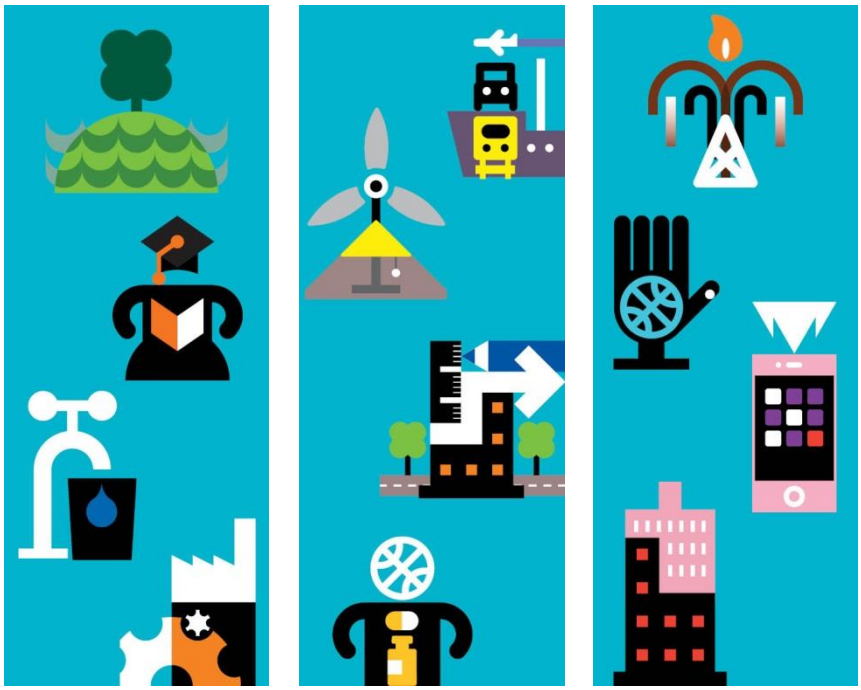

Staplehurst, Maidstone Cuckolds Corner Junction Review

Technical Note: Junction capacity assessment results

December 2015

Maidstone Borough Council

Mott MacDonald

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Issue and revision record

Revision	Date	Originator	Checker	Approver	Description
A	December 2015	P Rapa	M Olley	M Olley	First Issue

Information class: Standard

Contents

1 Introduction

1.1 Overview

Mott MacDonald was commissioned to by Maidstone Borough Council (MBC) to review the improvement proposal previously developed for the signalised junction A229 Station Road/Headcorn Road/High Street/ Marden Road, otherwise known as Cuckold's Corner in Staplehurst, Maidstone.

The previous scheme was aimed at achieving a 'within capacity' solution thereby covering 3rd party land. Following discussions with Kent County Council (KCC), MBC advised that such a solution was not feasible.

A revised solution is now sought avoiding any 3rd party land aiming at 'nil detriment' when comparing '2031 base' with '2031 with development' scenarios. However, in order to achieve a feasible design that will improve junction capacity, it is anticipated that existing facilities for non-motorised users may have to be negatively affected.

1.2 Scope of works

The following scope of works has been undertaken:

- Development flows previously produced for the June 2015 Staplehurst junction capacity assessment Technical Note were reviewed and updated to account for sites not previously included;
- One additional development site, H1 (68) was added to the development flows previously calculated in June 2015;
- Revised 'with development' flows were produced for the junction of A229 Station Road/Headcorn Road/High Street/ Marden Road, with flow diagrams produced for both the AM and PM peaks;
- A junction sketch was produced showing an improvement scheme avoiding 3rd party land;
- A Linsig model was created, reflecting the above sketch, and testing was carried out to ascertain whether the sketch solution achieves 'nil detriment'. This was run using the revised 'with development' flows;
- The above did not result in 'nil detriment' and hence, further mitigation was considered. The junction sketch was reconsidered with a view to increase flare lengths further. However, this was not feasible within highway land. The development flows were reduced by 20% thereby reducing the 'with development' flows. This is expected to be achieved through thorough residential travel planning measures;
- The Linsig model was re-run and the results with the reduced development flows showed "near" 'nil detriment' conditions;
- A feasibility drawing was produced based on the sketch; and
- A draft technical note was prepared.

2 Revised Development Flows

2.1 Previous development flows

Development flows calculated for the Staplehurst June 2015 Technical Note were reviewed to confirm all sites already included in the calculation were inputted correctly, and which additional sites were required to complete the revised development flows for the '2031 + Development' scenario.

2.2 Revised 'with development' flows

It was confirmed that only one additional site was to be added to the development flows, which was identified as development on 'Land at Stanley Farm', Headcorn Road. This site consists of 120 units, located on Headcorn Road to the east of the signalised junction.

An existing Transport Assessment (TA) produced by dha transport (August 2015, application number 15/507124/OUT) in support of the development site, was used in order to identify trip rates and distribution. Peak period departure and arrival trips were obtained, and the AM and PM distribution for 'all journey purposes' was used.

It was reviewed and confirmed that development site H1 (68) 'Land to north of Henhurst Farm' was already included within the previous development flow calculations and therefore the trip generation and distribution for this site remained as it was originally produced.

2.3 Revised 'with development -20%' flows

Initial junction testing revealed that the 'with development' scenario did not achieve 'nil detriment'. Development flows therefore had to be reduced to achieve near 'nil detriment' results compared to the 'Base 2031' scenario. The development flows were reduced by 20%. It is accepted that this a significant reduction, but by implementing strong residential travel planning measures and initiatives aiming at strengthening sustainable travel behaviour together with peak spreading which is likely to occur as residents would wish to avoid excessive queuing, it is considered reasonable to expect a reduction in that order. Furthermore, it is anticipated that while the junction shows overall performance over capacity within the 'Base 2031' scenario, both existing and future road users may consider using alternative routes within the peak periods in order to avoid significant delays and increased journey times.

2.4 Residential travel planning

Research commissioned by the DfT[1] found that a programme of smarter choices incentives (such as walking, cycling, travelling by public transport and car sharing) over 10 years could cut car traffic significantly, resulting in urban peak traffic potentially being reduced by 21% and off peak traffic by 13%. In theory, it is anticipated that this could be applied for the residential development schemes within the Maidstone area.

[1] Making Smarter Choices Work (DfT), 2005

3 Junction Improvements

3.1 Concept layout

The concept layout design that was developed based on the initial sketch produced can be found in **Appendix A**. The main aim of this was to explore a layout that maximises vehicular capacity whilst staying within the highway boundaries.

3.2 Design summary

The concept design shown on drawing number MMD-34395-D-SK-HH03-XX-0001 has been carried out to try and increase junction capacity by making modifications to the highway layout within the extents of the highway boundary.

A summary of the key proposed changes from the existing layout is set out below:

- Station Road:
  - Narrowing of eastern footway to a minimum of 1.2m
  - Introduction of a right turn flare of approximately 8.5m in length and changes to the stop line position
- Headcorn Road:
  - Setting back of stop line to accommodate vehicular swept paths
- High Street:
  - Removal of western footway from approximately opposite Conforth Close to Cuckold's Corner, with pedestrians proposed to travel via Chestnut Avenue
  - Relocation of northbound bus stop further south (as the footpath would not extend to the existing bus stop location)
  - Removal of controlled crossing of the arm (as there is proposed to be no footpath to cross to)
  - Introduction of a right turn flare of approximately 62m and changes to the stop line position
- Marden Road:
  - Introduction of a ghost traffic island to accommodate swept paths and to minimise the set-back of the stop line on Station Road
  - Relocated and realigned stop line
  - Widening of the carriageway
  - Proposed footway between the controlled pedestrian crossing and Chestnut Avenue.

Where possible, the design has been in accordance with the guidance provided with the Designing for Movement part of the Kent Design Guide (by Kent County Council). However there are a number of deviations from this standard. The width of all lanes including right turn lanes is 3m as per the minimum recommended. All movements have been tracked for a pantechnicon (from Design Bulletin 32). However the swept path analyses indicated that vehicles may need to straddle across the full width of the carriageway in order to successfully carry out some of the manoeuvres. It is therefore recommended that

this is taken into account when determining inter-green times. Other factors, such as radii and footway widths, amongst others, have deviated from the recommendations in the Kent Design Guide.

Road markings have been designed in accordance with the Traffic Sign Regulations and General Directions (2002) and Chapter 5 of the Traffic Signs Manual, where possible. The taper of the ghost island on Marden Road does not conform to guidance. Road markings have not been provided within the junction to try and improve road safety and not give motorists the illusion of safety, as the proposed layout is space constrained.

TD 50/04 from the Design Manual for Roads and Bridges has been used to design the entry lanes on Station Road and High Street. It should be noted that ideally the ghost island layout (shown in Figure 2/10 of TD 50/04) would have been used, however, due to space constraints the layout (shown in Figure 2/8 of TD 50/04) has instead been proposed. This is less favourable as it is expected that the majority of traffic will continue in the ahead / left turn lane rather than the right turn lane.

It should also be noted that, as per the existing layout, the proposed junction layout would not provide sufficient junction intervisibility as defined in TD50/04.

Local Transport Note 2/95 has been used in the design of the pedestrian crossings.

It is anticipated that existing waiting and stopping restrictions would remain in place, and these have therefore not been shown on the drawings.

During a site visit in April 2015, it was recorded that there were a number of service covers, fire hydrant signs and indications of a gas main located in the vicinity of the junction. It is therefore strongly recommended that further searches with all statutory undertakers that may have apparatus in the area should be carried out and that any costs relating to any diversions have been excluded from the high level cost estimate of £172,350 (exc VAT).

3.3 Cost estimate

A total high level cost estimate of £172,350.75 has been produced for the redesign of the junction as shown in the concept layout design in **Appendix A**. A detailed breakdown of the cost estimate can be found in **Appendix B**.

4 Revised LinSig Testing

4.1 Background

For the Staplehurst June 2015 Technical Note, Linsig models were run for the scenario 'Base 2031' with the existing junction layout, of which the results are summarised for comparison below in **Table 4.1**.

An initial sketch produced which formed the basis for the junction layout as shown in Section 3 above, was used to create an updated LinSig model. This was then initially run with the updated 'with development' flows as described in **Section 2.2**. The results are shown in **Table 4.2**.

The results of the 'with development' / improved layout scenario showed the junction to be significantly greater over capacity than the 'Base 2031' / existing layout scenario. The development flows were reduced by 20% creating the '2031 + Development (20% reduction)' scenario which was tested with this improved junction layout. The results are shown in **Table 4.3**.

4.2 Results

Table 4.1: Base 2031 – Existing Layout

	AM		PM	
Movement	DoS (%)	Mean Max Queue (PCU)	DoS (%)	Mean Max Queue (PCU)
A229 Station Road	77.8	16	71.5	18
Headcorn Road	94.7	17	110.2	34
A229 High Street	99.6	37	107.0	62
Marden Road	99.5	22	108.4	26
Practical Reserve Capacity (PRC) ~ over all lanes		-10.7%		-22.4%

For 'Base 2031', the results show that the junction operates within the theoretical capacity in the AM peak, but significantly over capacity within the PM peak. Within the AM peak, the A229 High Street displays the worst DoS and mean max queue of 99.6% and 37 PCUs respectively. Within the PM peak, Headcorn Road displays the highest DoS, whilst the A229 High Street displays the worst mean max queue of 110.2% and 62 PCUs respectively. The A229 Station Road is the only arm that operates within desirable capacity both in the AM and PM peaks.

Table 4.2: 2031 + Development - Improved Layout

	AM		PM	
Movement	DoS (%)	Mean Max Queue (PCU)	DoS (%)	Mean Max Queue (PCU)
A229 Station Road	110.0	41	108.5	82
Headcorn Road	114.0	50	126.4	75
A229 High Street	109.9	53	97.9	42
Marden Road	114.7	61	128.4	63
Practical Reserve Capacity (PRC) ~ over all lanes		-27.4%		-42.7%

For '2031 + Development' with improved layout scenario, the results show that the junction operates significantly greater over capacity within both the AM and PM peak when compared to 'Base 2031' with existing layout. This scenario does not achieve 'nil detriment'.

Table 4.3: 2031 + Development (20% reduction) – Improved Layout

	AM		PM	
Movement	DoS (%)	Mean Max Queue (PCU)	DoS (%)	Mean Max Queue (PCU)
A229 Station Road	105.0	27	108.4	66
Headcorn Road	105.9	35	109.6	45
A229 High Street	101.4	42	105.6	32
Marden Road	101.4	40	108.5	36
Practical Reserve Capacity (PRC) ~ over all lanes		-17.7%		-21.8%

For '2031 + Development (20% reduction)' (this includes a reduction of development flows by 20%), the results show that the junction operates over theoretical capacity within the AM and PM peak, with all arms displaying a DoS of 100.00% or over.

Within the AM peak, Headcorn Road displays the highest DoS of 105.9%, while the highest mean max queue is located on the A229 High Street as 42 PCUs. Whilst the highest DoS is significantly greater than in the 'Base 2031', the maximum queue is only 5 PCU greater. It is however accepted that with development, all arms are over capacity with significant queueing on all arms which is in the order of double that of the base scenario.

Within the PM peak, Headcorn Road displays the highest DoS of 109.6%, while the highest mean max queue is located on A229 Station Road as 66 PCUs. Compared to 'Base 2031', the DoS slightly reduces from 110.2 to 109.6, and the maximum queue increases from 62 PCUs (on Marden Road) in the 'Base 2031' to 66 PCUs (on A229 Station Road). The junction improvements would lead to significantly reduced queuing on A229 High Street (62 PCUs to 32 PCUs), however queues would increase on all other arms.

4.3 'Nil Detriment'

When comparing 'Base 2031' run with the existing junction layout and '2031 + Development' run with the improved junction layout, there is a marked difference in the results with the latter being significantly greater over capacity both in the AM and PM peak with queues increasing all arms to greater levels than the worst performing arm in the base scenario.

With the development flows reduced by 20% and the model re-run with the improved junction layout, 'nil detriment' is still not quite achieved. However, particularly in the PM peak, the maximum DoS is lower in the with development scenario than the base scenario with the maximum queue only insignificantly greater with development. In the AM peak, the highest DoS is greater with development than in the base, but queues are only insignificantly greater with development.

The changes in the results are considered to be relatively minimal for the maximum DoS and queue length values, although there is deterioration in performance on all arms in the AM peak and on one arm in the PM peak.

4.4 Conclusion

Whilst the mitigation in form of the improved junction layout does not quite achieve a 'nil detriment' solution, the remaining impacts of the development traffic (with 20% reduction) in terms of additional queueing, the measure most easily perceived by road users, are relatively small and cannot be considered severe.

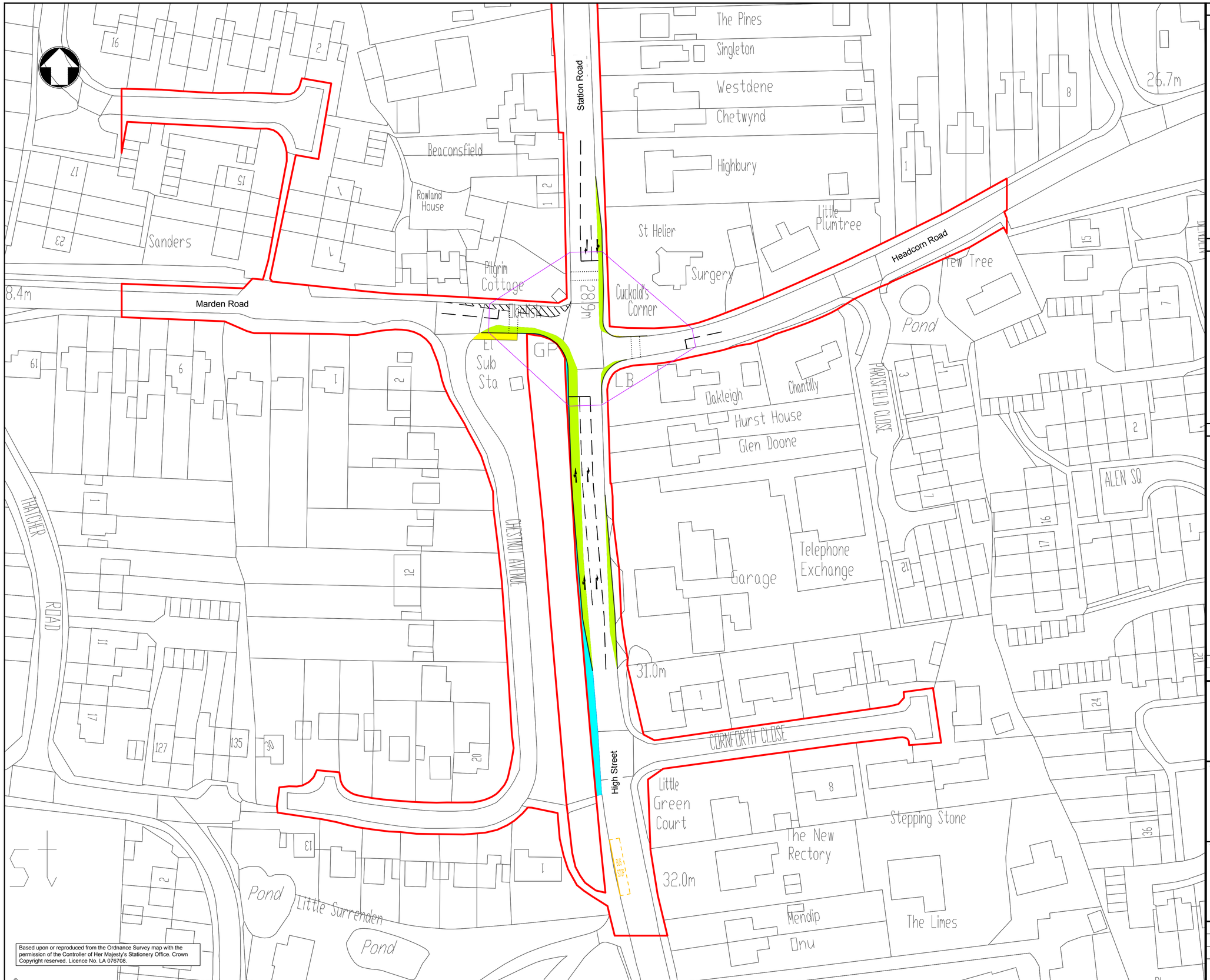
As set out earlier in this report, the improved layout presented in **Section 3** above represents the best possible solution that can be achieved within the highway boundaries. The LinSig outputs presented above therefore represent the best possible results which can only be improved upon if either the development flows were further reduced or the base flows would reduce.

5 Summary

- This report considers a revised junction layout for the Cuckold's Corner Junction avoiding any 3rd party land aiming at 'nil detriment' when comparing '2031 base' with '2031 with development' scenarios;
- Development flows calculated for the Staplehurst June 2015 Technical Note were reviewed and revised adding one additional site;
- 'With development' flows were produced;
- A junction layout sketch was produced;
- The LinSig model was updated based on the above sketch;
- Initial runs were carried out showing that 'nil detriment' cannot be achieved when comparing 'with development' flows run with the improved junction layout and 'Base 2031' run with the existing junction layout;
- The improvement sketch was reconsidered with a view to further extend the flares on the A229 approaches. This was however not feasible within the highway boundary;
- A second set of 'with development' flows was produced, reducing the development flows by 20%;
- The LinSig model was re-run with the above flows;
- The mitigation in form of the improved junction layout does not quite achieve a 'nil detriment' solution with development traffic reduced by 20%;
- The remaining impacts in terms of additional queueing are however relatively small and cannot be considered severe.

Appendices

Appendix A. Concept Design Layout



Notes

1. Do not scale.
2. Layout is indicative only and subject to detailed design.
3. Road markings in accordance with the Traffic Signs Regulations & General Directions (TSRGD) 2002.
4. All dimensions in metres unless otherwise stated.
5. Extent of Highway Ownership based on plan provided by S.Clarke (Maidstone Borough Council) on 24th March 2015.
6. The design is subject to a number of departures from standards and a Stage 1 Road Safety Audit.
7. The proposed footway removal on the western side of High Street should be subject to an assessment of pedestrian flows and an non-motorised user context report.
8. As in the existing junction layout, full junction intervisibility, as per TD50/04 of the Design Manual for Roads and Bridges, would not not be achieved under these proposals.
9. Sufficient inter-green times should be allowed for to allow turning vehicles to pass queuing traffic at the stop lines, which are set-back to accommodate vehicular swept paths.

Key to symbols

- Proposed kerbline
- Proposed back of footway
- Boundary of proposed junction intervisibility zone
- Highway Boundary
- Additional land required for proposed highway
- Additional land required for proposed footway
- Proposed footway removal

Reference drawings

1:500 0 25m 50m

Rev	Date	Drawn	Description	Ch'k'd	App'd
P1	27-11-15	RS	Preliminary Issue	AF	SC

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Title
Cuckold's Corner
Staplehurst
Concept Layout
Sheet 1 of 1

Designed	D. Desai		Eng check	A. Farrow	
Drawn	R. Smith		Coordination	M. Olley	
Dwg check	A. Farrow		Approved	S. Coker	

Scale at A1	Status	Rev	Security
1:500	PRE	P1	STD

Drawing Number
MMD-344395-D-SK-HH03-XX-0001

Appendix B. Detailed Cost Estimate

Cuckold's Corner, Staplehurst
High Level Cost Estimate

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	-	-	-	**20,891.00**
Preliminaries allowance - 20% of total	-	-	-	**20,891.00**
Traffic management allowance - 10% of total	-	-	-	**10,445.50**
Contractors' overheads and profits allowance - 10% of total	-	-	-	**15,668.25**
Site Clearance				
Breakout existing kerbline	235	m	5.00	**1,175.00**
Breakout existing footway (Area * 0.100) - BLUE + GREEN	45	cu m	63.00	**2,835.00**
Remove existing signage	1	nr	50.00	**50.00**
Remove existing road markings (lines)	215	m	1.30	**279.50**
Remove existing traffic signals	1	nr	100.00	**100.00**
Remove existing lighting columns	1	nr	100.00	**100.00**
Drainage and Service Ducts (including Service Diversions)				
Excluded	-	-	-	**-**
Earthworks				
Excluded	-	-	-	**-**
Road Pavement - GREEN				
Fill; granular material type 1 (Area * 0.150)	45	cu m	35.00	**1,575.00**
Compaction of fill (Area * 0.150)	45	cu m	2.00	**90.00**
Dense bitumin macadam base course (200mm)	300	sq m	25.00	**7,500.00**
Dense bitumin macadam binder course (50mm)	300	sq m	10.00	**3,000.00**
Dense bitumin macadam surface course (50mm)	300	sq m	10.00	**3,000.00**
Kerbs, Footways and Guard Railing				
Footway construction (bit-mac plus edgings) - YELLOW	25	sq m	60.00	**1,500.00**
Precast concrete kerbs; bedded and jointed in cement mortar	240	m	25.00	**6,000.00**
Traffic Signs				
Reinstate existing signage	1	nr	120.00	**120.00**
Bus stop flag	1	nr	510.00	**510.00**
Bus shelter	1	nr	2,400.00	**2,400.00**
4 way traffic signal installation; major road, includes markings, lights and signs	1	nr	73,000.00	**73,000.00**
Road markings - centre lines / lane lines	275	m	0.86	**236.50**
Road markings - arrows (6m straight or turning)	3	nr	31.20	**93.60**
Road markings - arrows (6m double headed)	3	nr	46.80	**140.40**
Road markings - hatching	1	nr	500.00	**500.00**
Road Lighting Columns and Brackets, CCTV Masts and Cantilever Masts				
Reinstate existing lighting columns	1	nr	250.00	**250.00**
Exclusions				
Drainage and service ducts	-	-	-	**-**
Service diversions	-	-	-	**-**
Earthworks	-	-	-	**-**
Electrical work for road lighting and traffic signs	-	-	-	**-**
Landscape and ecology	-	-	-	**-**
Land take	-	-	-	**-**
Accommodation works to dwellings	-	-	-	**-**
Professional fees	-	-	-	**-**
VAT	-	-	-	**-**
			Cost Estimate Total	**£172,350.75**