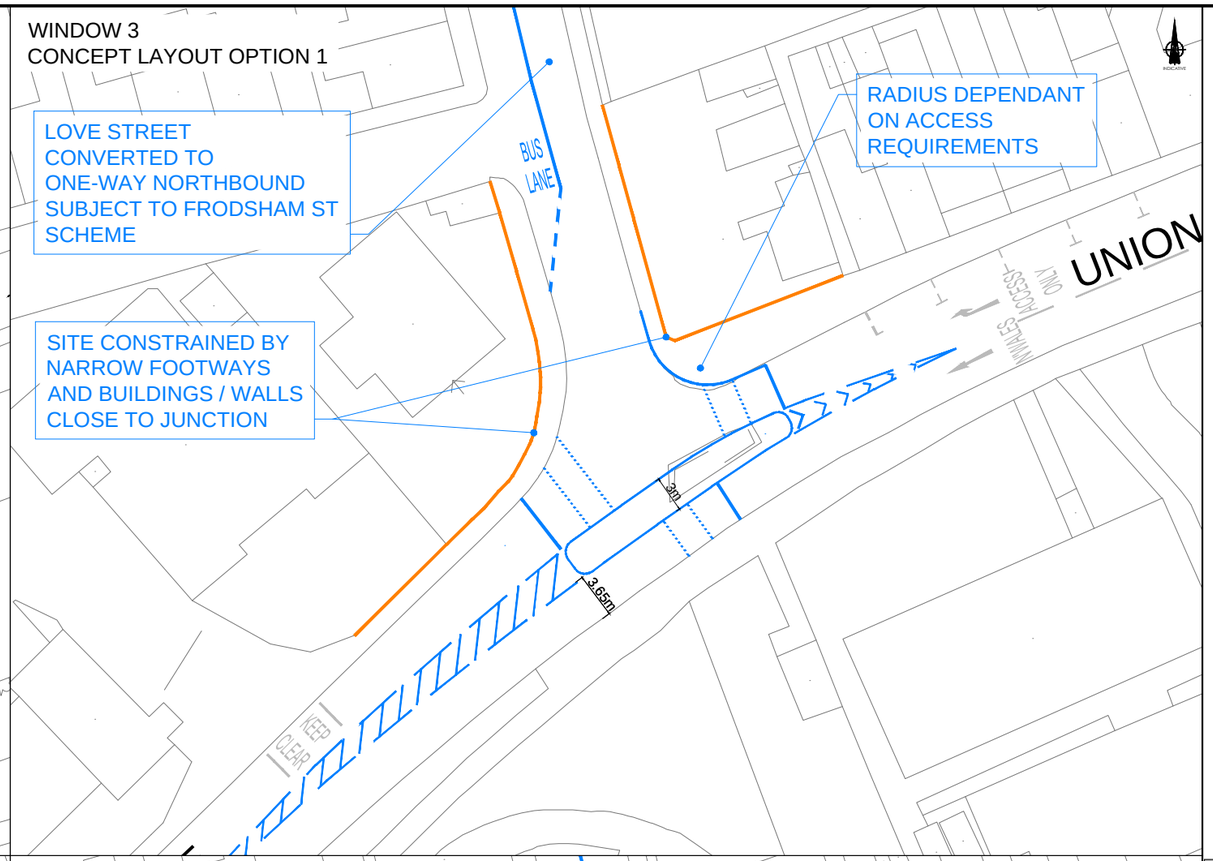
'Standard' Rigid Bus

Overall Length	12.000m
Overall Width	2.550m
Overall Body Height	3.100m
Min Body Ground Clearance	0.350m
Track Width	2.550m
Lock-to-Lock Time	4.00s
Wall to Wall Turning Radius	10.71m

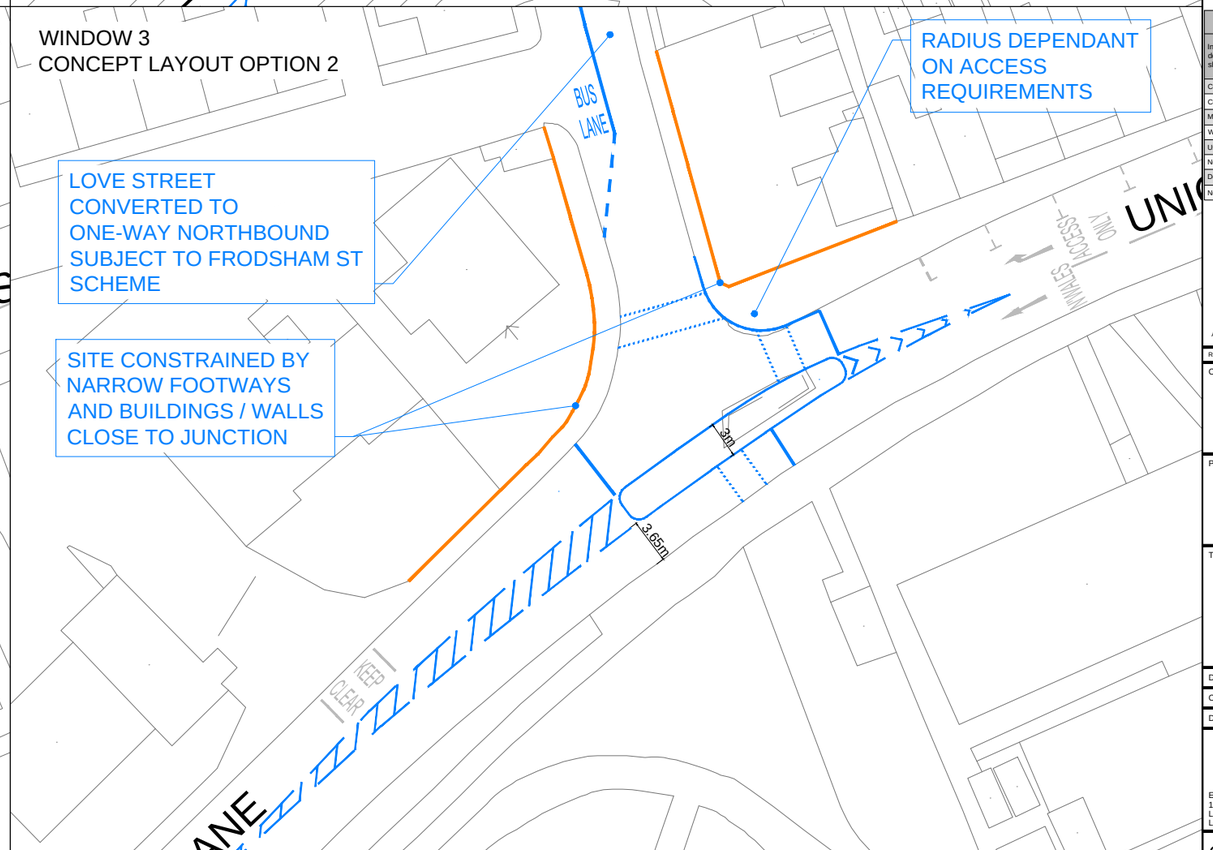
FTA Design Articulated Vehicle (1998)

Overall Length	16.480m
Overall Width	2.550m
Overall Body Height	3.870m
Min Body Ground Clearance	0.350m
Max Track Width	2.470m
Lock to Lock Time	7.00s
Kerb to Kerb Turning Radius	6.350m

WINDOW 3
CONCEPT LAYOUT OPTION 1



WINDOW 3
CONCEPT LAYOUT OPTION 2



NOTES

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2. ANY DESIGN DISCREPANCIES TO BE BROUGHT TO THE ATTENTION OF AECOM
3. CONCEPT DESIGN ONLY TO AID JUNCTION MODELLING AND FURTHER DESIGN DEVELOPMENT

KEY

— PROPOSED CONCEPT SCHEME

DRAFT

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following specific residual risks (Reference shall also be made to the design hazard log).

Construction
Conflict with buried and overhead services/utilities.
Maintenance / Cleaning
Working around live traffic. Working at height.
Use
None
Decommissioning / Demolition
None

Rev	Date	Detail	Made	Chk'd	App'd
A	02.11.15	Notes amended	PG	-	-

Client: Cheshire West and Chester

Project: CHESTER TRANSPORT STRATEGY PHASE TWO

Title: SITE 9 UNION STREET / LOVE STREET CONCEPT OPTION

Design: MH	CAD: MH
Chk'd: PG	App'd: APL
Date: AUG 2015	Scale: 1:250

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1 Dale Street,
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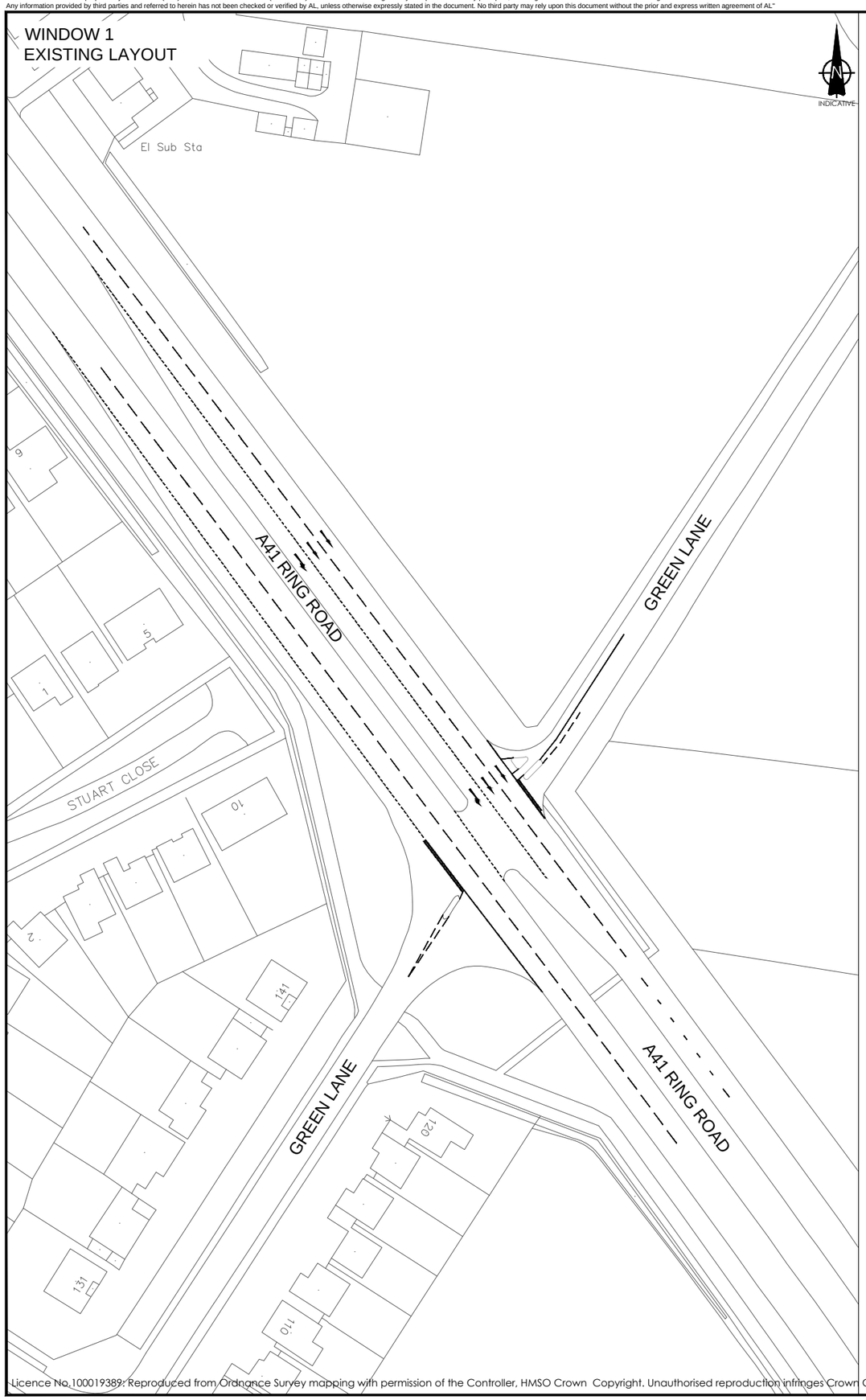
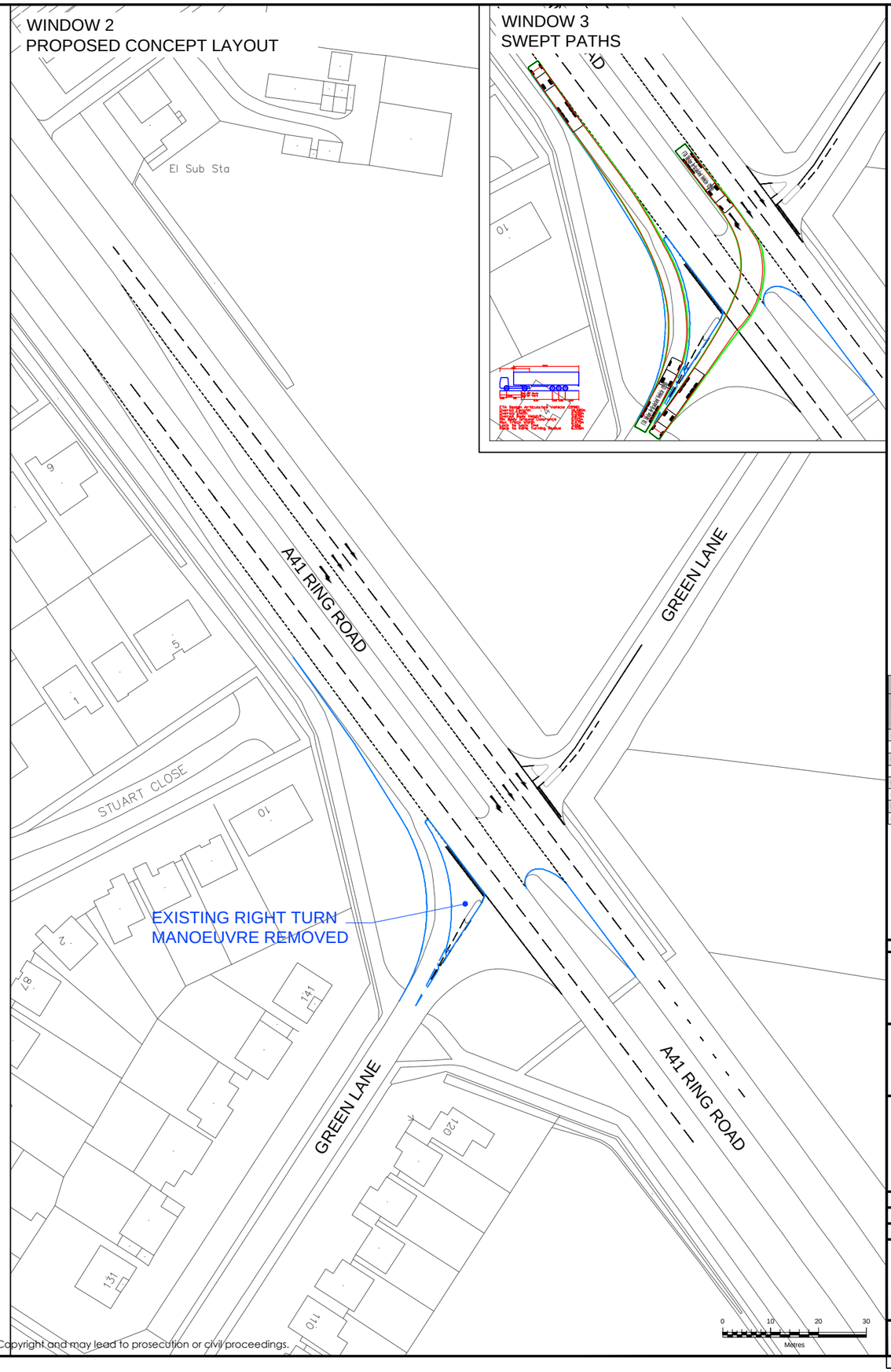
A1

WINDOW 1
EXISTING LAYOUT



WINDOW 2
PROPOSED CONCEPT LAYOUT



WINDOW 3
SWEPT PATHS

NOTES

1. ALL DIMENSIONS IN METRES UNLESS OTHERWISE STATED
2. ANY DESIGN DISCREPANCIES TO BE BROUGHT TO THE ATTENTION OF AECOM
3. CONCEPT DESIGN ONLY TO AID JUNCTION MODELLING AND FURTHER DESIGN DEVELOPMENT

DRAFT

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

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Construction
Conflict with buried and overhead services/utilities.
Maintenance / Cleaning
Working around live traffic. Working at height.
Use
None
Decommissioning / Demolition
None

Rev	Date	Detail	Made	Chk'd	App'd
A	02.11.15	Physical island extended	PG	-	-

Client: Cheshire West and Chester

Project: CHESTER TRANSPORT STRATEGY PHASE TWO

Title: SITE 10 GREEN LANE / A1 RING ROAD CONCEPT OPTION

Design: MH	CAD: MH
Chk'd: PG	App'd: APL
Date: AUG 2015	Scale: 1:500 @ A1 1:1000 @ A3

AECOM
Exchange Court,
1 Dale Street,
Liverpool,
L2 2ET
Tel: +44 (0) 151 331 8900
Fax: +44 (0) 151 331 8999
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A1

cm

CTS 2 - Pinch Point Schemes
Preliminary Budget Cost Estimates

Based on Concept Designs - require further work/input from QS / traffic count data / capacity tests / design iterations which will impact on budget estimates
High level cost estimate and should be considered as such in the scope / extent of this concept stage and should not be used out of such context

Key Exclusions
Works to Statutory Undertakers Equipment
Land acquisition
Surveys
Accomodation Works
Drainage and Earthworks
Contaminated or unnaccptable ground conditions
Temporary Works to accommodate existing business and land owners
Trafffic management diversion routes
Inclement weather
Road Safety Audits
Legal Costs
Public Consulatations
VAT

DRAFT 11.02.16

Concept Scheme	Preliminary Budget Cost Estimate	Rounding	Range +/- 30%		Key Notes
Overleigh Roundabout	£1,275,461	£1,300,000	£910,000.00	£1,690,000.00	Subject to traffic count data. Stats diversions required
Sealand Road	£3,165,914	£3,200,000	£2,240,000.00	£4,160,000.00	Significant 3rd Party land / accomodation works / stats diversions required
Tarvin Roundabout Concept Option 1	£663,602	£665,000	£465,500.00	£864,500.00	Telecomms present at carriageway widening
Tarvin Road / Barrow Lane Concept Option 1	£1,318,918	£1,310,000	£917,000.00	£1,703,000.00	3rd Party land / level difference / existing bridge requires further investigation
Liverpool Road / Hospital Access	£1,530,663	£1,420,000	£994,000.00	£1,846,000.00	TPOs and 3rd Party Land require further investigation
A41 / A5116 Moston Junction	£1,178,237	£1,180,000	£826,000.00	£1,534,000.00	3rd Party land and level difference requires further investigation
Fountains Roundabout	TBC				
Hoole Road	£124,000	£125,000	£87,500.00	£162,500.00	2 x puffin crossings
Union Street / Love Street	£187,784	£190,000	£133,000.00	£247,000.00	Subject to northbound only on Love Street / Foregate St scheme
Green Lane / A41 Ring Road	£86,018	£85,000	£59,500.00	£110,500.00	Extent of c'way re-surfacing tbc

APPENDIX E

Technical Note

Project:	**Chester Transport Strategy – Phase Two**	Job No:	
Subject:	**A4 Congestion Relief – Pinch Points – Traffic Modelling Technical Summary**		
Prepared by:	**Alistair Johnson**	Date:	**13.11.2015**
Checked by:	**Chris Peachey**	Date:	**18.11.2015**
Approved by:	**Adam Leary**	Date:	**23.11.2015**

Introduction

As part of the works to identify and develop schemes for ten individual Pinch Point locations across Chester's highway network, standalone junction models informed by Chester's SATURN model have been developed.

This note details how the 2030 Do Nothing SATURN model was updated to ensure that the model remains the most appropriate source to provide vehicle turning counts at all junctions.

In producing the final scheme several options / ideas have been identified and modelled at the various Pinch Point locations. As some of these locations are likely to be subject to scrutiny over the next few years as part of planning applications for new developments, this Technical Note presents the background work and methodology behind how the schemes developed. It is hoped this note will provide some clarity and a useful resource for CWaC officers when considering each location.

Saturn Model Update

An initial audit of the SATURN model identified that due to the strategic nature of the SATURN model two locations were not as well represented as would be required to extract turning counts for the Pinch Point Modelling. These locations were as follows;

- *A548 Sealand Road / B&Q Junction* - The B&Q junction was represented within the model as a signalised junction in order to replicate delay along the corridor. However, traffic flows entering and exiting B&Q were included within the Industrial Estate zone, therefore no turning count information at the junction was available; and

- *Tarvin Roundabout* – the junction was located within the buffer network of the existing SATURN model. Therefore, no turning count information could be extracted from the model.

A548 Sealand Road / B&Q Junction

AECOM agreed with CWaC officers a development planning approach which was adopted when calculating the volume of trips associated with B&Q. The TRICS database was interrogated to provide the total number of entries and exits from similar sized hardware store developments. The forecast flows from TRICS are presented in **Table 1** below.

Table 1 – TEMPRO traffic growth Factors

Peak	Arrivals	Departures	Total Two Way Trips
AM	103	56	159
PM	192	226	418

A new zone (264) and connection to the network was added into the SATURN model to represent the B&Q store. The existing matrix was updated to include the new trips which were distributed based on the distribution profile for the Sealand Road Industrial Estate Zone (184). To avoid double counting the total traffic added to the new zone was subtracted from the existing Sealand Road Industrial Estate Zone. The operation of the signals including the cycle time remained as per the Do Minimum model for both peak periods.

Tarvin Roundabout

The existing buffer node representing Tarvin Roundabout (3059) was updated to a simulation node with all associated parameters updated to reflect the existing roundabout. Zone 21 loaded directly onto the existing buffer node which represented Tarvin roundabout. Therefore to better reflect observed conditions the entry and exit points of Zone 21 have been moved from node 3059 to new nodes a short distance south and east of the junction.

No changes to the model demands were required as part of the Tarvin roundabout update.

The updates to the model have not added any new demands to the existing SATURN model and sought only to improve the model's representation of observed conditions. Therefore, it was important to check the updates did not have a significant impact upon existing traffic flows or more strategic routing within the model. Therefore, once updated, the amended AM and PM peak SATURN model network and matrices were converged and checked to ensure no significant changes in vehicle routing compared to the original models were completed.

Figures 1 and **2** below present screen shots of the SATURN model with directional traffic flow band widths plotted for the AM peak original and updated SATURN Models.

Figure 1, Bandwidth Plot Demonstrating Original AM Peak Directional Actual Traffic Flows (PCUs/hr)

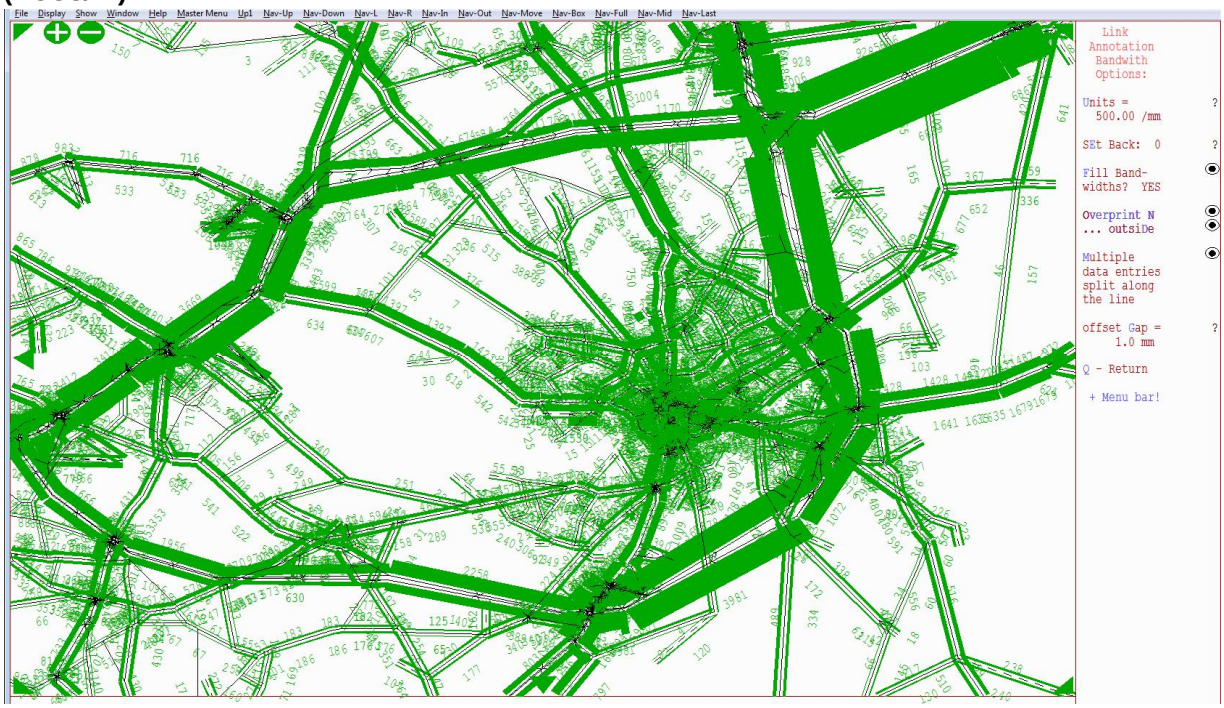
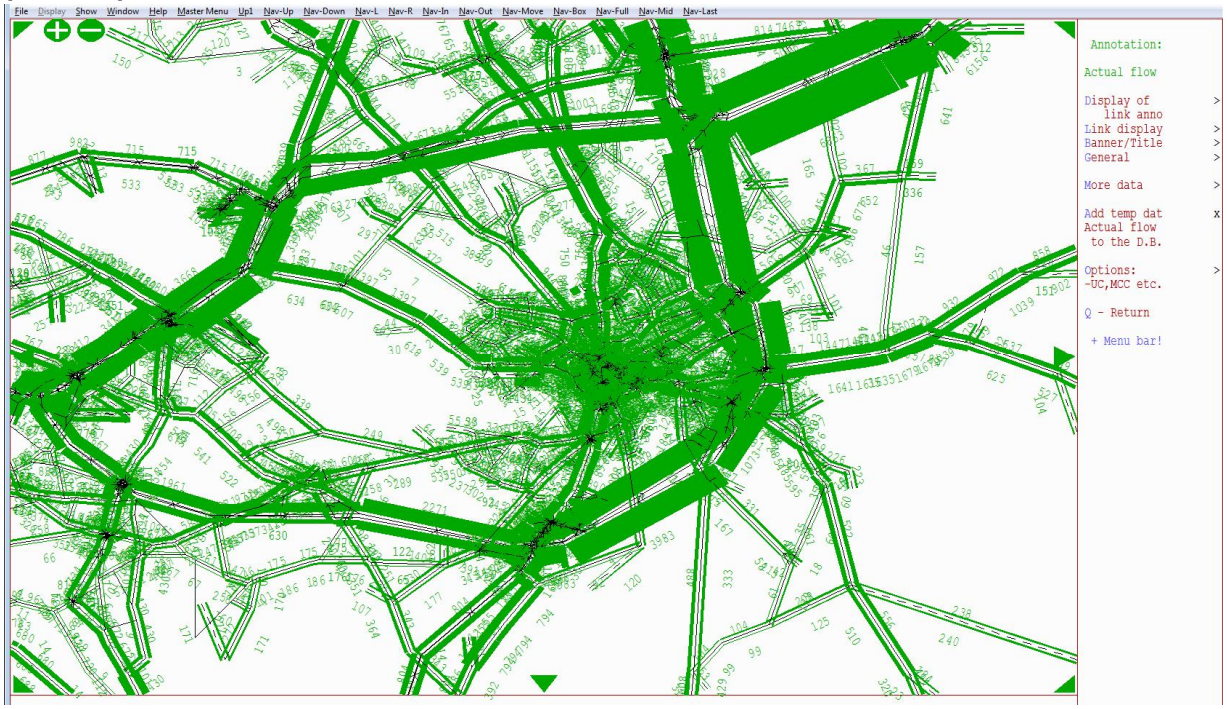


Figure 2, Bandwidth Plot Demonstrating Updated AM Peak Directional Actual Traffic Flows (PCUs/hr)



Figures 3 and **4** present screen shots of the SATURN model with directional traffic flow band widths plotted for the PM peak original and updated SATURN Models.

Figure 3, Bandwidth Plot Demonstrating Original PM Peak Directional Actual Traffic Flows (PCUs/hr)

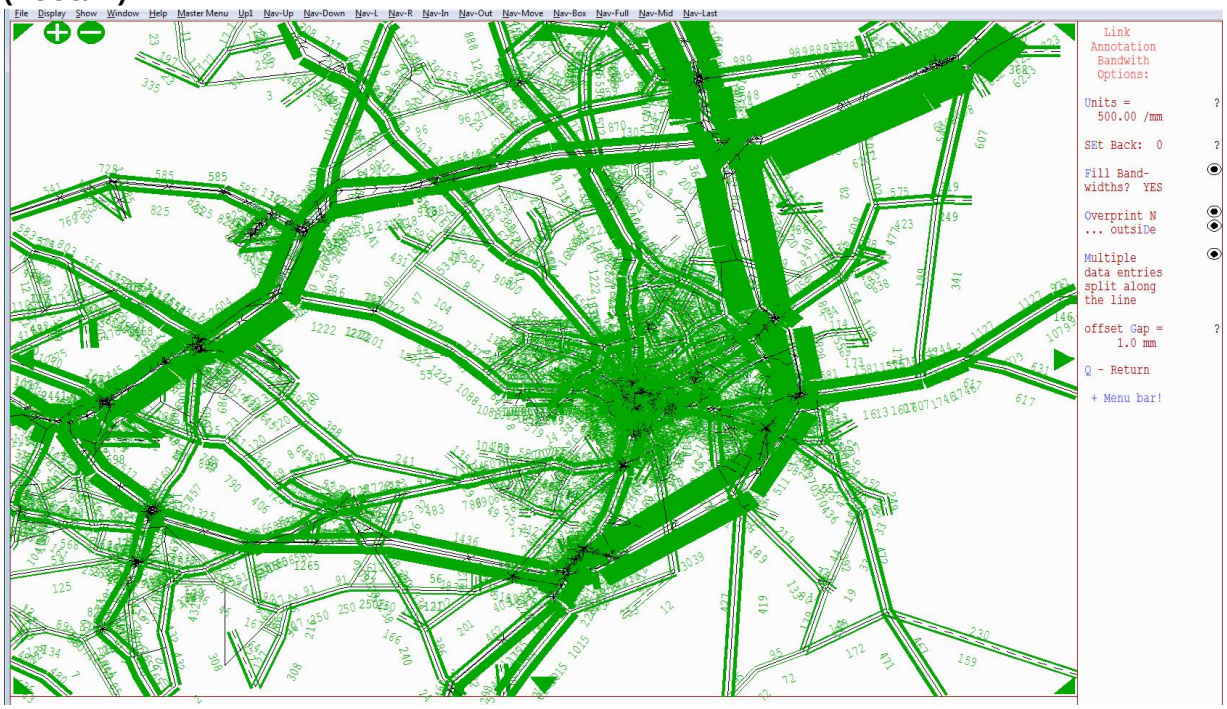
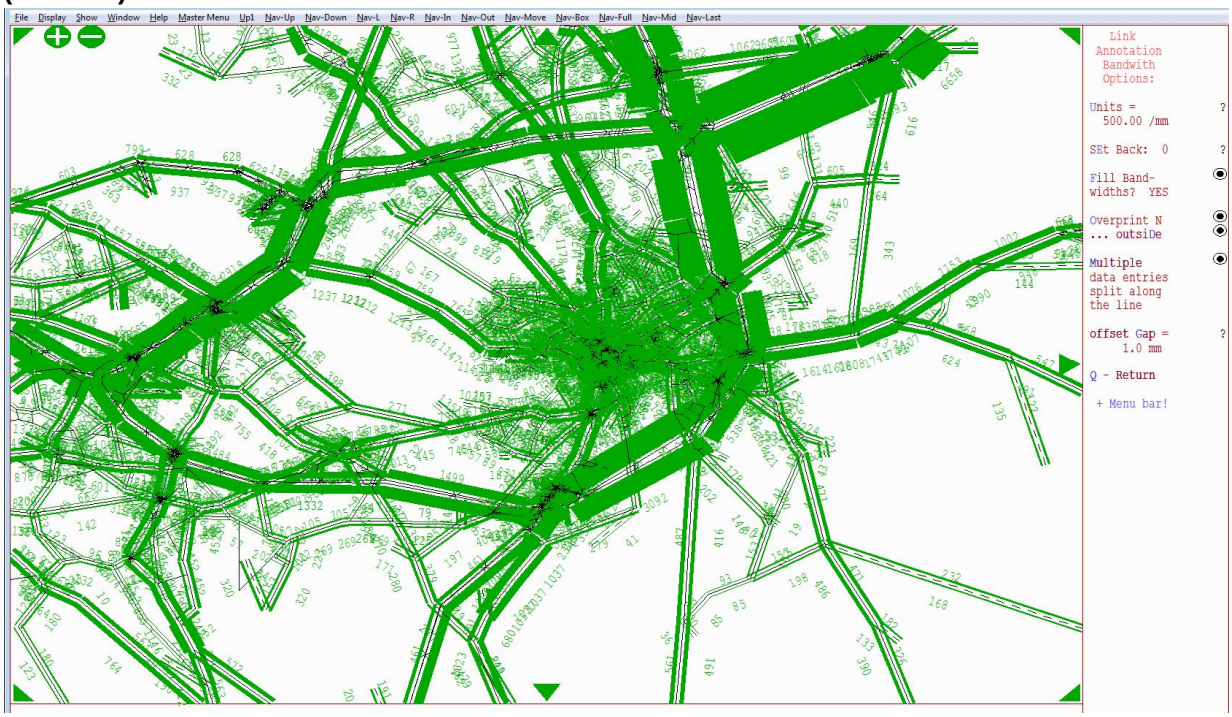


Figure 4, Bandwidth Plot Demonstrating Updated PM Peak Directional Actual Traffic Flows (PCUs/hr)



Figures 1 to **4** illustrate there are some minor changes in traffic flows at a local level close to the location of the A548 Sealand Road and Tarvin roundabout, but these changes are expected as a result of the update to the SATURN model. However, the general pattern and routing of traffic across Chester's highway network remains unaffected by the model update ensuring the SATURN model continues to remain fit for purpose and the most appropriate source for traffic flows.

Overleigh roundabout

Inclusion of Curzon Park Traffic

A review of the SATURN model identified that due to the strategic nature of the model the Curzon Park approach to Overleigh roundabout was not included within the model. Traffic flows from the Curzon Park area were contained within the model, but they entered via Hough Green. To best inform the standalone junction modelling a traffic count obtained from CWaC was used to identify vehicle movements to and from Curzon Park.

Curzon Park provides access to residential dwellings and at the time of writing no developments are proposed from this access route. Therefore, it is unlikely it will experience any significant growth in future traffic flows as a result. However, to ensure the growth factors account for background traffic growth as a result of increases in income and car ownership the alternative assumptions scenario facility within TEMPRO 7.14 was utilised. By ensuring the base year housing and jobs totals match the future year housing and jobs, totals the growth factors obtained from TEMPRO account for the background growth within the Chester area. Traffic growth factors from TEMPRO are shown in **Table 2**.

Table 2 – TEMPRO traffic growth Factors

	Years	Area	Growth Factors
AM	2010 - 2030	Chester	1.01
PM			1.02

The growth factors were applied to the traffic flows obtained from the counts. In addition checks against the forecast flows within the SATURN model from Zone 205 and the growthed traffic count flows were completed to ensure the growthed traffic flows were of the correct magnitude. The turn count matrix for the junction obtained from SATURN was then updated to reflect the inclusion of Curzon Park. This process simply involved removing the identified Curzon Park traffic entering and exiting the junction from Hough Green approach and reassigning it to the new arm. The revised turning count for the junction was then used to inform the standalone junction modelling of Overleigh roundabout.

Initial Design

Due to the convergence of five roads at one junction, four of which are main roads carrying heavy flows of traffic, Overleigh Roundabout proved to be a difficult junction to develop a variable solution for. Initial designs concentrated on adapting the existing signalised roundabout and prioritising north / south vehicle movements on the A483 into and out of the city. By reducing the distance vehicles have to travel across the junction it was believed the capacity of the junction would be increased.

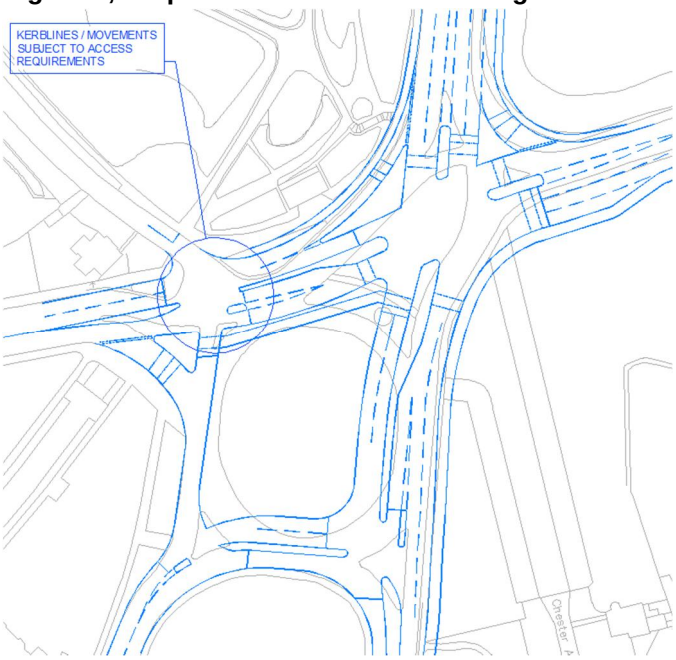
By prioritising the north / south movement for vehicles using the A483 the predominant feature becomes the four arm cross roads of the A483 / A5104 / Overleigh Road. In order to retain all movements within the junction Laches Lane and Curzon Park were retained and form junctions short distances from the main four arm cross roads.

With the high flow of traffic crossing the junction and in line with the operation of other similar sized junctions within Chester, due to safety concerns it was assumed the junction would operate with each approach receiving a green signal in separate stages. As a result the cycle time for the junction increases to 120 seconds compared with 88 seconds for the existing junction.

Pedestrian crossing movements within the junction were also retained as per existing and modelled as being called every cycle. This forms a worst case scenario and ensures any designs would be capable of operating under almost all potential scenarios.

Figure 5 overleaf identifies the initial proposed junction configuration.

Figure 5, Proposed Initial Junction configuration



The proposed junction arrangement was modelled within Linsig a summary of the model outputs is presented in **Table 3**.

Table 3 – Summary of Modelling Outputs for Initial Scheme

		Practical Reserve Capacity (PRC)	Total Delay Over All Lanes (pcu/hrs)	Highest Mean Max Queues (PCUs) at Arm:	
AM	**2030 Do-Nothing**	-309.4%	401.66	Laches Lane	300.8
	2030 With-Scheme	-507.4	985.34	Laches Lane	358.2
PM	**2030 Do-Nothing**	-130.62%	386.53	Wrexham Road Ahead	168.9
	2030 With-Scheme	-631.8	887.98	Grosvenor Road A483 Southbound	457.1

Table 3 above demonstrates the junction arrangement would, if constructed, result in delays which are significant higher than if the junction remained unchanged. Running each approach to the large cross roads in a separate stage increases the lost time within the junction and significantly increases the length of time vehicles would be stationary at the junction, therefore resulting in the unfavourable forecasts. In addition the proximity of the Laches Lane and Curzon Park junction results in short links within the junction which have to remain clear in order to ensure the junction continues to operate.

Revision 2

Following analysis of the initial scheme, revisions were made to the proposed junction, these included the following;

- Additional right turn lane northbound on the A483;
- Additional right turn lane on the Laches Lane approach to the A483; and
- Access into Curzon Park changed to left in left out only.

Whilst the original design attempted to retain all movements, in light of the inability to find a suitable solution that had spare capacity, analysis of which movements could be viably removed was completed. Agreement with CWaC officers was sought prior to considering the possibility of removing certain movements from the junction.

Banning the right turn movement out of and all movements into Curzon Park (apart from the left turn in) removes the requirement to provide traffic signals at Curzon Park, this simplifying movements within the junction and increasing the stop line capacity at the Hough Green approach to the A483 / A5104 / Overleigh Road junction.

In addition to rationalising movements revisions to the initial design sought to increase stop line capacity on approach to the A483 / A5104 / Overleigh Road junction and Laches Lane / A483 and remove the requirement to provide a signalised entry to Curzon Park but still some limited access.

The amended arrangement was modelled using LinSig and a summary of the model outputs is presented in **Table 4**.

Table 4 – Summary of Modelling Outputs for Revised Initial Scheme Layout

		Practical Reserve Capacity (PRC)	Total Delay Over All Lanes (pcu/hrs)	Highest Mean Max Queues (PCUs) at Arm:	
AM	**2030 Do-Nothing**	-309.4%	401.66	Laches Lane	300.8
	2030 With-Scheme	-266.6%	654.71	Grosvenor Road A483 Ahead Southbound	421.3
PM	**2030 Do-Nothing**	-130.62%	386.53	Wrexham Road Ahead	168.9
	2030 With-Scheme	-98.1%	436.32	Grosvenor Road A483 Ahead Southbound	215.4

Table 4 shows that whilst the amended design is forecast to improve the operation of the junction it is still forecast to operate over capacity. Queues of such magnitude would result in significant delays upon the surrounding highway network and so the proposed solution is considered unsuitable for further design.

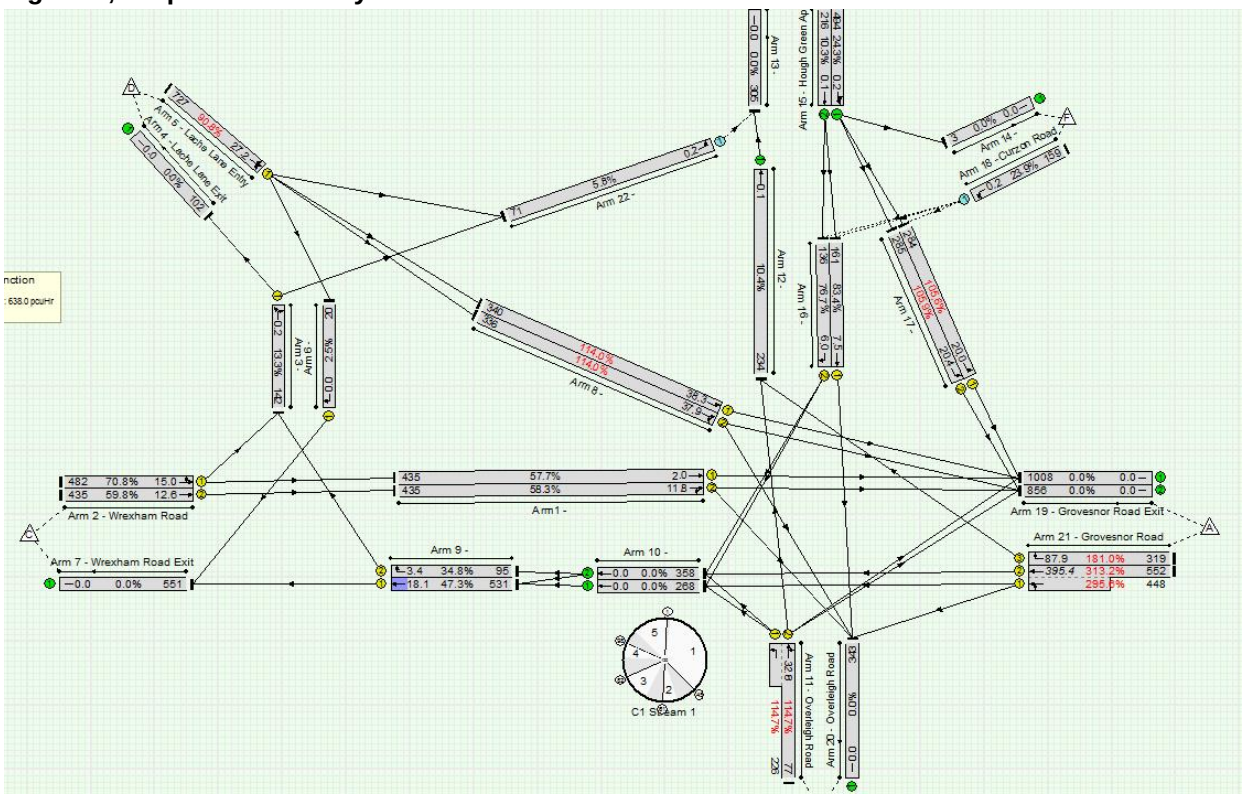
Revision 3

A third revision to the scheme was developed which sought to provide for all five major movements at the cross roads and so again reduce possible movements within the junction.

The design built upon the previous option providing an additional internal arm allowing a direct route from Laches Lane towards the A483. Whilst an additional stage was added to the heart of the junction, vehicles no longer need to use the internal A483 link if traveling from Laches Lane. This approached again simplified movements within the junction with a view to adding capacity.

A diagram of the proposed lane structure is presented in **Figure 6** overleaf.

Figure 6, Proposed Five Way Junction



The amended arrangement was modelled using LinSig. Unfortunately due to the restrictions on space within the Overleigh junction the internal links remained short. As such no stage arrangement or phasing could be developed that did not result in forecast MMQs which were greater than the length of the internal links. For this reason no results have been presented as in reality this junction arrangement would impose significant delays on local highway network and would not be feasible.

Revision 4

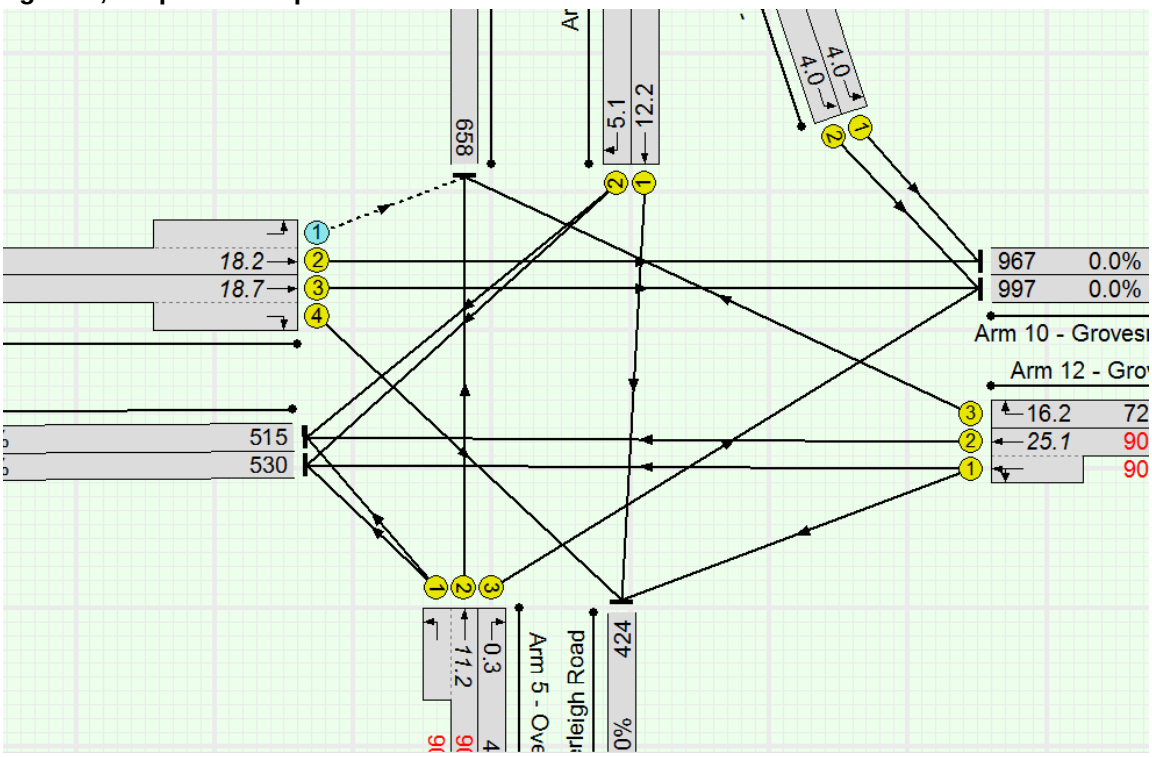
A post-mortem of the results was completed and the design for the junction was developed further. Traffic flows across the junction remain high to and from all arms with little difference between the four approaches. Therefore any right turn movements were significantly reducing the capacity of the junction. At this stage the decision was taken to investigate the possibility of closing access to Laches Lane and retain the left in left out access for Curzon Park. This option allowed the junction to be simplified further and operate as a single four arm signalised cross roads.

This option would result in vehicles having to reroute from Laches Lane to gain access into Chester. An initial assessment of the surrounding highway network identified vehicles accessing the junction via Laches Lane would have to reroute via the Hough Green enter / exit to Overleigh Roundabout.

In reality this may require additional works away from the junction to ensure vehicles can gain access to Laches Lane from Hough Green via its junctions with Cavendish Road or Cliveden Road. However, at this investigatory stage a design for a simple four arm junction was drawn up based on the assumption that all traffic which used Laches Lane would transfer onto Hough Green.

Figure 7 overleaf presents a screen shot of the LinSig model for the proposed junction layout.

Figure 7, Proposed Simple Four Arm Junction



A summary of the key principles of the proposed design are;

- Hough Green approach would benefit from 2 left turn approach lanes, a single ahead lane and single right turn lane;
- The A483 northbound approach would retain its two ahead lanes and benefit from short right and left turn lanes both 45m in length. The left turn lane would operate as a give way to all movements into Hough Green;
- The A483 southbound approach would retain its two lane approach and benefit from a 30m left turn lane;
- Overleigh Road would benefit from two additional lanes on approach to the junction; and
- The existing Pedestrian crossings would be retained across the A483 southbound approach.

As per the other options the junction was modelled operating four stages, one for each approach.

The amended arrangement was modelled within LinSig and a summary of the model outputs is presented in **Table 5** overleaf.

Table 5 – Summary of Modelling Outputs for Revised Simple Four Arm Signalised Junction

		Practical Reserve Capacity (PRC)	Total Delay Over All Lanes (pcu/hrs)	Highest Mean Max Queues (PCUs) at Arm:	
AM	**2030 Do-Nothing**	-309.4%	401.66	Laches Lane	300.8
	2030 With-Scheme	-1.9	57.77	Grosvenor Road A483 left turn Southbound	25.1
PM	**2030 Do-Nothing**	-130.62%	386.53	Wrexham Road Ahead	168.9
	2030 With-Scheme	-7.0	68.80	Grosvenor Road A483 left turn Southbound	37

Table 5 indicates that simplifying the junction and rationalising movements at Overleigh significantly improves the operation of the junction reducing delays and queue lengths compared with the Do Minimum Scenario. The MMQ of 37 PCUs on the A483 remains high but a queue of such magnitude would not result in stationary traffic on the Grosvenor Bridge.

Revision 5 Improve existing

Whilst the previous scheme is forecast to give a significant improvement in capacity over the Do minimum scenario and other proposed schemes it does require the diversion of Laches Lane, a main route for traffic into the centre of the city. In addition the junction is still forecast to operate over capacity in the future year.

A shift in design philosophy was adopted to try and develop a scheme which retains movements to and from Laches Lane and still operates within capacity. Observations made on site suggest there is sufficient space within the existing layout of the junction to provide an increase in capacity utilising the existing roundabout arrangement. Whilst the junction is forecast to operate over capacity in the future year it was still forecast to operate better than any scenario which retained all movements at the junction.

Therefore if additional capacity could be added to the existing roundabout arrangement it may significantly improve the junction and still provide for all movements. Following various small iterations of a suitable scheme a 'half hamburger' layout was developed. The design provides a more direct route for vehicles entering Chester on the A483 with an additional internal link and also provides an increase in circulatory capacity.

The design does rely on access to Curzon Park being stopped. However, by removing Curzon Park from the roundabout it allows its former traffic signal stage to be used by the new internal link. Whilst completely removing access to Curzon Park is undesirable, compared to if access to Laches Lane is removed vehicles have a shorter detour. Additionally traffic volumes on Curzon Park are significantly lower than Laches Lane. The latter point is of significant importance when assessing the scheme as part of a potential business case.

The key benefit of the design is that it can operate within the existing constraints of the junction and does not require expensive and potentially unobtainable lane take.

A summary of the key principles of the proposed design are;

- Access to Curzon Park from Overleigh Roundabout is stopped;
- An additional internal link benefiting from two 3.5 wide lanes;
- An additional circulatory lane at the Wrexham Road Westbound stopline; and
- An additional circulatory lane at the Laches Lane approach.

The junction also offers an additional benefit to pedestrians as the Curzon Park approach to the junction will be stopped up so removing an unassisted crossing point on a key pedestrian desire line.

The amended arrangement was modelled within LinSig and a summary of the model outputs is presented in **Table 6**.

Table 6 – Summary of Modelling Outputs for Revised Simple Four Arm Signalised Junction

		Practical Reserve Capacity (PRC)	Total Delay Over All Lanes (pcu/hrs)	Highest Mean Max Queues (PCUs) at Arm:	
AM	**2030 Do-Nothing**	-309.4%	401.66	Laches Lane	300.8
	2030 With-Scheme	-0.6%	57.45	A483 Chester Westbound	25.8
PM	**2030 Do-Nothing**	-130.62%	386.53	Wrexham Road Ahead	168.9
	2030 With-Scheme	-0.9%	53.73	A483 Chester Westbound	28.0

The proposed scheme is forecast to deliver significant improvements in PRC values with an increase of 308.8% to -0.6% and an increase of 129.72% to -4.2% in the PM peak. The scheme is forecast to reduce total delay across all lanes during the AM peak a decrease of 344 hours to 57 hours. The PM peak is also forecast to experience a reduction in total delay of 53 hours.

Importantly the highest MMQ is forecast to reduce by 275 PCUs in the AM peak and 141 PCUs during the PM peak. The forecast queue lengths with the scheme could be accommodated on the highway network without further delay on adjacent junctions.

In summary, whilst the PRC values are forecast to remain negative, the reductions in delay and queueing are significant. Furthermore, given that the proposed layout can be constructed within the constraints of the existing junction and retain all major movements at the junction, it provides the most beneficial and cost effective option.

Tarvin roundabout

Modelling Approach

Observations made at Tarvin Roundabout identified whilst the junction benefits from two approach lanes on all arms, due to the turning volumes at the roundabout certain lanes are underutilised. This was observed particularly on the A51 Tarporley Road approach which, whilst beneficial from two approach lanes over 85% of approaching vehicles make a left turn and so use the nearside lane. These observations have particular relevance as the Tarvin Road roundabout has been modelled within the ARCADY module of Junctions 8 and can over estimate capacity as a result of unequal lane usage.

Geometric parameters of the roundabout and traffic flows are input into ARCADY and the program forecasts the queue lengths and junction capacity. The overarching key parameter within ARCADY is the entry width which directly correlates to the overall capacity of a roundabout. At junctions such as Tarvin Road, where entry widths benefit from two lanes but a significant proportion of traffic use just one lane, ARCADY can significantly overestimate the capacity of the roundabout.

To account for the unequal lane usage on the A51 Tarporley Road approach the correction method detailed in “ARCADY HEALTH WARNING: Account for Unequal Lane Usage or risk damaging the public purse!” has been employed within the traffic modelling completed as part of this assessment works. Using the correction technique identified in the aforementioned paper ensures the assessment of Tarvin Roundabout will produce a more reflective forecast of junction capacity and importantly does not over estimate junction capacity.

A51 Tarvin Road / B5132 Barrow Lane

Modelling Approach

During a scheme design meeting CWaC officers highlighted the forecast traffic flows obtained from the SATURN model for movements entering and exiting the B5132 Barrow Lane appeared to be significantly higher than what they believed they would be. Therefore, as a sense check, several site visits during both AM and PM peak periods were completed to observe existing traffic flows entering and exiting Barrow Lane.

Spot counts of traffic volumes completing the left turn out of the B5132 Barrow Lane and right turn in identified existing turning flows were significantly lower compared to the 2030 SATURN model forecasts. Whilst it is appreciated the SATURN model flows are 2030, and so will experience traffic growth the difference in flow is so significant it can only be attributed to a forecast significant change in the strategic routing of traffic across the highway network or the SATURN model is not fully reflective of the road network within the location of the A5132 Broomhill.

Following the onsite observations it was agreed with CWaC officers that the potential over estimation of traffic flows completing the left turn out right turn in to B5132 Barrow Lane would be difficult to correct as part of these works and so improvements to the A5132 Barrow Lane approach would not be suggested. Within these works the flows have not been amended and remain as per those obtained from the SATURN model. However, it is important to note that as and when traffic counts are completed in order to validate existing flows at the junction as part of any funding submission further analysis should be completed to check if the SATURN model flows are representative.