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Technical Note

Project:	Cambridge South East Transport (CSET) Phase 2		
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Subject:	Signal-Controlled Crossing Assessment - Hinton Way		

1 Introduction

This technical note provides a summary of the potential traffic implications of the signal-controlled public transport route crossing proposed as part of CSET Phase 2 at Hinton Way. The assessment was simulated using LinSig modelling software and observed traffic data collected between 11 and 29 March 2019.

It is proposed that priority would be given to CSET public transport services at the crossing points. However, it should be noted that these will not operate in the same way as a railway level crossing where there is significant barrier downtime.

2 Traffic Analysis

In order to identify a representative location for the crossing impact assessment, an analysis was undertaken to compare the traffic flows on each of the roads the proposed CSET route would cross. This analysis is presented in Table 2.1 and indicates that Hinton Way had the highest flows in the AM and PM peaks, with 27% and 28% of the total flows respectively. These flows are the weekday average over a two-week period.

Therefore, Hinton Way was selected as the example crossing assessment location based on the peak traffic volume of circa 500 two-way vehicles, the proximity of housing along Hinton Way to the crossing itself, and stakeholder concerns regarding queuing from the Shelford station level crossing.

Table 2.1: Traffic Volumes in AM & PM Weekday Peak Hours

ID	Road	AM Peak (08:00-09:00)				PM Peak (17:00-18:00)			
		NB	SB	Total	%	NB	SB	Total	%
1	Granham's Road	276	120	**396**	21%	146	217	363	20%
2	**Hinton Way**	**304**	**215**	**519**	**27%**	**216**	**299**	**515**	**28%**
3	Haverhill Road	208	160	**368**	19%	262	120	392	21%
4	Babraham Road	175	281	**456**	24%	185	234	419	23%
5	High Street	73	78	**151**	21%	62	81	143	8%
	Grand Total	**1,036**	**854**	**1,890**	**100%**	**871**	**951**	**1,832**	**100%**

3 Baseline Assessment

A base model was developed in LinSig. Green times have been adjusted to simulate increased public transport service frequency to quantify the effect that this has on the junction, based on a standard 90 second cycle.

This includes:

1. Green time of 66 seconds / 90 second cycle – downtime 24 seconds (27%)
2. Green time of 50 seconds / 90 second cycle – downtime 40 seconds (45%)
3. Green time of 40 seconds / 90 second cycle – downtime 50 seconds (55%)

The CSET Phase 2 public transport service is proposed to operate at a 7/8-minute frequency in each direction. The actual frequency of crossings would be dependent on the coordination of the inbound and outbound services. Based on the service frequency, the maximum crossing rate would be once every 3 ½ minutes. It is therefore considered that the applied 1 ½ minute cycle time and implied frequency is a "worst" case scenario.

This "worst" case scenario accounts for any potential additional activity associated with pedestrian, cyclists, and other users travelling along the busway itself.

From the LinSig assessment, two key statistics have been extracted to demonstrate the impact of the CSET Phase 2 priority signals.

1. PRC – Practical Reserve Capacity with:
   - (+) number indicating additional reserve capacity
   - (-) number indicating a shortfall of capacity
2. Delay (pcuHr) – total travel time delay to traffic based on crossing downtime (pcu – passenger car units)

Table 3.1 demonstrates the change in these statistics based on the identified scenarios.

This assessment shows that, as green time is reduced, the reserve capacity is decreased and the delay at the junction increases in line with the increase in the crossing downtime. A comparison has been included to compare against the best case 66 seconds green time scenario.

In the "worst case" scenario, based on 50 seconds of downtime (40 seconds green time), the reserve capacity remains at approximately 190 vehicles.

Table 3.1: Baseline Results

Peak Hour	Scenario	PRC	Delay (pcuHr)	Difference in PRC (to best case) (%)	Difference in Delay (to best case) (%)	DoS in %
AM Peak (08:00-09:00)	66 Seconds Green Time	368	0.6	-	-	19.3
	50 Seconds Green Time	257	1.5	-30%	150%	25.2
	40 Seconds Green Time	189	2.3	-49%	283%	31.2
PM Peak (17:00-18:00)	66 Seconds Green Time	365	0.6	-	-	19.3
	50 Seconds Green Time	255	1.5	-30%	150%	25.3
	40 Seconds Green Time	188	2.3	-49%	283%	31.3

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4 Sensitivity Testing

In order to demonstrate the dependencies within the assessment, a simplistic approach has been adopted based on the application of a range of sensitivity tests to establish potential outcomes. These are as follows:

- Increasing traffic by 10%
- Increasing traffic by 25%
- Increasing traffic by 50%

Each of the demand scenarios has been assessed for green time scenario 1 (66 seconds green time) and scenario 3 (40 seconds green time).

Table 4.1 demonstrates that, under the most representative scenario of 66 seconds, the increase in traffic generates a corresponding reduction in the reserve capacity (PRC) and increased delay. However, the overall results demonstrate that substantial reserve capacity remains and that it is unlikely that an extensive and prolonged queue would develop. The increase in delay is representative of the increase in the number of vehicles incurring this delay.

Table 4.1: Sensitivity Test Results for 66 Second Green Time

Peak Hour	Scenario	Demand	PRC	Delay (pcuHR)	Difference in PRC (%)	Difference in Delay (%)	DoS in %
AM Peak (08:00-09:00)	66 Seconds Green Time	Baseline	368	0.6	-	-	19.3
		+10%	325	0.7	-12%	17%	21.2
		+25%	273	0.8	-26%	33%	24.1
		+50%	211	1	-43%	67%	29.0
PM Peak (17:00-18:00)	66 Seconds Green Time	Baseline	365	0.6	-	-	19.3
		+10%	323	0.7	-12%	17%	21.3
		+25%	273	0.8	-26%	33%	24.1
		+50%	211	1	-43%	67%	29.0

The sensitivity test results for the “worst case” scenario, based on 40 seconds green time, are presented in Table 4.2. This extensive downtime is an extreme sensitivity test and is not representative of the proposed operation of the CSET public transport service. Nevertheless, in this scenario, even a 50% increase in demand (500 vehicles to 750 vehicles) indicates a reserve capacity of approximately 90 vehicles.

Table 4.2: Sensitivity Test Results for 40 Second Green Time

Peak Hour	Scenario	Demand	PRC	Delay (pcuHR)	Difference in PRC (%)	Difference in Delay (%)	DoS in %
AM Peak (08:00-09:00)	40 Seconds Green Time	Baseline	189	2.3	-	-	31.2
		+10%	163	2.5	-14%	9%	34.3
		+25%	131	3	-31%	30%	39.0
		+50%	92	3.8	-51%	65%	46.9
PM Peak (17:00-18:00)	40 Seconds Green Time	Baseline	188	2.3	-	-	31.3
		+10%	162	2.5	-14%	9%	34.4
		+25%	131	2.9	-31%	30%	39.0
		+50%	92	3.7	-51%	65%	46.9

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5 Summary

Mott MacDonald has undertaken an exercise to establish the potential implications of the signal-controlled public transport route crossings proposed as part of the CSET Phase 2 scheme. The detailed assessment has evaluated what is considered to be the most sensitive crossing point, Hinton Way, north of Great Shelford.

The assessment has simulated the impact of a signal-controlled crossing with public transport priority at Hinton Way, through the application of LinSig modelling and observed traffic data collected in March 2019, based on peak traffic hours: AM 08:00-09:00 and PM 17:00-18:00.

Overall, the baseline assessment, using observed 2019 data, demonstrates that the proposed priority signals generate a minimal and infrequent traffic impact on Hinton Way. Due to the residual practical reserve capacity (PRC), the assessment shows no clear build-up of queued traffic which could impact residential properties along Hinton Way.

In addition, the assessment has considered the influence of a range of sensitivity tests, which are summarised as follows:

- Decreased green time (66/90)
    - Reserve capacity remains and it is likely any temporary queued traffic will remain within acceptable standards.
- Decreased green time (50/90)
    - Reserve capacity remains and it is likely any temporary queued traffic will remain within acceptable standards.
- Increased traffic (10%)
    - Queued traffic will remain within acceptable standards.
- Increased traffic (25%)
    - Queued traffic will remain within acceptable standards.
- Increased traffic (50%)
    - Queued traffic will be within acceptable standards. The reserve capacity is reduced; however, an increase in demand of 50% is an extreme growth scenario which is not expected and used as a sensitivity test only.

It should also be noted that this assessment considers a call frequency of once every 1 ½ minutes (90 seconds). Based on the proposed service frequency, this is more likely to be once every 3 ½ minutes (210 seconds). The assessment is therefore robust.

It is acknowledged that concerns have been raised regarding the traffic impact of the scheme based on perceptions that these crossings will operate in a similar way to the existing railway level crossings at Hinton Way and Granham's Road. This is not the case and this assessment has demonstrated that similar levels of delay would not be generated as a result of the proposed CSET Phase 2 scheme.

6 Addendum – Strategic Transport Modelling

Following the completion of the strategic transport modelling (CSRM2) for the CSET Phase 2, the following section provide a comparison between the predicted forecasted traffic volumes and the assumptions applied within the initial LinSIG assessment.

The Cambridge Sub Regional Model (CSRM2) represent the entire transport network throughout Cambridge including Highway and Public Transport. Figure 6.1 presents the highway network with the vicinity of Hinton Way including the three corridors: Granham's Road, Hinton Way and Haverhill Road. In addition, the figure presents the three key sources of traffic: Great Shelford, Stapleford, and the Babraham Park & Ride site.

The proposed CSET Busway is represented by the red line with the assessed Hinton Way crossing indicated.

Figure 6.1: CSRM2 CSET Phase 2 Do-Something SATURN Network

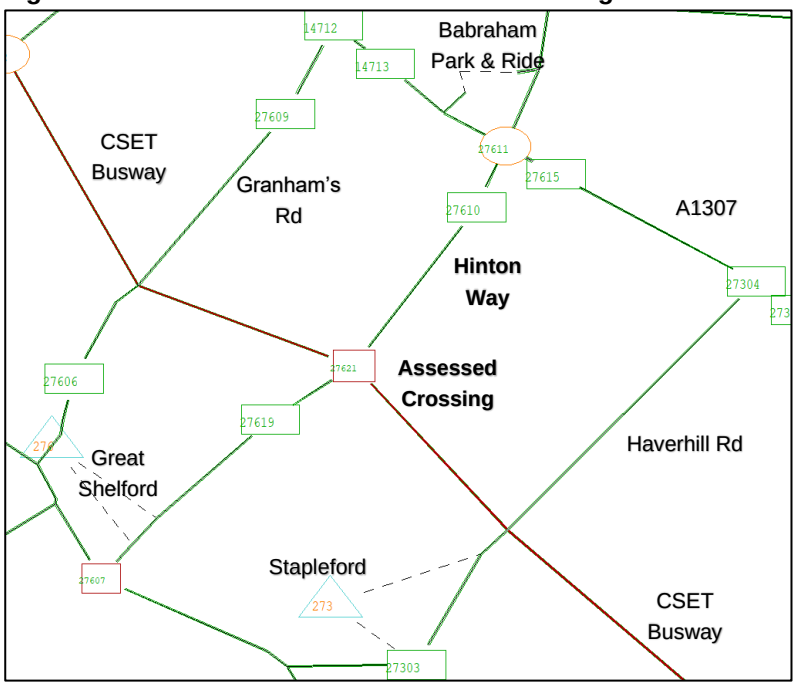


Table 6.1 below presents the forecasted traffic volumes from the strategic modelling for 2036 Do-Minimum and Do-Something (DS) in comparison to the 2015 Base Year.

The result indicates a maximum increase of 11% in the DS scenarios from the 2015 Base Year.

This level of growth is well within the levels assumed in the LinSig assessment (10% to 25%) and therefore confirms that the strategic modelling supports the conclusions of LinSig assessment. Based on this analysis and the LinSig assessment the proposed crossings will have minimal impact on the highway network.

Table 6.1: Hinton Way Forecasted Traffic Volumes 2036 (Vehicles)

Scenario	AM Peak (08:00-09:00)			PM Peak (17:00-18:00)		
	NB	SB	Total	NB	SB	Total
2015 Base Year (BY)	428	105	533	331	208	539
2036 Do-Minimum	453	134	587	356	247	603
% Difference from BY	**6%**	**28%**	**10%**	**8%**	**19%**	**12%**
2036 Do-Something	457	135	593	356	240	596
% Difference from BY	**7%**	**29%**	**11%**	**8%**	**15%**	**11%**