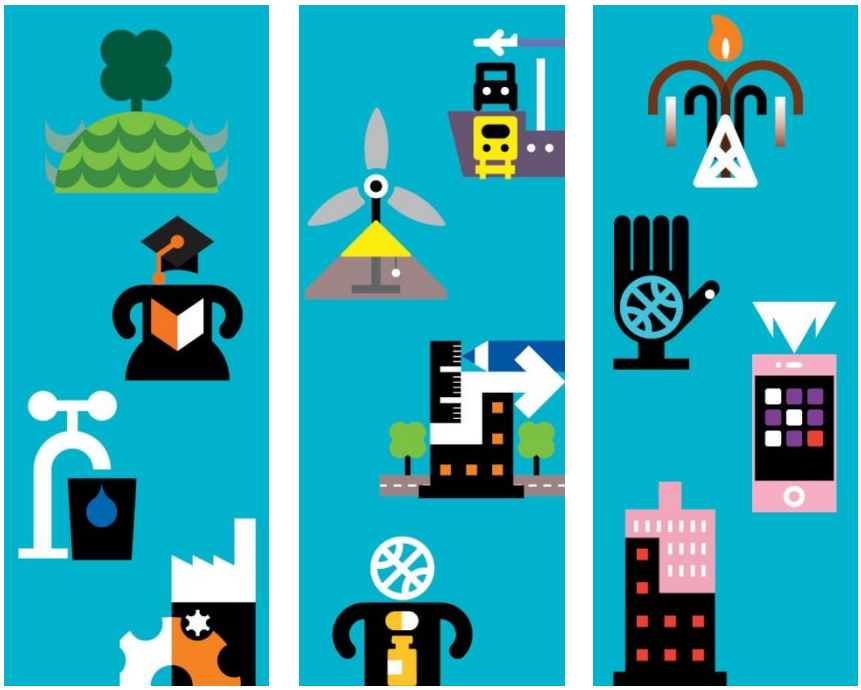


A229 / Boughton Lane - Junction Review

Technical Note

344395/ITD/TPS/009/A

April 2016

Maidstone Borough Council

Mott MacDonald

A229 / Boughton Lane - Junction Review

Technical Note

April 2016

Maidstone Borough Council

Maidstone House
King Street
Maidstone
ME15 6JQ

Mott MacDonald, Stoneham Place, Stoneham Lane, Southampton, SO50 9NW, United Kingdom
T +44 (0)23 8062 8800 **F** +44 (0)23 8064 7251 **W** www.mottmac.com

Issue and revision record

Revision	Date	Originator	Checker	Approver	Description
A	April 2016	R Khakh / A Pridige	P Rapa / O Daffarn	M Olley / A Farrow	First Issue

Information class: Standard

Contents

Executive Summary

Mott MacDonald was commissioned by Maidstone Borough Council to consider the capacity of the A229 / Boughton Lane / Cripple Street junction.

A number of options were considered, namely:

- A signalised sketch option produced by DHA;
- Two further signalised options; and
- Two mini-roundabout options.

The only option that mitigates the impact of the anticipated development is the second signalised option, Option B. This layout provides secondary stoplines on the A229 thereby allowing for the side roads to receive green at the same time.

Sketches for all the options considered as well as assessment results are provided in this report. Indicative costings for Option B have been produced and are also included in this report.

1 Introduction

1.1 Background

Mott MacDonald was commissioned by Maidstone Borough Council (MBC) to consider the capacity of the A229 / Boughton Lane / Cripple Street junction, and to develop possible improvement measures. Our proposal responded directly to the brief received from MBC with the tasks as set out below.

1.2 Tasks

The tasks as set out below were taken from the MBC brief and were detailed further in our proposal:

1. Using all of the available information provided consider traffic increases on the A229 corridor and at the nominated junction at 2031 to use as a benchmark.
   a. Collation of all the relevant information to establish the base traffic at the junction of A229 / Boughton Lane / Cripple Street junction.
   b. Calculate the growth applicable to the base traffic based on TEMPro for 2031.
   c. Add any relevant development sites and adjust TEMPro if necessary.

2. Consider the existing road and junction layout to identify capacity issues at the junction as it currently operates.
   a. Review the modelling carried out in DHA's Transport Report for Boughton Lane; note, Project Centre's Transport Assessment for Boughton Lane and DHA's Transport Assessment for the Primary and Studio School only contain spreadsheet models. The DHA Transport Report contains modelling for 2014, as well as 2018 Base and with development. The results for 2014 are within capacity whereas both 2018 assessment scenarios exceed capacity.
   b. Based on the modelling results and any comments on the modelling that has been carried out, the existing road layout will be considered with a view to identify what elements of the junction layout affect the capacity constraints most.

3. Use the information provided about road infrastructure secured through developer contributions and any that has already been constructed or is under construction to make suggestions for improvement measures to mitigate future congestion. This should include a wide range of potential solutions and indicative viability / cost implications, illustrated by way of a traffic light coding approach.
   a. Review information regarding road infrastructure secured (wording of S106 agreements), improvements that have been implemented, are being implemented or designed.
   b. Based on the outcomes in point 2 above, we will consider possible improvements to the junction. For costing purposes, we have allowed for a maximum of 3 options to be sketched up.
   c. We are aware of DHA's recent sketch with proposed improvements which is likely to form a starting point.
   d. We will carry out assessments for the options to understand whether they provide the additional capacity required for the junction to perform within capacity in 2031 with the relevant development traffic.

e. Based on our sketches, we will consider the viability and cost implications of the options and rank them based on a traffic light coding approach as requested in the brief.

4. Provide detailed designs for the most viable / feasible solution at the junction, ensuring all of the solution can be delivered within the extent of the existing highway / KCC Highways controlled land.
   a. For the overall best option emerging from point 3 above, we will produce a preliminary drawing (not detailed design).
   b. Given the significant overcapacity of the junction in 2018 (as per DHA Report), it is possible that no satisfactory solution that can be achieved that mitigates the impacts of 15 years of growth plus planned development. We would discuss a potential reduction in trip generation for any planned development and run the assessment again with such reduced trip rates.

5. Provide a written report identifying the methodology and approach undertaken, summarising the findings, and drawing the conclusions. The written report should be accompanied by relevant mapping and/or illustrations as deemed appropriate.
   a. We will produce a Technical Note detailing the above steps and outcomes. The report will contain the sketches and preliminary design drawing as well as any other supporting documents.

1.3 Report Structure

This Technical Note is structured as follows:

- **Chapter 2** contains the traffic flows.
- In **Chapter 3**, the existing layout is reviewed and capacity issues are identified.
- **Chapter 4** contains the improvement options considered.
- The best performing solution is further developed in **Chapter 5**.
- **Chapter 6** summarises the work that has been undertaken.

2 Traffic Flows

2.1 Existing Traffic Flows

In order to calculate traffic flows for 2014, the following report was used:

- Proposed Residential Development and Playing Field, Boughton Lane, Maidstone; Transport Report produced by DHA Transport, June 2015.

The traffic surveys were undertaken by K&M Traffic Surveys Limited on Wednesday 26th November 2014. The AM (07:00-10:00) and PM (14:00-17:00) peaks were surveyed in 15 minute intervals, with the flows factored into Passenger Car Units (PCUs). The peak hours were identified as 08:00-09:00 for the AM peak and 17:00-18:00 for the PM peak, as shown in **Figure 2.1** and **Figure 2.2.**

Figure 2.1: Base 2014 Flows (AM Peak)

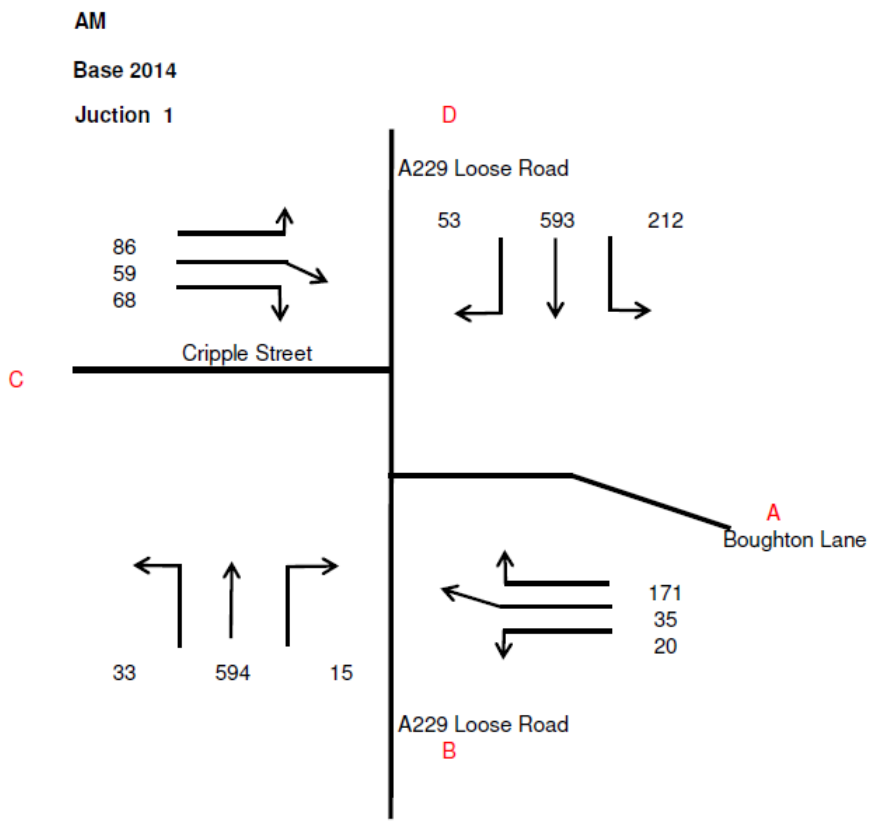
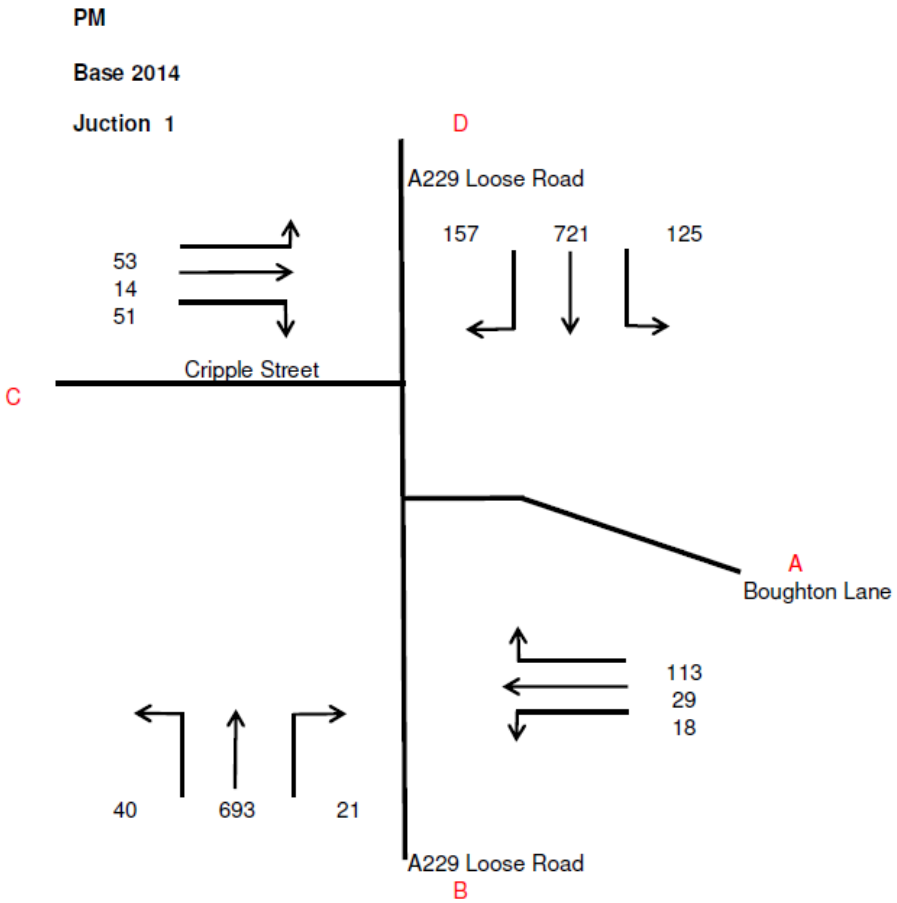


Figure 2.2: Base 2014 Flows (PM Peak)



2.2 Development Flows

In agreement with Maidstone Borough Council, the following planning applications were reviewed:

- Primary and Studio School, Boughton Lane, Maidstone, Kent, produced by DHA Transport, October 2012 (Planning Reference 12 / 1989)
- Land South of Sutton Road, Langley produced by DHA Transport, March 2016 (Planning Reference 15 / 509015)
- Land at Cripple Street, Proposed Residential Development produced by MONSON, July 2014 (Planning Reference 14 / 503167)
- Proposed Residential Development and Playing Field, Boughton Lane, Maidstone produced by DHA Transport, June 2015 (Planning Reference 13 / 2197)
- Proposed Residential Development, Bicknor Green, Land North of Bicknor Wood, Maidstone, Kent produced by Iceni Projects, November 2015 (Planning Reference 15 / 509251)

- Proposed Redevelopment, Kent Police HQ Land and Kent Police Training School produced by DHA Transport, April 2012 (Planning Reference 12 / 0986 and 12 / 0987)
- Land North of Sutton Road, Redrow Homes produced by WSP, August 2013 (Planning Reference 13 / 1523)
- Langley Park, Maidstone produced by i-Transport, June 2013 (Planning Reference 13 / 1149)
- Land at Bicknor Farm, Sutton Road produced by WYG Transport, December 2015 (Planning Reference 14 / 506264)

The traffic flows in the transport assessments listed above were interrogated to determine the potential future impact of each development on the A229 / Boughton Lane junction. Subsequently, if the development is expected to affect the junction, the flows were noted for each movement at the junction.

The Transport Assessment for Land at Cripple Street did not produce the distribution of flows at the junction. Therefore, the traffic flows entering the junction were distributed in accordance with the distribution of the base flows across the junction for the AM and PM peaks.

The development flows from all the transport assessments were added for the AM and PM peaks and are displayed in **Figure 2.3** and **Figure 2.4**.

Figure 2.3: Development Flows (AM Peak)

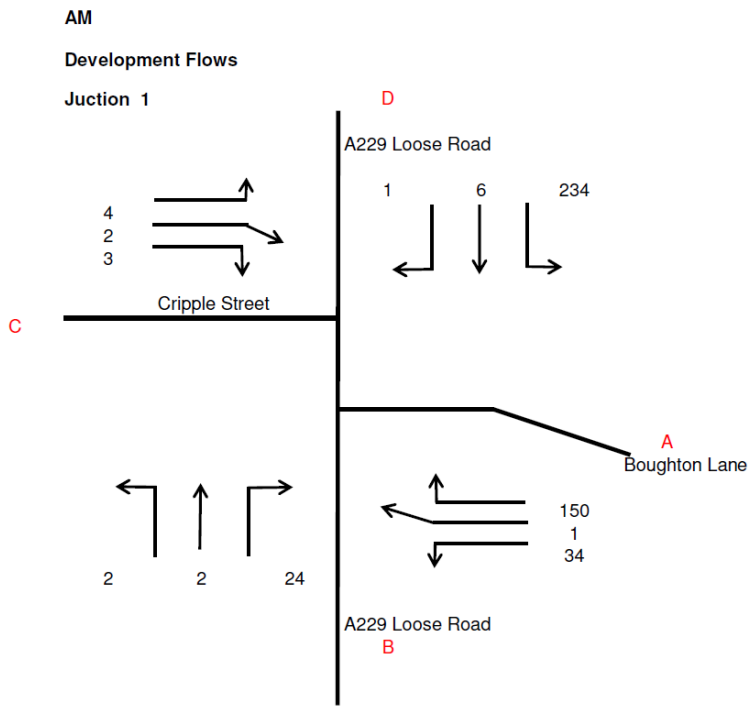
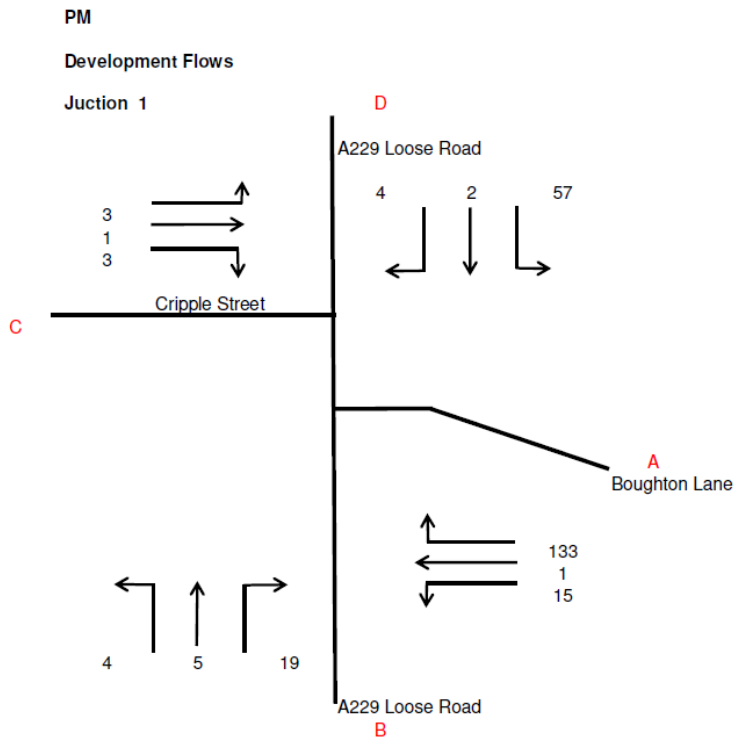


Figure 2.4: Development Flows (PM Peak)



2.3 TEMPro

TEMPro (version 6.2 with planning dataset 62 and NTM dataset AF09) has been interrogated with regards to forecast growth in traffic. The growth rates were adjusted using the National Transport Model (NTM) for an urban principal road in Maidstone.

Growth rates for between 2013 and 2031 have been generated. **Table 2.1** shows the growth rates.

Table 2.1: TEMPro Growth Rates for Maidstone – 2013 - 2031

Time period	Factor
AM peak	1.205658
PM peak	1.217424

Future growth from 2013-2031 identifies an increase in housing of 6,034 households in the Maidstone area. The various developments as set out in **Section 2.2** total approximately 2,617 units. It is considered that these units are double counted due to their inclusion in the 6,034 increase in households derived from

TEMPro. TEMPro has therefore been adjusted to a 'Future HH' of 46,129, to ensure the developments are not double counted, deducting 2,617 units from the current 'Future HH' of 48,746, as shown in **Table 2.2**.

Table 2.2: Planned Development Adjustments

Current Future HH	Adjustment for Future HH
48,746	46,129

The adjusted growth rates for between 2013 and 2031 have been generated and are displayed in **Table 2.3**.

Table 2.3: Adjusted TEMPro Growth Rates for Maidstone – 2013 - 2031

Time period	Factor
AM peak	1.176328
PM peak	1.186686

2.4 Future 2031 Base Flows

Based on the above factors in **Table 2.3**, the 2031 Base flows were calculated. The AM and PM peaks are illustrated in **Figure 2.5** and **Figure 2.6**.

Figure 2.5: Base 2031 Flows (AM Peak)

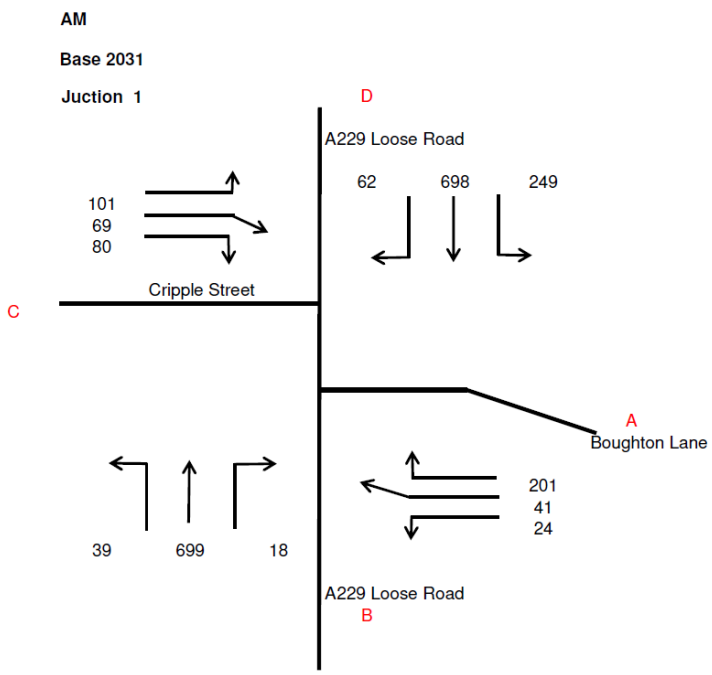
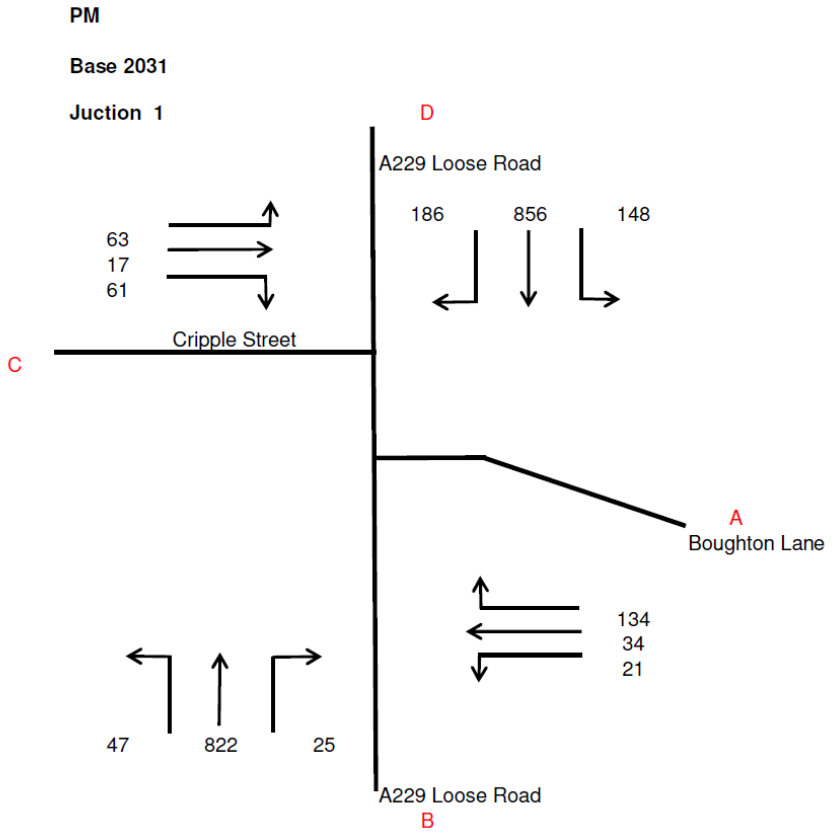


Figure 2.6: Base 2031 Flows (PM Peak)



2.5 2031 with Development Flows

The development flows illustrated in **Section 2.2** were added to the 2031 Base flows to create the 'with development flows'. These are shown in **Figure 2.7** and **Figure 2.8**.

Figure 2.7: 2031 'with Development' Flows (AM Peak)

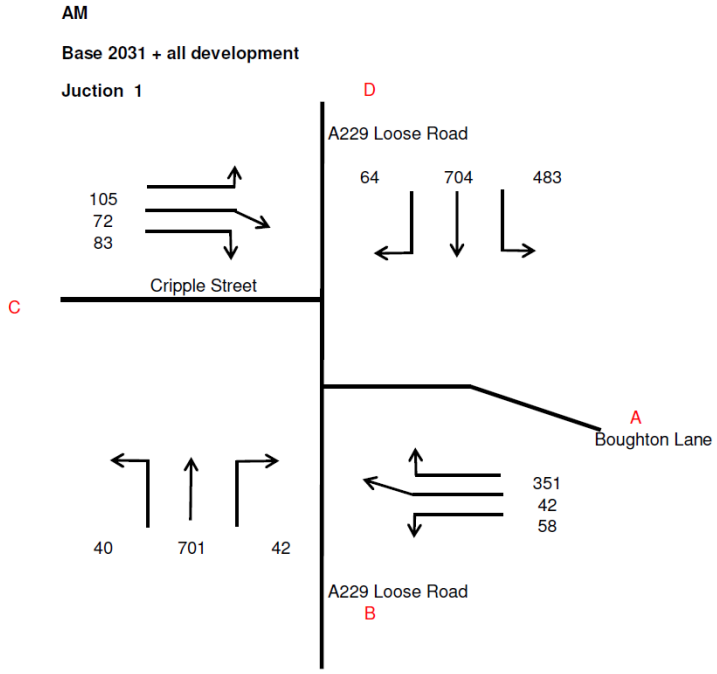
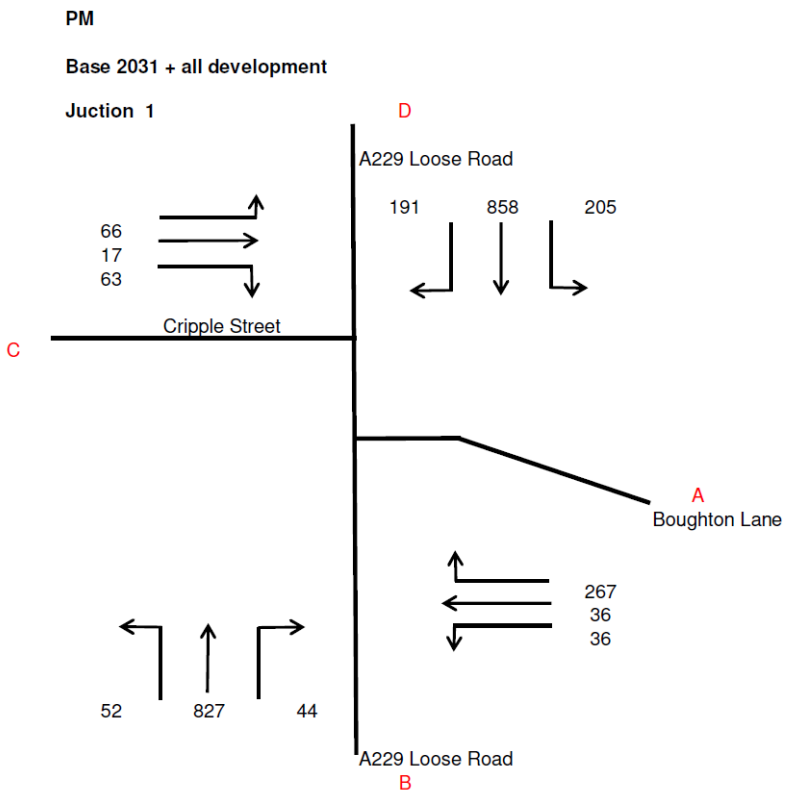


Figure 2.8: 2031 'with Development' Flows (PM Peak)



3 Review of Existing Junction Layout

3.1 Review of DHA Transport Report

DHA produced a Transport Report on behalf of BDW Trading Ltd to support the appeal site off Boughton Lane which was originally subject to planning application 13/2198 which was refused planning permission at Planning Committee on 24 July 2014.

Traffic surveys were undertaken in November 2014. These are presented in the above mentioned report and also form the basis for the assessments undertaken in this report. They are illustrated in **Section 2.1**.

The DHA Report contains assessment results for the junction of A229 Loose Road with Boughton Lane / Cripple Street for 2014 and 2018. Two scenarios were tested for 2018, 'Do Nothing' and 'Do Minimum' with the former including growth plus the school developments (New Line Learning Academy, Tiger Primary, Studio School and Five Acre SEN School). The latter adds the Boughton Lane development flows.

The 2018 'Do Nothing' scenario is therefore not a "Base" scenario and is not directly comparable with the 2031 Base scenario considered in this report.

In the 2014 Base, the junction is shown to be within capacity. In both 2018 scenarios, the junction exceeds capacity significantly with long queues forming. Table 5.2 of DHA's Transport Report is shown in **Figure 3.1**.

Figure 3.1: A229 / Boughton Lane, Results from DHA's Report

Arm	AM peak		EPM peak		PM peak	
	DoS	MMQ	DoS	MMQ	DoS	MMQ
2014 Base						
Loose Rd (N)	87.7%	31.2	82.4%	27.9	85.0%	31.4
Boughton Ln	85.8%	10.9	82.8%	10.0	82.8%	8.0
Loose Rd (S)	65.3%	18.6	60.6%	16.7	63.8%	18.7
Cripple St	83.9%	10.1	81.0%	8.2	80.5%	6.2
PRC	2.6%		8.6%		5.8%	
Avg. Delay (s/PCU)	50.9		44.5		38.2	
Cycle Time (seconds)	135		135		135	
2018 Do Nothing						
Loose Rd (N)	113.8%	118.9	105.1%	72.4	97.3%	48.4
Boughton Ln	113.9%	40.8	103.5%	29.3	97.6%	16.8
Loose Rd (S)	73.2%	22.3	72.2%	21.2	72.5%	23.2
Cripple St	112.3%	26.0	105.9%	17.3	93.0%	8.3
PRC	-26.5%		-17.7%		-8.4%	
Avg. Delay (s/PCU)	225.8		135.9		66.3	
Cycle Time (seconds)	135		135		135	
2018 Do Minimum						
Loose Rd (N)	120.8%	150.4	111.7%	103.8	104.7%	78.7
Boughton Ln	116.4%	52.2	111.6%	45.3	100.5%	21.3
Loose Rd (S)	77.4%	23.8	86.3%	24.2	76.4%	25.2
Cripple St	120.3%	32.7	105.9%	17.3	103.3%	11.5
PRC	-34.3%		-24.2%		-16.3%	
Avg. Delay (s/PCU)	290.0		204.6		115.5	
Cycle Time (seconds)	135		135		135	

Table 5-2: Boughton Lane/A229 Signal Junction Operational Performance

Source: Transport Report for Proposed Residential Development and Playing Field, Boughton Lane, Maidstone, produced by DHA Transport on behalf of BDW Trading Ltd, June 2015

3.2 Results of Junction Assessment – Existing Layout with 2031 Base Flows

The existing junction layout was assessed with 2031 Base flows to establish a future base scenario. As described in **Section 2**, the 2031 Base flows only contain growth. Unlike the DHA's Report which established the impact of the Boughton Lane development and therefore added all other 'committed' development to the base flows, or 'Do Nothing' as it is termed in their report, this report considers the impact of all development in the vicinity of this junction compared to base which only includes background growth.

The results of the existing signalised junction layout tested with future 2031 Base flows are shown in **Table 3.1** below.

Table 3.1: LinSig Assessment Results – Existing Layout with 2031 Base Flows

	AM		PM	
Movement	DoS (%)	Mean Max Queue (PCU)	DoS (%)	Mean Max Queue (PCU)
A229 Loose Road North	104.6	71	104.5	82
Boughton Lane	101.0	19	97.8	13
A229 Loose Road South	75.8	24	76.6	26
Cripple Street	104.0	21	96.1	10
Practical Reserve Capacity (PRC) over all lanes	-16.2%		-16.1%	

The results show the junction to be over capacity in both the AM and PM peak, with only the southern arm (the A229 south) being within capacity. The maximum queue is expected on the northern arm (A229 north) reaching 71 PCUs (approximately 390m) in the AM peak and 82 PCUs (approximately 450m) in the PM peak. Such queues would not extend to the Wheatsheaf junction.

Although the side roads are over their theoretical capacity (100%) in the AM peak and over their desirable capacity (90%) in the PM peak, the queuing on these arms is relatively limited.

4 Improvement Options Considered

4.1 DHA Scheme

A potential junction improvement scheme was passed to us by DHA. This consists of flaring the southbound A229 through the junction providing a left turn flare into Boughton Lane. The layout produced by DHA is included in **Appendix A**. The LinSig assessment results are shown in **Table 4.1** below.

Table 4.1: LinSig Assessment Results – DHA Layout with 2031 with Development Flows

	AM		PM	
Movement	DoS (%)	Mean Max Queue (PCU)	DoS (%)	Mean Max Queue (PCU)
A229 Loose Road North	129.7	204	124.4	124
Boughton Lane	131.1	78	122.7	50
A229 Loose Road South	85.0	28	85.2	32
Cripple Street	123.3	40	123.3	24
Practical Reserve Capacity (PRC) over all lanes	-45.7%		-38.2%	

The results show the junction to be considerably over capacity in both peaks with only the southern arm of the A229 within capacity. Compared to 2031 Base with existing layout, queues would increase significantly with 204 PCUs (over 1.1km) in the AM peak and 124 PCUs (approximately 680m) in the PM peak. Such queuing would extend to and beyond the Wheatsheaf junction which is just over 600m to the north of the Boughton Lane junction.

Queuing on the side roads is also significantly higher with queues on Cripple Street roughly doubling compared to base and trebling on Boughton Lane where the impact of the development is felt more than on Cripple Street.

4.2 Signalised Option A

Further signalised options were considered with the aim to achieve greater overall capacity.

The first signalised option considered – Option A – introduced a staggered pedestrian crossing in the middle of the junction (between Cripple Street and Boughton Lane). This replaced the pedestrian crossings on the A229 on both the northern and southern arms. The staggered crossing reduces the crossing length and therefore allows for slightly shorter pedestrian greens. A sketch of this option is shown in **Appendix B**, and it is further described in **Section 5** of this report.

The LinSig assessment results are shown in **Table 4.2** below.

Table 4.2: LinSig Assessment Results – Signalised Option A with 2031 with Development Flows

	AM		PM	
Movement	DoS (%)	Mean Max Queue (PCU)	DoS (%)	Mean Max Queue (PCU)
A229 Loose Road North	101.2	46	114.2	113
Boughton Lane	99.4	27	116.9	43
A229 Loose Road South	101.5	47	112.2	93
Cripple Street	98.7	17	111.0	17
Practical Reserve Capacity (PRC) over all lanes	-12.8%		-29.8%	

The results show the junction to be over capacity in both peaks. Compared to 2031 Base with existing layout, the AM peak is over capacity to a lesser extent. From a capacity point of view, the impact of development traffic can be mitigated in this peak, with queues on the northern arm (A229 north) significantly reducing, although queues would increase on all other arms.

In the PM peak however, the junction is over capacity to a greater extent than in the base with queues on all arms, particularly on the two A229 arms, significantly increasing. The A229 north would see queues of 113 PCUs (approximately 620m) and the A229 south 93 PCUs (approximately 500m). Such queuing would extend to around the Wheatsheaf junction in the north.

4.3 Signalised Option B

In the second signalised option considered – Option B – secondary stop lines were introduced on the A229. This allows for both side roads (Boughton Lane and Cripple Street) to run at the same time. This option is further described in **Section 5** of this report and **Appendix C** contains a sketch of this option.

The LinSig assessment results are shown in **Table 4.3**.

Table 4.3: LinSig Assessment Results – Signalised Option B with 2031 with Development Flows

	AM		PM	
Movement	DoS (%)	Mean Max Queue (PCU)	DoS (%)	Mean Max Queue (PCU)
A229 Loose Road North	90.8	31	101.2	60
Boughton Lane	91.1	21	102.2	24
A229 Loose Road South	92.1	32	74.5	25
Cripple Street	77.9	11	84.3	8
Practical Reserve Capacity (PRC) over all lanes	-2.4%		-13.6%	

The results show the junction to be within theoretical capacity in the AM peak and only slightly over theoretical capacity in the PM peak. Compared to 2031 Base with existing layout, the junction performance is better in both peaks.

In the AM peak, the queues on the northern arm (A229 north) would be reduced significantly. Queues on A229 south and Boughton Lane would be slightly greater than in the base. In the PM peak, queues on A229 north would be reduced compared to base. They would slightly increase on Boughton Lane where the impact of development is greatest. Queues on the other two arms remain unchanged.

Overall, it is considered that this junction layout mitigates the impact the development traffic would have on this junction.

4.4 Mini-Roundabout Option 1

A double mini-roundabout scenario was considered that provides two lanes southbound between the two roundabouts. A basic sketch is included in **Figure 4.1**. The Arcady assessment results are shown in **Table 4.4** below.

Figure 4.1: Mini-Roundabout Option 1

Source: Sketch produced by Mott MacDonald

Table 4.4: Arcady Assessment Results – Mini-Roundabout Option 1 with 2031 with Development Flows

	AM		PM	
Movement	RFC	Queue (PCU)	RFC	Queue (PCU)
North Junction: A229 Loose Road North	1.477	644	1.402	634
North Junction: A229 Loose Road South	0.946	3	0.956	3
North Junction: Cripple Street	0.932	29	0.480	2
South Junction: A229 Loose Road North	0.799	3	0.931	3
South Junction: Boughton Lane	0.843	47	0.700	16
South Junction: A229 Loose Road South	1.133	243	1.282	390

The results show that queuing on the side roads (Boughton Lane and Cripple Street) is relatively limited. However, queuing on the main A229 is very significant, particularly on the approach to the junction from the north. The model predicts queues in the order of 630 PCUs which would equate to approximately 3.5km. Such a queue would stretch into and through the centre of Maidstone.

Such a double mini-roundabout option is therefore not considered a viable solution.

4.5 Mini-Roundabout Option 2

An alternative double mini-roundabout scenario was considered providing two lanes at the southbound stopline of the northern roundabout as well as two lanes southbound between the two roundabouts. A basic sketch is included in **Figure 4.2**. The Arcady assessment results are shown in **Table 4.5** below.

Figure 4.2: Mini-Roundabout Option 2

Source: Sketch produced by Mott MacDonald

Table 4.5: Arcady Assessment Results – Mini-Roundabout Option 2 with 2031 with Development Flows

	AM		PM	
Movement	RFC	Queue (PCU)	RFC	Queue (PCU)
North Junction: A229 Loose Road North	-	443	-	432
North Junction: A229 Loose Road South	0.946	3	0.958	3
North Junction: Cripple Street	0.784	15	0.420	2
South Junction: A229 Loose Road North	0.815	3	0.940	3
South Junction: Boughton Lane	0.949	75	0.795	32
South Junction: A229 Loose Road South	1.081	217	1.251	386

The results are similar to Option 1 and show that queuing on the side roads (Boughton Lane and Cripple Street) is relatively limited. However, queuing on the main A229 is – although reduced compared to Option 1 – still very significant, particularly on the approach to the junction from the north. The model predicts queues in the order of 440 PCUs which would equate to approximately 2.5km.

This improved double mini-roundabout option is not considered a viable solution.

4.6 Summary of Assessment Results

Table 4.6 and **Table 4.7** below compare the queuing results of the various options that were tested. These show that in the AM peak, both signalised options perform similarly to the 2031 Base. However, in the PM peak, only Option B performs similarly to 2031 Base. It is therefore considered that this (Option B) is the only option that mitigates the combined developments' impact on this junction.

Table 4.6: AM Queues

Movement	2031 Base	DHA Scheme	Signalised Option A	Signalised Option B	Mini-roundabout Option 1	Mini-roundabout Option 2
A229 Loose Road North	71	204	46	31	644	443
Boughton Lane	19	78	27	21	47	75
A229 Loose Road South	24	28	47	32	243	217
Cripple Street	21	40	17	11	29	15

Table 4.7: PM Queues

Movement	2031 Base	DHA Scheme	Signalised Option A	Signalised Option B	Mini-roundabout Option 1	Mini-roundabout Option 2
A229 Loose Road North	82	124	113	60	634	432
Boughton Lane	13	50	43	24	16	32
A229 Loose Road South	26	32	93	25	390	386
Cripple Street	10	24	17	8	16	2

5 Signalised Option B

5.1 Introduction

As described in **Section 4** of this report, two signalised options were considered. The key constraint was to keep the proposed highway alignment within the existing highway boundary. Option A was discounted following the traffic capacity assessment. The layout for Option A is shown on sketch 344395-BL02-BNI-BCL-SK001 and is included in **Appendix B** for reference.

This section of the report provides information in relation to the swept path and concept highway layout designs that have been undertaken. The following design standards have been used in the preparation of the layouts:

- TD 50/04 – The Geometric Layout of Signal-controlled Junctions & Signalised Roundabouts
- LTN 2/95 – The design of Pedestrian Crossings
- KCC Design (a guide to sustainable development technical appendix 2009)
- The Traffic Signs Regulations and General Directions 2002

This memo should be read in conjunction with the following sketch:

- 344395/BL02/BNI/BCL/SK002 - Option B, included in **Appendix C**

5.2 Swept Path Analysis

Swept path analysis for both junction options has been carried out using;

- Large car 1.9m wide, 5.1m long with a 6.4m turning radius
- Panel van 2.2m wide, 7.2m long with a 6.4m turning radius
- Pantechnicon 2.5m wide, 11m long with a 13.1m turning radius

These vehicles have been chosen in lieu of local Highway Authority specified tracking requirements. They are considered worst case in terms of turning radius for each type of vehicle.

The bus layby has been designed to allow a bus (Dart SLF 11.2m) to access the layby and stop within the bus cage without impacting the lane for through traffic. Swept path analysis of the large car and panel van indicated that these vehicles can make all required movements around the junction. Pantechnicon movements were possible with the exception of the following movements:

- A Pantechnicon coming from Boughton lane and turning onto the A229 southbound cannot do so in one movement. However, as the stop line and kerb alignment are existing, this is no worse than the existing turn.
- A Pantechnicon turning into Cripple Street from the new stop line on the A229 northbound, crosses the existing stop line on Cripple Street. Although the stop line on the A229 is new, the stop line on Cripple Street is existing and therefore this overrun is no worse than the existing arrangement. In addition, there is an existing sign on the northbound approach of the A229 stating that there is “no through movement” for goods vehicles.
- A Pantechnicon turning left from Cripple Street onto the A229 northbound, comes close to the A229 southbound right turn only lane with the vehicle and wheel envelope just crossing the white line at the

stop line. This is due to having to accommodate the road widening, making the northbound lane narrower than existing.

Photo 5.1: A229 southern arm, looking north towards the junction

Source: Mott MacDonald Site Visit

Photo 5.2: A229 northern arm, looking south towards the junction

Source: Mott MacDonald Site Visit

Photo 5.3: A229 / Boughton Lane looking south towards the junction

Source: Mott MacDonald Site Visit

Photo 5.4: A229 / Boughton Lane looking west towards the junction

Source: Mott MacDonald Site Visit

5.3 Design Standard Compliance

5.3.1 Visibility

For both options, junction intervisibility is below the standards of TD 50/04 section 2.10, which requires an intervisibility zone incorporating the junction up to 2.5m behind each stop line, as existing buildings (including the Swan Pub, the building containing Lloyds bank and existing terraced houses) obstruct full junction intervisibility. However, neither option has made the intervisibility worse than the existing junction.

The junction intervisibility zones also pass over land that is not dedicated as adopted highway. However, as noted above, this is as it is for the existing arrangement.

The design incorporates the existing stop line locations for the A229 northbound, Boughton Lane northbound and Cripple Street eastbound. The A229 southbound stop line is moved approximately 4m south of its current location for Option A.

For Option B the new northbound intermediate stop line has a minor obstruction from the existing terraced houses within the intervisibility zone looking towards Cripple Street. There is scope to move the stop line further forward by approximately 2m to eliminate this obstruction within the intervisibility zone but may impede traffic flow modelling and turning space for vehicles.

The signal head visibility has been assessed for occasions when a bus is located in the bus layby. The sightlines achieved meet the requirements of LTN2/95, Section 5.1.5 for drivers to be able to see a minimum of 1 signal head (the far side signal aspect) on the approach to a signalised junction. The stopping sight distance achieved to the far side signal is in excess of the minimum stopping sight distance of 40m for a 30mph speed limit (LTN2/95 Section 12 Table 1).

5.3.2 Carriageway and Footway Alignment

For both options, footways have been maintained at their existing widths which vary between approximately 1.8m and 2.5m, with exception of the footpath adjacent to the new bus stop taper, where the width reduces to 1.4m due to existing utility cabinets (see **Section 5.4** for further details).

The footway width at the proposed bus layby has been maintained at greater than 3m in accordance with KCC Design (a guide to sustainable development technical appendix) section 2.3.4.1 for footways adjacent to new bus stops. No assessment of pedestrian flows has been carried out as part of this work, and therefore the widths of the pedestrian crossings match the existing crossing width of 3m.All carriageway lanes are 3m in width or greater, complying with DMRB, TD50/04, section 2.22 requirements for a minimum lane width of 3m.

The distance between the northern A229 southbound stop line and studs has been taken as 1.7m to provide maximum queuing space. The space between the northbound stop line and studs at the crossing in front of the bus stop is also 1.7m to provide extra clearance between the proposed bus layby and stop

line. 1.7m is the absolute minimum permitted in TSRGD 2016. All other crossings (on Cripple Street and Boughton Lane) maintain 3m between stop line and studs as per the existing arrangement.

An existing uncontrolled pedestrian crossing island on the northern arm of the A229 is being relocated further north to provide addition queuing capacity for southbound traffic. Whilst the carriageway widths are being maintained, the relocation will reduce the space available for vehicles turning right into the new development. There may be a need to refine the exact position of the island to balance the traffic demands of southbound traffic against traffic turning right into the development.

5.4 Utilities

No utility enquiries have been carried out as part of this work. However, it is reasonable to assume that there will be below ground utilities located in the existing footpaths on the A229 that will require protection or diversion to allow the new carriageway to be constructed.

From a site visit and further review of Google street view, there are a number of large utility cabinets on the footway adjacent to the existing bowling green and existing bus stop. There is also a grey signals cabinet just south of the junction adjacent to the kerb line which would have to be moved. These mean that it would be inappropriate to locate the bus layby in the position indicated on DHA Planning's proposal as there would be approximately 1.5m clearance between kerb and existing cabinets (based on assumption that the existing cabinets are 0.5m wide) leaving no space for the bus shelter. It would be possible to locate the layby in the location shown on the DHA's proposal if the cabinets are removed. However, only 2m of footway would be available between kerb and back of footway rather than the preferred 3m noted in Kent County Council design guidance. Therefore, it is proposed to move the new layby closer to the stop line in the position shown on the SK001 (**Appendix B**) and SK002 (**Appendix C**). This avoids the need to relocate the cabinets (except for the grey signals cabinet) and to maintain a compliant footway width for the bus boarding point.

Photo 5.5: A229 south, utility cabinets

Source: Mott MacDonald Site Visit

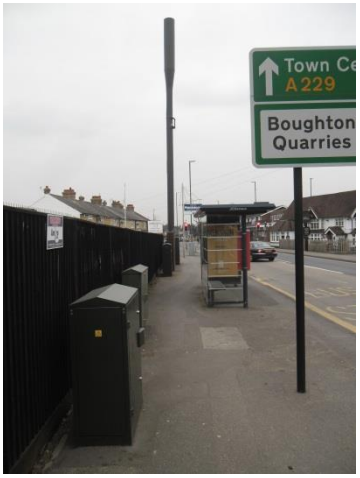
Photo 5.6: A229 looking south towards utility cabinets

Source: Mott MacDonald Site Visit

Photo 5.7: Utility cabinets on A229 south

Source: Mott MacDonald Site Visit

Photo 5.8: A229 south, looking north



Source: Mott MacDonald Site Visit

5.5 High Level Cost Estimate

A high level cost estimate has been undertaken which indicates an approximate cost of £150,000 to construct the scheme, subject to various assumptions and exclusions. Details of these, along with further information of the breakdown of the costs (based on those used for work carried out in Staplehurst) can be found on the separate high level cost estimate sheet 344395-BL02-BNI-BCL-002-A which is included in **Appendix D**.

5.6 Other Considerations

The proposed works will also impact on the following highway elements:

- Assessment of how the existing utilities in the area are affected by the proposals
- Street lighting (relocation of existing columns and need to increase area of luminance)
- Road signs (mainly relocation of existing signs)
- Drainage (check of existing system condition and capacity)
- Traffic regulation orders (relocation of bus stop and new stop lines)
- Existing trees (assessment of the root protection area proximity to the widening)
- Road safety audit (and review of accident data for the junction)

These have not been assessed in detail as part of this work but will need further work during the next stage of design.

6 Summary

Mott MacDonald was commissioned by Maidstone Borough Council (MBC) to consider the capacity of the A229 / Boughton Lane / Cripple Street junction.

Flows were obtained from DHA's Transport Report that was produced for the Boughton Lane appeal (Proposed residential development and playing field, Boughton Lane, Maidstone; Transport Report produced by DHA Transport, June 2015).

MBC advised which developments should be considered for inclusion and provided the transport assessments from which development flows were extracted.

TEMPro was used to growth the base flows. Growth factors were adjusted taking account of the development considered to avoid double counting.

A number of options were considered, namely:

- A signalised sketch option produced by DHA;
- Two further signalised options, in one of which a staggered pedestrian crossing was introduced and the second one considered secondary stoplines on the A229; and
- Two mini-roundabout options.

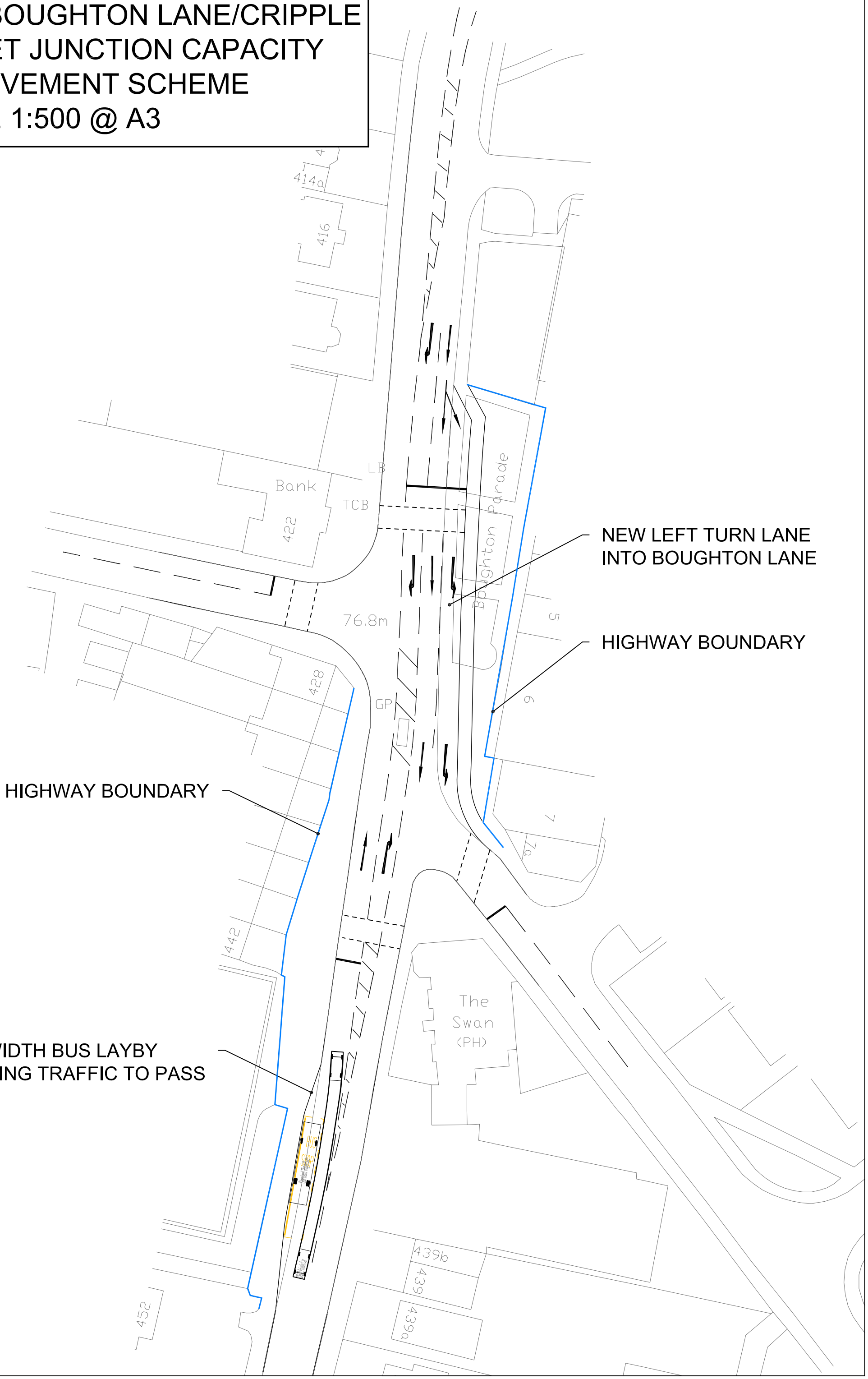
The only option that mitigates the impact of the anticipated development is the second signalised option, Option B. The secondary stopline on the A229 in this layout allow for the side roads to receive green at the same time thereby affording more greentime to the main A229 movements.

Sketches for all the options considered as well as assessment results are provided in **Section 4** of this report and **Appendices A, B and C**. Further information including indicative costings for Option B have been produced and are included in **Section 5** and **Appendix D** of this report.

Appendices

Appendix A. DHA Junction Sketch

A229/BOUGHTON LANE/CRIPPLE STREET JUNCTION CAPACITY IMPROVEMENT SCHEME
SCALE 1:500 @ A3



Appendix B. Signalised Option A

Key:

- Proposed kerbline
- Uncontrolled pedestrian crossing
- Extent of highway ownership taken from Kent County Council drawing
- Privately owned land within extent of junction intervisibility zone (based on DMRB TD 50/04)
- Visibility obstructed
- Junction intervisibility zone boundary (based on DMRB TD 50/04)

Indicative location of existing utility cabinets and mobile phone mast

Bus lay-by moved forward to avoid clashes with existing utility cabinets

Stop line retained in existing position

Junction intervisibility obscured by existing buildings

Crossing and stop line retained in existing position

Junction intervisibility obscured by existing building

Junction intervisibility zone is as existing

Existing position of traffic signals provides the following visibility for northbound traffic:
22m to nearside signal
>40m to farside signal

Junction intervisibility obscured by existing pub

Crossing and stop line retained in existing position

Existing large trees that may need removal. TPO check required

1 in 4 Taper to be agreed

Uncontrolled crossing moved north to accommodate longer queuing lanes

Cripple Street

A229 Loose Road

A229 Loose Road

Boughton Lane

1.4

3

3

3.4

3.3

3.2

Mott MacDonald

Mott MacDonald House
8-10 Sydenham Road
Croydon, CR0 2EE
United Kingdom

T +44 (0)20 8774 2000
F +44 (0)20 8681 5706
W www.mottmac.com

Client

Maidstone Borough Council
Maidstone House, King Street
Maidstone, Kent
ME15 6JQ

Rev	Date	Drawn	Description	Ch'k'd	App'd
P1	19.04.16	ADP	Issued for discussion	OD	AF

Title

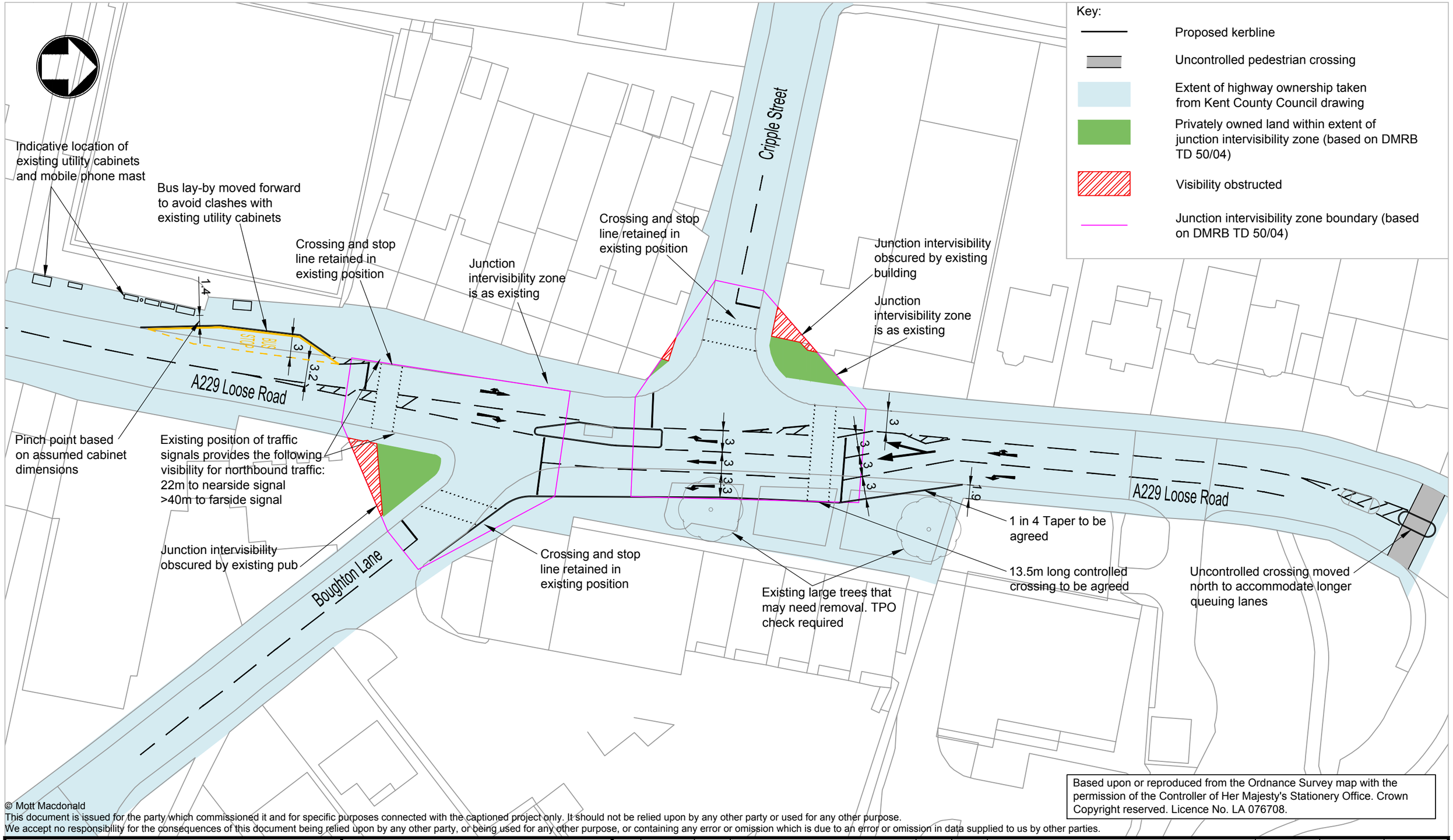
Boughton Lane/Cripple Street Junction
Concept Sketch
Option A

Drawn	ADP	
Checked	OD	
Approved	AF	
Scale at A3	1:500	

Drawing Number	Security	Status	Rev
344395-BL02-BNI-BCL-SK001	STD	Pre	P1

P:\Croydon\MMH\BSD\344395 - Maidstone support\344395-Boughton Lane\3.0 Technical\3.10 CAD\3.10.4 Working Drawings\Sketches\344395-BL02-BNI-BCL-SK001.dwg Apr 21, 2016 - 10:51AM pri62721

Appendix C. Signalised Option B



Based upon or reproduced from the Ordnance Survey map with the permission of the Controller of Her Majesty's Stationery Office. Crown Copyright reserved. Licence No. LA 076708.

Mott MacDonald

Mott MacDonald House
8-10 Sydenham Road
Croydon, CR0 2EE
United Kingdom

T +44 (0)20 8774 2000
F +44 (0)20 8681 5706
W www.mottmac.com

Client

Maidstone Borough Council
Maidstone House, King Street
Maidstone, Kent
ME15 6JQ

Rev	Date	Drawn	Description	Ch'k'd	App'd
P1	18.04.16	ADP	Issued for discussion	OD	AF

Title

Boughton Lane/Cripple Street Junction
Concept Sketch
Option B

Drawn	ADP	
Checked	OD	
Approved	AF	
Scale at A3	1:500	

Drawing Number	Security	Status	Rev
344395-BL02-BNI-BCL-SK002	STD	Pre	P1

P:\Croydon\MMH\BSD\344395 - Maidstone support\344395-Boughton Lane\3.0 Technical\3.10 CAD\3.10.4 Working Drawings\Sketches\344395-BL02-BNI-BCL-SK002.dwg Apr 20, 2016 - 5:36PM pri62721

Appendix D. Indicative Costings for Signalised Option B

A229 Boughton Lane / Cripple Street Junction
High Level Cost Estimate: Option B

Mott MacDonald

Item	Quantity Required	Unit	Cost (£) per Unit	Total Cost (£)
Preliminaries, Design Changes, Traffic Management, Contractors' Overheads and Profits				
Design changes allowance 20% of total	-	-	-	**17,842.55**
Preliminaries allowance - 20% of total	-	-	-	**17,842.55**
Traffic management allowance - 10% of total	-	-	-	**8,921.28**
Contractors' overheads and profits allowance - 10% of total	-	-	-	**13,381.91**
Site Clearance				
Breakout existing kerbline	112.0	m	5.0	**560.0**
Breakout existing footway (Area * 0.100)	26.1	cu m	63.0	**1644.3**
Excavate under existing footway to depth of new road construction (Area * 0.350)	91.4	cu m	50.0	**4567.5**
Remove existing signage	3.0	nr	50.0	**150.0**
Remove existing road markings (lines)	430.0	m	1.3	**559.0**
Remove existing traffic signals	9.0	nr	100.0	**900.0**
Remove existing traffic island Weebols	2.0	nr	20.0	**40.0**
Remove existing trees	2.0	nr	150.0	**300.0**
Remove existing lighting columns	3.0	nr	100.0	**300.0**
Drainage and Service Ducts (including Service Diversions)				
Excluded	-	-	-	**-**
Earthworks				
Excluded	-	-	-	**-**
Road Pavement				
Fill; granular material type 1 (Area * 0.150)	39.2	cu m	35.0	**1370.3**
Compaction of fill (Area * 0.150)	39.2	cu m	2.0	**78.3**
Dense bitumen macadam base course (200mm)	261.0	sq m	25.0	**6525.0**
Dense bitumen macadam binder course (50mm)	261.0	sq m	10.0	**2610.0**
Dense bitumen macadam surface course (50mm)	261.0	sq m	10.0	**2610.0**
Kerbs, Footways and Guard Railing				
Footway construction (bit-mac plus edgings)	196.0	sq m	60.0	**11760.0**
Precast concrete kerbs; bedded and jointed in cement mortar	208.0	m	25.0	**5200.0**
Traffic Signs & Signals				
Reinstate existing signage	3.0	nr	120.0	**360.0**
Allowance for reinstating existing bus stop flag and shelter	1.0	nr	1000.0	**1000.0**
New Traffic signal installation - per pole (estimated)	12.0	nr	3500.0	**42000.0**
Road Studs at Pedestrian Crossings (2 metal studs per metre)	60.0	nr	6.0	**360.0**
Road markings - centre lines / lane lines / stop line	360.0	m	0.9	**309.6**
Road markings - arrows (6m straight or turning)	7.0	nr	31.2	**218.4**
Road markings - arrows (6m double headed)	3.0	nr	46.8	**140.4**
Road markings - hatching & Bus Stop marking	1.0	nr	500.0	**500.0**
High Friction Surfacing for new carriageway lane	220.0	sq m	20.0	**4400.0**
Road Lighting Columns and Brackets, CCTV Masts and Cantilever Masts				
Reinstate existing lighting columns	3	nr	250.00	**750.00**
Exclusions				
Drainage	-	-	-	**-**
Service diversions of public utilities	-	-	-	**-**
Earthworks	-	-	-	**-**
Electrical work for road lighting and traffic signs	-	-	-	**-**
Landscape and ecology	-	-	-	**-**
Land take	-	-	-	**-**
Accommodation works to dwellings	-	-	-	**-**
Professional fees	-	-	-	**-**
VAT	-	-	-	**-**

Cost Estimate Total	**£147,201.04**
Cost Estimate Roundup	**£150,000.00**

Please see sheet 2 for clarifications for fee estimate

A229 Boughton Lane / Cripple Street Junction
High Level Cost Estimate: Option B

Mott MacDonald

Clarifications for Fee Estimate

1 - No records have been requested from utility companies and therefore no allowance has been made for the cost of diverting utilities. It is recommended that the records are obtained by KCC to allow a cost to be assigned for this element
2 - Traffic signal cost is based on provision of all new equipment (assumed average cost of £3,500 per signal pole and 12 poles required)
3 - All existing tactile paving units to be re-used
4 - Existing lighting columns are of sufficient quaility to allow for re-use and meet the necesssary requirements for illumination of the new road

5 - Assumed that no TPO's are in place for the trees that may need to be removed
6 - Assumed that no new carraigeway surfacing works are to be carried out to the existing carraigeway surface
7 - Grey signals cabinet may need to be moved/removed and replaced