Buro Happold

025497 B3073 Corridor Study

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1 Introduction

1.1 Introduction

Dorset County Council (DCC) has contracted Buro Happold to examine the potential for development in the Bournemouth Airport Aviation Business Park area over and above that current being promoted. DCC believes that the business park could be a major location for future employment, and is seeking guidance on the level of development that can be accommodated on the B3073 Corridor by upgrading the existing transport networks and the point at which a new link road is required.

This report forms the second part of the scope of work and includes the following aspects:

- An assessment of the expected level of performance of the B3073 corridor in terms of the five main junctions and road links with committed development plus increasing levels of additional business park development traffic in 2020 until failure;
- A summary of previously proposed upgrades to junctions along the corridor, with identification of any additional options, so as to provide additional in-line capacity as required. These improvements are then tested in the modelling work with increasing levels of additional development until failure:The potential for full signalisation of the Chapel Gate junction to cope with additional development, to include a signalised roundabout configuration;
- A summary of the existing junction and proposed improvements for Blackwater Interchange on the A338, the subject of previous, separate studies;
- Testing of proposed improvements to Parley Cross Junction under additional business park development traffic; and
- Test, as an additional scenario, the impact at Parley Cross junction of the proposed West Parley eastern residential sites (Area 3&4), as identified in the East Dorset Housing Options report.

This report describes the methodology that Buro Happold employed, together with the results of the corridor study.

1.2 The B3073 Corridor Study Area

The extent of the study area is shown in Figure 1.1. The study area contains the following five junctions:

- Parley Cross – a signalised four-arm junction
- Chapel Gate – a three-arm roundabout
- Hurn Roundabout – a three-arm roundabout
- The Airport Entrance – a four-arm signalised junction

Blackwater Junction – a signalised interchange with the A338For the purposes of this study, it was assumed that the Aviation Business Park area is available for additional development, which was assumed to be a mixture of light industrial development and offices. The development traffic will enter and exit via Chapel Gate Roundabout, but will distribute along the B3073 Corridor and will affect all of the junctions within the study area.

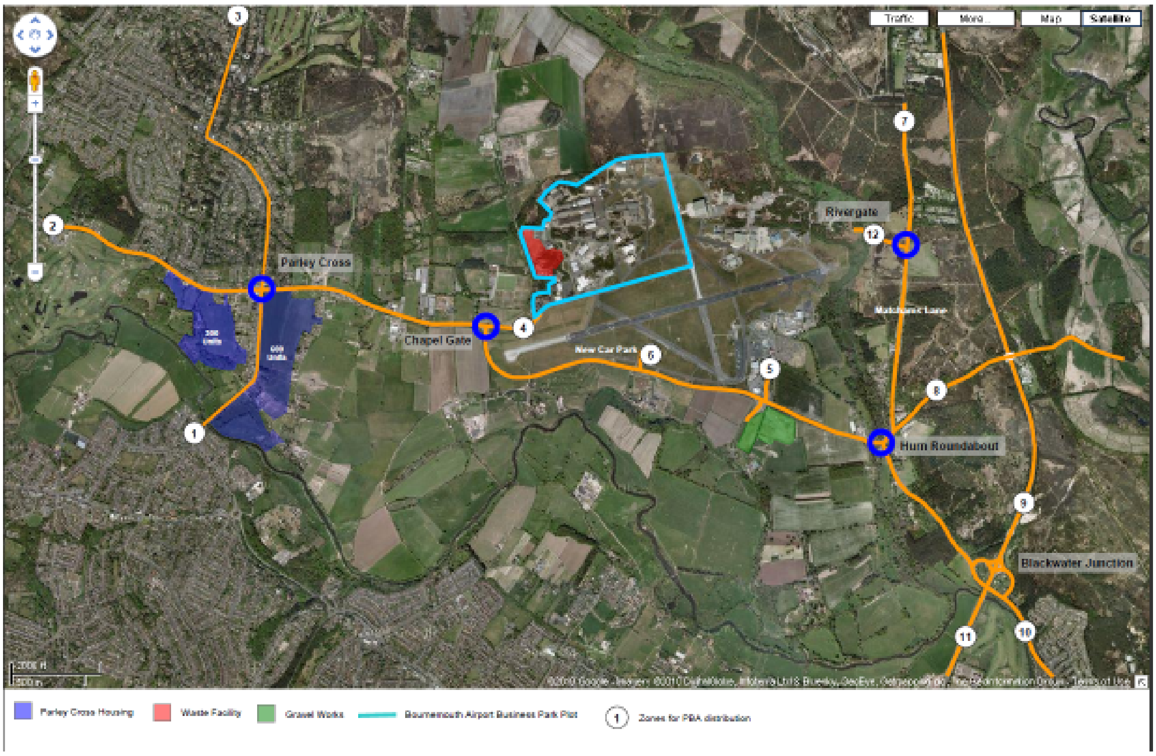

Figure 1.1: The B3073 Corridor (Background ©2010 Infoterra Ltd & Bluesky, Tele Atlas)

1.3 Report Structure

The remainder of the report is structured as follows:

- Chapter 2 sets out the methodology for the modelling work in this study;
- Chapter 3 describes the study of the whole corridor, and the transport impact of development at the Aviation Business Park upon the junctions and links along the corridor;
- Chapter 4 provides a summary of the modelling work undertaken previously at the Blackwater Interchange;
- Chapter 5 describes the assessment of two proposed improvement schemes at Chapel Gate to signalised junction control;

- Chapter 6 describes the assessment of the proposed improvement scheme at Parley Cross, to include the test of the proposed West Parley eastern residential sites (Area 3&4) ; and
- Chapter 7 provides a summary and conclusions for this report.

2 Methodology

2.1 Sources of Information

A number of sources have been utilised to establish the most appropriate data for the assessment, these include:

- "Bournemouth International Airport; Transport and Infrastructure Study" - PBA, September 2008
- "SEDMMTS Forecasting Report" – South East Dorset Client Partnership, September 2010
- "Development Programme Review; Aviation Park, Bournemouth" - Drivers Jonas Deloitte, July 2010
- East Dorset Housing Options - East Dorset Housing Masterplan Reports 2010
- West Dorset Transport Strategy – Buro Happold, April 2010

2.2 Traffic Flows

The base flows selected for the Aviation Business Park modelling were those for the '2020 Base plus committed developments' AM and PM peak scenarios, and were extracted from the Bournemouth International Airport; Transport and Infrastructure Study PBA 2008 (the PBA report). The committed development includes the following:

1. AIM industrial development
2. The Gravel Works
3. MBT Waste Treatment Plant
4. Additional development of B1 and B8 land uses within the Aviation Business Park
5. An expansion to three million airport passengers per year which have been approved during a previous planning application.

The following assumptions were made about the proposed additional development in the Aviation Business Park, and were taken from the Drivers Jonas Deloitte Development Review report on the likely development at this location.

- 10% of the development GFA will be office space
- 90% of the development GFA will be light industrial space
- Over the 25 year period, from 2010-2035, the Aviation Business Park could add 1.1 million sq ft (110,000 square metres) GFA of development

The trip rates shown in Table 2.1 were taken from TRICS, and were used to predict the number of trips associated with development at the Aviation Business Park. The TRICS reports are reproduced in Appendix A.

Usage	Units	AM peak		PM peak	
		Arrivals	Departures	Arrivals	Departures
Light Industry	100 sq. m	0.111	0.066	0.065	0.115
Business Park	100 sq. m	1.587	0.283	0.223	1.304

Table 2.1: Trips rates from TRICS which were used in the assessment

The 2020 base flows selected for the West Parley eastern residential sites (Area 3&4) modelling were also extracted from the PBA report, but without the committed developments. The residential trip rates assumed for this study were obtained from the West Dorset Transport Strategy. The trip rates used are summarised in Table 2.2

Usage	Units	AM peak		PM peak	
		Arrivals	Departures	Arrivals	Departures
Residential, Rural Zone	per dwelling	0.176	0.437	0.424	0.243

Table 2.2: Trips rates from WDTS which were used in the assessment

2.3 Scenarios Considered

The following scenarios were considered:

1. Existing Hurn Roundabout, existing Chapel Gate Roundabout and signalised airport entrance. This is the current situation, albeit with 2020 traffic flows and committed development.
2. Relocated Hurn Roundabout (DCC design), improved Chapel Gate Roundabout. A practical link capacity of 1600 vehicles/hour/lane was assumed for this study – above this link capacity, traffic starts to become congested.
3. Hurn Roundabout DCC design, improved Chapel Gate Roundabout, and the relaxation of link capacity restriction on the basis that the B3073 could be widened to two lanes where required.

3 Whole Corridor Modelling

3.1 Existing Junctions on B3073 Corridor

The existing five junctions contained in the study area are described below. The existing airport entrance has recently been upgraded from a staggered priority junction to full signal control.

3.1.1 Blackwater Interchange

The existing Blackwater interchange is shown in Figure 3.1 and Figure 3.2. Blackwater Interchange operates under full signal control at two junctions which straddle over the A338 and are separated by 350 metre. Each of the two junctions is controlled using compact MOVA controlled traffic lights.

Separate lanes are provided for each traffic turning movement which are flared out from one lane to two lanes on each approach. Controlled pedestrian/cycle facilities are provided across the A338 slip road approaches.

Figure 3.1 Blackwater Western Junction

Figure 3.2 Blackwater Eastern Junction

3.1.2 Existing Hurn Roundabout

The existing Hurn Roundabout is shown in Figure 3.3. Each of the approaches is flared out from one lane to two lanes, although the length of the flare is very short. The ability to improve Hurn Roundabout is limited by the neighbouring infrastructure. The western approach (Parley Lane) is restricted by the width of the bridge over the River Stour. The southern approach (Christchurch Road) is restricted in width by the adjacent garden centre.

The main issue with the roundabout is that it has very limited capacity for right-turning traffic moving from Parley Lane to Christchurch Road, which is an important movement for the connection between Bournemouth and the airport. The capacity of this arm is restricted by the width of the bridge, which prevents the provision of an additional lane.

Figure 3.3: Existing Hurn Roundabout

The operational aspects of the existing Blackwater interchange are discussed in Section 4.

3.1.3 Existing Airport Entrance

The current junction layout is shown in Figure 3.4. Parley Lane, running east-west is the major arm, with minor give-way approaches to the south (the gravel pits) and to the north (the airport). Three lanes are provided in each direction along Parley Lane, comprising a right turn lane and two through lanes, the nearside through lane also providing a left turn movement. The gravel pits to the south have one approach lane for left and right movements, and the airport approach has two lanes, one for the left turn movement and one for the right turn movement.

The signal staging is shown in Figure 3.5. The right turn flow from the western approach is very low, and so it has been combined in Stage 1 with the through movements along Parley Lane. The right turn movements into the airport are much more substantial, and so they run without opposition in Stage 2. Stages 3 and 4 accommodate the traffic on the minor arms.

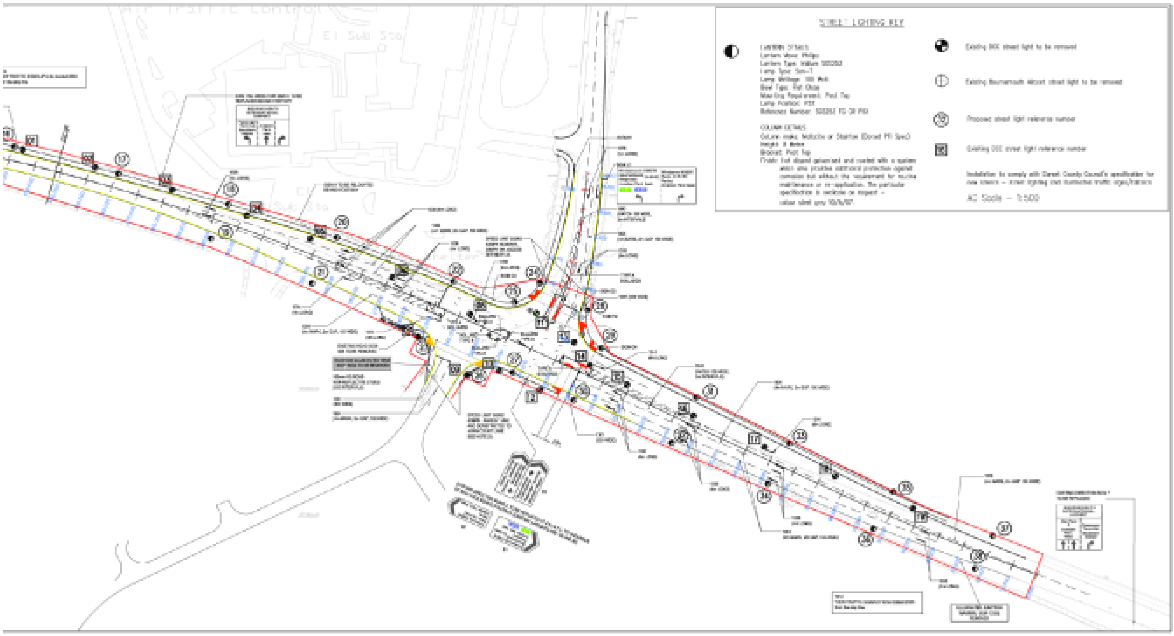

Figure 3.4: Existing airport entrance

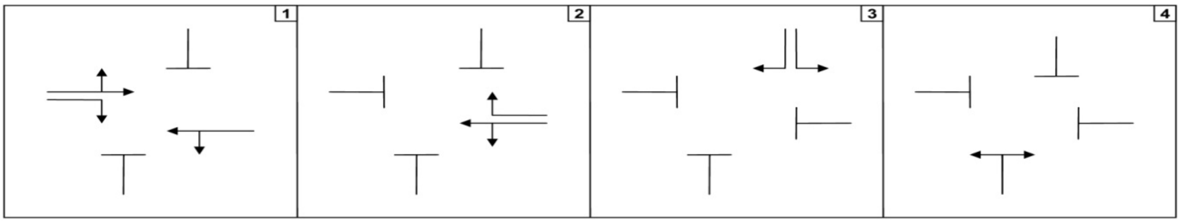

Figure 3.5: Signal staging

3.1.4 Existing Chapel Gate Roundabout

The layout of the existing Chapel Gate Roundabout is shown in Figure 3.6. The junction is a 3-arm unsignalised roundabout. The southern (Parley Lane) and eastern (Aviation Business Park) approaches consist of single lane approaches which flare to 2 lanes close to the give-way line. The western approach consists of one unflared approach lane for right turning traffic, and one bypass lane for left-turning traffic but which gives-way to traffic entering the business park.

A narrow footway exists on the north side of the roundabout with an uncontrolled crossing facilitating a link across the eastern splitter island to a footway that continues south towards Hurn. DCC's Parley Cross to Hurn Airport Cycleway scheme seeks to widen this footway to form a cycleway by removing boundary hedges.

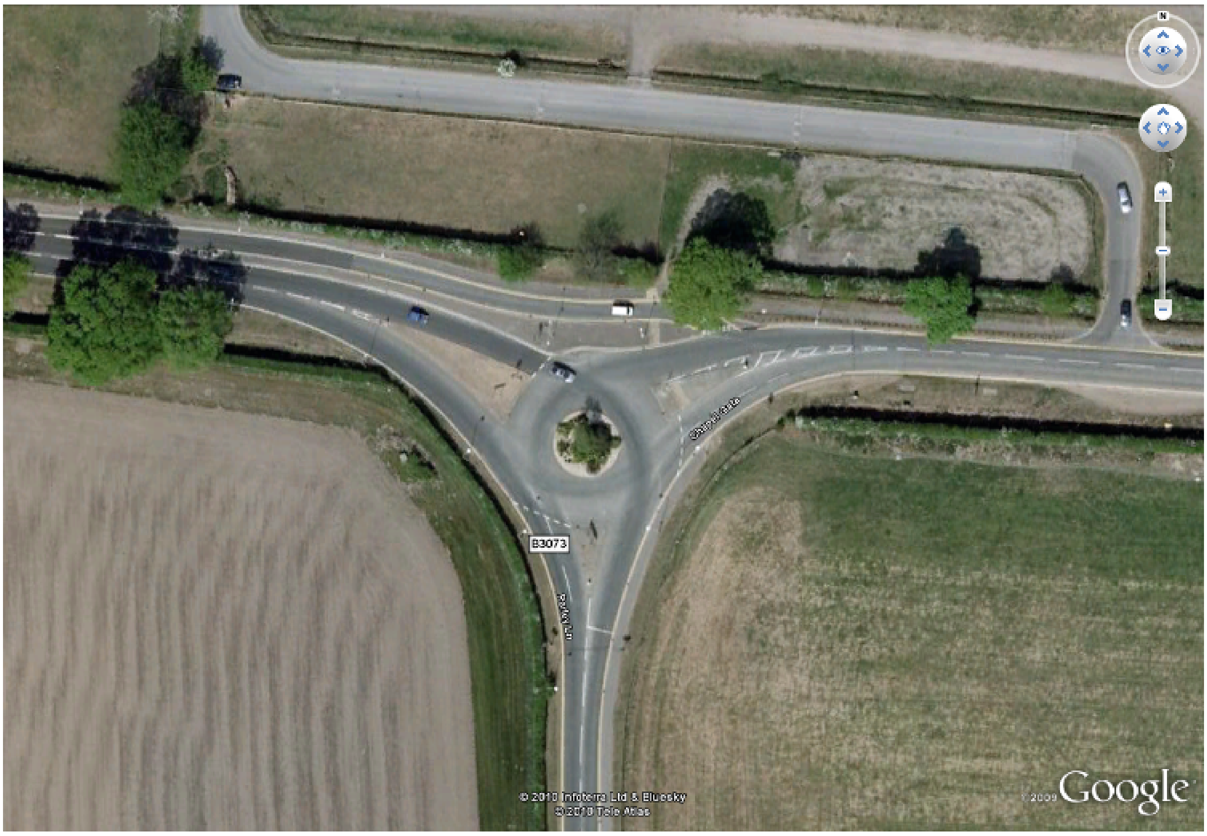

Figure 3.6: Existing Chapel Gate Roundabout

3.1.5 Existing Parley Cross Junction

The existing Parley Cross junction is shown in Figure 3.7. Parley Cross junction is a four-arm signalised junction. The eastern and southern approaches flare out to one through lane, one right turn lane, and one left turn lane. The western and northern approaches flare out to two lanes. The eastern left turn lane continues through the junction as a left turn slip lane.

Figure 3.7: The existing Parley Cross junction

Parley Cross runs in a total of five stages to accommodate all traffic turning movements and controlled pedestrian crossings which are present on three out of the four approaches. The existing staging diagram is shown in Figure 3.8. Stage 3 allows the pedestrian crossing (Phase J) on B3073 West to operate, at the expense of traffic phases.

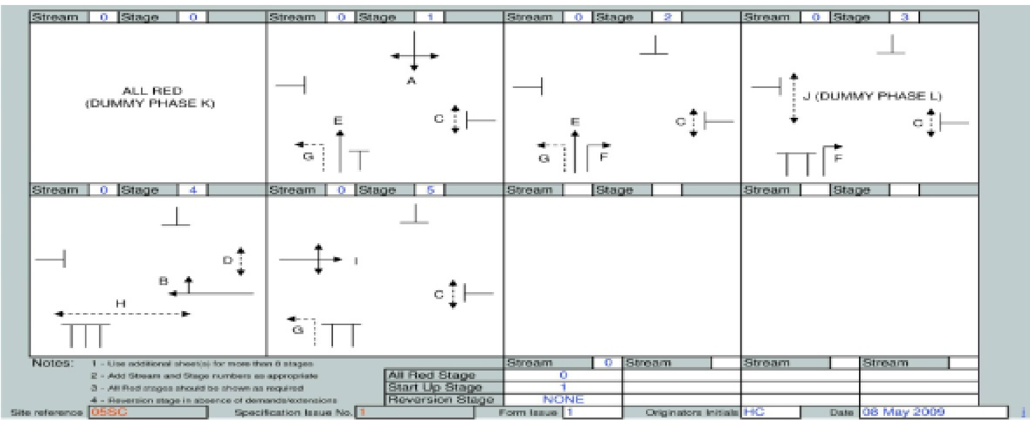

Figure 3.8: Existing staging at Parley Cross junction

3.2 Proposed Junctions on B3073 Corridor

There are a number of improvement schemes previously identified for several of the B3073 corridor junctions. A summary of these schemes is set out in this section, with identification of additional options where possible.

The proposed improvements to Blackwater Interchange have been the subject of a separate study. The key findings are presented in Section 4.

3.2.1 Improved Hurn Roundabout

In the PBA proposal, the roundabout is moved a short distance to the east, allowing the western approach to be flared (it is currently limited in width by the bridge over the river just before the roundabout). Figure 3.9 illustrates the proposed junction layout.

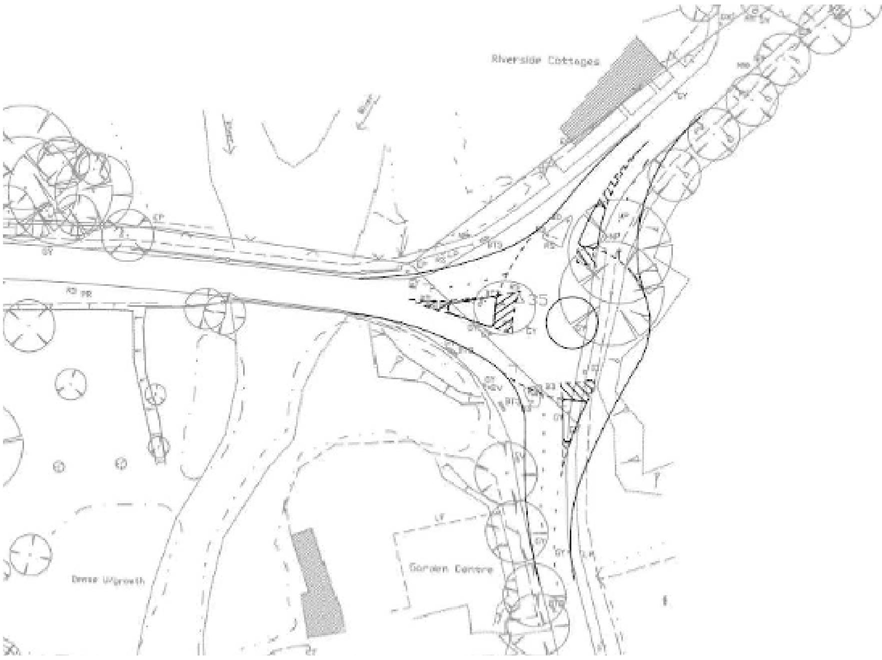

Figure 3.9: PBA's proposed Hurn Roundabout layout

The PBA proposal would require the removal of at least two mature trees as well as several others to achieve necessary visibility requirements and the reinstatement of a parallel footway. Ground levels to the east of the roundabout are thought to rise up from the existing road edge so expansion in this direction is expected to necessitate significant earthworks which could force the full extent of highway embankments well into adjacent private land.

3.2.2 Relocated Hurn Roundabout

The proposed relocated Hurn Roundabout is shown in Figure 3.10, and was drawn up by Dorset County Council. By moving Hurn Roundabout to the west, more land is available and so the roundabout can have more approach lanes. For the critical right turn from Parley Lane to Christchurch Road two approach lanes are provided, and in the other direction a slip lane is provided.

Figure 3.10: Proposed Hurn Roundabout

Of the two junction layouts, the DCC scheme provides more capacity, since two right turn lanes can be provided on B3073 west approach and there is the ability to provide a left turn slip lane on the B3073 east approach.

3.2.3 Proposed Chapel Gate Roundabout

The proposed Chapel Gate Roundabout is also based upon a Dorset County Council design and is shown in Figure 3.11. In the DCC design, bypass slips are provided on southern and western approaches, and the western and eastern approaches have two and three lanes respectively entering the roundabout.

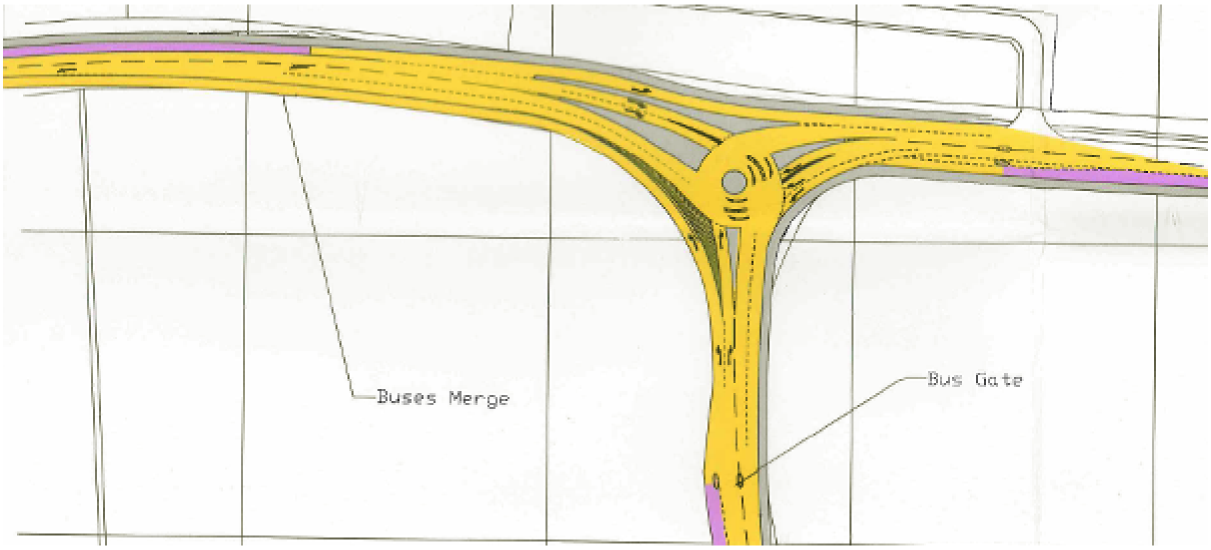

Figure 3.11: DCC proposal for Chapel Gate

An alternative design is shown in Figure 3.12. In this design, the existing layout is amended to include longer flared approach lanes in order to provide extra capacity, and left turn slips included on two arms.

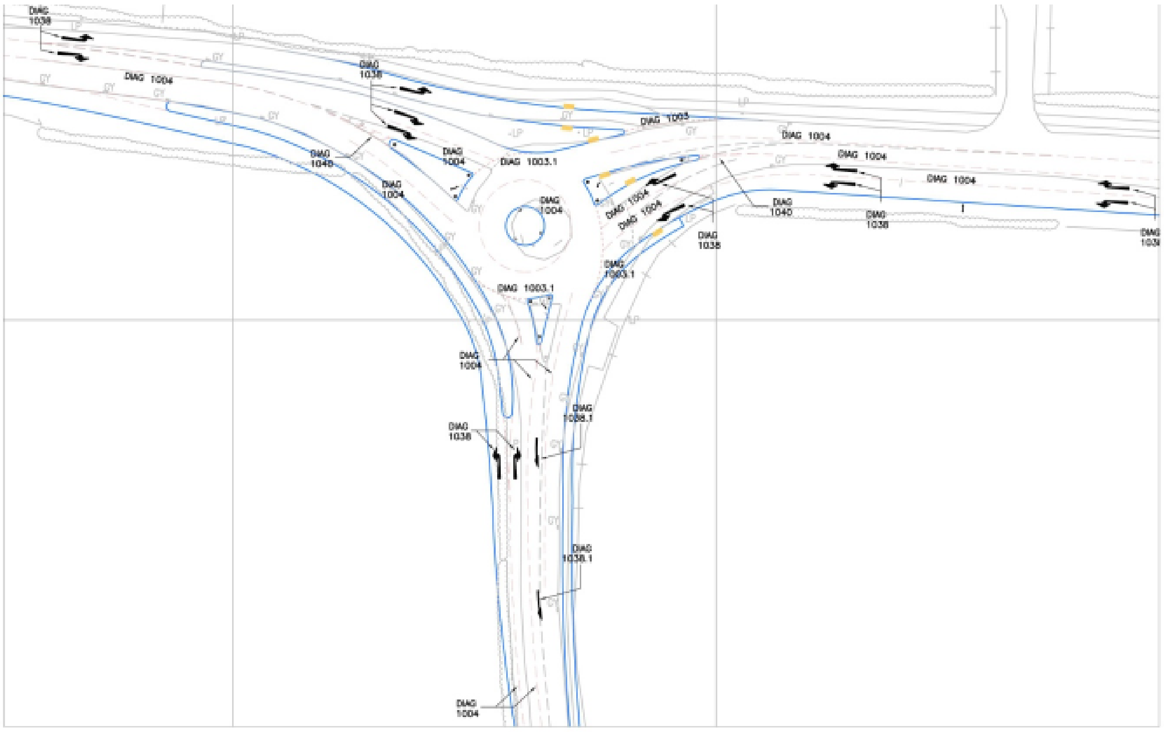

Figure 3.12: Buro Happold proposal for Chapel Gate

Buro Happold's proposed signal junction upgrades to the Chapel Gate junction are discussed later in Section 5 to this report.

3.2.4 Parley Cross Previous Designs

Both PBA and DCC have previously proposed modifications to the Parley Cross junction. The junction layouts are shown in Figures 3.13 and 3.14. Both junction layouts consist of a gyratory, for which an area of land to the southwest of the existing junction is taken for the junction, which sterilises a large area of land which could otherwise be used for development.

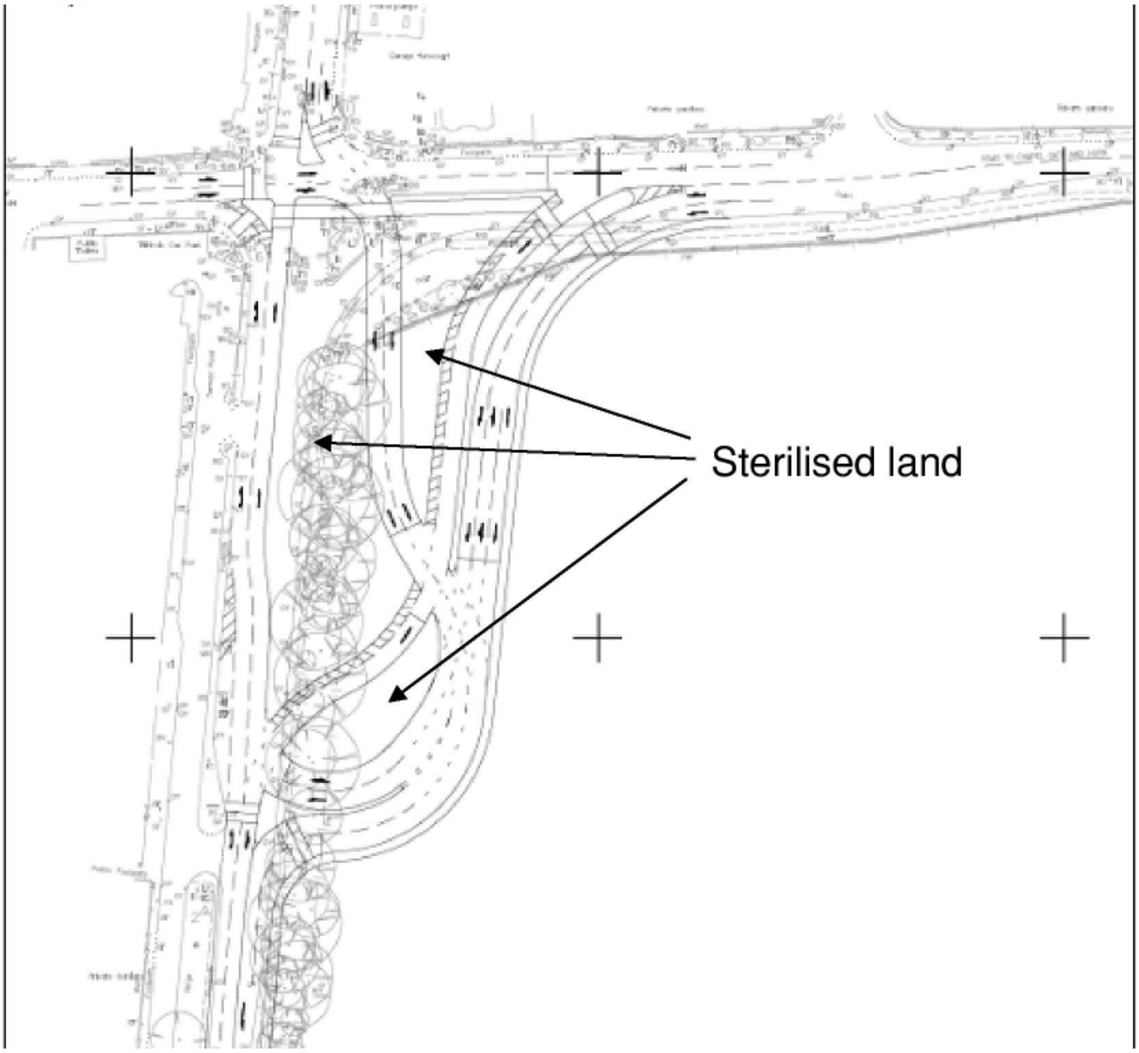

Figure 3.13: PBA's proposed Parley Cross junction layout

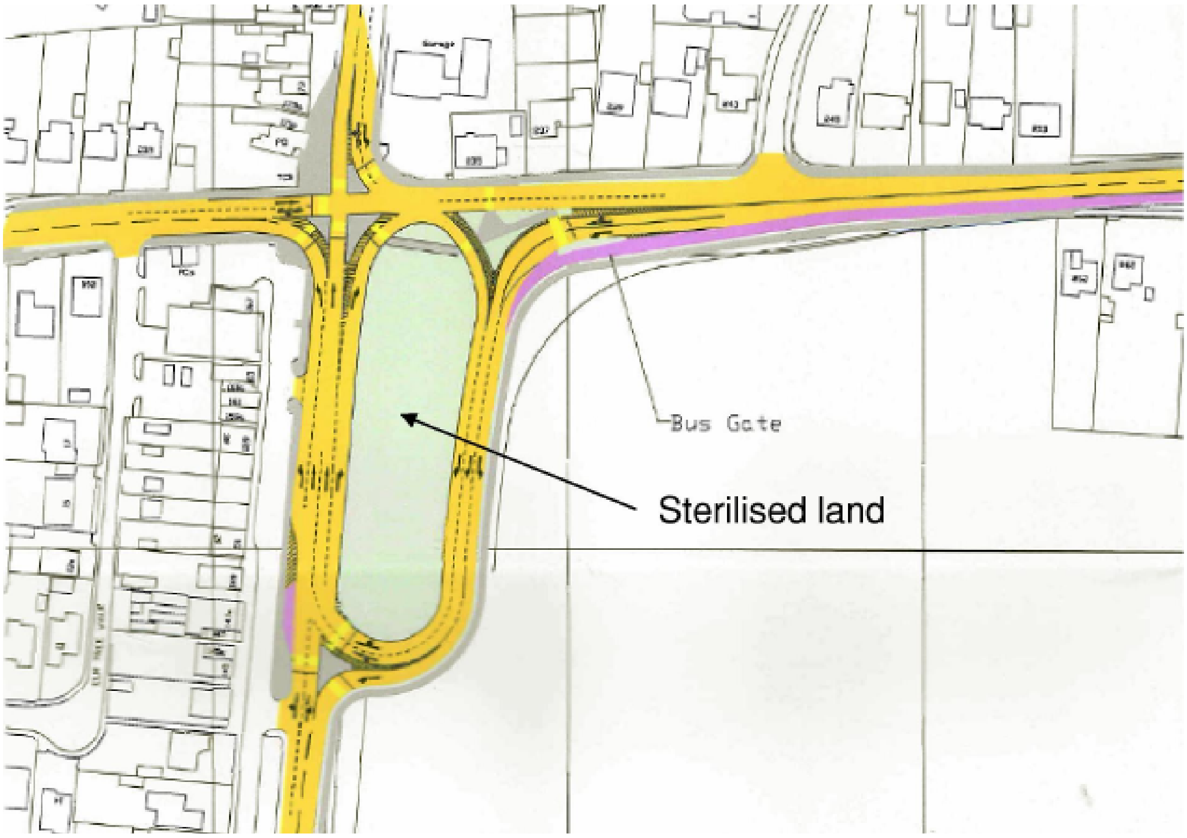

Figure 3.14: DCC's proposed Parley Cross junction layout

Of the two junction layouts, the DCC scheme is potentially less confusing to car drivers than the PBA scheme. The DCC proposal is a standard gyratory, whereas the PBA design has a mixture of direct (e.g. south-to-east) and gyratory (e.g. east to west) movements. The PBA design also sterilises three parcels of land, which becomes unusable, whereas the DCC proposed layout keeps one contiguous parcel of land intact. Finally, the DCC proposal additionally includes bus lane facilities.

Buro Happold's have considered both scheme and used them to further develop improvements to the Parley Cross junction, these are discussed later in Section 6 to this report.

3.3 Spreadsheet Corridor Model

A strategic SATURN model has been developed for the South East Dorset Multi-Modal Transport Study (SEDMMTS) that includes the area under consideration in this report. It was the original intention of the study to utilise data from the SEDMMTS model to inform the assignment of traffic for the future year scenarios. The area under consideration within this report is on the outskirts of the SEDMMTS model and after review of the model outputs by both Buro Happold and DCC it was agreed that the model did not provide suitable accurate information that could be used to inform this study.

The trip generation, distribution and assignment to the B3073 Corridor was modelled in an Excel spreadsheet. In the base year, the link flows predicted by the model were found to match well to the observer link counts.

The three scenarios laid out in Section 2.3 were explored using the spreadsheet. The use of the spreadsheet allowed varying amounts of arrival and departure traffic at the Aviation Business Park to be automatically added to the background flows, and by use of the standard formulae that underpin empirical based transportation software, provide a relatively quick indication of critical junction approaches, and allow the performance of the junctions (and links) on the B3073 to be assessed under differing quanta of development.

For roundabouts, the empirical formulae underlying ARCADY was used. The entry geometry was input and the approach versus circulating flow used to determine the ratio of flow to capacity (RFC) for each arm of the junction. This approach is reasonably accurate when compared to using the ARCADY program;

For signalised junctions, the critically important movements were identified, leading to a calculation of the capacity of each turning movement, the critical degree of saturation (DoS) and hence the likely practical reserve capacity of the junction. This also required an assumption of cycle time. This approach is reasonably accurate compared to use of LinSig software, but only gives a broad indication of performance as cannot deal with very detailed staging and phasing arrangements;

For links, the flow along the links was calculated and compared to the normal flow limit which was taken to be 1600 vehicles / hour, which is a typical boundary flow rate between free-flow traffic and congested traffic flow.

This modelling work was undertaken for all links and also the following junctions:

1. Hurn Roundabout
2. Airport Main Entrance
3. Chapel Gate Roundabout

The Blackwater Junction was previously examined in detail by both PBA and Buro Happold in a separate modelling exercise and this is discussed and summarised in Section 4. The Parley Cross junction was also examined separately using LinSig 3, due to the complexity of the proposed junction layout and staging and the difficulty of modelling it accurately in an Excel spreadsheet.

The development flows for Aviation Business Park were increased in the spreadsheet until either a) the links exceeded their normal flow limit, b) the RFC values of one or more arms of the roundabouts exceeded 0.85 or c) the highest DoS for any of the movements at the airport entrance junction, exceeded 90%

3.4 Results from the Corridor Model

The results from the spreadsheet model assessment of the three scenarios established in Section 2.3 are set out in this section.

3.4.1 Scenario 1– Existing junctions

Even without additional aviation park traffic flows, the model was predicting that by 2020, with the committed developments, the existing Chapel Gate and Hurn roundabouts will be over 85% of their capacity in the AM peak period. Chapel Gate is predicted to operate at an RFC of 102% on the B3073 western approach in the AM peak, and Hurn Roundabout is predicted to operate at an RFC of 100% on the B3073 western approach in the PM Peak. Table 3.1 provides a summary of the results.		**AM Peak RFC**	**PM Peak RFC**
Eastbound Link from Parley Cross to Chapel Gate		82%	47%
Westbound Link to Parley Cross from Chapel Gate		56%	84%
Chapel Gate Junction	B3073 West Approach	**102%**	62%
	Chapel Gate	17%	59%
	B3073 East Approach	69%	67%
Eastbound Link from Chapel Gate to Airport Access		66%	66%
Westbound Link to Chapel Gate from Airport Access		74%	61%
Airport Access Junction		76%	70%
Eastbound Link from Airport Access to Hurn Rbt		62%	75%
Westbound Link to Airport Access from Hurn Rbt		89%	63%
Hurn Roundabout	B3073 West Approach	85%	**100%**
	Avon Causeway	56%	58%

	B3073 East Approach	86%	71%
Eastbound Link from Hurn Rbt to Blackwater Jcn		68%	73%
Westbound Link from Blackwater Jcn to Hurn Rbt		79%	70%

Table 3.1 - Summary of modelling results for Existing Corridor in 2020 + Committed Development.

The results from this test suggest that improvements / new junctions at Hurn Roundabout and Chapel Gate Roundabout would be required in order to deliver any additional expansion of the Aviation Business Park in the year 2020.

3.4.2 Scenario 2– New junctions

With the proposed DCC junctions at Chapel Gate and Hurn, and assuming a link flow limit of 1,600 vehicles per hour, the model was re-run with adjusted geometry, and the additional development traffic from the Aviation Park ramped up until failure. This occurred at 137,000 square metressquare metres of development. Table 3.2 provides a summary of the results.

		AM Peak RFC	PM Peak RFC
Eastbound Link from Parley Cross to Chapel Gate		93%	49%
Westbound Link to Parley Cross from Chapel Gate		60%	**94%**
Chapel Gate Junction	B3073 West Approach	70%	41%
	Chapel Gate	14%	43%
	B3073 East Approach	33%	8%
Eastbound Link from Chapel Gate to Airport Access		70%	74%
Westbound Link to Chapel Gate from Airport Access		85%	61%
Airport Access Junction		78%	72%
Eastbound Link from Airport Access to Hurn Rbt		66%	83%
Westbound Link to Airport Access from Hurn Rbt		**100%**	63%
Hurn Roundabout	B3073 West Approach	35%	47%

	Avon Causeway	78%	62%
	B3073 East Approach	25%	34%
Eastbound Link from Hurn Rbt to Blackwater Jcn		71%	79%
Westbound Link from Blackwater Jcn to Hurn Rbt		86%	70%

Table 3.2 - Model results summary for 2020 + Committed Development and 137,000 square metressquare metres of. development

The limitation on traffic flow is predicted to occur after 137,000 square metres of development is built at the Aviation Business Park. This occurs on the Westbound Link from Hurn Roundabout to the Airport Access junction in the AM peak, where the traffic flow exceeds 1,600 vehicles per hour.

The conclusion is that the merge on exit of two lanes back to one would become increasingly ineffective as traffic flows were increased beyond that point, and so to accommodate the traffic demand two full lanes would be required, between Hurn Roundabout and the Airport Access junction.

3.4.3 Scenario 3– Increasing traffic to failure

For Scenario 3, the development flows were increased beyond those of Scenario 2, in order to determine the key locations where the road network would fail first

At a threshold of **208,000 square metres**. of development at the Aviation Business Park, in the AM peak the B3073 Eastbound link between Parley Cross and Chapel Gate would become in excess of capacity (1,600 vehicles per hour) on the single lane link. Likewise, during the PM peak, the B3073 Westbound link between Parley Cross and Chapel Gate would become overcapacity on the single lane link. Mitigation of this overcapacity would require that Parley Lane is widened between Chapel Gate and Parley Cross to two lanes in both directions. It is anticipated that this could potentially be problematic due to highway land constraints on both sides of the road, especially in proximity to Parley Cross.

At a threshold of **272,000 square metres** of development at the Aviation Business Park, in the AM peak, the Avon Causeway Eastern approach to the DCC proposed Hurn Roundabout fails, where the RFC exceeds 0.85 on that arm. Mitigation of this overcapacity may be possible by adding an additional third lane, but this may require the roundabout to be relocated further westwards.

At a threshold of **335,000 square metres** of development at the Aviation Business Park, in the AM peak, the B3073 Westbound link between the Airport Access and Chapel Gate would exceed link capacity. Mitigation of this overcapacity would be to widen the link to two lanes in each direction.

At a threshold of **442,000 square metres** of development at the Aviation Business Park, in the AM peak, the B3073 Western approach to Chapel Gate junction becomes over-capacity where the RFC values exceeds 0.85.

As there are two right turn lanes provided in this scenario already, it may not be possible to widen this any further and hence mitigation is not considered to be possible within a roundabout design. Figure 3.9 provides an illustration of the flows and capacities generated by the corridor spreadsheet model.

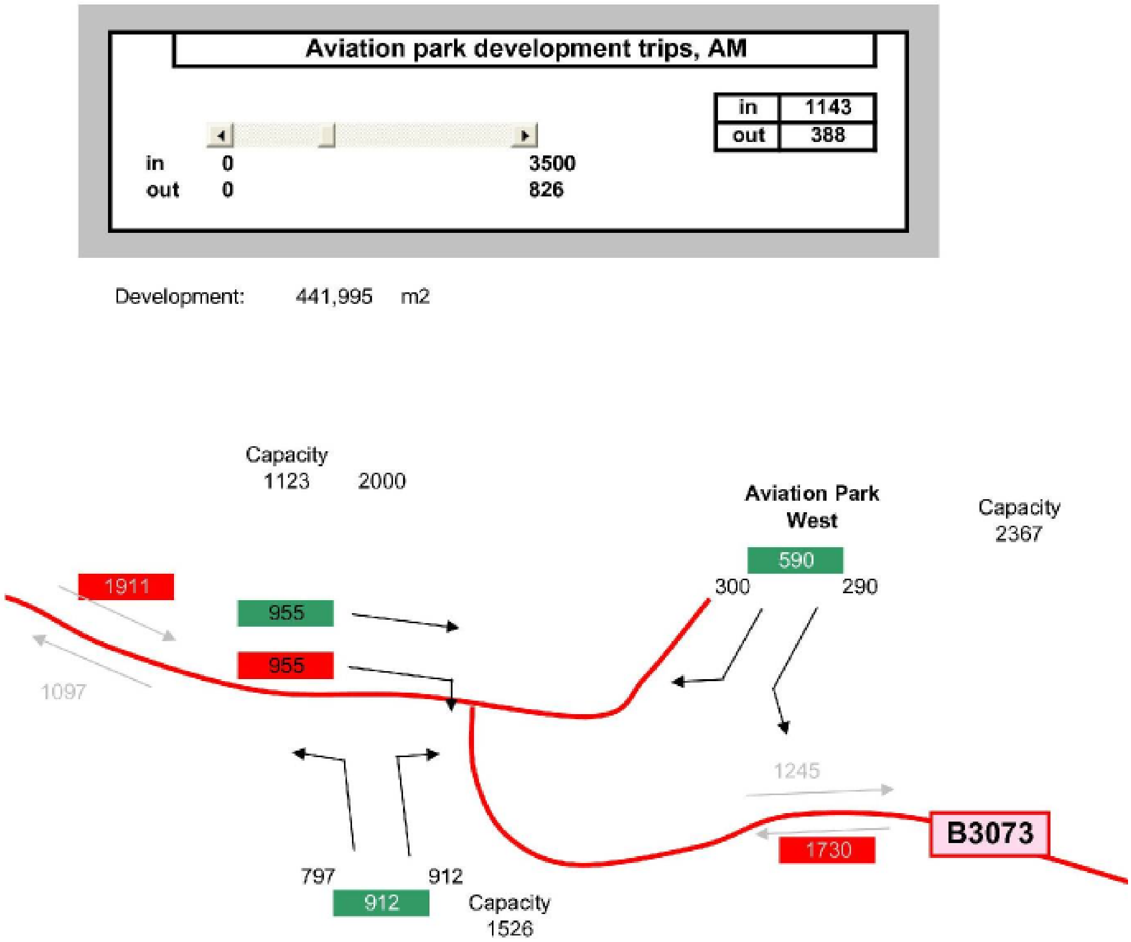

Figure 3.9: Final predicted position - AM peak - Chapel Gate junction

In conclusion, if the widening of Parley Lane to two lanes on key sections is accepted in principle, the size of the Aviation Business Park can be greatly increased, without causing congestion for the airport, Chapel Gate or Hurn Roundabout junctions. The capacity of the Parley Cross junction and the Blackwater Interchange is not included in this summary, as these are considered separately in the following sections.

In practice, it is understood that no more than 110,000 square metres is likely to be built at the Aviation Business Park by 2035, and so just implementing the new junctions (with a maximum development capacity of 137,000 square metres GFA) should be sufficient for the next 25 years.

4 A338 Blackwater Interchange

4.1 Summary of Modelling

4.1.1 Existing Junction

The layout of the existing Blackwater interchange is shown in Figure 3.1 and Figure 3.2 in Section 3. The junction forms a grade separated partial cloverleaf layout which links the B3073 with the A338 dual carriageway. Both of the A338 slip road junctions with the B3073 are signalised. There is one lane provided for each turning movement at each junction, which are flared from single lane approaches.

There are four traffic stages present at each junction which provides for all traffic movements together with pedestrian and cycle crossing facilities across the A338 slip roads. At the western junction, stage 4 is operated on demand to cater for the TOUCAN crossing, and likewise, at the eastern junction, stage 3 is operated on demand for the TOUCAN crossing. There are hurry calls also provided on the slip roads to help prevent queuing vehicles tailing back onto the main line.

This junction has been modelled by Buro Happold both with LinSig Version 3 and VISSIM/PCMOVA. Buro Happold modelled the junction using VISSIM/PCMOVA to provide an accurate assessment of the operation of the two junctions so the MOVA control could be accommodated including the linkage between the junctions. Significant effort was made to agree the baseline model with DCC to enable the future options to be considered.

Both approaches demonstrated that the junction is currently (2009 flows) at capacity in both the AM and PM Peaks. The queuing traffic between the junctions also causes interaction through blocking back and further reduced performance as a result. This modelling indicates that the existing traffic signals would not be able to cater for future traffic demand.

4.1.2 Proposed Improvement Scheme

At the request of DCC, Buro Happold undertook a feasibility assessment of highway options to improve the Blackwater Interchange in March 2009. This study investigated a range of options (9) from simple upgrades to the existing signalised junctions, to more complex arrangements including new bridge structures over the A338.

This study took into account the Bournemouth International Airport Transport and Infrastructure Study by PBA (September 2008), DCC's A338 Widening Feasibility Study (June 2008) and DCC's Bournemouth Aviation Park Highway Access Route Corridor Options Report (August 2007).

DCC considered that Options 1, 3 and 5 should be explored further in terms of modelling. Option 1 of the BH study was the lowest cost option which provides interim capacity enhancements to the interchange. This option proposes the retention of the single two-lane bridge over the A338, but includes local carriageway widening in the vicinity of the traffic signals to allow ahead movements in two lanes on the B3073 to provide additional capacity, with a 2 to 1 lane merge on junction exits.

Figure 4.1 illustrates the proposed junction improvements of Option 1.

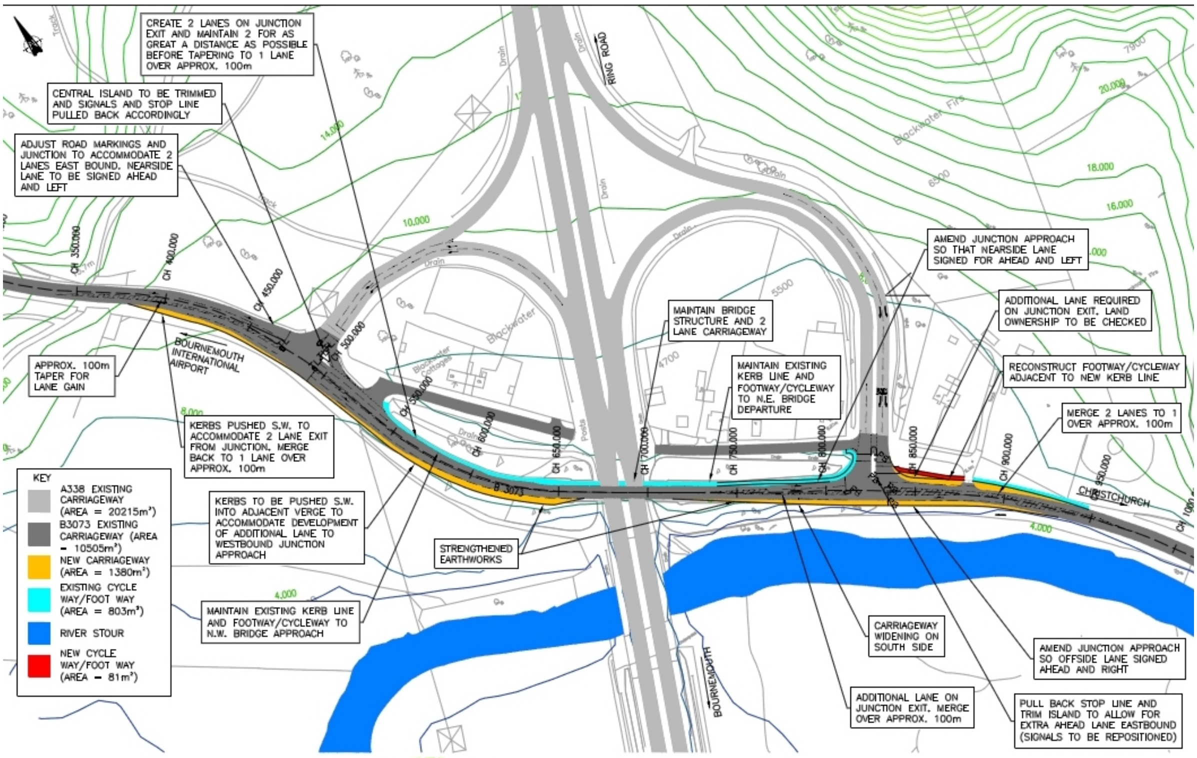

Figure 4.1: Blackwater Junction Highway Improvements Option 1

At a meeting with PBA on 11 June 2009 DCC requested that a broad assessment in capacity terms of Buro Happold's Option 1 should be undertaken in relation to the Bournemouth International Airport Transport and Infrastructure Study. PBA then produced an addendum report which set out their findings. PBA used TRANSYT version 12 for this assessment.

The PBA assessment considered that the proposed shared offside ahead and right turn lanes on the B3073 approaches in Option 1 would only be used by right turn traffic, with all the "ahead" traffic using the nearside lane only. It is understood that this assumption was made due to the signal staging which would result in right turning traffic requiring an indicative green arrow, leading to blocking effect by right turners and discouraging ahead traffic from using the offside lane. As a result, the PBA report considered that the expected capacity improvements would not materialise.

PBA then considered a modification to the Option 1 scheme, which at the Western junction included a longer right turn lane on the B3073 (E) approach, together with a third left turn lane on B3073 (W) approach. At the Eastern junction, this included the creation of two right turn lanes on the B3073 (E) approach, and a third left turn lane on the the B3073 (W) approach. Figure 4.2 and Figure 4.3 provide an illustration of the PBA modified Option 1 scheme.

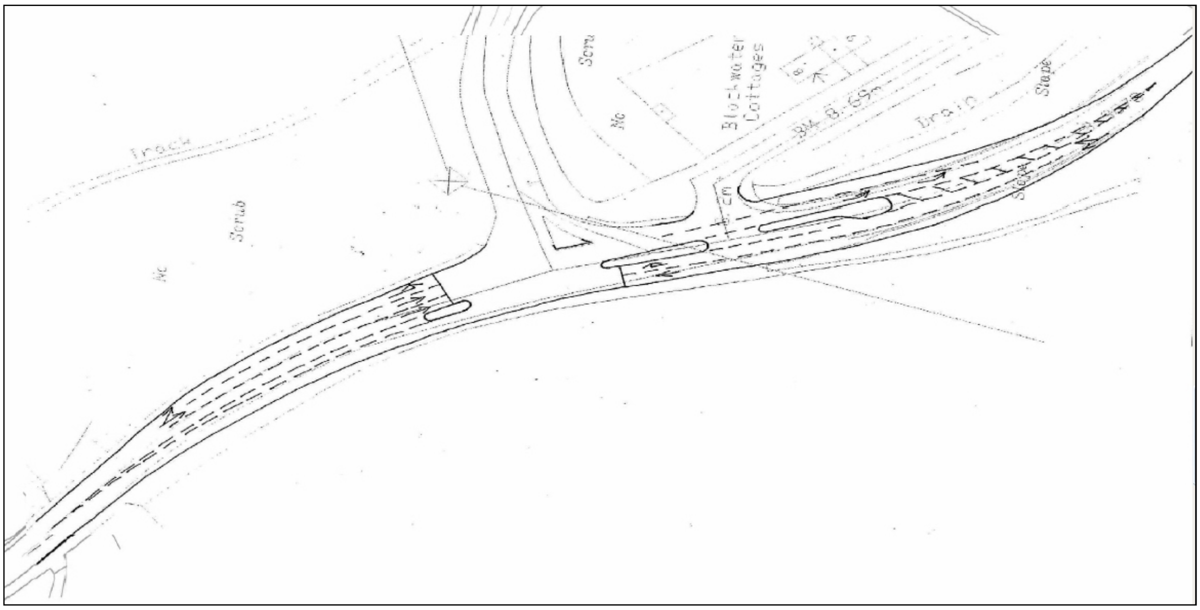

Figure 4.2 : Blackwater PBA Revised Option 1 Western Junction

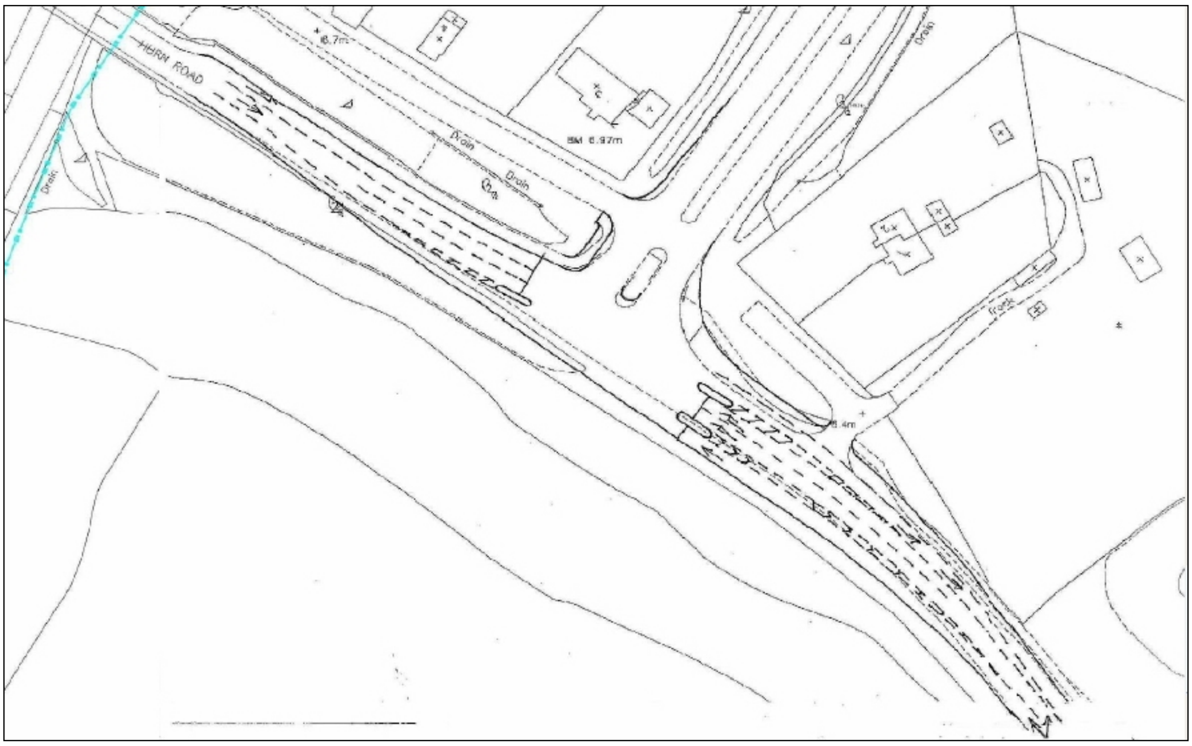

Figure 4.3 : Blackwater PBA Revised Option 1 Eastern Junction

The capacity results from the PBA TRANSYT model are briefly summarised in Table 4.1. The results illustrate that the proposed modifications to Option 1 would be sufficient to accommodate expansion of the airport to 4.5 million passengers per annum and also the housing at West Parley (including the Travel Plan measures). The maximum Degree of Saturation on each arm predicted by the PBA revised option 1 model is 92% in the AM peak and 94% in the PM peak, as opposed to 124% in the AM Peak and 131% in the PM peak in the Buro Happold Option 1 model. The results are briefly summarised in Table 4.1.

Arm	Peak	Buro Happold Option 1: Highest DoS %	PBA Revision to Option 1 : Highest DoS %
Blackwater West : B3073 West Arm	AM	124%	92%
	PM	131%	94%
Blackwater West : A338 Slip Road	AM	85%	89%
	PM	81%	88%
Blackwater West : B3073 East Arm	AM	66%	72%
	PM	59%	68%
Blackwater East : B3073 West Arm	AM	93%	88%
	PM	98%	93%
Blackwater East : A338 Slip Road	AM	91%	85%
	PM	67%	70%
Blackwater East : B3073 East Arm	AM	110%	90%
	PM	113%	89%

Table 4.1 : Summary of PBA TRANSYT model results

Whilst Buro Happold agree that the method of control (and the lane usage) needs further consideration in the modelling work for Option 1, Buro Happold hold some reservations with respect to the PBA revised layout and also to the modelling work undertaken by PBA. This includes the following issues:

- Although rarely called, the TOUCAN crossings on the A338 Slip roads are not included in the TRANSYT model. It is also unclear how the proposed Eastern junction layout with the increased bell-mouth dimensions on the A338 South Slip road (shown in Figure 4.3) would be able to accommodate a right-left staggered TOUCAN crossing, the slip road stop line (not shown) and the access to Blackwater Cottages;
- The B3073 eastbound ahead movement through the Blackwater Eastern junction looks to be mis-aligned, requiring traffic in both of the two ahead lanes to undertake a 'chicane' type of movement;
- TRANSYT version 12 is more limited compared to later versions of TRANSYT (or indeed LinSig) in dealing accurately with flared lane approaches which may be critical at this location. The same flared lane values have been input to both the AM and PM peak models suggesting no effective lane usage adjustments using QUEPROB or LINSAT. As such, the models might be assuming that all traffic can utilise all lanes, i.e. TRANSYT doesn't know that there are specific lane markings and flow demands and therefore the models may be overestimating capacity; and
- The cycle time used is set to a generic 90 seconds which is different to the known cycle times at this junction.

It is recommended by Buro Happold that the modelling and layout issues should be addressed in the capacity assessment of Option 1. Notwithstanding, the PBA modelling work has suggested that the Option 1 scheme (or a revision thereof) is likely be able to accommodate some additional development traffic, but the detailed layout may require further consideration and capacity assessment work to determine just how much.

5 Chapel Gate Proposed Signals

5.1 Introduction

At the request of DCC, the feasibility of providing signals at the Chapel Gate junction was explored. Two different layouts were identified, namely a small signalised roundabout, and secondly a conventional three arm signal junction.

Wig-wag lights (a wig-wag is a vehicle or railway crossing control system, usually found at level crossings and outside fire or ambulance stations) are provided on the B3073 to the south of the Chapel Gate junction to stop traffic movement underneath the flight path when large aircraft are arriving or departing. The introduction of signal control at this junction may allow this safety facility to be incorporated though special stages.

5.2 Signalised Roundabout Design

A layout sketch is illustrated in Figure 5.1. This layout includes a 50 metre diameter roundabout and multiple flared lanes on approaches to maintain capacity given that the junction would need to be relatively short cycled due to the small size of the junction and the need to keep queues short. This layout would require additional agricultural land from the southwest quadrant.

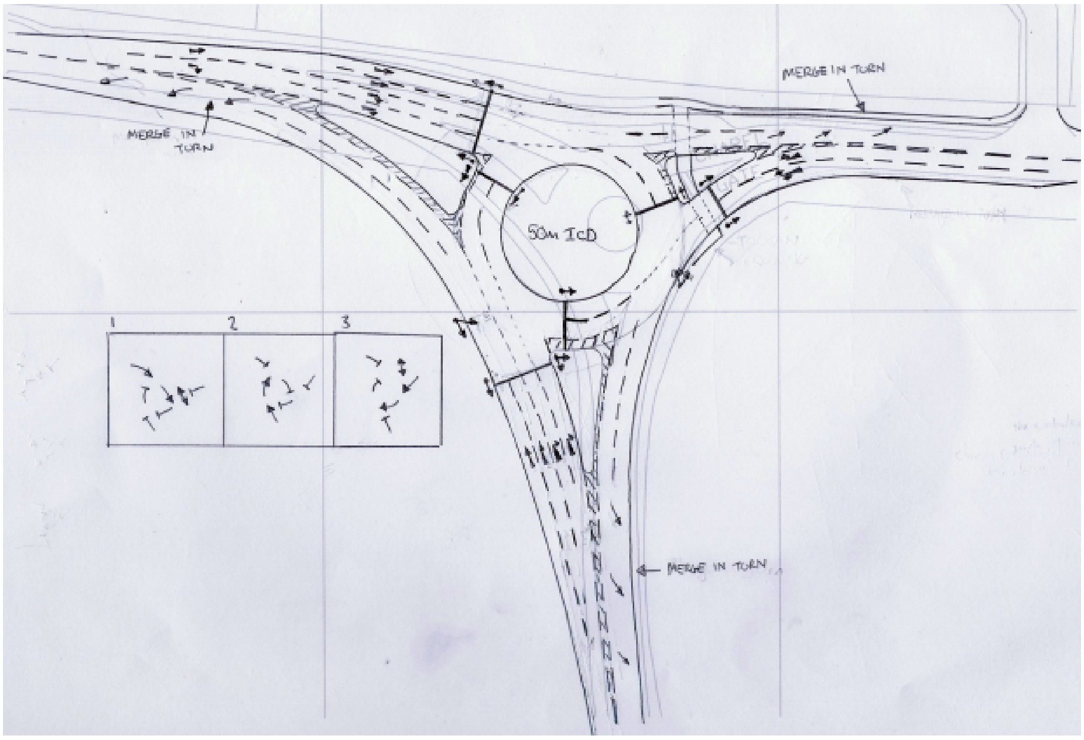

Figure 5.1 - Proposed Signalised Roundabout at Chapel Gate

The proposed junction was modelled using LinSig v.3. The flow input to the model was taken from the corridor spreadsheet and included the 2020 baseline plus committed development scenario, followed by several development scenarios, including 110,000 square metres, 137,000 square metres and 208,000 square metres of development (the latter of which was previously identified as the limit for single link approaches at Chapel Gate). The results of the assessment are summarised in Table 5.1 with the full output provided in Appendix B.

Scenario	AM peak		PM peak	
	Highest DoS	Junction Practical Reserve Capacity (PRC) %	Highest DoS	Junction Practical Reserve Capacity (PRC) %
2020 Base + Committed development	71%	+26.8%	71.3%	+26.3%
2020 Base + Committed + 110,000 sqm development	71%	+26.8%	79.9%	+12.6%
2020 Base + Committed + 137,000 sqm development	71%	+26.8%	82.4%	+9.3%
2020 Base + Committed + 208,000 sqm development	71%	+26.8%	91.6%	-1.8%

Table 5.1 Summary of LinSig Model Results for Signalised Roundabout option

The results demonstrate that the proposed signals would have spare capacity in the future 2020 design year for the baseline, committed and development traffic scenarios.

The AM peak retains significant spare capacity in all scenarios, with no impact on overall performance, as the critical degree of saturation is not located on those lanes affected by additional development traffic, which remains relatively minor compared to the through movements on the B3073.

The PM peak retains significant reserve capacity in the 2020 base plus committed development scenario, but reduces in capacity with the addition of development traffic. The roundabout eventually fails on the Chapel Gate and B3073 East arm.

5.3 Signalised T-Junction Design

A layout design is illustrated in Figure 5.2. This layout includes multiple flared lanes on B3073 approaches to maintain capacity. This layout would require less additional agricultural land from the southwest quadrant than the signalised roundabout option. This layout also permits controlled pedestrian/cycle crossing facilities on the Chapel Gate arm which would assist those crossing the junction.

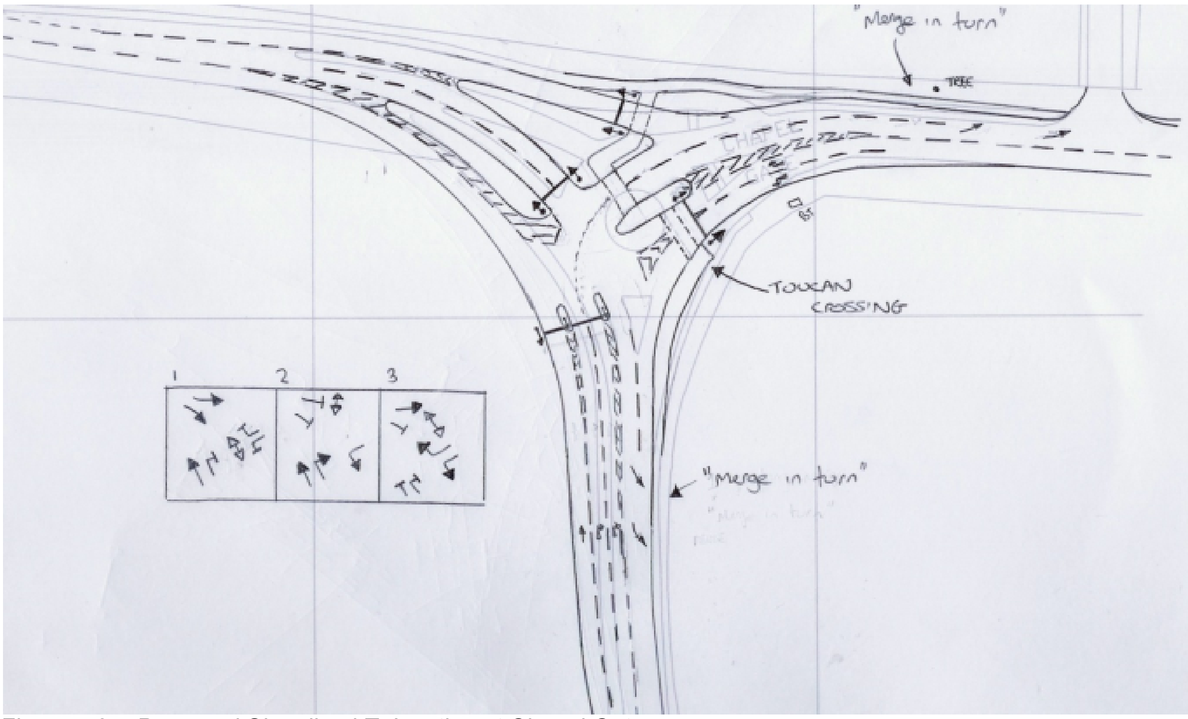

Figure 5.2 - Proposed Signalised T-Junction at Chapel Gate

The proposed junction was modelled using LinSig v.3. The flow input to the model was also taken from the corridor spreadsheet to include the 2020 baseline plus committed development scenario, plus the 110,000 square metres, 137,000 square metres and 208,000 square metres of development scenarios. The results of the assessment are summarised in Table 5.2 with the full output provided in Appendix B.

Scenario	AM peak		PM peak	
	Highest DoS	Junction Practical Reserve Capacity (PRC) %	Highest DoS	Junction Practical Reserve Capacity (PRC) %
2020 Base + Committed development	64.4%	+39.8%	81.1%	+11.0%
2020 Base + Committed + 110,000 sqm development	68.0%	+32.4%	90.5%	-0.5%
2020 Base + Committed + 137,000 sqm development	68.8%	+30.9%	92.9%	-3.2%
2020 Base + Committed + 208,000 sqm development	71.2%	+26.4%	100.7%	-11.9%

Table 5.2 Summary of LinSig Model Results for Signalised T-Junction option

The results demonstrate that the proposed T-junction signals would retain spare capacity in both the 2020 AM and PM peak baseline plus committed traffic scenarios.

The AM peak retains significant spare capacity in all scenarios with additional development, as the critical degree of saturation is not located on those lanes affected by development traffic, which remains relatively minor compared to the through movements on the B3073.

The PM peak retains reserve capacity in the 2020 base plus committed development scenario, but reduces in capacity with the addition of development traffic, with lanes becoming over 90% degree of saturation when over 110,000 square metres development.

5.4 Conclusions

The proposed roundabout signal design at Chapel Gate has been shown to accommodate the 2020 base plus committed development traffic, together with traffic from an additional 208,000 square metres development at the Aviation Business Park. It should be noted that this level of development was previously identified in the whole corridor modelling work as the limit for single lane links on the B3073.

The performance results of the T-Junction are similar to the signalised roundabout results in the AM peak, but about 10% worse in the PM peak with the junction becoming congested above about 110,000 square metres of development.

6 Parley Cross Proposed Signals

6.1 Introduction

This section considers the proposed signal based scheme for Parley Cross. Also included is a brief assessment of the existing junction operation for comparative purposes.

6.2 Parley Cross Existing Situation

The traffic flows for 2011 were derived from the spreadsheet model, with known committed development traffic added into the flow matrix. Figure 6.1 provides a summary of the demand flows.

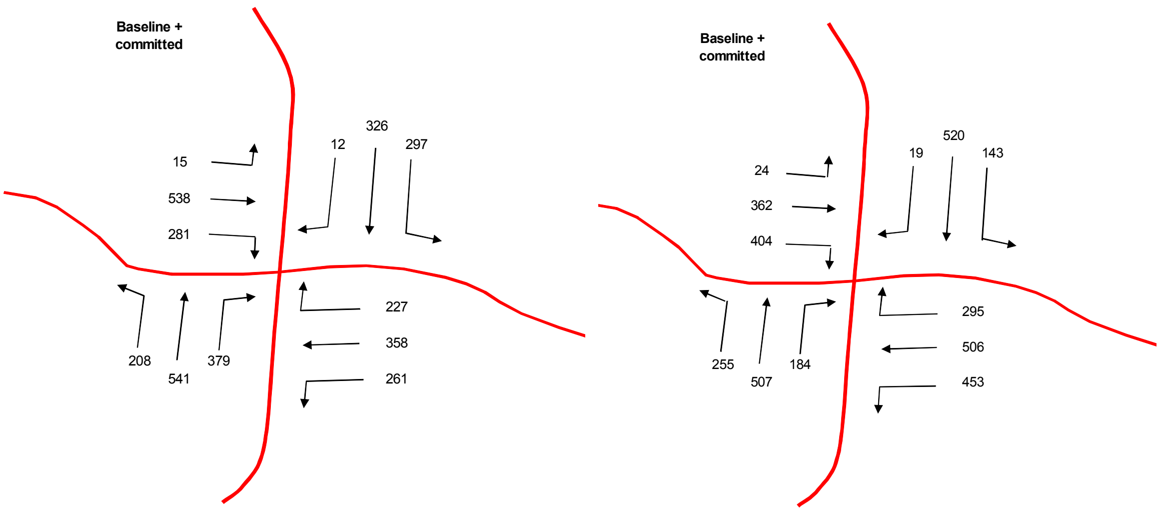

Figure 6.1 : Predicted 2011 Baseline and Committed Flows)

A traffic model of the existing junction was constructed using LinSig version 3 to demonstrate how the existing junction operates in comparison to the proposed improvement scheme.

The existing junction operates under compact MOVA control and continuously changes the signal timings in response to traffic demands. In order to model the average conditions experienced during the AM and PM weekday peak hour, a MOVA Log was requested from DCC to help determine actual stage lengths and cycle times that occur on-street. The current controller specification was also obtained from DCC to determine phases, stages and inter-greens. The results of the modelling are summarised in Table 6.1 with the full results reproduced in Appendix C.

Scenario	AM peak	PM peak

	Highest DoS	Junction Practical Reserve Capacity (PRC) %	Highest DoS	Junction Practical Reserve Capacity (PRC) %
2011 Base + Committed	100.9%	-12.1%	101.5%	-12.8%

Table 6.1 Summary of Baseline Model Results

The results in Table 6.1 illustrate that the junction is at capacity in 2011. The detailed model output provided in Appendix B illustrates that all arms in the AM peak have a degree of saturation close to 100%, whereas in the PM peak, three arms have a degree of saturation close to 100%, with the A347 South approach at 78%. A long cycle time is present at this junction to maximise traffic throughput, however this also leads to long queues forming on each approach.

Due to the limitations of the highway boundary and the proximity of the built environment on three sides of the junction, it is understood that there is little extra capacity to be gained from modifications to the existing layout.

6.3 Parley Cross Future Modelled flows

The future year modelling scenarios at the Parley Cross junction were obtained from the spreadsheet model.

The predicted baseline + committed flows in 2020 are shown in Figure 6.2.The predicted baseline + committed flows + 110,000 square metres square metresGFA of development is shown in Figure 6.3, which corresponds to the likely largest development in the next 25 years in the opinion of Drivers Jonas Deloitte.

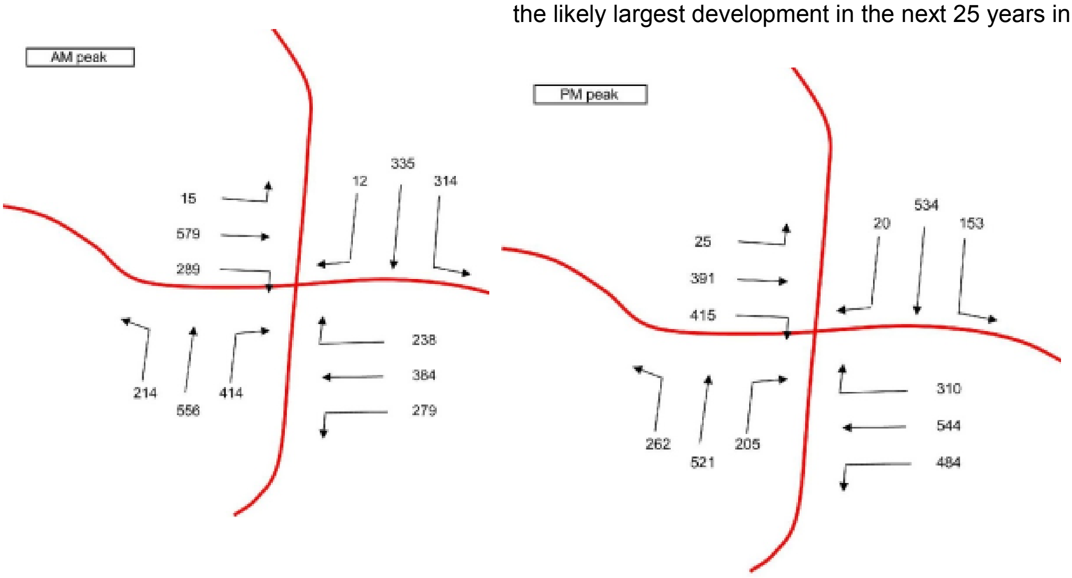

Figure 6.2: Predicted 2020 baseline + committed flows

Figure 6.3: Predicted 2020 baseline + committed flows + 110,000 square metres square metres GFA development

6.4 Proposed Junction Design

Buro Happold redesigned the existing junction in order to reduce the level of congestion in future years. By using a well-separated link road in the south east quadrant, the land to the southeast of the existing junction is kept intact, and the junction layout is kept easily understandable for road users.

In principle, the act of splitting up Parley Cross Junction into a series of smaller and more efficient junctions should make the whole junction more efficient, and offer the opportunity to reduce the severance in the centre of the village of West Parley by better distribution of traffic flows.

Retaining traffic signals will also benefit pedestrians and cyclists who will have a dedicated, safe means of negotiating the junction. This ties in well with DCC's Parley Cross to Hurn Airport Cycleway scheme that is understood to be part of a Section 106 contribution for the proposed expansion of nearby Aviation Business Park.

As is typically the case the majority of Statutory Undertakers apparatus run parallel with the road, commonly in footways and verges, and converge at the crossroads. Introducing a bypass route away from the centre of the existing junction will help to avoid costly diversions or protection of the main cluster of apparatus which includes numerous telecommunications cables and a mast, a high voltage power line, and a water main.

An analysis of the existing flows indicates that the two major conflicting right-turn movements are the northbound right turn (baseline + committed flows have 401 and 196 PCUs / hour in the AM and PM peaks respectively) and the eastbound right turn (baseline + committed flows have 289 and 415 PCUs / hour in the AM and PM peaks respectively).

The northbound right turn was removed from the junction by means of a new road, and two new junctions, as is shown in Figure 6.4. Junction 1 is the redesigned Parley Cross junction. Junctions 2 and 3 are the two new signalised auxiliary junctions, which are coordinated to Junction 1, and which therefore share the same cycle time. Using the two auxiliary junctions to remove the eastbound right turn movement was considered, but was rejected as it placed too much traffic load upon the auxiliary junctions, and a careful redesign of the Parley Cross junction provided enough capacity to incorporate the eastbound right turn.

Figure 6.5: New proposed Parley Cross Junction design

Figures 6.6 through 6.8 identify the most prominent features of the new schematic design, which are described in Table 6.2.

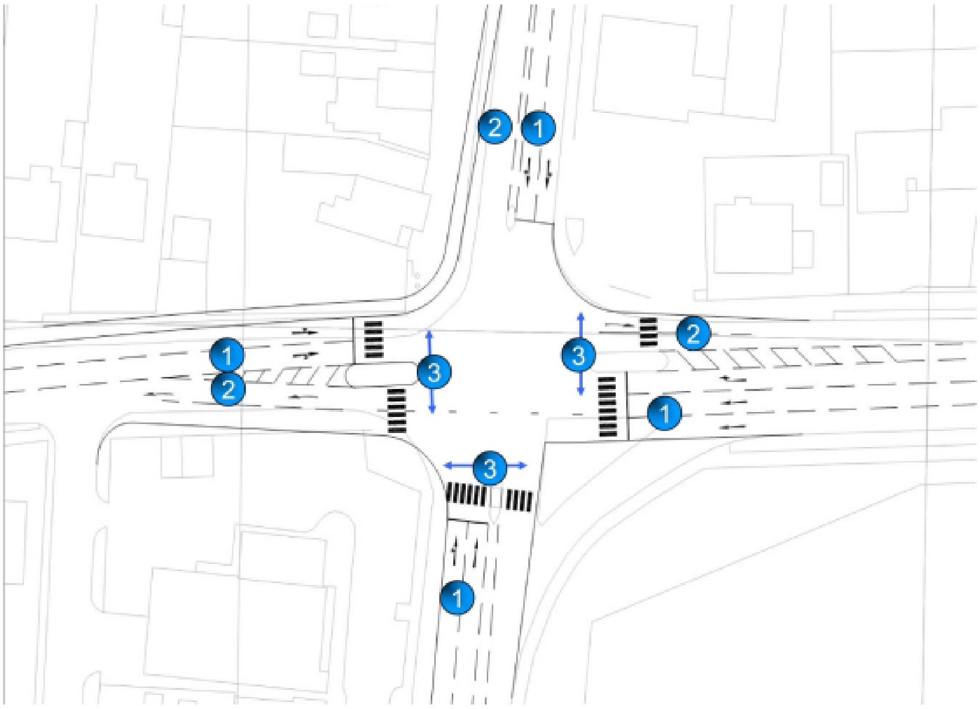

Figure 6.6: The redesigned Parley Cross junction

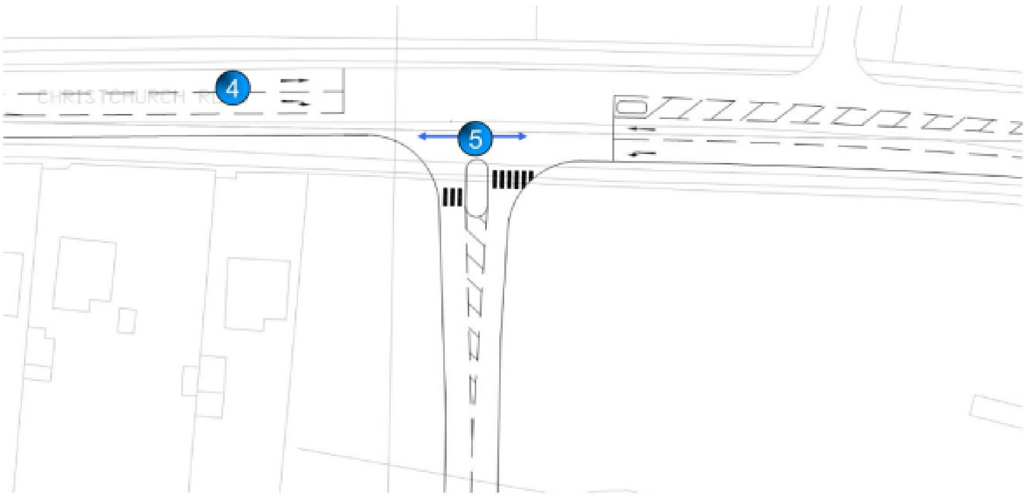

Figure 6.7: Auxiliary Junction 2

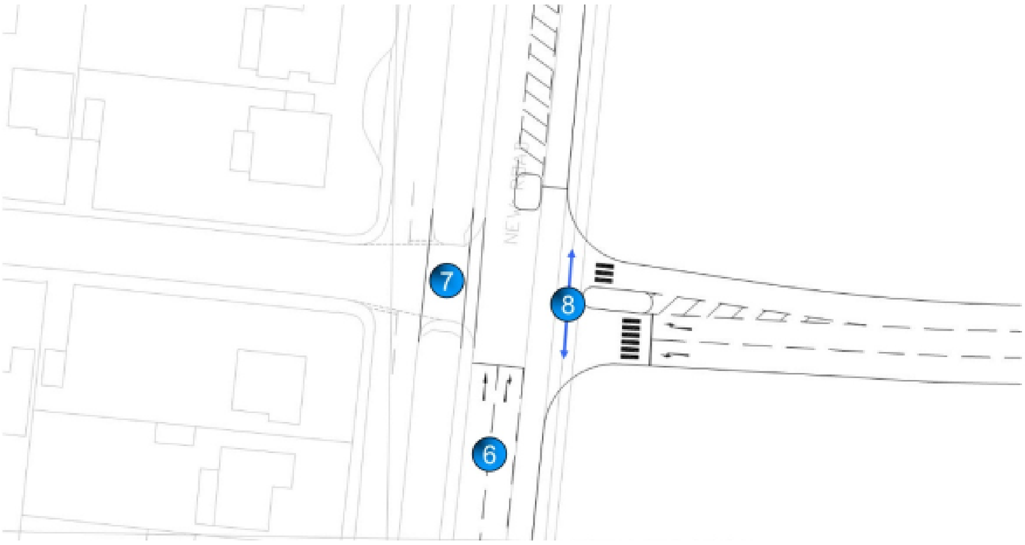

Figure 6.8: Auxiliary Junction 3

Junction	Feature Number	Feature Description
Parley Cross	1	All approaches to Parley Cross has two ahead lanes, shared with left (and right) turning movements
	2	All exits from the Parley Cross junction are two lanes, which funnel down to one lane only. This facilitates the two through lanes on each arm.
	3	Three signalised pedestrian crossing are provided on the southern, western and eastern arms of Parley Cross Junction. The eastern and western crossings are staggered. Additionally, an unsignalised crossing island is provided on the northern arm.
Auxiliary Junction 2	4	A separate right turn lane is provided, with an indicative arrow. This facilitates right turning movements at this junction.
	5	A staggered signalised pedestrian crossing is provided across the southern arm of the junction
Auxiliary Junction 3	6	A separate right turn lane is provided, with an indicative arrow. This facilitates right turning movements at this junction. The left turn lane of the minor arm runs as an overlap when the indicative arrow is green.
	7	The parking lane access is closed off at this point so that the junction only has three lanes.
	8	A staggered signalised pedestrian crossing is provided across the minor arms of the junction.

Table 6.2: Description of new proposed junction layouts

6.5 Model Results:Aviation Business Park

Buro Happold modelled the signalised junction at Parley Cross, as a LinSig v.3 model. The three parts of the junction were modelled using multiple controllers linked together with a common cycle time. Junction 1, Parley Cross, was controller 1, Junction 2 was controller 2, and Junction 3 was controller 3. The saturation flows were conservatively taken to be 1,900 PCUs / hour. The model assumed that the pedestrian demands across the link road at the two auxiliary junctions would not result in demands greater than every other cycle. The flow demands were extracted from the corridor spreadsheet model.

The results of the modelling under different development flow scenarios are reproduced in Appendix C, and are summarised in Table 6.3.

Scenario	AM peak		PM peak	
	Highest DoS	Lowest Junction Practical Reserve Capacity (PRC) %	Highest DoS	Lowest Junction Practical Reserve Capacity (PRC) %
2020 Base + Committed development	82.1%	+9.6%	83.5%	+7.8%
2020 Base + Committed + 110,000 square metres development	83.6%	+7.7%	87.3%	+3.1%
2020 Base + Committed + 137,000 square metres development	85.8%	+5.0%	88.1%	+2.1%
2020 Base + Committed + 208,000 square metres development	90.6%	-0.7%	96.2%	-6.9%

Table 6.3: Summary of Results with Aviation Business Park Traffic

With no extra development at the Aviation Business Park, the system of junctions ran with a minimum cycle time of 90 seconds in the AM peak, and 100 seconds in the PM peak. In both the AM and PM peak periods, the junctions were predicted to operate with degree of saturation values of less than 90%.

With the additional quantum of development, the required cycle times increased up to a maximum of 120 seconds, but the junctions continue to function, and all movements remain within 90% capacity. The exception to this was the PM peak with 208,000 square metres development.

The results above demonstrate that the proposed new layout will comfortably accommodate the predicted base + committed 2020 traffic flows, as well as reasonably accommodating the likely development at the Aviation Business Park.

6.6 Model Results: West Parley Housing

As an additional scenario test, Buro Happold modelled the proposed Parley Cross signalised junction with the proposed West Parley eastern residential sites (Area 3&4), as identified in the East Dorset Housing Options report. The scenarios tested were as follows:

- Area 3 (to the East of A347 New Road) consisting of 400 dwellings, accessed from the proposed link road only; and
- Area 3 plus Area 4 (to the west of New Road) consisting of 210 dwellings accessed from the B3073 Christchurch Road to the west of Parley Cross junction.

The base 2020 traffic flows (without committed development) were extracted from the spreadsheet corridor model, and the development traffic for each residential developed area was added to the base flows in the LinSig model. Development traffic was assigned as a separate layer in the model.

The distribution of residential traffic was based on the 2020 directional base link flows at Parley Cross. For the Area 3 development, the precise assignment of traffic through the internal LinSig network was left up to the delay based optimiser. The results from the scenario tests are summarised below in Table 6.4 with the full LinSig output contained at Appendix C.

Scenario	AM peak		PM peak	
	Highest DoS	Lowest Junction Practical Reserve Capacity (PRC) %	Highest DoS	Lowest Junction Practical Reserve Capacity (PRC) %
2020 Base + Committed development	82.1%	+9.6%	83.5%	+7.8%
2020 Base + Area 3 residential (400 dwellings)	82.1%	+9.6%	86.2%	+4.4%
2020 Base +Area 3 +Area 4 residential (210 dwellings)	85.1%	+5.7%	89.0%	+1.1%

Table 6.4: Summary of Results with West Parley Housing

The results given in Table 6.4 illustrate that the expected traffic generated from the proposed West Parley housing developments can be accommodated in both the 2020 AM and PM peak periods, and the junctions are predicted to operate with maximum degree of saturation of less than 90%.

7 Summary and Conclusions

7.1 Summary

The investigations contained in this report have revealed that the existing junctions on the B3073 in the study area would not be able to cope with the predicted base plus committed development traffic flows in 2020. It is expected that four out of the five junctions in the study area would encounter capacity issues leading to congestion, queuing and delay.

Without widening of the B3073 Corridor, but with the provision of new roundabout junctions at Chapel Gate and Hurn Roundabout, the possible practical size of the Aviation Business Park in the year 2020 is predicted to be 137,000 square metres GFA (assuming that the gross floor area is split into 10% office and 90% light industrial).

The proposed Parley Cross junction design with two auxiliary junctions would also be able to accommodate 137,000 square metressquare metres GFA of development. The modelling work undertaken at Blackwater Interchange has also suggested that the highways Option 1 scheme (or a revision thereof) may also be able to accommodate additional development traffic, but the detailed layout may require further consideration and assessment work to determine how much.

If widening of the B3073 corridor to two lanes is possible, then considerably larger amounts of development could be accommodated as link capacity becomes the more critical element. If the section of the B3073 corridor between the new proposed Hurn Roundabout and the airport entrance was widened to two lanes, this could enable a development of up to 208,000 square metressquare metres GFA.

Successive widening, including the difficult built-up section between Parley Cross and Chapel Gate could enable as much as 442,000 square metres GFA of development, although this quantum of development might not be able to be accommodated at the Parley Cross junction.

If replacement signals were provided at the Chapel Gate junction instead of a roundabout, it is anticipated that they would be able to reasonably cope with up to 208,000 square metres GFA of development.

The modelling has demonstrated that the proposed Parley Cross junction design would also be able to accommodate the expected traffic generated from the proposed Area 3 &4 West Parley housing developments in both the 2020 AM and PM peak periods

7.2 Conclusions

Dependant on the widening of the B3073 Corridor and the provision of larger replacement junctions, various levels of development at the Aviation Business Park are possible. With new junctions, 137,000 square metres GFA of development is possible, which is predicted to be sufficient for the next 25 years. With the widening of the B3073 to dual carriageway along its length, 442,000 square metres GFA may be possible.

A new design for the Parley Cross junction has been shown to work in the 2020 AM and PM peak hours, assuming 137,000 square metres GFA of development at the Aviation Business Park or the proposed Area 3 &4 West Parley housing developments .

However, notwithstanding the above and according to Drivers Jonas, the likely greatest demand for new office and light industrial accommodation at the Aviation Business Park over the next 25 years is likely to be 110,000 square metres GFA. Therefore, based on the modelling work undertaken in this report, it is reasonable to conclude that the provision of a series of new and upgraded junctions on the B3073 corridor would be sufficient to accommodate the demand from development.

Appendix A – TRICS Reports

Appendix B – Chapel Gate LinSig Results

Appendix C – Parley Cross LinSig Results

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