Isle of Wight Council

Isle of Wight Junction Assessment and Design

Junction Feasibility Study – Lake Hill / The Fairway

A090129-99

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Contact Information

WYG Environment Planning Transport Ltd

11th Floor, 1 Angel Court
London
United Kingdom
EC2R 7HJ

+44 (0)20 7250 7500
london@wyg.com
www.wyg.com

Registered in England & Wales Number 3050297
Registered office: Arndale Court, Headingley, Leeds, LS6 2UJ

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Limitations

Contents

Tables

Figures

Appendices

1 Introduction

General

1.1 WYG have been appointed by the Isle of Wight (IOW) Council to undertake a feasibility study for a series of highway junctions located throughout the island, with a particular focus on the towns of Newport, Ryde, Shanklin and Sandown. The study has been carried out to identify traffic management issues impacting on all road users and develop proposals that will form part of a package of schemes to be progressed as part of the Council's Local Implementation Plan (LIP) process.

1.2 IOW Council has identified 15 highway junctions which currently experience traffic issues such as congestion and queuing. The study considers where the main issues lie in relation to traffic movement, road safety, bus operation, pedestrian and cycle provision, public realm, parking provision and servicing. Each of the 15 highway junctions are to be supplemented by a feasibility study report, with traffic modelling software used to test the various proposals in order to identify a range of measures aimed at improving the behaviour and movement of traffic at each junction.

1.3 The 15 key junctions identified are summarised in **Table 1.1** below:

Table 1.1 List of Junctions

ID Num	Junction Name	Area	Junction Type
1	St Mary's Roundabout	Newport	4 arm Roundabout
2	Coppins Bridge Gyratory	Newport	Gyratory
3	Hunnyhill/Hunnycross Way	Newport	Signalised Crossroads
4	Hunnycross Way/Riverway	Newport	3x Roundabouts
5	Medina Way/Coppins Bridge Roundabout	Newport	Gyratory
6	Queens Road/West Street	Ryde	5 arm Signalised Jct
7	Argyll St/West St	Ryde	Signalised Crossroads
8	Binstead Road/Pellhurst Road	Ryde	3 arm Signalised Jct
9	Quarr Hill/Newnham Road	Ryde	4 arm Roundabout
10	Marlborough Road/Great Preston Road	Ryde	Signalised Crossroads
11	High Street/Victoria Avenue, Shanklin	Shanklin	3 arm Signalised Jct
12	Newport Road/Industrial Way	Shanklin	4 arm Roundabout
13	Newport Road/Sandown Road	Shanklin	3 arm Signalised Jct
14	Lake Hill/The Fairway	Shanklin	Triangular 3x Priority Jcts
15	Morton Common/Perowne Way	Sandown	3 arm Signalised Jct

Site Location & Background

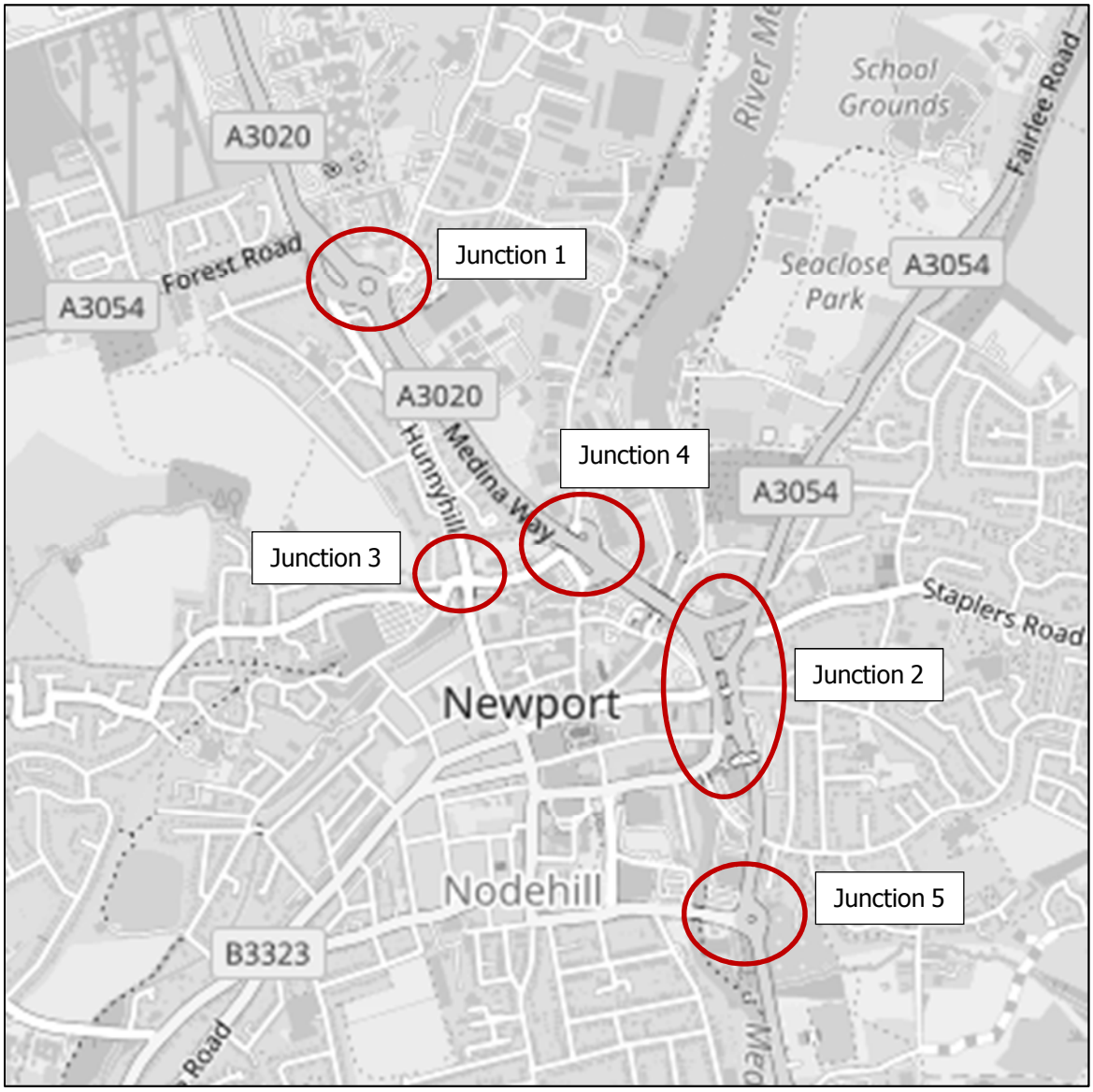
1.4 The Isle of Wight is an island located in the English Channel, approximately 6km off the Hampshire coast. The towns of Newport, Ryde, Shanklin and Sandown comprise the project study area for this feasibility study.

1.5 The town of Newport is the largest town on the IOW and is located in the centre of the island, the town of Ryde is located approximately 10km to the east of Newport, on the north-eastern coast of the island whilst Shanklin and Sandown are located approximately 9km to the south of Ryde and 10km to the south east of Newport.

1.6 The IOW as a whole is characterised by high car ownership levels, with 77.5% of households on the island owning a car or van, as indicated by the 2011 Census. Thus, the private vehicle remains the most convenient and fastest way to travel around the island.

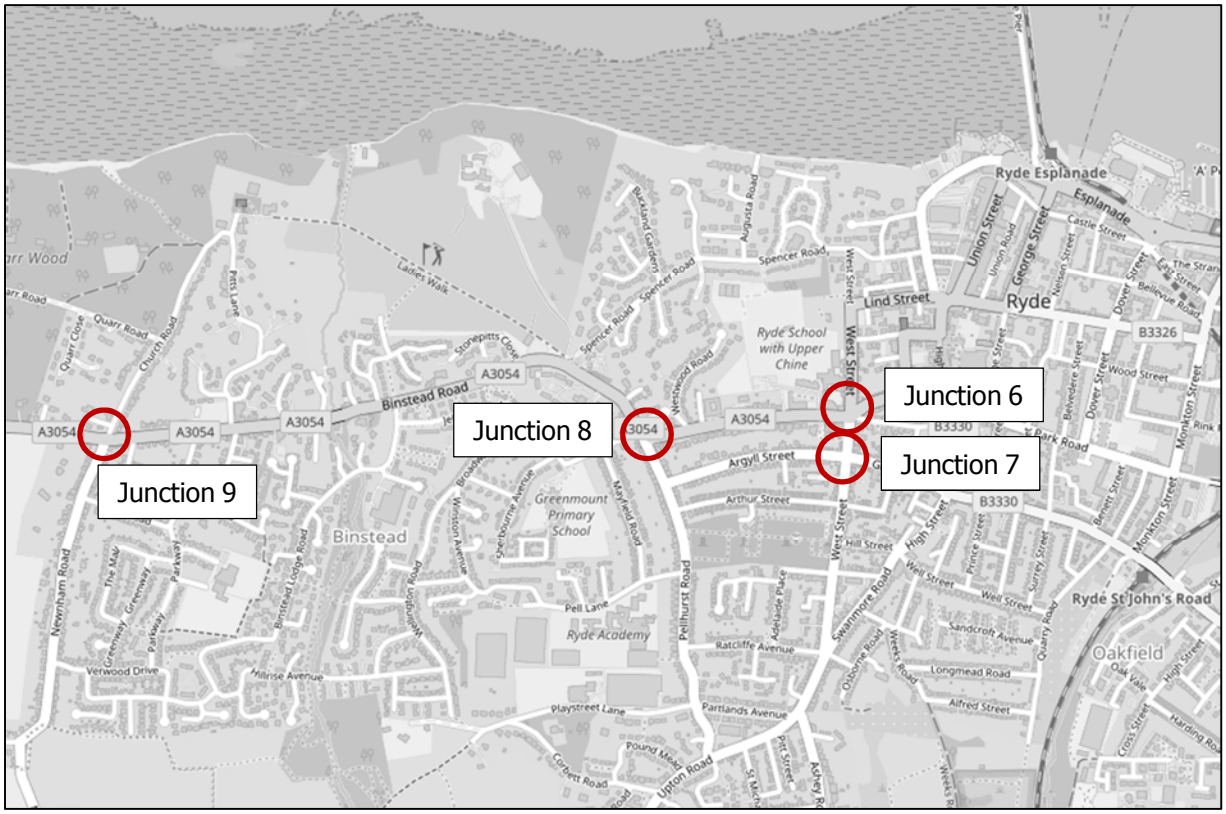
1.7 **Figures 1.1 – 1.3** presents the locations of all 15 junctions within Newport, Ryde and Shanklin & Sandown as listed in Table 1.1, which comprise the feasibility study area.

Figure 1.1 Feasibility Study Area – Newport Junctions



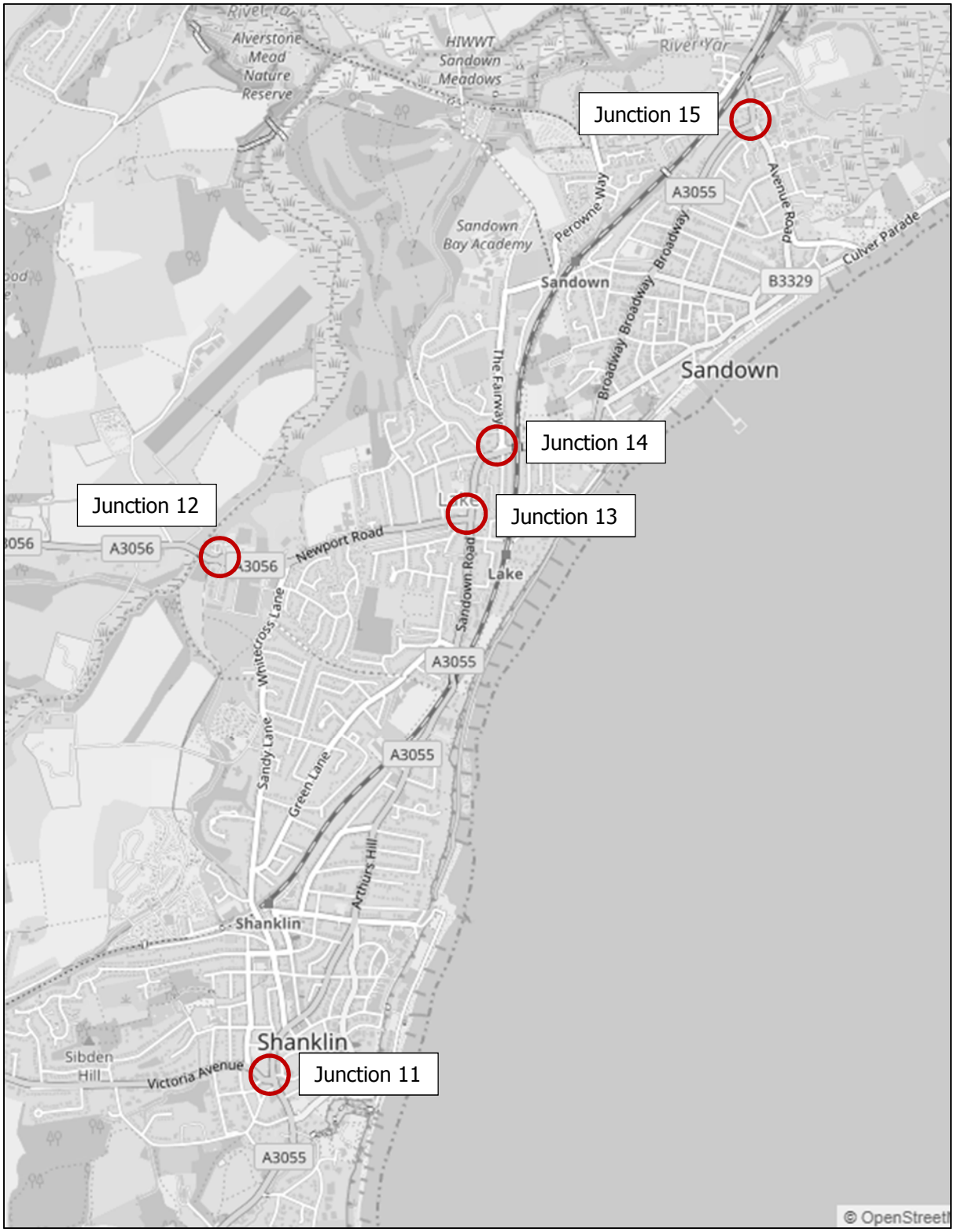
Source: OpenStreetMap with WYG Annotations, September 2017

Figure 1.2 Feasibility Study Area – Ryde Junctions



Source: OpenStreetMap, September 2017

Figure 1.3 Feasibility Study Area – Sandown & Shanklin Junctions



Source: OpenStreetMap, September 2017

1.8 Each of the 15 junctions are to be addressed within an individual feasibility study report. This report focuses on Junction 14, the highway junction of Lake Hill / The Fairway comprising a triangular priority junction. **Figure 1.4** presents a site location plan of the priority junction.

Figure 1.4 Junction Location Plan

Source: Google Image, August 2017

Scope/Purpose of Study

1.9 The purpose of the study is to identify, through the use of traffic modelling software, where the main issues lie in terms of capacity, congestion and queuing at the junction; the traffic modelling will inform the type of highway improvements and design required at each junction.

Report Structure

1.10 The remainder of this document is structured as follows:

- **Chapter 2: Existing Conditions –** summarising the existing conditions at the junction, providing background to the junction, local highway network and detailing the current traffic issues experienced at the junction;
- **Chapter 3: Modelling Methodology -** setting-out details of tasks undertaken to build traffic models of the study area using specialist software, including results of option testing for the junction of interest;
- **Chapter 4: Summary and Conclusions -** summarising the feasibility study process and outlining the key findings of the assessment.

1.11 All Appendices are included at the end of this report for information.

2 Existing Conditions

General

2.1 This chapter establishes the existing, or 'baseline', highway conditions which currently prevail in the area surrounding the junction. It describes the existing local highway network and any traffic issues present at the junction.

2.2 Baseline studies have been informed by detailed site visits and desk-based research carried out between August and September 2017.

2.3 This report focuses on the highway junction of Lake Hill / The Fairway comprising a triangular priority junction in Sandown.

Data Collection

2.4 Traffic flow surveys were undertaken by MHC Traffic Ltd on Thursday 20th July 2017 to establish the baseline traffic conditions for the local highway network on the IOW. A range of surveys were undertaken including:

- Manual Classified Counts (MCC) for turning flow information at 15 key junctions on the IOW;
- Automatic Traffic Counts (ATCs) were placed at strategic locations on the network allowing the speeds to be obtained at each of these junctions;
- Queue length surveys at stop lines of all 15 junctions; and
- Traffic video surveys at each of the 15 junctions.

2.5 The surveys allowed for the identification of turning movements at all key junctions as well as routing within the IOW. Signal timing data was additionally supplied by the IOW Council for use for the correct modelling of signal timing data.

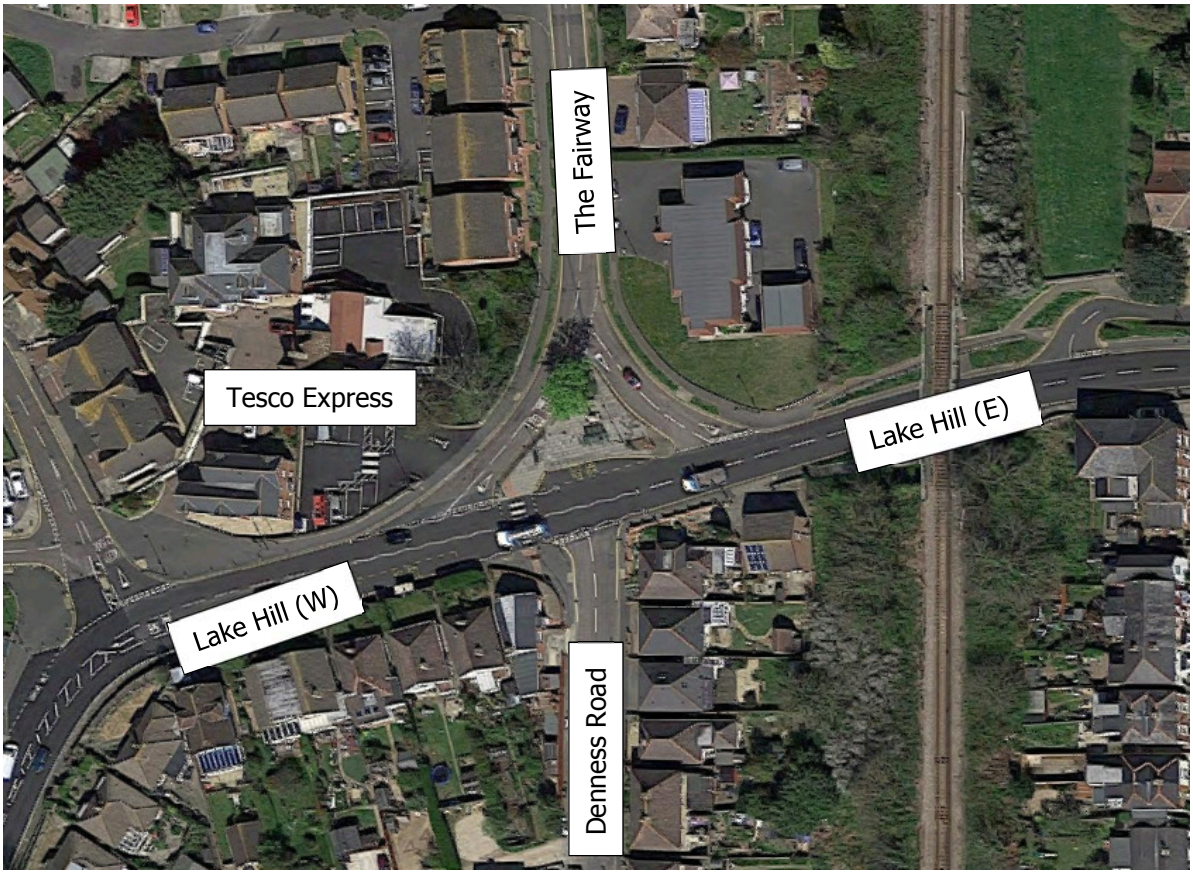
2.6 The data collected as part of the surveys was used directly for calibrating and validating the base scenario for both the Junctions 9 and LinSig models. Video footage of the surveyed junctions was additionally reviewed to ensure that the base models reflect the on-street road conditions as closely as possible.

Study Area/Junction Background

2.7 The Lake Hill / The Fairway triangular priority junction is located in Sandown, approximately 900m to the south west of Sandown town centre. The Fairway forms the two northern arms, whilst Lake Hill forms the eastern and western arms. Denness Road, a residential cul-de-sac, lies to the south of the junction.

2.8 The junction provides access to Tesco Express to the west of the junction, residential streets and the Sandown Bay Academy to the north, Sandown town centre to the east and the towns of Lake and Shanklin to the southwest. A location plan of the junction is provided in **Figure 2.1**.

Figure 2.1 Junction Location Plan



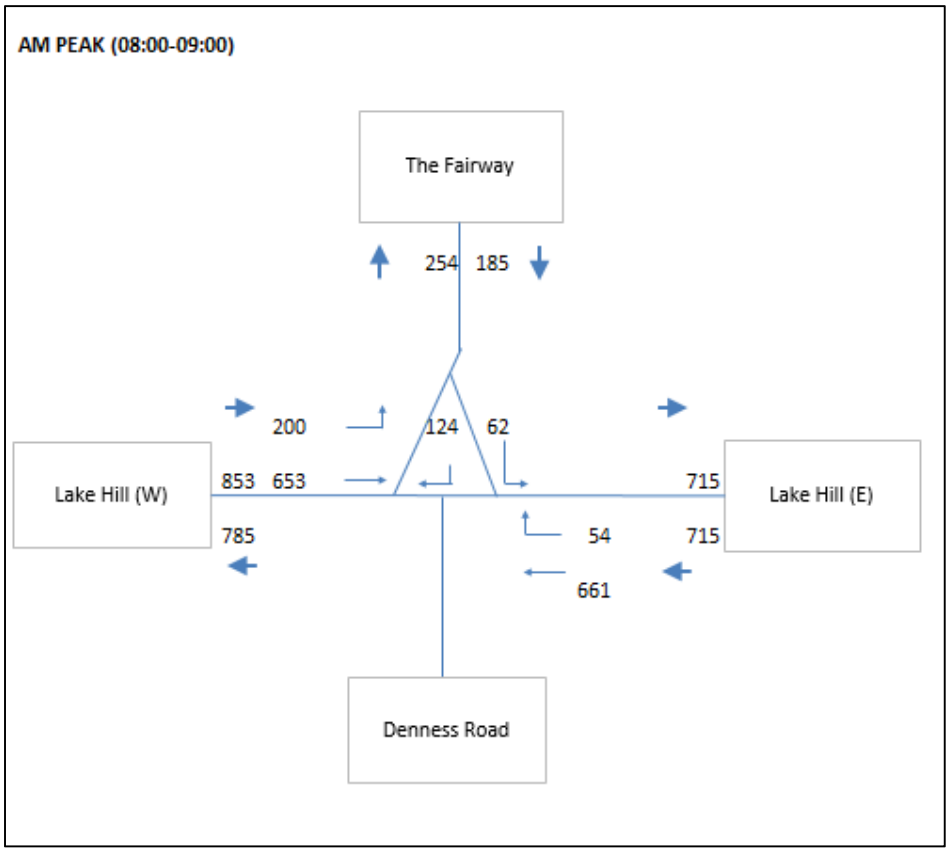
Source: Google Image, August 2017

2.9 The existing junction layout means all turning movements are permitted at each arm of the junction. The north-eastern arm (The Fairway) acts as a shortcut for traffic travelling from Lake Hill (E) turning right to The Fairway and vice versa. The north-western arm adjacent to Tesco Express (The Fairway) provides the quickest route for traffic turning right onto Lake Hill (W) from The Fairway.

Base Traffic Flows

2.10 This section details the current traffic flows and queuing at the junction, as recorded by the survey data. These are shown in **Figures 2.2** and **2.3**.

Figure 2.2 AM Traffic Flows (PCUs)



2.11 As shown in Figure 2.2, the eastbound flow in the AM Peak (08:00-09:00) was recorded as 653 PCUs. The flows are likely to be associated with those commuting to Sandown town centre for work.

2.12 Westbound traffic is comparable, with 661 PCUs recorded travelling from Lake Hill (E) to Lake Hill (W). Lake Hill (W) provides the quickest route for traffic travelling to Shanklin and further afield to the Newport, along the A3056. Thus, it can be assumed that the majority of this traffic is likely to be associated with the morning commute.

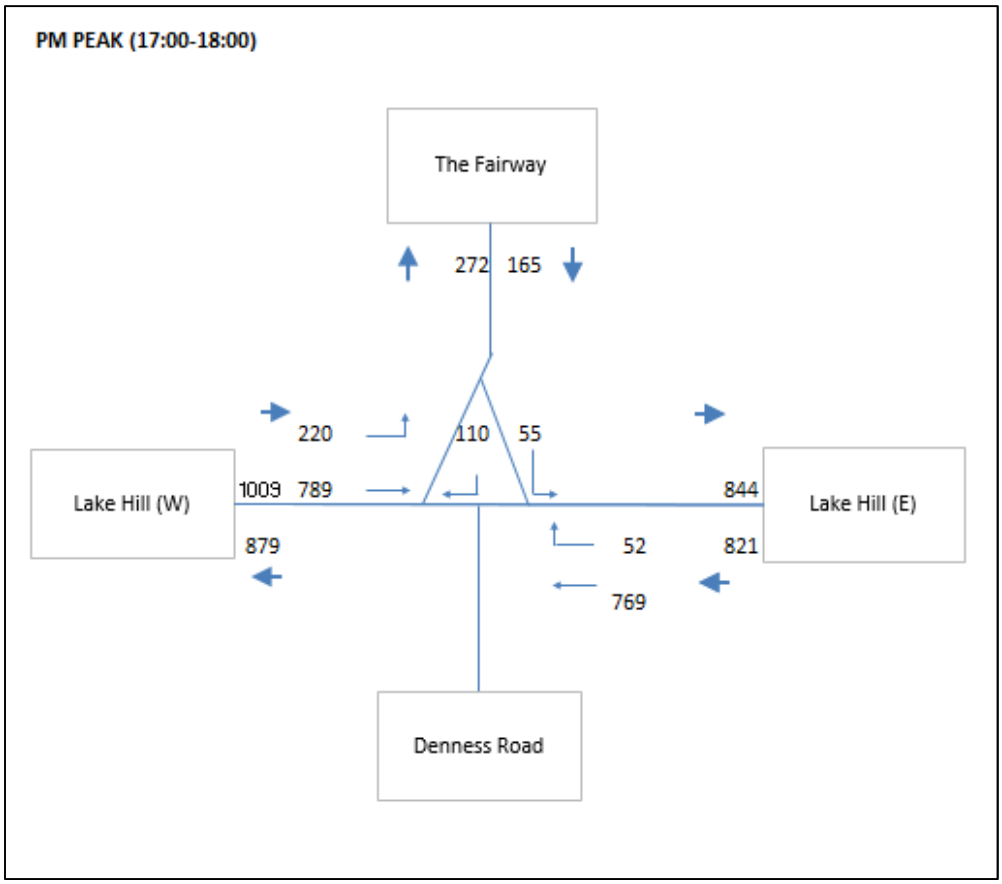
2.13 From Lake Hill (W) to the Fairway; there were 200 PCUs recorded undertaking this movement and 124 PCUs recorded travelling in the opposite direction. The Sandown Bay Academy is located approximately 800m to the north of the junction along The Fairway. It is anticipated that a significant proportion of this traffic in the AM peak hour is associated with the school drop-off at the Academy, as well as some traffic travelling to the adjacent Fairway Sports Complex.

2.14 From Lake Hill (E) to The Fairway, there were 54 PCUs recorded undertaking this movement, and 62 PCUs travelling the opposite direction.

2.15 The most significant queuing occurs on The Fairway (north-western arm). The maximum observed queue recorded on The Fairway was five vehicles. Queuing was not observed to be an issue on the other arms at the junction during the AM Peak.

2.16 **Figure 2.3** below shows the traffic flows for the PM Peak (17:00-18:00).

Figure 2.3 PM Traffic Flows (PCUs)



2.17 As shown in Figure 2.3, the highest traffic flows are those travelling eastbound in the PM Peak (17:00-18:00), with 789 PCUs undertaking this movement. However, traffic travelling westbound is comparable, with 769 PCUs recorded. Again, as seen during the AM Peak, there are also a relatively number of left-turners from Lake Hill (W) to The Fairway, with 220 PCUs recorded and 110 PCUs travelling in the opposite direction. Similar numbers of PCUs as seen in the AM Peak were recorded during the PM Peak, travelling to and from Lake Hill (E) and The Fairway, with 52 PCUs recorded from Lake Hill (E) and 55 PCUs travelling in the opposite direction.

2.18 As seen in the AM Peak, the majority of queuing occurs on The Fairway (north-western arm), with a maximum observed queue of six vehicles recorded during the PM Peak. Queuing was not observed to be an issue on the other arms at the junction during the PM Peak.

Local Highway Network

Lake Hill

2.19 Lake Hill is a two-way single carriageway road and forms a main road between Sandown and Shanklin. Lake Hill is the priority arm at the junction and is subject to a 30mph speed limit in the vicinity of the junction. A zebra crossing with dropped kerbs and tactile paving is provided across the carriageway, in the centre of junction with The Fairway. A bus stop is located on the northern side of the carriageway, which can be accessed via the zebra crossing. Footways are provided on both sides of the carriageway.

The Fairway

2.20 The Fairway is a two-way single carriageway road and is mostly residential in nature. The road provides access to the Sandown Bay Academy, The Fairway Sports Complex as well as a route to the villages of Alverstone and Brading. There are footways on either side of the carriageway and it is subject to a 30mph speed restriction.

Existing Traffic Issues

2.21 At present, the junction is known to experience congestion and queuing, which has been observed during site visits and traffic video surveys at the junction. It was observed that congestion and queuing is particularly evident on The Fairway (north-western arm).

The Fairway

2.22 The Fairway forms both the north-eastern and north-western arms of the triangular priority junction. On the north-western arm, there is a high number of vehicles turning right from The Fairway to Lake Hill (W). This arm currently comprises a single lane of traffic on the approach to the junction.

2.23 It has been observed from the video footage that during both the AM (08:00-09:00) and PM (17:00-18:00) Peaks, queuing is common on The Fairway (north-western arm). Due to the high traffic flows experienced on Lake Hill (eastbound and westbound), vehicles wanting to turn right from The Fairway and travel westbound (to Lake Hill W) struggle to find a sufficient gap in order to merge onto Lake Hill (W). Delays of over a minute have been observed on this arm.

Lake Hill

2.24 Lake Hill forms the priority arm of the junction. The bus stop located on the northern side of the carriageway, in the centre of the junction causes restricted visibility for traffic wanting to right from The Fairway to Lake Hill (W).

2.25 From the video footage it has been noted that when a bus is stationary within the bus stop, positioned immediately to the east of The Fairway, the bus blocks visibility to the east. As a result, when a vehicle is waiting at the give-way line, it is unable to see on-coming westbound traffic and therefore results in a delay until the bus has moved on.

Utilities Assessment

2.26 A utilities assessment has been carried out at the junction as an indication of which utilities are present within the vicinity of the junction. The following utilities which may be affected by improvements at the junction are listed below:

- Environment Agency
- Isle of Wight Council
- LinesearchbeforeUdig
- Network Rail
- Openreach – (British Telecommunications)
- Scottish and Southern Electricity
- SGN – Southern Gas Networks
- Southern Water

3 Modelling Methodology

Introduction

3.1 Traffic modelling has been undertaken as part of the feasibility study, identifying how the local highway network operates and how it might operate following the proposed improvements to the junction. Junctions 9 is the latest version of TRL's industry-standard software for modelling priority junctions, and has therefore been used for modelling this junction.

3.2 The modelling has been undertaken for two weekday periods determined to be the network peaks in terms of traffic volumes, with the AM peak between 08:00 and 09:00 and the PM peak between 17:00 and 18:00. These peaks were identified through analysis of traffic count data. Initially, Base Year modelling was using survey data collected in July 2017. Future Year modelling was subsequently carried out in order to test the proposed changes to the network and assess the scale of impact on road traffic.

Explanation of Results

3.3 Junction capacity results are usually expressed in terms of 'Ratio of Flow to Capacity' (RFC) for priority junctions. An existing junction is considered to have reached its theoretical capacity when it has an RFC of 1.00 or greater, however most highways authorities will usually expect an applicant to be able to achieve an RFC of less than 0.85, as a value above either of this figure is considered too close to the theoretical capacity for the junction to perform satisfactorily. Where junction improvements or a new junction are proposed, applicants should aim to achieve results of significantly less than 0.85 RFC.

3.4 Queue lengths at junction approaches are usually expressed in terms of 'Passenger Car Equivalent' (PCE) or 'Passenger Car Unit' (PCU). A standard car typically has a PCE/PCU value of 1.0; larger vehicles, such as goods vehicles, typically have PCE/PCU values greater than 1.0 and smaller vehicles, such as motorcycles, typically have PCE/PCU values less than 1.0.

Base Year Modelling

3.5 Data collected as part of the surveys was compared to the base year outputs to calibrate modelled flows and queue patterns to those observed, within acceptable variations. The results for the Lake Hill / The Fairway triangular priority junction are summarised in **Table 3.1**, with full output results included in **Appendix B**.

Junction 9 Results – 2017 Base Year

Table 3.1 2017 Base Year Junction Assessment

Approach	2017 Base Year Assessment			
	AM Peak (08:00-09:00)		PM Peak (17:00-18:00)	
	RFC	Queue (PCU)	RFC	Queue (PCU)
Stream B-ACD (Denness Rd)	0.05	0.1	0.04	0.0
Stream AB-CD (Lake Hill - E)	0.03	0.0	0.04	0.0
Stream D-ABC (The Fairway)	0.51	1.0	**0.57**	**1.3**
Stream CD-AB (Lake Hill – W)	0.01	0.0	0.01	0.0

3.6 The Base Year results as shown in Table 3.1, indicate that the junction operates within recommended capacity during the AM and PM Peaks. However, it is shown that particularly The Fairway arm, which is known to experience issues, has a recorded RFC of 0.57. Although maximum observed queues of 5 vehicles during the AM Peak and 6 vehicles during the PM Peak were recorded in the queuing survey, the model registered average queues of 1.3 PCU on this arm, as shown in **Table 3.1**. This is in range with data recorded in the queuing survey, which shows average queues of 2-3 vehicles during the AM and PM Peak periods.

3.7 The existing junction has been tested in the 2034 Future Year assessment to provide a comparison with the proposed junction design options, which have been tested in the following section. The Future Year assessment results for the existing junction are shown in **Table 3.2** below.

Table 3.2 2034 Future Year Junction Assessment

Approach	2034 Base Year Assessment			
	AM Peak (08:00-09:00)		PM Peak (17:00-18:00)	
	RFC	Queue (PCU)	RFC	Queue (PCU)
Stream B-ACD (Denness Rd)	0.07	0.1	0.07	0.0
Stream AB-CD (Lake Hill - E)	0.04	0.0	0.05	0.0
Stream D-ABC (The Fairway)	0.80	3.3	1.04	9.7
Stream CD-AB (Lake Hill – W)	0.01	0.0	0.02	0.0

3.8 The Future Year results indicate that the existing junction would operate over maximum capacity in the PM Peak, with an RFC of 1.04 and queues of 10 PCUs. The junction would effectively remain within capacity in the AM Peak.

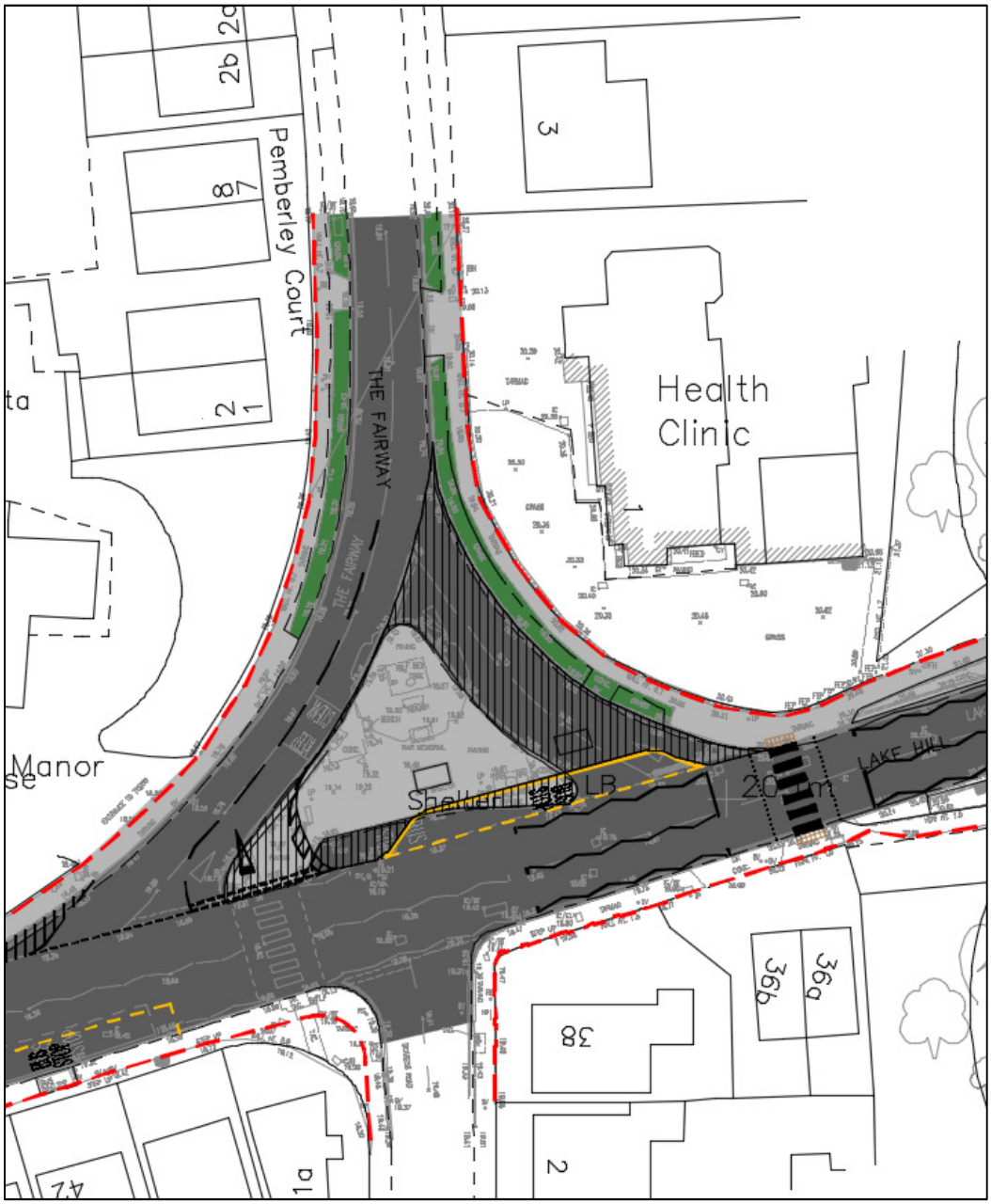
Proposed Scheme Options

Option 1

3.9 The first proposed scheme, Option 1 includes pedestrianising the north-eastern arm which is presently used as a cut-through for right turners from Lake Hill (E) to the Fairway and left-turners in the opposite direction. The north-western arm is to be widened allowing for two vehicles to be accommodated at the give-way line.

3.10 The existing bus stop and pedestrian zebra crossing would be moved further east as part of the proposals. The proposed scheme is to be focused on improving the public realm for pedestrians and bus users. This scheme is shown in **Figure 3.1** below, with the 1:250 drawing is included at **Appendix A**.

Figure 3.1 Proposed Junction Layout – Option 1



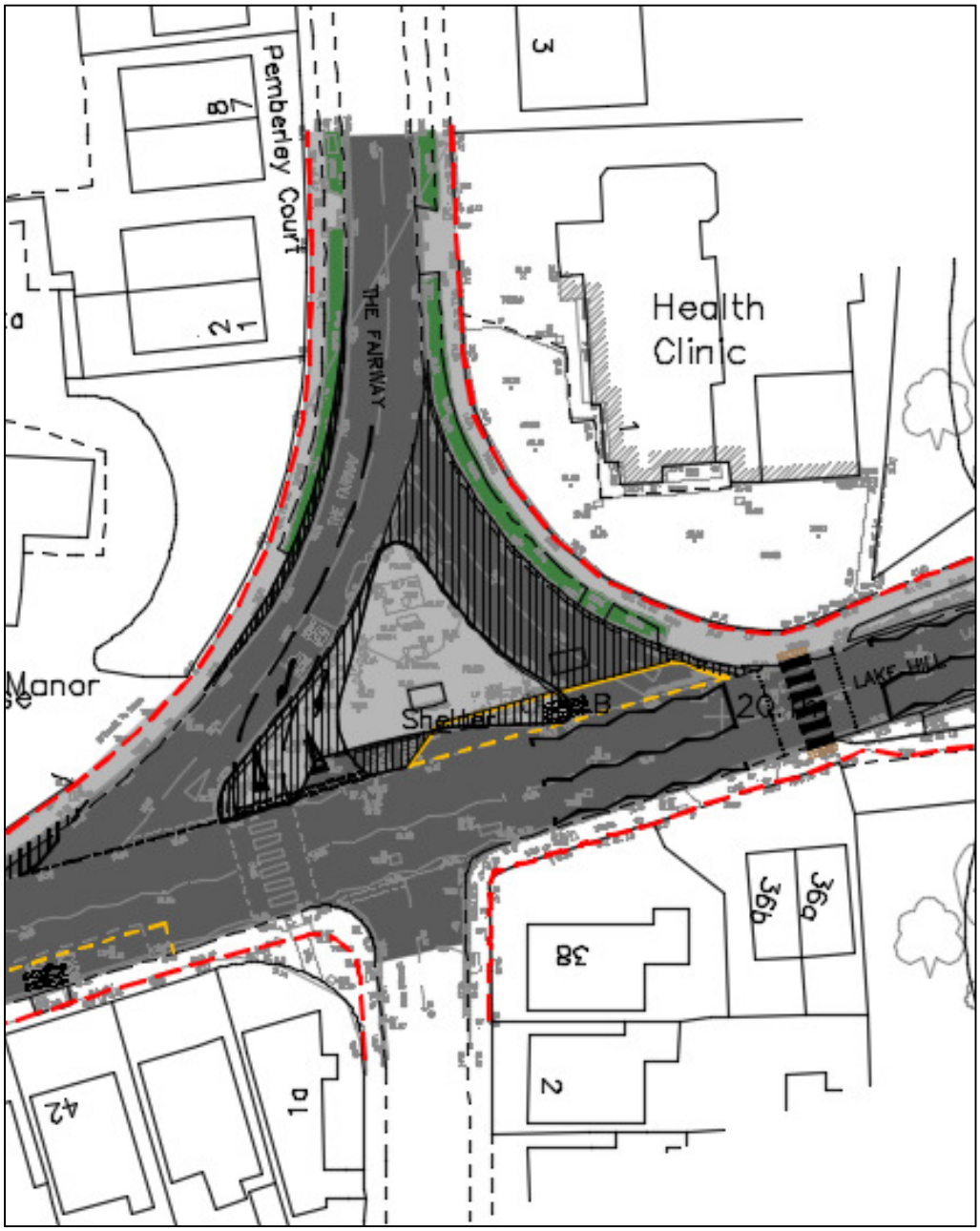
Source: WYG Drawing A90129-99-003

3.11 As part of the scheme, the left and right-turners using the north-eastern arm (The Fairway) are to be reassigned to the north-western arm which would form the sole arm for The Fairway. This scheme has been tested as part of the traffic modelling. Visibility splays of 2.4 x 43m are achievable in both directions.

Option 2

3.12 The second proposed scheme, Option 2 includes widening The Fairway along the length of the arm in order to accommodate a traffic lane for left-turners. The location of the bus stop and the zebra crossing remains consistent with the Option 1 proposals. It is anticipated that these proposals would reduce queuing on The Fairway arm. This scheme has been tested as part of the traffic modelling. This scheme is shown in **Figure 3.2** below, with the 1:250 drawing included in **Appendix A**.

Figure 3.2 Proposed Junction Layout – Option 2

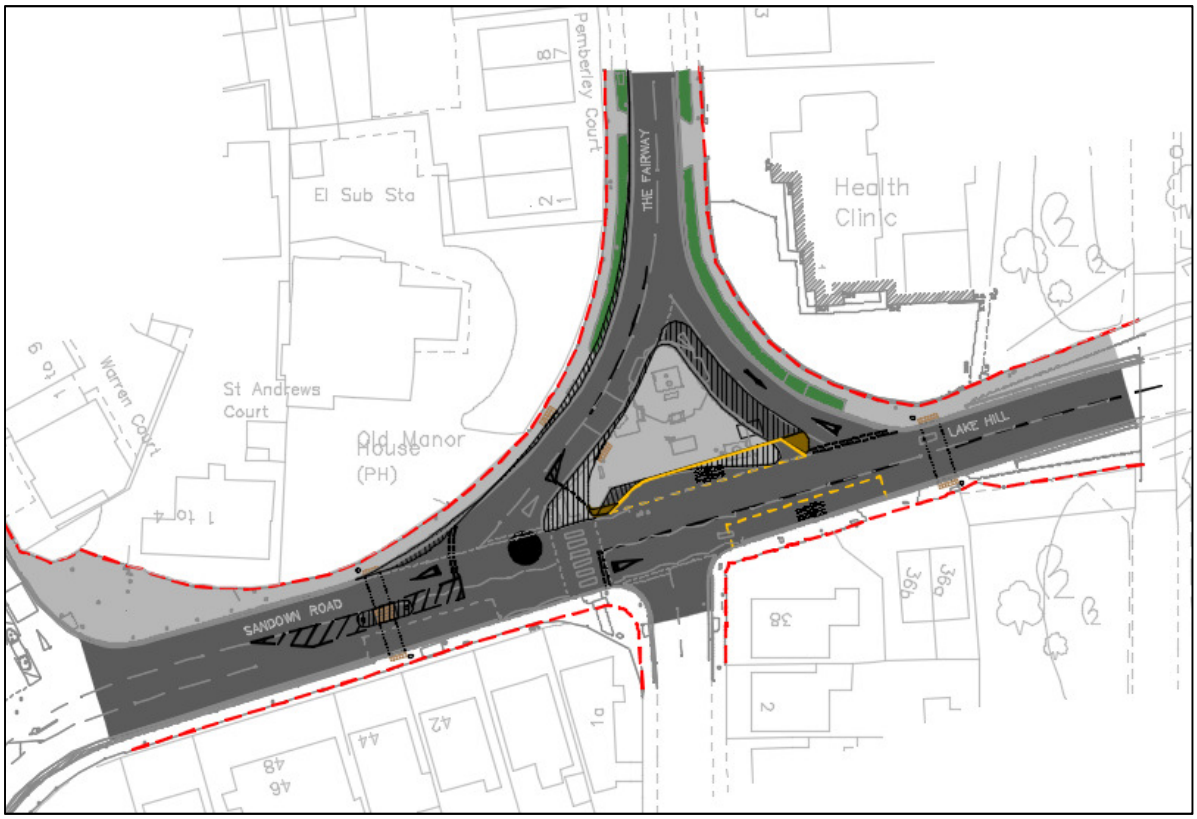


Source: WYG A090129-99-003

Option 3

3.13 The third proposed scheme, Option 3 includes a mini-roundabout to replace the existing priority junction at The Fairway / Lake Hill / Sandown Road, whilst the eastern Fairway arm is to be reduced to one lane, as a left-turn southbound only to provide a public realm improvement at the centre of the junction. It is anticipated that this would allow traffic to flow more efficiently through the junction, in particular, from The Fairway onto Lake Hill. This scheme has been tested as part of the traffic modelling. This scheme is shown in **Figure 3.3** below, with the 1:250 drawing included in **Appendix A**.

Figure 3.3 Proposed Junction Layout – Option 3

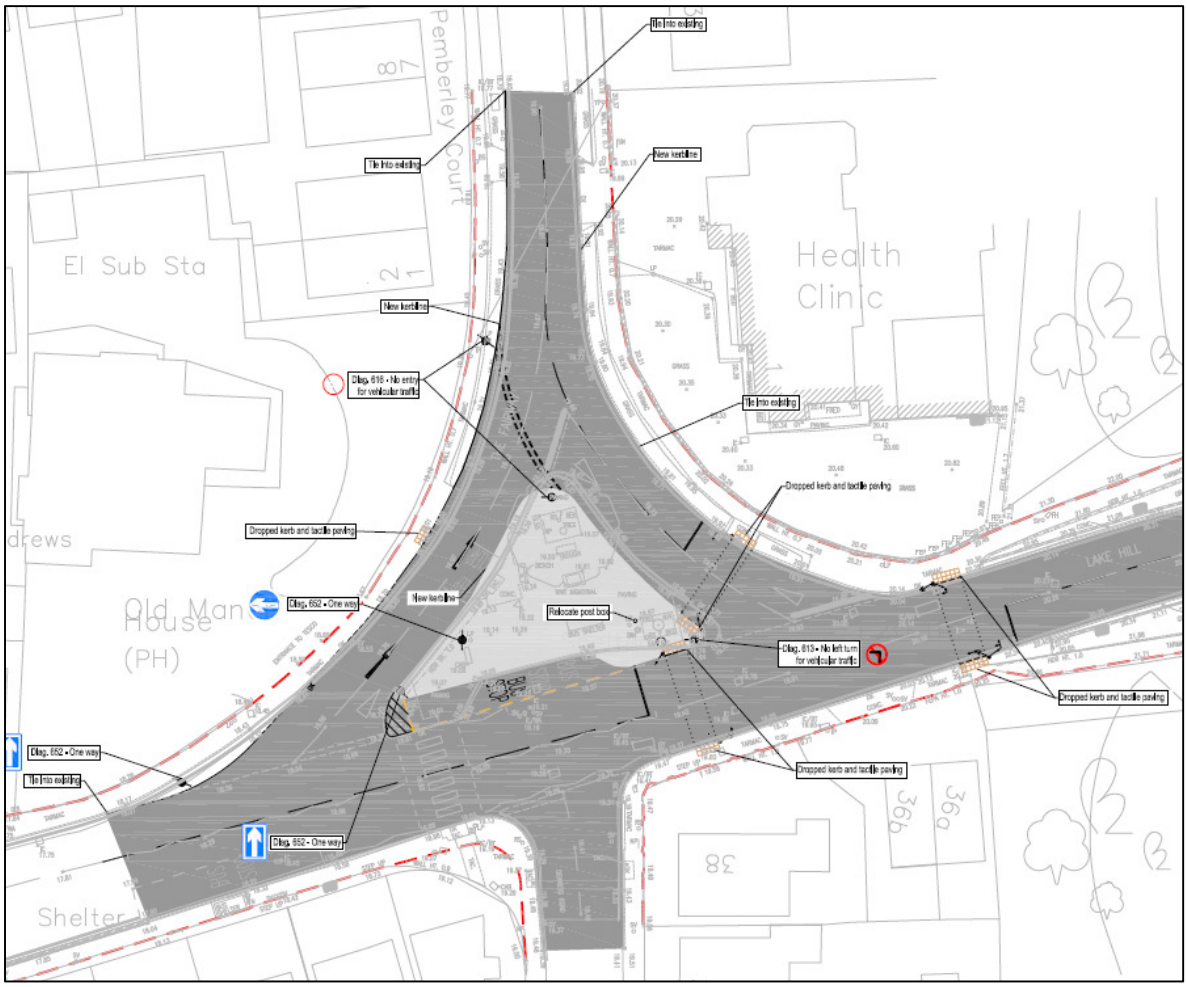


Source: WYG A090129-99-003

Option 4 – Signalised Junction

3.14 The fourth proposed scheme, Option 4 includes a signalised junction at the eastern Fairway arm, which will act as the minor arm, whilst the western Fairway arm is to become a slip road for left-turning traffic from Lake Hill (west). Traffic will be able to turn left and right (east and west) from the minor arm, and three signalised pedestrian crossings are to be introduced across the arms of the junction, improving pedestrian safety at the junction. It is anticipated that by implementing a signalised junction, this will vastly improve capacity and queueing on the Fairway arm by allowing vehicles to travel onto Lake Hill within a designated green time, thus making the junction more efficient. This scheme has been tested as part of the traffic modelling. This scheme is shown in **Figure 3.4** below, with the 1:250 drawing included in **Appendix A**.

Figure 3.4 Proposed Junction Layout – Option 4



Source: WYG A090129-99-014

Forecast/Future Year Modelling

3.15 Forecast or Future Year modelling was undertaken using the proposed highway design for the junction to ascertain the effectiveness and feasibility of the proposed scheme options outlined in **Section 3**. The three proposed junction designs have been tested in both the Base and Future Years as to offer a comparison with the existing junction. The results which take into account the proposed junction designs are summarised in **Tables 3.3-3.10**, with full output results included in **Appendix B**.

PICADY Results – Future Year/Proposals

Option 1 – Modelling Results

Table 3.3 2017 Base Year: Option 1

Approach	2017 Base Year Assessment			
	AM Peak (08:00-09:00)		PM Peak (17:00-18:00)	
	RFC	Queue (PCU)	RFC	Queue (PCU)
Stream B-ACD (Denness Rd)	0.05	0.1	0.05	0.0
Stream AB-CD (Lake Hill - E)	0.17	0.3	0.19	0.3
Stream D-AB (The Fairway)	0.17	0.2	0.19	0.2
Stream D-ABC (The Fairway)	0.51	1.0	0.59	1.4
Stream CD-AB (Lake Hill – W)	0.01	0.0	0.01	0.0

3.16 The Option 1 proposals indicate that the junction is expected to operate within recommended capacity, with a marginal decrease in capacity in comparison to the existing junction.

Table 3.4 2034 Future Year: Option 1

Approach	2034 Future Year Assessment			
	AM Peak (08:00-09:00)		PM Peak (17:00-18:00)	
	RFC	Queue (PCU)	RFC	Queue (PCU)
Stream B-ACD (Denness Rd)	0.08	0.1	0.07	0.1
Stream AB-CD (Lake Hill - E)	0.23	0.4	0.26	0.6
Stream D-AB (The Fairway)	0.69	1.8	1.21	8.9
Stream D-ABC (The Fairway)	0.88	4.7	1.19	15.7
Stream CD-AB (Lake Hill – W)	0.01	0.0	0.02	0.0

3.17 The Future Year assessment indicates that the Option 1 proposals are expected to operate over capacity on The Fairway arm in the AM and PM Peak. An RFC of 0.88 is recorded on this arm in the AM Peak, whilst this is recorded as 0.88 in the AM Peak. Thus, this demonstrates that the Option 1 proposals provide no additional benefit in comparison to the existing junction.

Option 2 – Modelling Results

Table 3.5 2017 Base Year: Option 2

Approach	2017 Base Year Assessment			
	AM Peak (08:00-09:00)		PM Peak (17:00-18:00)	
	RFC	Queue (PCU)	RFC	Queue (PCU)
Stream B-ACD (Denness Rd)	0.05	0.1	0.05	0.0
Stream AB-CD (Lake Hill - E)	0.17	0.3	0.19	0.3
Stream D-AB (The Fairway)	0.17	0.2	0.18	0.2
Stream D-ABC (The Fairway)	0.49	0.9	0.56	1.2
Stream CD-AB (Lake Hill – W)	0.01	0.0	0.01	0.0

3.18 The Option 2 proposals indicate that the junction is expected to operate within recommended capacity, with a slight improvement in capacity compared to the existing junction.

Table 3.6 2034 Future Year: Option 2

Approach	2034 Future Year Assessment			
	AM Peak (08:00-09:00)		PM Peak (17:00-18:00)	
	RFC	Queue (PCU)	RFC	Queue (PCU)
Stream B-ACD (Denness Rd)	0.08	0.1	0.07	0.0
Stream AB-CD (Lake Hill - E)	0.23	0.4	0.26	0.3
Stream D-AB (The Fairway)	0.42	0.7	1.13	7.4
Stream D-ABC (The Fairway)	0.81	3.5	1.12	12.8
Stream CD-AB (Lake Hill – W)	0.01	0.0	0.02	0.0

3.19 The Future Year assessment indicates that the Option 2 proposals are expected to operate over capacity on The Fairway arm in the PM Peak. An RFC of over 1.00 is recorded on this arm in the PM Peak. Thus, this demonstrates that the Option 2 proposals provide little benefit in comparison to the existing junction, performing worse than the existing junction.

Option 3 (Mini-Roundabout) – ARCADY Modelling Results

3.20 Similarly to Options 1 and 2, Option 3 proposals were tested in the Base Year and the Future Year, in order to assess whether the junction would perform better in comparison to the existing junction. The results for the Base Year are shown in **Table 3.7.**

Table 3.7 2017 Base Year: Option 3

Approach	2017 Base Year Assessment			
	AM Peak (08:00-09:00)		PM Peak (17:00-18:00)	
	RFC	Queue (PCU)	RFC	Queue (PCU)
Arm 1 – Lake Hill (East)	0.85	5.4	0.96	105.1
Arm 2 – Lake Hill (West) / Sandown Road	0.89	7.3	1.05	41.8
Arm 3 – The Fairway	0.35	0.5	0.37	0.6

3.21 The Option 3 proposals indicate that a mini-roundabout junction would cause a significant reduction in capacity on the eastern and western arms on Lake Hill, whilst The Fairway arm sees an improvement in capacity compared to the existing junction. While this proposed option does provide additional capacity on The Fairway, it is detrimental to capacity on the main arms (eastern and western arms) on Lake Hill which comprise the main traffic flows. Thus, the results for the Future Year are expected to be much worse, as shown in **Table 3.8**.

Table 3.8 2034 Future Year: Option 3

Approach	2034 Future Year Assessment			
	AM Peak (08:00-09:00)		PM Peak (17:00-18:00)	
	RFC	Queue (PCU)	RFC	Queue (PCU)
Arm 1 – Lake Hill (East)	1.06	41.7	1.20	105.1
Arm 2 – Lake Hill (West) / Sandown Road	1.10	61.8	1.29	188.9
Arm 3 – The Fairway	0.49	0.9	0.45	0.8

3.22 As shown in Table 3.8, in the Future Year, the junction's capacity reduces more so due to the growth in traffic flows at the junction. The Fairway arm (northern arm) is the only arm which remains within capacity, however to the detriment of the eastern and western arms on Lake Hill. Subsequently, it can be concluded that the Option 3 proposals are not feasible in both the Base and Future Years.

Option 4 (Three-arm Signalised Junction) – LinSig Modelling Results

3.23 Similarly to Options 1, 2 and 3, the Option 4 signalised junction proposals were tested in the Base Year and the Future Year, in order to assess whether the junction would perform better in comparison to the existing junction. The results for the Base Year are shown in **Table 3.9.**

Table 3.9 2017 Base Year: Option 4

Arm Cycle time 90 secs (Proposed)	AM peak			PM peak		
	Deg Sat (%)	Mean Max Queue (pcu)	Av. Delay Per PCU (s/pcu)	Deg Sat (%)	Mean Max Queue (pcu)	Av. Delay Per PCU (s/pcu)
1/1 - The Fairway (Left Right)	64.2%	5.2	51.4	70.1%	5.0	61.5
3/1 - Lake Hill (East) (Ahead Right)	64.9%	12.0	14.4	74.6%	15.4	16.6
4/1 - Lake Hill (West) (Ahead)	43.6%	6.7	6.8	50.4%	8.0	6.3
PRC	38.6%			20.7%		
Total Delay (pcu/hr)	6.98			8.24		

3.24 The Option 4 proposals indicate that in the 2017 Base Year, the junction would operate with a PRC of 38.6% in the AM peak and a PRC of 20.7% in the PM peak. Therefore, a signalised junction would operate with good levels of capacity in the Base Year, whilst also moderating queues on The Fairway arm. However, this does assume that the pedestrian phases will not run every cycle, and it is noted that running the pedestrian phases every cycle severely reduces the junction capacity, in both peak periods.

Table 3.10 2034 Future Year: Option 4

Arm Cycle time 90 secs (Proposed)	AM peak			PM peak		
	Deg Sat (%)	Mean Max Queue (pcu)	Av. Delay Per PCU (s/pcu)	Deg Sat (%)	Mean Max Queue (pcu)	Av. Delay Per PCU (s/pcu)
1/1 - The Fairway (Left Right)	84.0%	7.9	73.7	101.0%	12.7	177.0
3/1 - Lake Hill (East) (Ahead Right)	87.3%	21.5	27.7	101.4%	44.9	88.3
4/1 - Lake Hill (West) (Ahead)	52.6%	8.8	7.3	59.8%	10.1	6.6
PRC	3.1%			-12.7%		
Total Delay (pcu/hr)	13.31			36.49		

3.25 As shown in Table 3.10, the signalised junction would operate within capacity during the AM peak in the 2034 Future Year, with a PRC of 3.1% in the AM peak, whilst the PM peak would operate over capacity with a PRC of -12.7%. It has also been shown that queuing is more severe on The Fairway arm in comparison to the existing junction, queueing would also become an issue on the Lake Hill eastern and western arms. As a result, it can be considered that implementing a signalised junction layout provides immediate benefits in current conditions (without pedestrian phases running every cycle), however, unfortunately the same benefits are not replicated in the Future Year.

Outcome / Conclusions

3.26 The outcome of the modelling results demonstrates that Options 1, 2 and 3 for the existing triangular priority junction, provide little or no benefit in terms of capacity and ultimately result in a reduction in capacity, in particular Options 1 and 3, in comparison with the existing junction.

3.27 The main factor in the reduction in junction capacity, is due to the closure of The Fairway eastern arm, which is used as a slip road for left and right turners, to and from The Fairway. With the removal of this slip road, the left and right turners are reassigned to the western Fairway arm. This reassignment of traffic flows therefore puts more pressure on the remaining Fairway arm. As a result, in order to provide public realm improvements at the junction, this would result in a detrimental impact compared to how the existing junction operates.

3.28 During the Base Year scenario as per the existing junction layout, the north-western arm on The Fairway is the one arm which experiences issues with queuing and has the highest RFC of 0.57. However, as a whole, the junction operates within capacity. With the removal of the north-eastern arm as part of the proposed junction designs (Option 1 and 2), it reduces capacity at the junction but very marginally.

3.29 Despite only having a marginal reduction in capacity in the Base Year, the removal of the north-eastern arm has a much more detrimental impact on capacity in the Future Year 2034. Therefore, it can be concluded that there is little that can be done to improve the junction design, when keeping the layout as a priority junction. A mini-roundabout was tested as a third design option, whilst providing greater capacity for The Fairway arm, this was to the detriment of the eastern and western arms on Lake Hill, comprising the main traffic flows.

3.30 However, the Option 4 proposal, which involves implementing a signalised junction, does provide immediate benefits in current conditions, operating within capacity and moderating queues on The Fairway arm, but this does assume that the pedestrian phases will not run every cycle. It is noted that when the pedestrian phases do run every cycle, junction capacity is severely reduced. Unfortunately, the same benefits seen in current conditions are not replicated in the Future Year, with the junction performing worse in comparison to the existing junction.