



# **Harrogate District Transport Model: Local Plan Testing Phase 2**

Harrogate Borough Council

**Technical Note**

21<sup>st</sup> October 2016



## **HBTM - Phase 2**

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# 1. Introduction

## 1.1 Background

The National Planning Policy Framework (NPPF) requires local authorities to prepare Local Plans to identify planning policies and the most suitable development and infrastructure sites based on the objectives, principles and policies outlined in the framework. Harrogate Borough Council (HBC) is currently preparing a new Local Plan for the District which is scheduled for adoption in Autumn 2018. The Council's Strategic Housing Market Assessment (as updated June 2016) identifies the need to plan for a minimum of 557 dwellings per annum, which equates to 11,697 dwellings over the plan period 2014 to 2035. The Council's Employment Land Review identifies the need for at least 18ha of additional employment land over the same period.

To assist in the development of the Local Plan HBC have commissioned Jacobs to undertake the traffic modelling set out in this report to support the selection of a preferred growth option. This report builds on initial work undertaken to assess the impacts of two high level Local Plan development tests for a 2035 future year scenario by assessing in more detail the infrastructure requirements and transport impacts of three possible Local Plan options.

The methodology used for this report is based on best practice and widely-accepted industry standards to ensure that the analysis undertaken provides a robust evidence base to inform the option developments. For this study details of committed development and three Local Plan options for testing have been provided by HBC with details including the locations and quantum of developments. All assumptions made during this phase of work have been agreed with HBC, NYCC and Highways England.

The modelling set out in this report uses the Harrogate District Transport Model, developed by Jacobs, which represents AM peak (08:00-09:00) and PM peak (16:45-17:45) traffic situation in the 2015 Base year and uses industry standard VISUM software. The 2015 model is fully WebTAG compliant and has been calibrated and validated for the area around Harrogate, Knaresborough and Ripon.

Harrogate District is situated on the edge of the Yorkshire Dales, with the Vale of York to the east and the upland Yorkshire Dales to the west and north-west. The district has three key settlements – Harrogate and Knaresborough within a close proximity of each other and Ripon approximately 15 km to the north. The district is well connected to the strategic road network via the A1(M), with Junction 47 serving Harrogate and Knaresborough and Junctions 49 and 50 serving Ripon. As well as the A1(M) the main strategic roads through the area are the A61, connecting Harrogate to Leeds and Ripon, and the A59, connecting the town to York and Skipton. Harrogate is also connected to Wetherby and the A1, by the A661.

## 1.2 Report Structure

This Technical Note provides a breakdown of the methodology, key assumptions, results and analysis of the three Local Plan options tested in the VISUM model.

This report consists of eight sections including this introduction. The remainder of this Technical Note is summarised as follows:

- **Section 2** provides a background description of the model;
- **Section 3** summarises the initial piece of high level modelling that analyses network performance under forecast conditions for a Do Minimum scenario and two high level development tests in 2035;
- **Section 4** sets out the committed development and Local Plan options which have been considered in this report;
- **Section 5** sets out the methodology and assumptions that have been used in the modelling;
- **Section 6** details an analysis of the forecasting results;
- **Section 7** covers the proposed junction mitigation measures; and
- **Section 8** outlines a summary to the report findings and conclusions.

## 2. Harrogate Borough Transport Model

The initial Phase 1 of this study was the development of the Harrogate District Transport Model which was commissioned by North Yorkshire County Council (NYCC), the Local Highway Authority, and HBC for the main purpose of testing future land-use options for the Local Plan. The model was developed using VISUM transport modelling software and represents accurate traffic movements in the detailed model area for both the AM peak (08:00-09:00) and PM peak (16:45 to 17:45) time periods for the 2015 Base year for the following five user classes:

- Car Commute;
- Car Business;
- Car Other;
- LGV; and
- HGV.

The model building process was concluded at the end of September 2015 when both a fully WebTAG compliant 2015 Base, with 2025 and 2035 forecast model, based on standard TEMPRO growth, were presented to the client.

The full details of the model can be found in the Local Model Validation Report (LMVR) however in summary, the model assignment meets the WebTAG required convergence criteria for both AM and PM which shows that the model achieved an acceptable level of stability. The model also meets full WebTAG calibration criteria, for both car only and all vehicles categories and the WebTAG guidance for the journey time validation, the latter being important given the use of the model for testing the Local Plan. The screenline/count validation did not quite meet the full criteria in all cases although it was very close to guidelines. WebTAG guidance has been followed with regards to not compromising the observed demand in order to accommodate validation screenlines/counts and instead a lower level was reported.

The calibrated and validated model area coverage of the model is shown in Figures 2-1 and 2-2 and extends around Harrogate, Knaresborough and Ripon.

Figure 2-1: Detailed Model Area Harrogate and Knaresborough

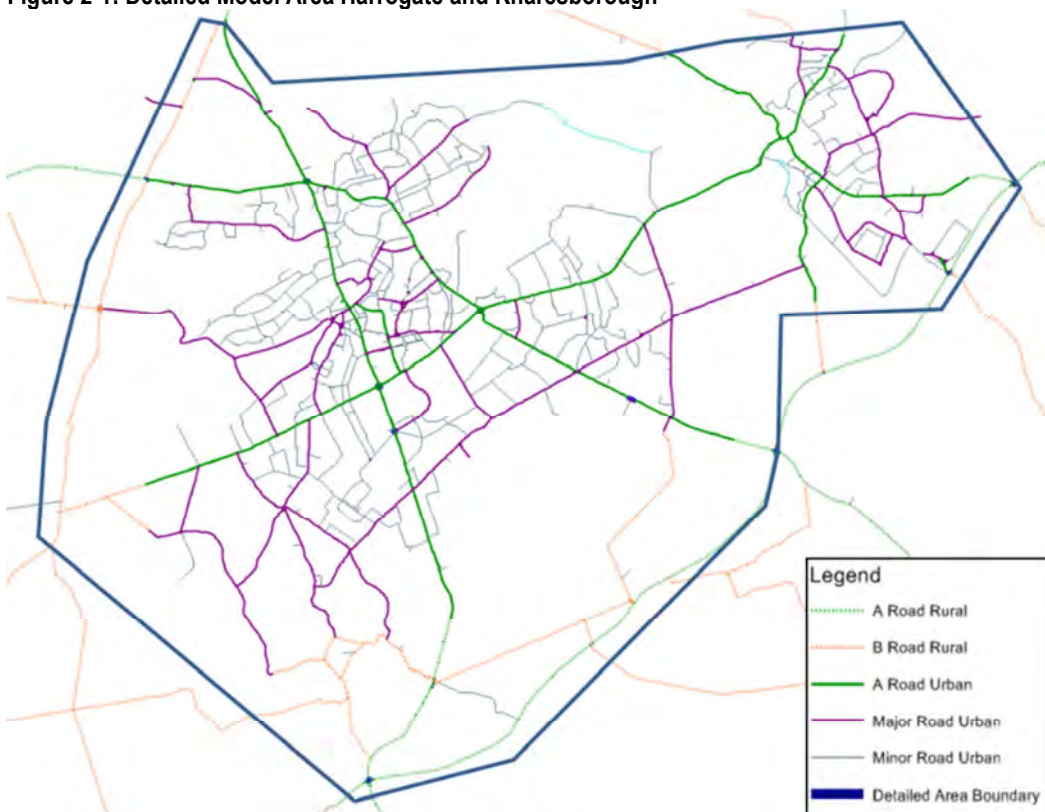
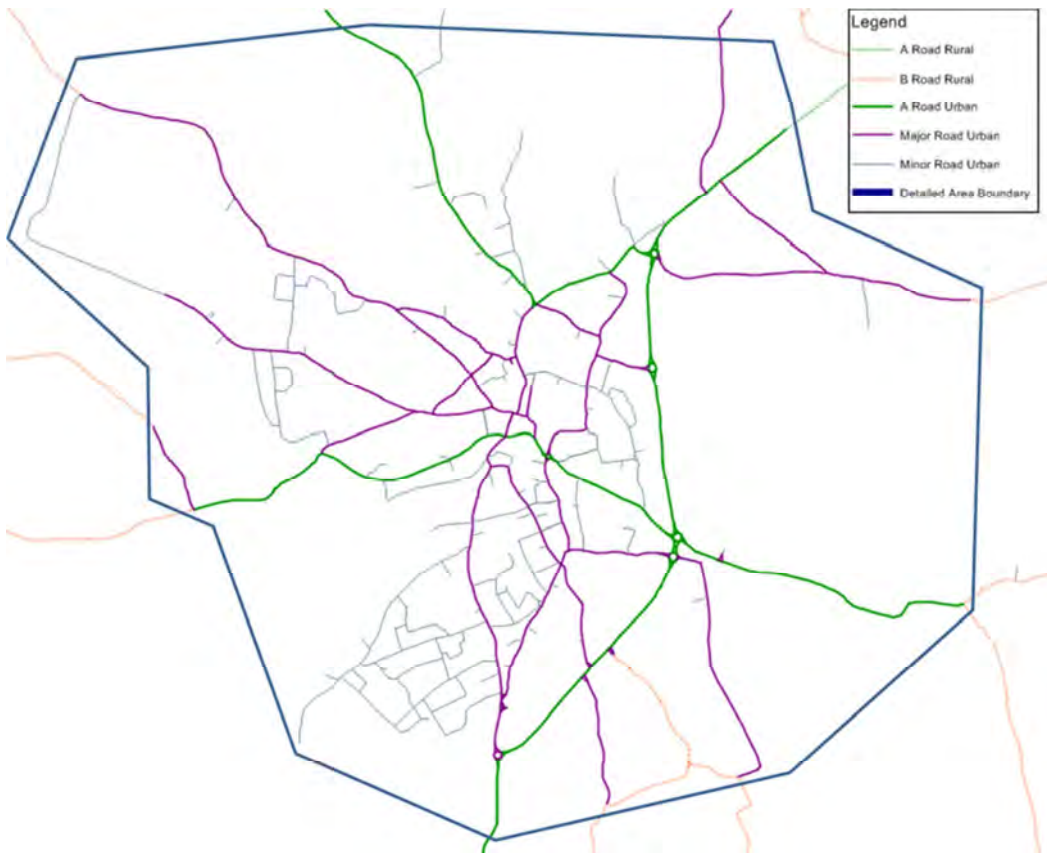


Figure 2-2: Detailed Model Area Ripon

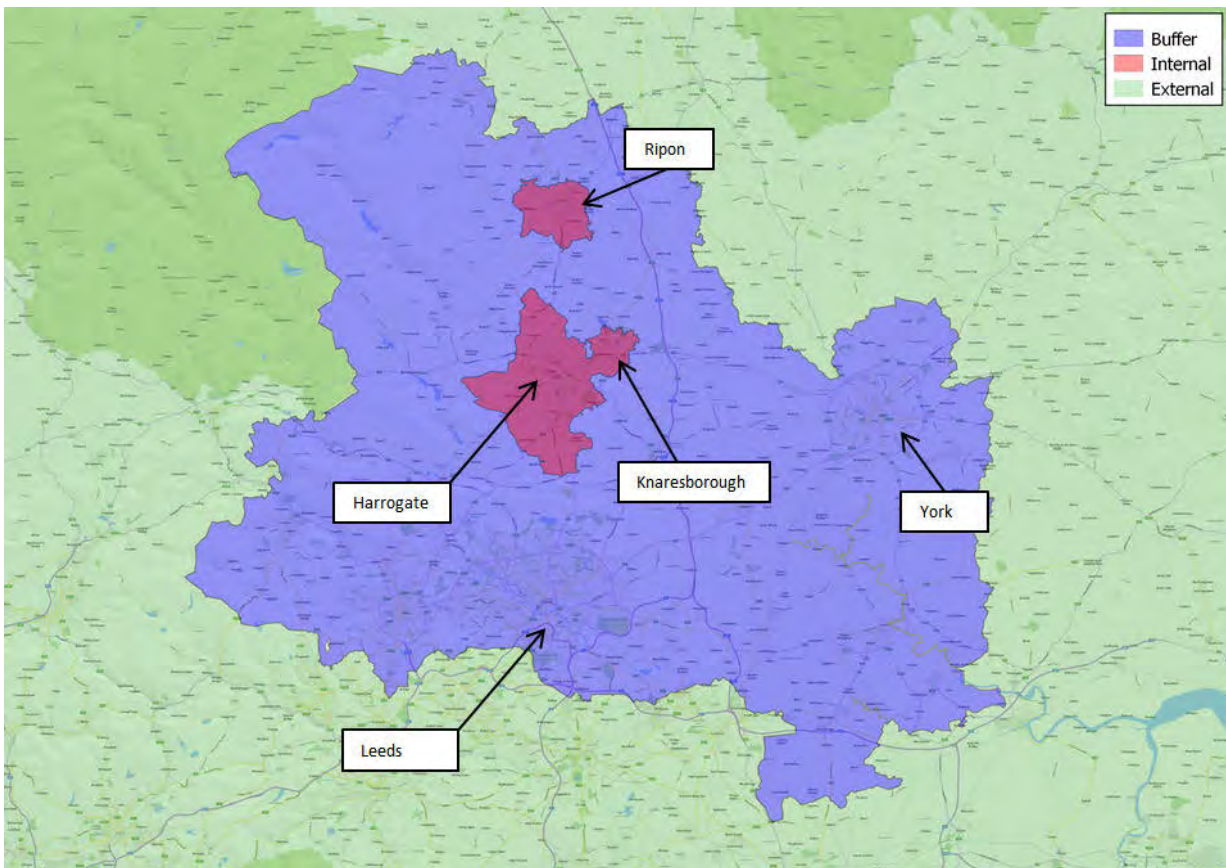


In line with latest WebTAG Unit M3.1 guidance, the network for the Harrogate District Transport Model made use of a three tier structure with levels of detail reducing away from the centre of the main study area. The breakdown of the network structure is outlined below:

- Fully modelled area:
  - Internal area of detailed modelling with full coding;
  - Rest of detailed modelled area (Buffer Area); and
- External Area

The extents of the above areas can be seen in Figure 2-3.

Figure 2-3: HDTM Modelled Areas - Harrogate, Knaresborough and Ripon



The area of detailed modelling is used to allow the identification of the impact of additional traffic from the Local Plan on the junctions in Harrogate, Knaresborough and Ripon. The buffer modelled area is not modelled in as much detail with capacity restraint modelled via link capacities and the external area modelled at the lowest level of detail with no explicit capacity restraint modelled.

The external area of the model includes any commuter trips from other parts of the UK which may be impacted by changes to the operation of the network in the area being tested by the model. The area defined is representative of any trips directly to and from the fully modelled area and mindful of those trips which may pass through the fully modelled area and thus may be impacted by changes to the performance of the network as a result of the Local Plan.



### 3. Initial High Level Test

#### 3.1 Overview

To inform the detailed Local Plan modelling set out in this report, an initial high level study on the impact of development locations was undertaken using a light touch modelling methodology. The initial high level testing reviewed network performance under forecast conditions for a Do Minimum scenario and two high level Local Plan development tests in a 2035 future year scenario.

The methodology used was based on best practice and widely-accepted industry standards to ensure that the analysis undertaken provided a robust evidence base to inform the option developments. The development locations and quantum for all committed development and Local Plan developments were provided by HBC with all assumptions made during this phase of work agreed with HBC.

#### 3.2 Summary of Development Tested

The high level testing added traffic associated with committed development sites to the highway network as well as traffic associated with two Local Plan option scenarios. The Local Plan scenarios assumed that 6,634 new homes and 20-25ha of additional employment land would be required for a 2035 Future Year assessment.

The two high level development scenarios are summarised as follows:

- 1) **High Level Test 1: Development concentrated within the District's main urban areas by 2035.**  
The majority of new housing (70%) would be built in the main urban areas of Harrogate, Knaresborough and Ripon. In the rural areas the focus would be in the district's other market towns (Boroughbridge, Masham and Pateley Bridge) and those villages with the best access to jobs, shops and services.
- 2) **High Level Test 2: Significant new development at a new settlement close to the A1(M) by 2035.**  
Assumed the creation of a new settlement within the A1 (M) corridor to create up to 3,000 new homes. The remaining housing requirement would be met in the main urban areas of Harrogate, Knaresborough and Ripon, as well as the other market towns and villages.

#### 3.3 Models and Limitations

The high level modelling work was conducted in order to provide a steer on how the network performs under forecast conditions in order to inform the detailed modelling set out in the remainder of this report.

The high level modelling undertook six tests to gauge the impact of the tests on the local and strategic highway network. The tests that were undertaken are summarised in Table 3-1.

Table 3-1: High Level Model Test Scenarios

| Year | Time Period | Development Option |
|------|-------------|--------------------|
| 2035 | AM Peak     | Do Minimum         |
|      |             | High Level Test 1  |
|      |             | High Level Test 2  |
|      | PM Peak     | Do Minimum         |
|      |             | High Level Test 1  |
|      |             | High Level Test 2  |

As stated above, the work was high level with a number of high level assumptions as follows:

- Development was added directly to the identified zone with no detailed assessment of trip distribution. This however caused limitations if the new development changed the current land use, meaning trip distributions may not have accurately represented the new land uses;
- Access points into the network were left unchanged; and
- Tests were conducted for a 2035 future year only.

### **3.4 Methodology**

Forecasting was undertaken using JTREND, a distribution programme developed by Jacobs. The future trip ends resulting from this process were compared to the original 2015 results in order to determine growth factors that were applied to all user classes within the VISUM model to create forecast matrices for all three tests. The tests were then constrained to TEMPRO growth for the area.

Traffic models were then assigned for the 2035 Do Minimum, Test 1 and Test 2 scenarios for both the AM and PM peak time periods.

### **3.5 Model Outputs and Results**

The outcomes of the model were presented mainly as demand variation and traffic variation in the network.

#### **Demand variation:**

Demand variation considers the origin and destination points of trips. By comparing the percentage difference of test 1 against test 2 it was then possible to see which test had a bigger impact on the demand in each zone.

Test 1 has a larger effect on demand around the main urban and rural parts of Harrogate (above 20%) This corresponds directly to the new development areas suggesting they have the expected impact on the zone demand in the model.

Test 2 shows a wider spread of impacts, but the largest impacts follow a buffer around the A1 and the A59.

There were no percentage differences shown in Knaresborough or central Ripon between the Two tests as the development quantum in both tests was identical.

#### **Traffic variation:**

The models were assigned and the results of these runs were analysed by comparing the two 2035 test results against the 2035 Do Minimum and the 2035 Do Minimum against the 2015 Base. The key outcomes were:

- The strategic routes travelling both through and around Harrogate have an average increase of 60-80 vehicles for both tests in the AM period.
- Test 1 shows a larger increase of traffic to the west and south of Harrogate centre, due to the higher quantum of development in this area. This consequently increases the mean delay at key junctions in the town centre;
- In the Knaresborough area, in the AM period, an increase in volume and delay in Test 2 can be seen along the A59 and Stockwell Rd. This corresponds with the increase in traffic created by Test 2 developments adjacent to the A1 and A59. Test 1 shows no difference in Knaresborough centre.
- In the Knaresborough area, in the PM period, a similar pattern of increase in volume is shown for both tests with an average of 60-80 additional vehicles on the B6163, Boroughbridge Rd,

B6165 and the A658. In both scenarios there is also a decrease in traffic volumes in the town centre on the A59, Manse Ln, Manor Road and Aspin Rd.

- In Ripon, in the AM period, Test 1 and Test 2 showed the largest increase in traffic on the A61, A6108 and Kirkby Rd. The majority of roads through Ripon showed an increase of 40-60 vehicles, with both tests showing a small increase in mean delay at the junctions.
- In Ripon, in the PM period, Test 1 and Test 2 showed an increase of vehicles along A61 through Ripon. There was however, a decrease in traffic in Test 2 along the A61, Allhallowgate, Boroughbridge Rd and Bondgate Green, suggesting traffic is bypassing Ripon centre
- Across the whole modelled area, the 2015 Base vs 2035 Do Minimum scenario showed a much larger flow difference when compared to the 2035 Do Minimum vs 2035 Options, suggesting that the background growth and committed developments were causing a large increase in traffic on the network in the AM peak.

### **3.6 Conclusion**

The overall results showed that Test 1 had a larger impact in the urban centres of Harrogate, with Test 2 having a larger impact on the network as a whole due to the developments being situated closer to the A1(M) and A59 strategic routes therefore resulting in longer ranging trips which do not pass through the urban areas of the model.

Furthermore, a review of all the information showed that the relatively small increases in junction delay caused by the Local Plan test traffic can have a knock on effect throughout the network, increasing the delay on a number of links in the surrounding area due to the level of congestion already present in the Do Minimum scenario.

The remaining sections of this report set out the parameters, outputs and analysis of the detailed model test.

## 4. Local Plan Options

### 4.1 Introduction

This section details the committed development and Local Plan options which have been considered in the detailed Phase 2 model assessment which is set out in the remainder of this report. It should be noted that the options tested are the 2035 Future Year Assessment, the end date of the Local Plan, and a 2025 Intermediate Year.

### 4.2 Committed Developments

A list of committed development sites has been provided by HBC with a total of 95 sites identified (some sites consisted of multiple parts of the same development where the development was expected to use multiple accesses or was mixed use).

Of the list of 95 sites provided, traffic from 83 sites were specifically added to the traffic flows on the network and included in the modelling undertaken. A list of the included committed development sites is provided in Appendix A which also details the proportion of each site assumed to come forward in the 2025 and 2035 assessment years.

A further 12 sites were also identified but were considered to generate only a negligible increase in trips. Traffic from these sites was therefore not specifically added to the model as it would be expected that additional traffic from these sites would be picked up in background TEMPRO growth factors.

The committed development sites which were considered to generate only negligible additional trips and were disregarded are identified in Table 4-1.

**Table 4-1: Committed Development Sites Identified as Generating Negligible Additional Trips**

| Planning Ref no. | Type of development    | Reasoning  |
|------------------|------------------------|--|
| 14/00811/FULMAJ  | Retail, Pub/Restaurant | Small increase in retail GFA and a public house. Location is the town centre and is unlikely to generate additional trips in its own right |
| 12/00316/RG3MAJ  | Cemetery               | Land use unlikely to generate significant additional trips   |
| 12/04089/FULMAJ  | Fitness Club           | Extension of sports club, would not generate trips during peak hours   |
| 13/02072/FULMAJ  | School                 | Equestrian training centre with school grounds, usage likely to be connected to existing students at the school                            |
| 13/03788/FULMAJ  | School                 | Small extension to school, not expected to generate significant additional trips   |
| 14/00524/FULMAJ  | Tennis Club            | Indoor tennis courts for existing users, minimal additional peak hour trips expected   |
| 14/00910/OUTMAJ  | Football               | Outdoor sports facility with two football pitches, minimal additional trips expected   |
| 14/01408/FULMAJ  | Army Accommodation     | Residential development at army barracks, not expected to generate additional trips during peak hours                                      |
| 14/01613/FULMAJ  | Secondary School       | Boarding school development, not expected to generate regular additional trips during peak hours   |
| 14/03437/FULMAJ  | Offices                | Additional use stated in planning application as being two employees. Minimal additional trips expected.                                   |
| 15/01103/FULMAJ  | College                | No additional staff or students anticipated  |
| 13/02786/EIAMAJ  | Retail                 | Convenience store, not expected to generate significant additional trips in its own right.   |

### **4.3 Local Plan Growth Options**

A total of three Local Plan Growth options have been considered in the testing, with the location and quantum of development for each site provided by HBC. The Local Plan options are named as follows:

- Option 1 – Urban Growth option
- Option 2 – Flaxby new settlement option
- Option 3 – Green Hammerton new settlement option

The majority of Local Plan developments were consistent across each of the three options with 92 of the 104 development sites having consistent development quantum, location and build out rates across each option. Similarly to the list of committed development sites, some of the 104 sites consisted of multiple parts of the same development where the development was expected to use multiple accesses or was mixed use.

A full list of the Local Plan development sites and quantum of development can be found in Appendix B which also details the proportion of each site assumed to come forward in the 2025 and 2035 assessment years. A plan showing the location of each site is provided in Appendix C. A high level summary of the quantum of Local Plan development that has been tested in each option is provided in Table 4-2 below.

As can also be seen from Table 4-2, each Local Plan option also includes a total of 1,650 homes from windfall sites, representing small piecemeal development sites that are likely to come forward in currently unidentified locations over the plan period. The windfall sites have been distributed equally across all of the 249 zones within Harrogate Borough and are equivalent to just under seven additional houses per zone.

Table 4-2: Summary of development for each option

|   | Option 1<br>Urban Growth   | Option 2<br>Flaxby | Option 3<br>Green<br>Hammerton | Notes  |
|---|--|--------------------|--------------------------------|--|
| Quantum of identified housing sites consistent across all options | 6,698 homes  |                    |                                | Quantum and location of development, build out rates are consistent across each option |
| Quantum of identified employment consistent across all options    | 96,000 sqm of B1a; 34,700 sqm of B1c; 31,700 sqm of B2; 33,400 sqm of B8 |                    |                                | Quantum and location of development, build out rates are consistent across each option |
| Additional identified housing in each option                      | 134 homes  | 2,884 homes        | 2,130 homes                    |  |
| Additional identified employment in each option                   | 0  | 0                  | 0                              |  |
| Windfall housing in each option                                   | 1,650 homes  |                    |                                | Houses split equally across all zones in Harrogate Borough                             |
| Total housing in each option                                      | 8,482 homes  | 11,232 homes       | 10,478 homes                   |  |
| Total employment each option                                      | 96,000 sqm of B1a; 34,700 sqm of B1c; 31,700 sqm of B2; 33,400 sqm of B8 |                    |                                |  |

When combined with the 3,752 committed development homes, the total number of homes being tested in each option is as follows:

Option 1 – 12,234 homes;

Option 2 – 14, 984 homes; and

Option 3 – 14,230 homes.

Table 4-2, demonstrates the high degree of similarity between each of the Local Plan options, with all employment sites identical across each option and only small differences in the number of housing sites included in each option. To assist in understanding the difference between the options, Table 4-3 provides a summary of the sites which are **not** consistent across all options.

**Table 4-3: Development Sites Not Included Within Each Option**

| Option1 Urban Growth         |              |                        |      | Option 2 Flaxby                |              |                        |      | Option 3 Green Hammerton       |              |                        |      |
|------------------------------|--------------|------------------------|------|--------------------------------|--------------|------------------------|------|--------------------------------|--------------|------------------------|------|
| Site ref no.                 | No. of homes | Proportion complete in |      | Site ref no.                   | No. of homes | Proportion complete in |      | Site ref no.                   | No. of homes | Proportion complete in |      |
|                              |              | 2025                   | 2035 |                                |              | 2025                   | 2035 |                                |              | 2025                   | 2035 |
| KH11                         | 25           | 1                      | 1    | KH11                           | 25           | 1                      | 1    |                                |              |                        |      |
| GH2                          | 46           | 1                      | 1    | GH2                            | 46           | 1                      | 1    |                                |              |                        |      |
| GH4                          | 18           | 1                      | 1    | GH4                            | 18           | 1                      | 1    |                                |              |                        |      |
| GH9                          | 45           | 1                      | 1    | GH9                            | 45           | 1                      | 1    |                                |              |                        |      |
|                              |              |                        |      | FX3                            | 2,750        | 0.266                  | 1    |                                |              |                        |      |
|                              |              |                        |      |                                |              |                        |      | GH11                           | 2,130        | 0.267                  | 1    |
| Total – 134 additional homes |              |                        |      | Total – 2,884 additional homes |              |                        |      | Total – 2,130 additional homes |              |                        |      |

As can be seen in Table 4-3, a further 134 additional houses are included in Option 1 across four different development sites. These four sites are also included in Option 2 which includes 2,750 homes coming forward at the FX3 site near Flaxby, to the west of Junction 47 of the A1(M). These sites are not included in Option 3 which only includes the GH11 site near Great Hammerton, to the east of Junction 47 of the A1(M), which comprises a total of 2,130 homes.

The differences between the scenarios are thus limited to variances around Junction 47 of the A1(M), with no differences in Harrogate, Ripon or Knaresborough. The locations of the developments identified in Table 4-3 (i.e. the differences between the options) can be seen in Figure 4-1 below.

**Figure 4-1 Location of Developments Not Included Within Each Option**



#### 4.4 Modelled Growth Options

Modelling has been undertaken for a Do Minimum test without the Local Plan as well as the Local Plan options described above. The modelling has thus tested the following scenarios:

- **Do Minimum** – including committed developments sites as described in 4.2 and background traffic growth as described in section 5;
- **Option 1 – Urban Growth** - including Option 1 sites as described in section 4.3, committed developments sites as described in 4.2 and background traffic growth as described in section 5;
- **Option 2 – Flaxby new settlement** - including Option 2 sites as described in section 4.3, committed developments sites as described in 4.2 and background traffic growth as described in section 5; and
- **Option 3 – Green Hammerton new settlement** - including Option 3 sites as described in section 4.3, committed developments sites as described in 4.2, and background traffic growth as described in section 5;

These model tests have been undertaken for both a 2025 Intermediate Year and a 2035 Future Year assessment and for both the AM and PM peak periods. This thus comprises a total of 16 individual modelling tests which have been undertaken which are summarised in Table 4-4 below.

Table 4-4: Forecast Option Scenarios

| Year | Time Period | Development Option |
|------|-------------|--------------------|
| 2025 | AM Peak     | Do Minimum         |
|      |             | Forecast Option 1  |
|      |             | Forecast Option 2  |
|      | PM Peak     | Forecast Option 3  |
|      |             | Do Minimum         |
|      |             | Forecast Option 1  |
| 2035 | AM Peak     | Forecast Option 2  |
|      |             | Forecast Option 3  |
|      |             | Do Minimum         |
|      | PM Peak     | Forecast Option 1  |
|      |             | Forecast Option 2  |
|      |             | Forecast Option 3  |

The methodology and assumptions used in the modelling of the above tests are described in section 5 of this report.



## 5. Methodology

### 5.1 Overview of Forecasting Methodology

This section outlines the assumptions applied to the committed development and Local Plan option sites, the modelling methodology used and all changes to the calibrated and validated 2015 Baseline Model and includes:

- To reflect future change in travel patterns, proposed employment and residential developments were incorporated into the future year highway networks.
- In the detailed model area car trips associated with these developments were added fully the 2015 Base without being subsequently constrained to TEMPRO. This methodology was used to show the full impact of the developments. For the external model areas forecasting was undertaken using the latest TEMPRO growth (version 6.2 at the time of modelling) in order to cover the strategic movement through the model.
- LGV and HGV forecasting was undertaken using the latest NTM results for the Yorkshire area.
- The effect of induced/generated traffic was calculated in the form of matrix row and column totals using a bespoke forecasting spreadsheet created by Jacobs. These forecast row and column totals were then used to furnish the base matrix up to the desired levels.

### 5.2 Changes to the Baseline Highway Network

To allow for modelling of the Do Minimum and Local Plan options, a series of changes were required to the modelled highway network of the calibrated and validated 2015 Baseline model. These changes are listed in Table 5-1 and have been applied to all the scenarios modelled in this report.

Table 5-1: Network Changes

| Description                                | Network edit  |
|--|---|
| <b>Zone Connector Changes</b>              |   |
| Location change for zone connector 1009    | Connector relocated to represent traffic from new access for supermarket development. Zone connector relocated to just west of A59 / A61 junction   |
| Location change for zone connector 1029    | Connector for rural zone relocated and used for addition of development traffic from South Western development sites. Zone connector relocated to location just west of Lady Lane / Whinney Lane junction in Pannal Ash                   |
| Location change for zone connector 4009    | Connector for rural zone relocated and used for addition of development traffic from development site B4 to better reflect demands on the A1(M) junction roundabout. Zone connector relocated to location off Front Street, Boroughbridge |
| <b>Additional Zones</b>                    |   |
| Addition of Zone 44251 (Flaxby Employment) | Additional zone added to model to avoid traffic from both FX3 and FX4 sites being added to the network (and using the same distributions) at zone 4425.   |

### Committed Highway Network Changes

|  |   |
|--|---|
| New roundabout junction on A59 to west of A59 / A61 junction to provide access to new supermarket development        | New roundabout on A59 and junction on A61. Coded as described with default roundabout measures and pocket lanes as described in plan. Omega Street has also been coded in as oneway system to align with promoter's document.   |
| Two new roundabouts on A59 to provide access to Manse Farm development   | Two new roundabouts. Coded as described with default roundabout measures  |
| Signalisation of existing crossroad junction at Crag Lane / Otley Road / Beckwithhead Road.                          | Signalisation of junction. Coded with dummy times and spigot connector added  |
| Existing priority junction at A59 / Crowberry Drive changed to roundabout junction as part of committed development. | New roundabout on A59/Crowberry Drive junction. Coded as described with default roundabout measures   |
| Modifications to existing Skipton Rd/Otley Rd/Oaker Bank roundabout.   | Widen approach legs on both Skipton Road arms and the Oaker Bank arm to provide two traffic lane on Skipton Rd/Otley Rd/Oaker Bank roundabout. Provide traffic signals at Ripon Road/Otley Road junction in Killinghall. Coded with approach width doubled and entry width enhanced by 3.50m as general default parameter value per lane. |
| Signalisation of existing A61/ Otley Road priority junction  | Existing priority junction changed to signals   |
| Replacement of existing Barr Lane / Boroughbridge Road priority junction with roundabout                             | Roundabout as per drawing provided  |
| Replacement of existing staggered crossroads with roundabout at Pannal Station Road                                  | Roundabout as per drawing provided  |
| Junction 47 Signalisation  | Installation of signals on all arms of Junction 47  |
| Signalisation of A168 / A59 junction east of Junction 47 as part of above scheme                                     | Installation of signals at A168 / A59 junction  |

### Modelling Network Changes

|   |  |
|---|--|
| A1 (M) changed to non-roadwork status   | Baseline model surveys undertaken when A1(M) restricted to 50mph for works. Has now been changed to reflect normal motorway conditions. A1 (M) changed to non-roadwork status - (70 mph speed limit) and 3 lanes throughout  |
| Junction immediately west of A1(M) Junction 47 (A59 / FX3 / FX4 development sites roundabout) | Changes made to allow traffic from major FX3 and FX4 trip generating sites to enter the model. Junction would require review as part of any planning application when exact points of access are known. Coding of model to accurately reflect flares, approach road widths at junction as in buffer zone |

## 5.3 Committed Development Sites

The following section provides a summary of the assumptions used for the committed development sites.

### **5.3.1 Committed Development Sites Trip Zone Connection Methodology**

Traffic from each development site was loaded onto one of the existing zone connectors of the calibrated Base Model. By default, developments were added to the zone in which they were situated with the appropriateness of these connections reviewed to ensure the connection points were representative of where traffic from the site would load onto the network. Changes to the connection assumptions for the committed developments are set out in Appendix A with major changes involving the relocation of zone connectors listed below and as set out in Table 5-1 previously:

- Zone 1009 was relocated from a location just south of the A59/A61 junction to a location just west of the A59/A61 junction. The connector was used to represent a proportion of the trips associated with a new supermarket development which has access points to both the west and south of the A59/A61 junction (connector 1010 was already in place to the south of the junction for movements from the other access point).

### **5.3.2 Committed Development Site Trip Rates**

As set out previously in section 4.2, a list of committed development sites has been provided by HBC. The trip generations of each site have been determined from a number of sources as follows:

- Deriving trip rates from the TRICS database;
- Obtaining trip generations from the Transport Assessment or other planning documents submitted as part of the planning application for the development; and
- Trip generations being provided by HBC which were taken from the sites Transport Assessment.

For sites which used trip rates derived from the TRICS database, the trip rates used are set out in Table 5-2.

Table 5-2: Trip Rates Used from the TRICS Database

| Description                          | Unit            | Trip Rates      |          |                 |          |
|--------------------------------------|-----------------|-----------------|----------|-----------------|----------|
|                                      |                 | Weekday AM Rate |          | Weekday PM Rate |          |
|                                      |                 | Inbound         | Outbound | Inbound         | Outbound |
| Housing - light vehicles             | per dwelling    | 0.159           | 0.420    | 0.391           | 0.191    |
| B1 office - light vehicles           | per 100 sqm GFA | 1.819           | 0.242    | 0.195           | 1.463    |
| B1c / B2 Industrial - light vehicles | per 100 sqm GFA | 0.714           | 0.351    | 0.153           | 0.506    |
| B8 Warehousing - light vehicles      | per 100 sqm GFA | 0.301           | 0.192    | 0.125           | 0.250    |
| B8 Warehousing - HGVs                | per 100 sqm     | 0.105           | 0.116    | 0.105           | 0.037    |
| Retail Superstore - light vehicles   | per 100 sqm GFA | 2.845           | 2.092    | 5.732           | 5.768    |
| Hotel - light vehicles               | Per room        | 0.135           | 0.277    | 0.192           | 0.091    |
| Tennis Club - light vehicles         | Per court       | 1.656           | 0.993    | 5.629           | 4.305    |
| Holiday homes - light vehicles       | per dwelling    | 0.016           | 0.03     | 0.099           | 0.108    |
| DIY store - light vehicles           | per 100 sqm GFA | 0.986           | 0.613    | 1.464           | 1.629    |

The trip generations used for each committed development site are provided in Appendix A alongside how the figures have been derived. The proportion of developments expected to be complete in the 2025 and 2035 scenario years has been provided by HBC and is also included in Appendix A.

### 5.3.3 Committed Development Sites Trip Distribution Methodology

By default, trips for the committed development sites have been based on the trip distributions of the zone in which the committed development is situated. In cases where this was agreed to be unrealistic, the distributions of a neighbouring zone have been used. The zone distribution methodology for each committed development is identified in Appendix A.

## 5.4 Local Plan Developments Sites

Trip rates and distributions for the development sites have been developed in consultation with NYCC Highways Officers and Consultants retained by Highways England. As previously set out in section 4.3, three options for Local Plan development have been tested in this second part of the report. The following section provides a summary of the modelling assumptions used for the development sites.

### 5.4.1 Local Plan Development Site Trip Rates

The trip rates used in the Local Plan options testing are as per the TRICS trip rates used for some of the committed development sites and as shown in Table 5-2. Only trip rates for residential dwellings, B1a (office), B2 (industrial) and B8 (storage and distribution) land uses have been used in the Local

Plan option testing assessments. Trip rates for B1c (light industrial) are as per the B2 (industrial) trip rates as the TRICS database does not distinguish between B1c and B2 land uses.

The only site considered likely to generate a significant number of additional HGVs was the FX4 Flaxby Employment site which included 23,700 sqm of B8 development to provide a worst case traffic scenario. HGV trips for this site were determined from the TRICS database using the rates outlined in Table 5-2 above and were assumed to all travel to and from the A1(M) and be split 50:50 between travelling north and south.

The proportion of developments expected to be complete in the 2025 and 2035 scenario years has been provided by HBC and is included in Appendix B.

#### **5.4.2 Local Plan Development Sites Trip Zone Connection Methodology**

Traffic from each development site was loaded onto one of the existing zone connectors from the calibrated Base Model. By default, developments were added to the zone in which they were situated with the appropriateness of these connections reviewed to ensure the connection points were representative. The zone connection assumptions are provided in Appendix B with major changes involving the relocation of zone connectors listed below (and previously identified in Table 5-1):

- Using the above methodology the FX3 Flaxby housing site and FX4 Flaxby employment site would have entered the zone at the same location (zone 4425). As both sites are significant trip generators and have different trip distribution methodologies an additional zone (44251) was created and was used to distribute traffic for the FX4 Flaxby employment site;
- The positioning of zone connector 1029 was changed to a location just west of Lady Lane / Whinney Lane junction in Pannal Ash. In the Base Model Zone 1029 was mainly rural land uses and has been used to represent developments (including H51 and H71) coming forward south of the Cardale Park employment area; and
- The positioning of zone 4009 was changed to a location off Front Street Boroughbridge. In the Base Model zone 4009 was mainly rural land uses and has been relocated to accommodate traffic from development site B4 to better reflect movements at the A1(M) junction roundabout.

#### **5.4.3 Local Plan Development Sites Trip Distribution Methodology**

This section sets out the methodology used to distribute trips associated with the development sites in each option. For the three most significant trip generators (the FX3 Flaxby housing site in Option 2, the GH11 Green Hammerton employment site in Option 3 and the FX4 Flaxby employment site in all options) a bespoke distribution methodology was provided by HBC in consultation with Highways England and NYCC.

For these distributions, the input demand into the models has been setup to match the distribution in terms of the logical zone to zone movements that would represent these patterns. However, it should be noted that due to the level of congestion in the forecast models, there will be some minor rerouting that occurs during model assignment so the actual links used aren't 100% exactly as the provided distribution.

The distribution methodology used for these sites is as follows:

FX3 Flaxby housing site - Trip distributions have been based on the travel to work data from the 2011 census as created by consultants retained by Highways England. There has been some modification to this distribution due to a wider than expected disparity between the two new housing settlement options in terms of trips East on the A59 to York. To achieve a consistent test assuring a realistic level of trip on the A59 corridor an addition has been made on A59 trips in the direction of York and

removed from the West towards Harrogate / Knaresborough direction. This better reflects the more separated nature of the site as the MSOAs used to calculate the initial Flaxby housing distribution were weighted towards Knaresborough. Where the Highway England consultants' distribution contained a general direction rather than a more detailed route the ratio provided by the consultant retained by the developers was used to provide the additional detail required

The trip distribution also includes 3.2% of trips which do not enter the modelled network. The resulting distribution proportions for trips to and from the site are set out in Table 5-3.

**Table 5-3: Trip Distribution Proportions for FX3 Flaxby Housing Site**

| Site ref no.           | No. of homes | Notes   |
|------------------------|--------------|---|
| A59 East (through J47) | 14.1%        | All trips will be sent to York to east and out of the model                   |
| A59 E to A1(M) North   | 10.4%        | All trips assigned onto A1(M) to north and continue on A1(M) out of the model |
| A59 W                  | 57.1%        | Trips distributed as per the flows bundle proportions on the A59              |
| A59 E to A1(M) South   | 15.2%        | All trips assigned onto A1(M) to south and continue on A1(M) out of the model |
| Internal trips         | 3.2%         | Trips do not enter the model  |

- GH11 Green Hammerton employment site - In consultation with consultants retained by Highways England, trip distributions have been based upon initial analysis of the Middle Super Output Area containing the site (MSOA 016). Where a general direction had been identified (i.e. trips not affecting the Highways England network) a split proportional to that identified by the developers consultants was applied to the relevant routes, in the Hammerton case, East of junction 47 of the A1(M) in order to achieve a suitable distribution.

The resulting trips heading west along the A59 from the site access have been proportioned according to the travel to work data from the 2011 census for residents living in Middle Super Output Area Harrogate 016. The proportions have been used to determine the number of trips heading north and south on the A1(M) at Junction 47 and out of the model area and the number of trips which would continue west on the A59 towards Harrogate and Knaresborough. The destinations of trips continuing west along the A59 have been distributed based on existing users of this section of the A59. The resulting distribution proportions for trips to and from the site are set out in Table 5-4.

**Table 5-4: Trip Distribution Proportions for GH11 Green Hammerton Housing Site**

| Site ref no.                | No. of homes | Notes   |
|-----------------------------|--------------|---|
| A1(M) North                 | 6.1%         | All trips assigned onto A1(M) to north and continue on A1(M) out of the model |
| A59 E to York               | 19.9%        | All trips will be sent to York to east and out of the model                   |
| A1(M) South                 | 24.1%        | All trips assigned onto A1(M) to south and continue on A1(M) out of the model |
| A59 W towards Harrogate     | 28.4%        | Trips distributed as per the flows bundle proportions on the A59              |
| B6265 towards Boroughbridge | 2.2%         | All trips sent to zone 4022 in Boroughbridge                                  |
| Internal trips              | 19.3%        | Trips do not enter the model  |

- FX4 Flaxby employment site - Trip distributions have been based on the travel to work data from the 2011 census for employment sites for Middle Super Output Areas Harrogate 007, Harrogate 009 and Harrogate 012. Any trip heading north or south on the A1(M) or east on the A59 has been assumed to continue on these routes out of the modelled area. Trips travelling east along the A59 towards Harrogate and Knaresborough have been distributed based on existing users of this section of the A59. The resulting distribution proportions for trips to and from the site are set out in Table 5-5.

**Table 5-5: Trip Distribution Proportions for FX4 Flaxby Employment Site**

| Site ref no.            | No. of homes |   |
|-------------------------|--------------|---|
| A1(M) North             | 15.2%        | All trips assigned onto A1(M) to north and continue on A1(M) out of the model |
| A59 E to York           | 9.5%         | All trips will be sent to York to east and out of the model                   |
| A1(M) South             | 7.2%         | All trips assigned onto A1(M) to south and continue on A1(M) out of the model |
| A59 W towards Harrogate | 68.0%        | Trips distributed as per the flows bundle proportions on the A59              |
| Internal trips          | 0.0%         | -   |

Owing to the changes in the model associated with the distributions of the GH11 site, Local Plan sites KH4, KH11, GH2, GH4 and GH9 have also used the distributions of the GH11 site shown in Table 5-4 (excluding the proportion of internal trips).

For the other development sites considered in each option, the existing land uses and trip distributions within the zone were reviewed to determine the appropriateness of the distributions.

When zone distributions were considered to be unrealistic for the proposed land use, the zones of a neighbouring zone have been used. The trip distribution assumptions for every development site are set out in Appendix B.

#### **5.4.4 Local Plan Windfall Development Sites**

As mentioned previously, a total of 1,650 homes across Harrogate District have been included in each Local Plan option representing windfall sites across the district at unidentified locations. The additional housing from these sites has been proportioned equally across all 249 zones within Harrogate District with the default trip distributions for that zone used unless modified for any other developments as set out above. The trip generations for these sites are as per the other Local Plan housing sites as set out in Table 5-2.

### **5.5 Other Forecasting Considerations**

#### **5.5.1 Introduction**

In addition to the Car trips added to the network for the specific developments as detailed above, a series of traffic factors have also been used to represent increases in strategic traffic movements, LGV's and HGV's.

#### **5.5.2 Strategic Car Growth**

For traffic to and from the external zones which will not be impacted by the local developments, TEMPRO factors have been used to growth these strategic traffic movements. The TEMPRO factors take into account expected local demographic changes, socioeconomic variation and changes in modes as well as other factors that affect the growth of traffic within the locality.

Due to the large zones present in the external areas of the model, these TEMPRO factors consist of averages across a number of TEMPRO sectors in order to represent the traffic likely to be used using the key strategic routes in the model.

These traffic forecast factors have been to growth the 2015 Baseline year to the 2025 intermediate year and 2035 future year assessment. The growth factors are for car trips and have been extracted from the TEMPRO database (version 6.2) for the AM and PM periods.

The TEMPRO growth factors used in the modelling are shown in Table 5-6.



Table 5-6: Strategic TEMPRO Factors

| Road/Location              | 2025 |      |      |      | 2035 |      |      |      |
|----------------------------|------|------|------|------|------|------|------|------|
|                            | AM   |      | PM   |      | AM   |      | PM   |      |
|                            | O    | D    | O    | D    | O    | D    | O    | D    |
| A1 Northeast England       | 1.13 | 1.13 | 1.14 | 1.13 | 1.23 | 1.23 | 1.24 | 1.24 |
| A59 Lancashire             | 1.13 | 1.13 | 1.13 | 1.13 | 1.22 | 1.23 | 1.24 | 1.23 |
| A1 Scotland                | 1.15 | 1.15 | 1.15 | 1.15 | 1.27 | 1.27 | 1.27 | 1.27 |
| A1/M1 South                | 1.16 | 1.16 | 1.16 | 1.16 | 1.28 | 1.28 | 1.29 | 1.29 |
| M6/M62 South               | 1.15 | 1.15 | 1.15 | 1.15 | 1.26 | 1.26 | 1.27 | 1.27 |
| A483/M56/M62 South (Wales) | 1.17 | 1.17 | 1.17 | 1.17 | 1.33 | 1.33 | 1.33 | 1.33 |
| A65                        | 1.10 | 1.11 | 1.11 | 1.11 | 1.17 | 1.19 | 1.19 | 1.19 |
| South Yorkshire            | 1.17 | 1.17 | 1.17 | 1.17 | 1.31 | 1.32 | 1.32 | 1.32 |
| A1079 East Yorkshire       | 1.15 | 1.14 | 1.15 | 1.15 | 1.27 | 1.26 | 1.28 | 1.28 |
| A59 Yorkshire Dales        | 1.17 | 1.20 | 1.20 | 1.18 | 1.32 | 1.38 | 1.37 | 1.34 |
| A6108 Yorkshire Dales      | 1.30 | 1.18 | 1.21 | 1.29 | 1.55 | 1.32 | 1.38 | 1.52 |
| A170 Yorkshire Moors       | 1.13 | 1.16 | 1.16 | 1.14 | 1.24 | 1.29 | 1.29 | 1.26 |
| A1 North Yorkshire         | 1.10 | 1.14 | 1.14 | 1.12 | 1.17 | 1.26 | 1.26 | 1.20 |

### 5.5.3 LGV and HGV Background Growth

The 2015 Base year LGV and HGV demand matrices have also been growthed up for each of the future year assessments using factors derived from the 2015 forecast results from the DfT's National Transport Model.

Factors for the 2025 and 2035 forecast years were obtained by interpolating between 2015 and 2040. For both cases, linear growth was assumed in order to calculate the years which were not specifically modelled within NTM.

The NTM growth forecasts are split into different regions and are universal across the day, hence the same factors have been applied to all of the time periods within the model and the same value applied to both origin and destination. The NTM growth factors used in the modelling for this assessment are set out below in Table 5-7.

Table 5-7: NTM LGV and HGV Growth Factors Used

| Vehicle Type | NTM Period  | Calculated Factor |
|--------------|-------------|-------------------|
| LGV          | 2015 - 2025 | 1.28              |
|              | 2015 - 2035 | 1.53              |
| HGV          | 2015 - 2025 | 1.07              |
|              | 2015 - 2035 | 1.15              |

### 5.5.4 Car Ownership Factors

Forecast car ownership factors were extracted from TEMPRO and applied with the forecast demand spreadsheet calculations in order to account for changes in ownership trends in the future years. The factors used were as follows:

**Table 5-8: Car Ownership Factors**

| Area                    | 2025     | 2035     |
|-------------------------|----------|----------|
| Harrogate/Knaresborough | 1.062191 | 1.124944 |
| Harrogate_Rural         | 1.073783 | 1.143049 |
| Ripon/Sharow            | 1.068767 | 1.138729 |
| Boroughbridge           | 1.067627 | 1.136126 |

As external trips have already been adjusted by TEMPRO car ownership factors would be included, thus the above factors have only been applied to trips within the detailed model area.

## 5.6 Other Changes to Demand

In addition to the above demand changes for specific development and background traffic growth, the following further changes have also been incorporated to represent specific interventions coming forward during the Local Plan period.

### 5.6.1 Harrogate to Leeds Railway Line Improvements

The Harrogate to Leeds section of rail line is due frequency enhancements, significant improvements to rolling stock and capacity alongside upgrading ticketing opportunities by around 2020. Trends have been examined and strong growth is evident across all Harrogate stations across the last seven years. 2011 census data shows that the top destination, by a large margin, for Harrogate District rail users is Leeds. To appropriately represent the improved services, trends for growth in rail and a level of mode shift HBC has confirmed that 100 vehicle trips from Harrogate to Leeds should be removed from the network in the AM peak and 100 trips from Leeds to Harrogate should be removed from the network in the PM peak.

The final trip matrices have thus been adjusted accordingly with trips removed proportionally according to the level of demand for trips to / from Leeds for each zone across the Harrogate and Knaresborough urban area.

## 5.7 Future Year Trip Matrix Totals

Using the above methodology, a summary of the resultant future year trip origin matrix totals for internal zones within Harrogate Borough is provided in Table 5-9 for each scenario.

**Table 5-9: Future Year Trip Matrix Totals**

| Scenario   | 2025            |                 | 2035            |                 |
|------------|-----------------|-----------------|-----------------|-----------------|
|            | AM Origin Total | PM Origin Total | AM Origin Total | PM Origin Total |
| Do Minimum | 104,902         | 161,500         | 107,971         | 164,751         |
| Option 1   | 107,344         | 163,480         | 111,809         | 168,293         |
| Option 2   | 107,433         | 163,524         | 113,031         | 168,857         |
| Option 3   | 107,274         | 163,449         | 112,515         | 168,619         |

As is evident from Table 5-9, the overall difference in the number of trips between each of the three options is relatively minor, particularly in the 2025 Intermediate Year scenario. As seen in Appendices A and B, the Option 3 scenario includes more housing than Option 1 in 2035, a large part of the housing in Option 3 is from the GH11 site which is only around a quarter complete in 2025 and thus results in Option 1 showing a larger number of trips in 2025.

## 6. Forecast Option Results

### 6.1 Introduction

This section sets out the modelling results using the methodology and assumptions set out in section 5. The scenarios modelled in this section are as follows:

- Do Minimum – consisting of growthed background traffic and committed development traffic only;
- Option 1 – Local Plan option 1 Urban Growth and Do Minimum scenario traffic;
- Option 2 – Local Plan Option 2 Flaxby and Do Minimum scenario traffic; and
- Option 3 – Local Plan Option 3 Green Hammerton and Do Minimum scenario traffic.

As noted previously there is a high degree of similarity between the above options with the only difference centring around sites included around Junction 47 of the A1(M) at Flaxby and Green Hammerton, with the details of all other development sites in the remainder of the district consistent across all options.

The modelling has been based on the calibrated and validated fully WebTAG compliant 2015 model which has been validation and calibrated for the area around Harrogate, Knaresborough and Ripon as described previously. The adjustments to the model and methodology for these Local Plan tests are described in section 5 of this report.

This section sets out the following results from the modelling:

- Demand Variation – high level review shows the percentage difference in demand for each zone in each option to demonstrate where additional traffic is expected;
- Traffic Impacts and Flows Differences – shows the change in traffic flows as a result of the options considered;
- Forecast Volume to Capacity Ratios – shows the Volume to Capacity ratios for junctions within the detailed model area and highlighting junctions that are brought overcapacity as a result of the Local Plan; and
- High Level Statistics – summary statistics of the key changes in additional vehicle kilometres and vehicle hours for each model.

The above results are presented in the following sections.

### 6.2 Demand Variation

This section graphically illustrates the differences in demand as a result of the scenarios and performs a high level check of the implementation of the change in vehicle demand in the model which is associated with each option.

To create these figures, the difference in demand between two scenarios has been calculated and by comparing the percentage differences it is possible to see where the greatest changes in demand are found. As all Local Plan scenarios are based on housing growth, analysis was mainly focussed on checking the AM origin and PM destination trip rates as this most accurately reflects commuting

patterns and therefore trips associated with housing developments in those time periods. From these figures it was possible to check whether the impact on each zone was consistent with the developments set out in Appendices A and B. To demonstrate the different demands of the scenarios, the following demand variations are shown:

- Percentage change between Option 1 and Do Minimum scenario, AM origin – demonstrates where additional demand as a result of the Local Plan Option 1 originates in the AM peak;
- Percentage change between Option 1 and Do Minimum scenario, PM destination – demonstrates where additional demand as a result of the Local Plan Option 1 is destined for in the PM peak;
- Percentage change between Option 1 and Option 2, AM origin - given the similarity between the Options, this plot shows where there are changes in demand between Options 1 and 2; and
- Percentage change between Option 1 and Option 3, AM origin – given the similarity between the Options, this plot shows where there are changes in demand between Options 1 and 3.

The graphics described above are shown in Figure 6-1 to Figure 6-4.

Figure 6-1 High Level Model Demand – Percentage Difference Between Option 1 and Do Minimum– AM Origin

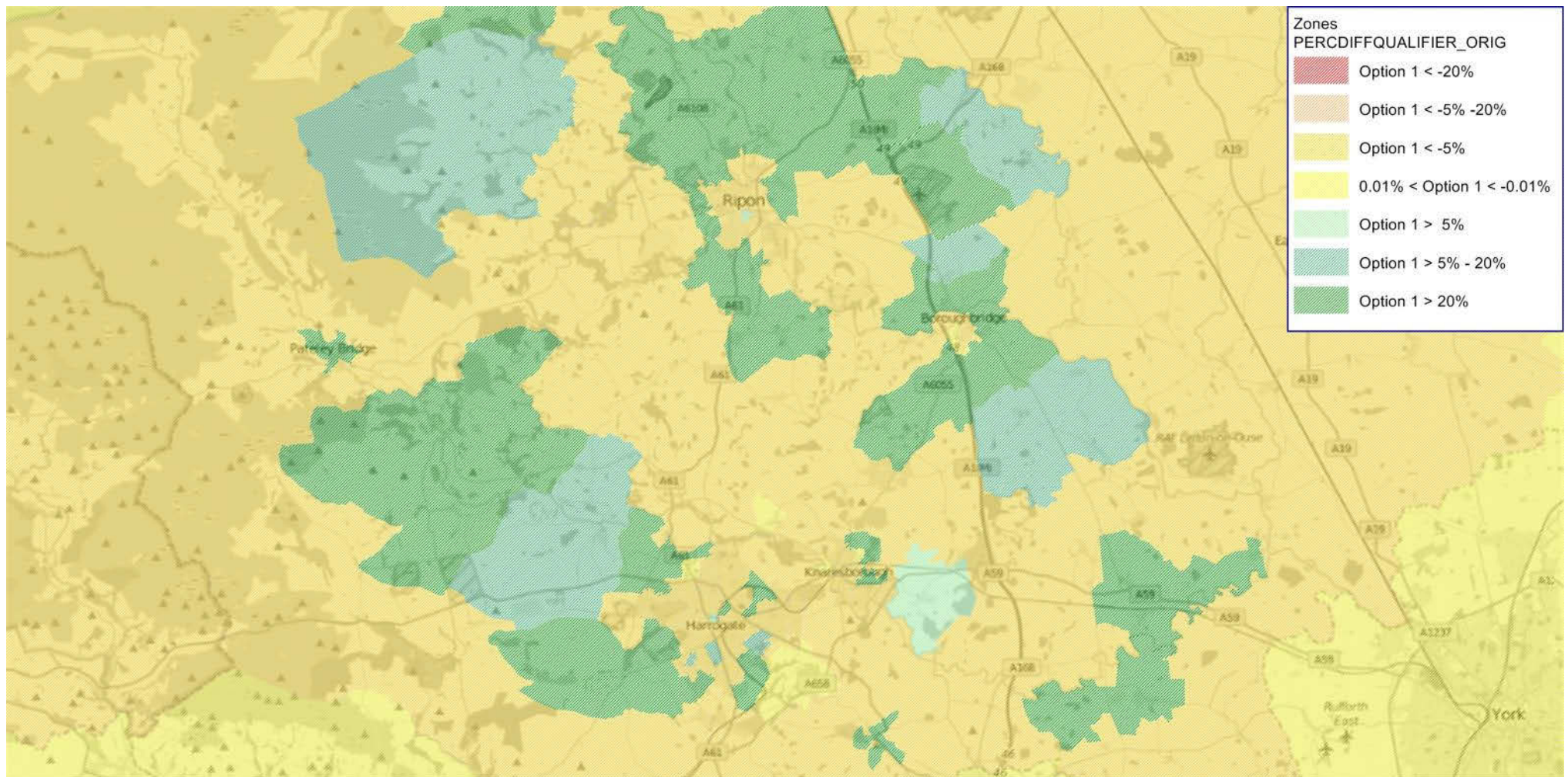


Figure 6-2 High Level Model Demand – Percentage Difference Between Option 1 and Do Minimum– PM Destination

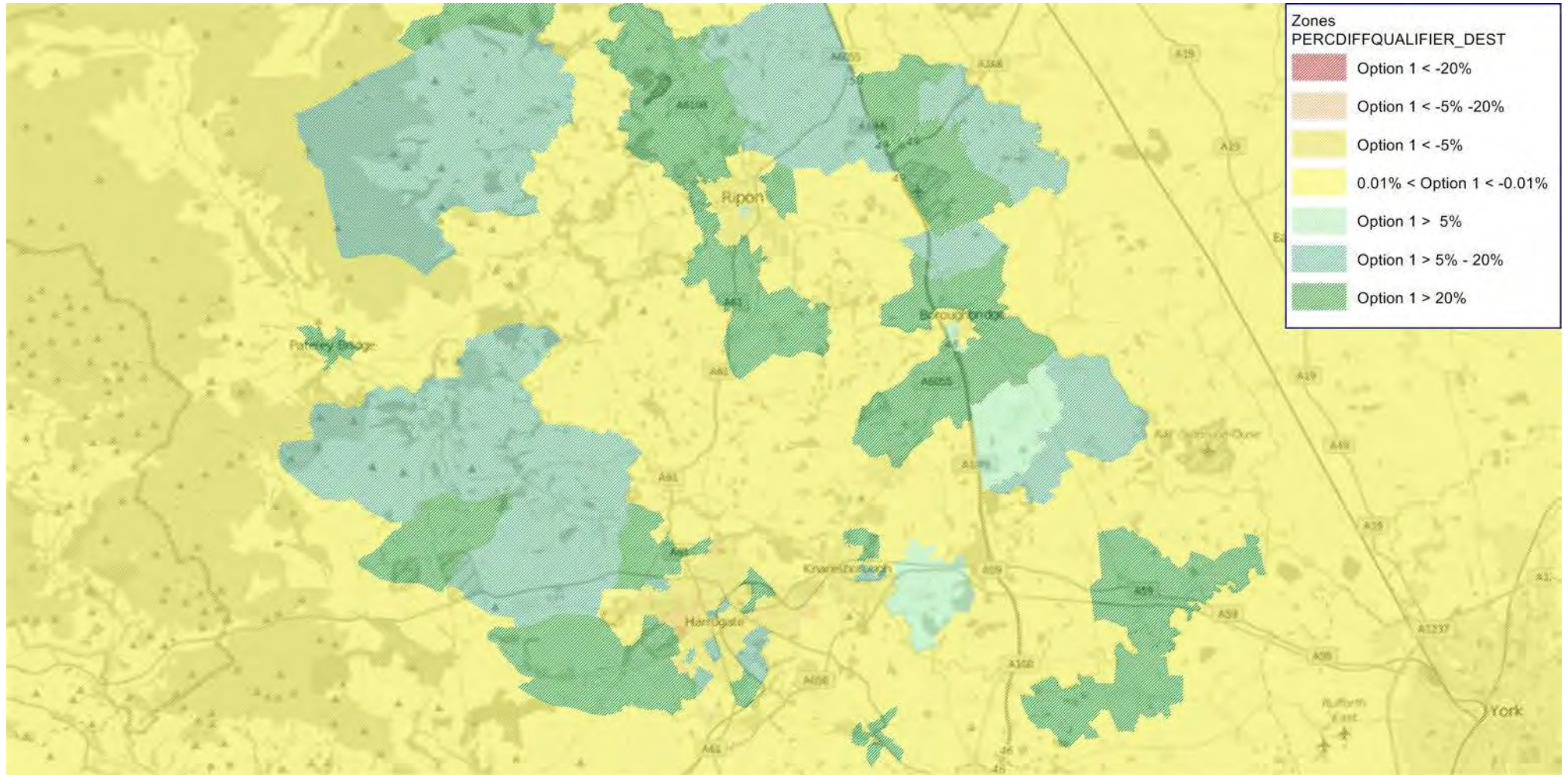


Figure 6-3 High Level Model Demand – Percentage Difference Between Option 1 and Option 2 AM Origin

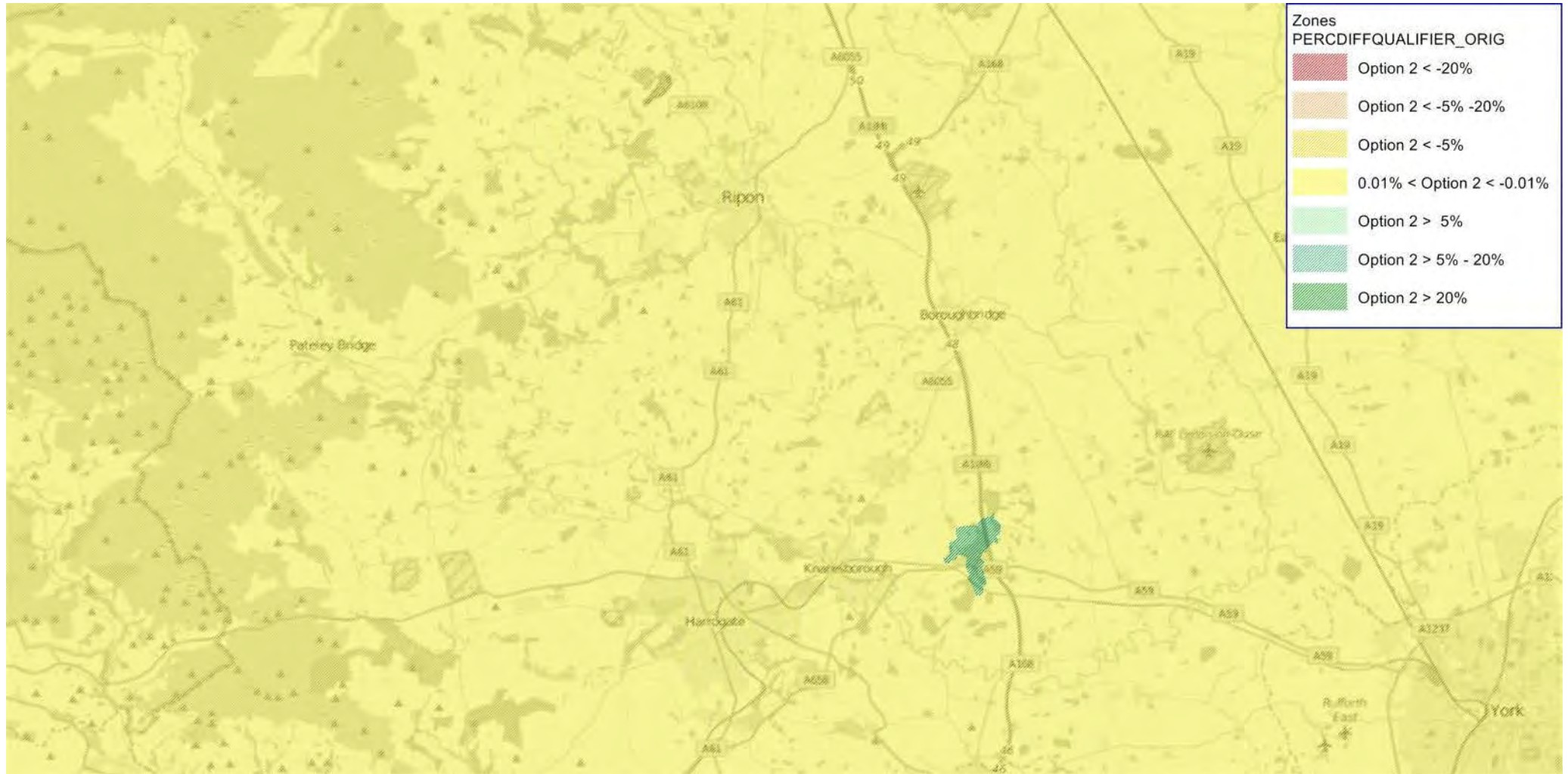
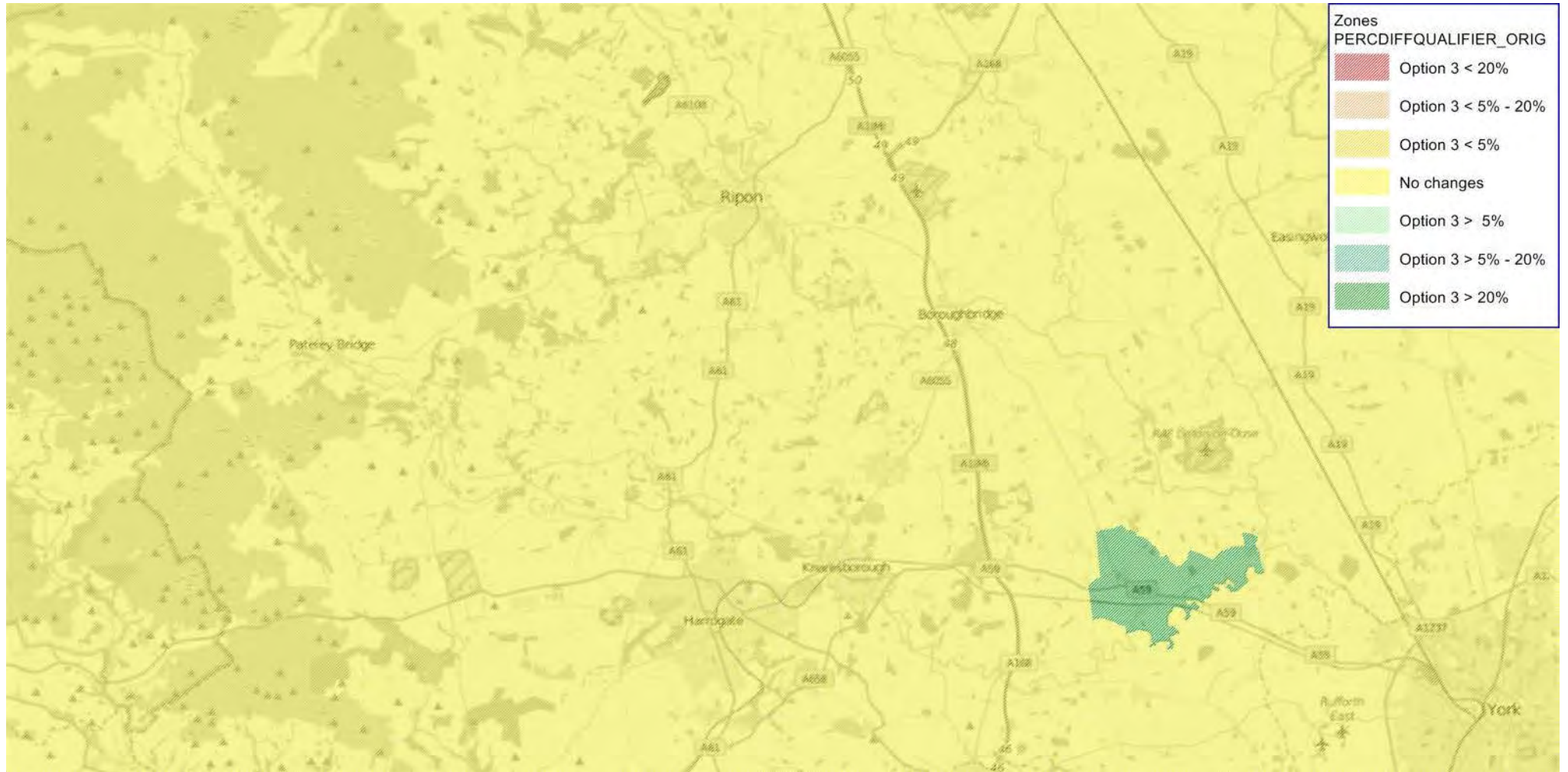




Figure 6-4 High Level Model Demand – Percentage Difference Between Option 1 and Option 2 AM Origin



As can be seen from the above graphics, the development in Option 1 is mainly in the areas outside the urban centres of Harrogate, Ripon and Knaresborough, in line with the list of Local Plan development sites set out in Appendix B.

The similarities between Options 1, 2 and 3 are demonstrated in Figure 6-3 and Figure 6-4 with the graphics showing the only differences being an increase in demand in the zones around Flaxby (Option 2) and Green Hammerton (Option 3) which is associated with the major housing sites. The corresponding PM peak destination graphics are identical to the results shown in Figure 6-1 and Figure 6-2.

### 6.3 Traffic Impacts and Flows Differences

The results are based on the following model runs:

- Two forecast years (2025 and 2035);
- Two time periods (AM and PM); and
- Four scenarios (Do Minimum and Do Something Local Plan Options 1, 2 and 3).

For each forecast year and time period the three Do Something options were compared to the Do Minimum scenario using the version comparison tool in VISUM which allows for a direct analysis of network performance across two separate models. This thus allows all background traffic to be ‘filtered out’ and just shows the traffic distributions of the Local Plan option.

The results of these were graphically displayed and are presented in the remainder of this section. Figure 6-5 to Figure 6-28 show both the difference in the volume of traffic across the two compared models and the difference in junction delay across all vehicles in the hour.

The key used for the following figures is as shown on the right. Blue bands are used to show a decrease in flow between the two models and red bands are used to show an increase in flow. Coloured circles at junctions indicate delay at a junction for all vehicles during the one hour time period.

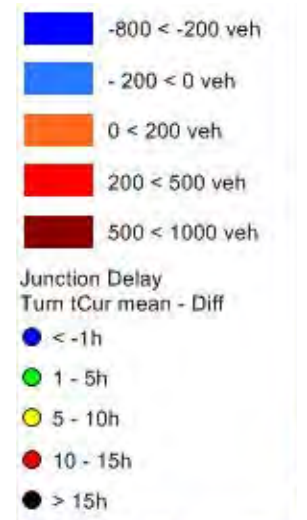


Figure 6-5: 2025 Harrogate and Knaresborough - Option 1 Minus Do Minimum (AM)



Figure 6-6: 2025 Harrogate and Knaresborough - Option 2 Minus Do Minimum (AM)



Figure 6-7: 2025 Harrogate and Knaresborough - Option 3 Minus Do Minimum (AM)



Figure 6-8: 2025 Ripon - Option 1 Minus Do Minimum (AM)

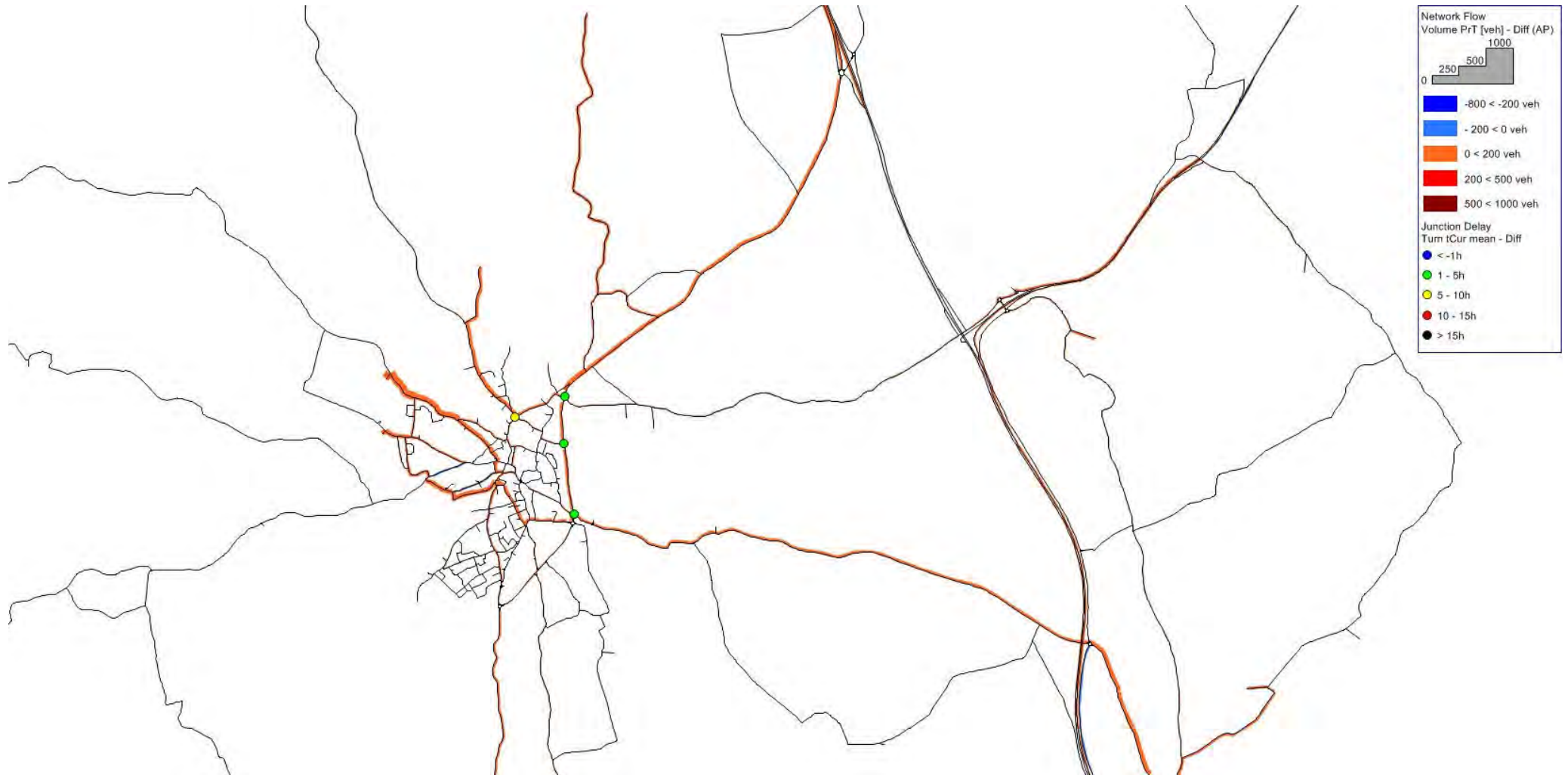


Figure 6-9: 2025 Ripon - Option 2 Minus Do Minimum (AM)







Figure 6-11: 2025 Harrogate and Knaresborough - Option 1 Minus Do Minimum (PM)

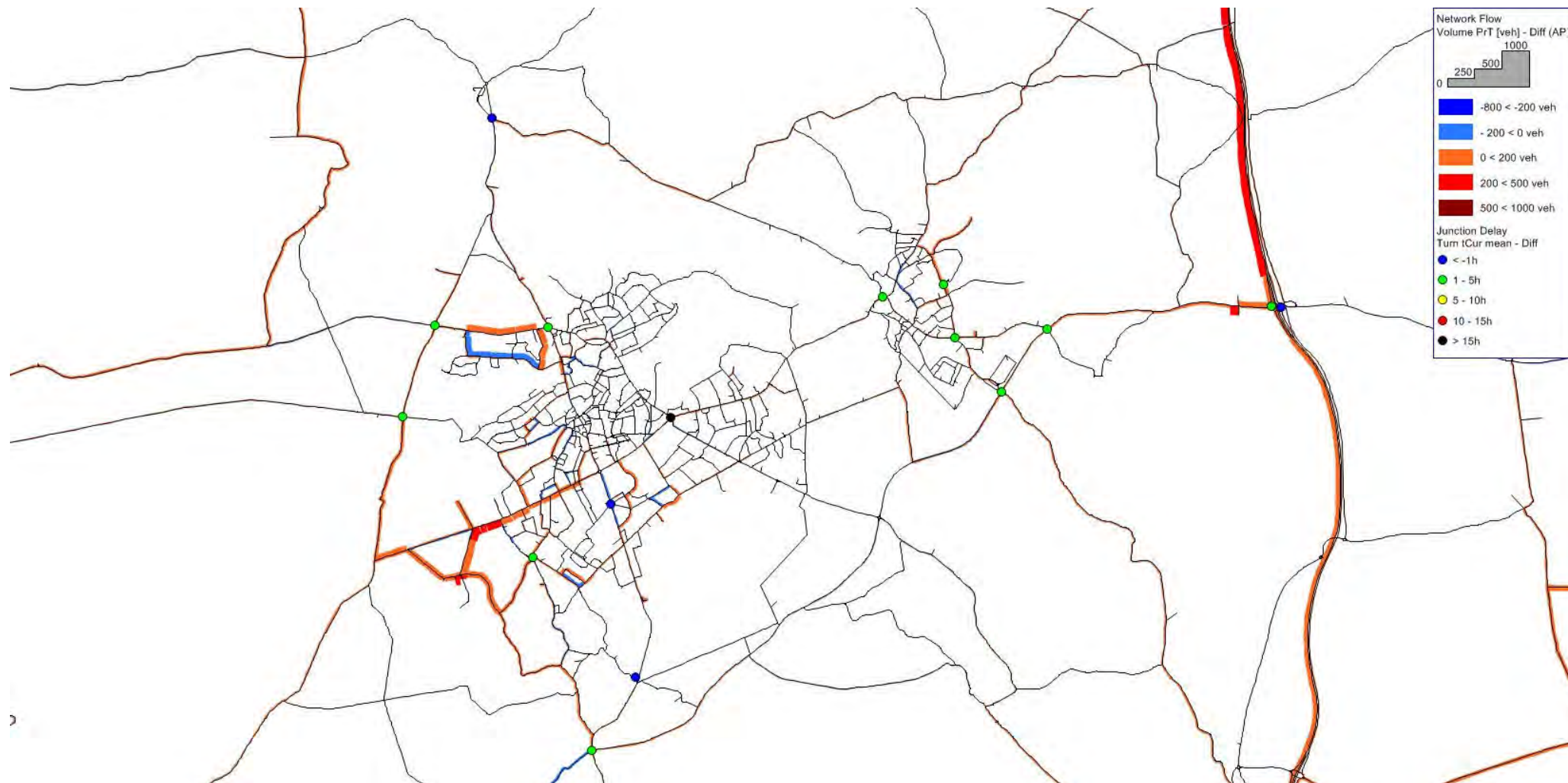


Figure 6-12: 2025 Harrogate and Knaresborough - Option 2 Minus Do Minimum (PM)



Figure 6-13: 2025 Harrogate and Knaresborough - Option 3 Minus Do Minimum (PM)

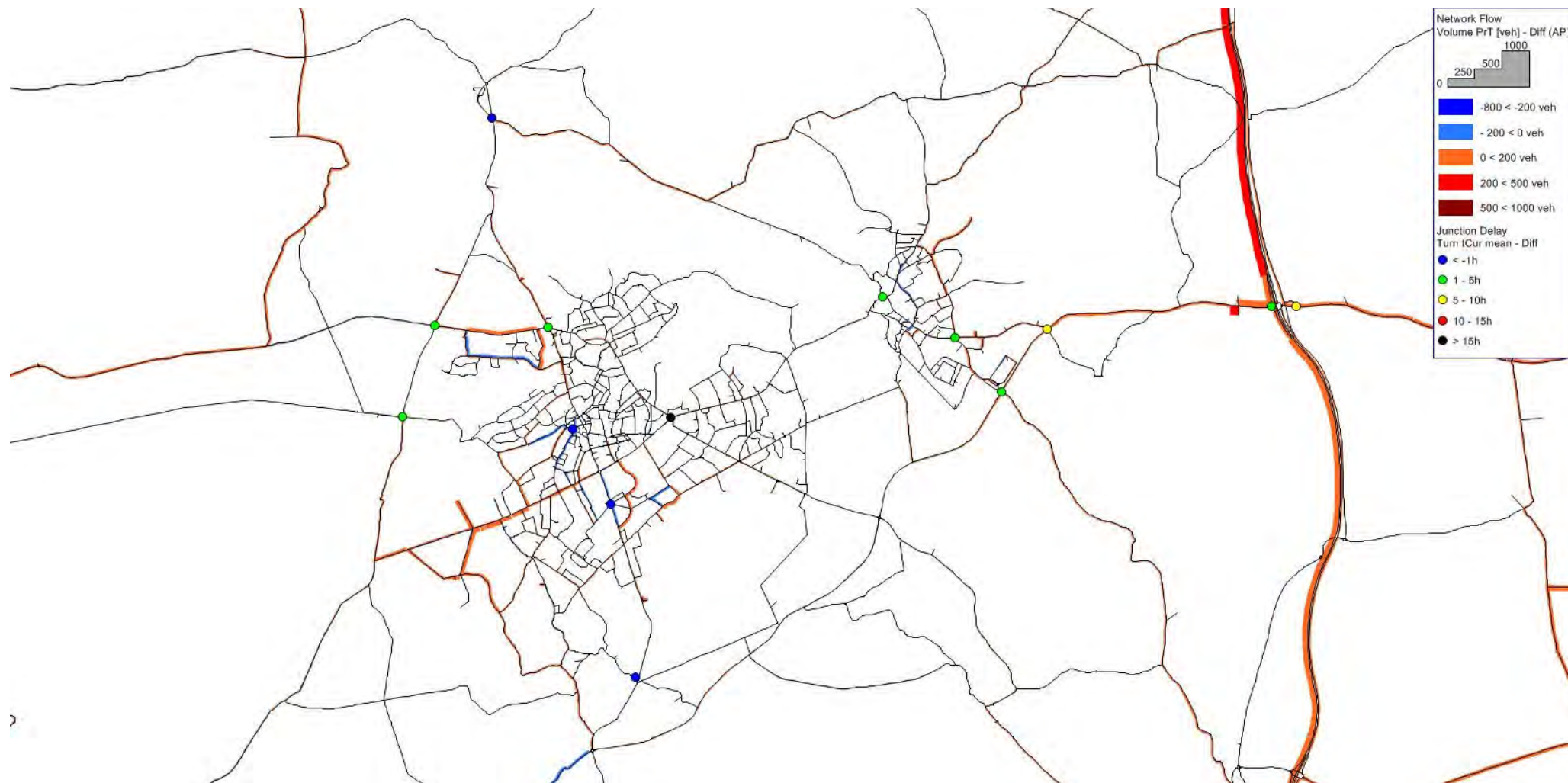


Figure 6-14: 2025 Ripon - Option 1 Minus Do Minimum (PM)



Figure 6-15: 2025 Ripon - Option 2 Minus Do Minimum (PM)



Figure 6-16: 2025 Ripon - Option 3 Minus Do Minimum (PM)



With regards to the 2025 comparison tests, the majority of strategic routes in and around Harrogate and Knaresborough see a general increase in traffic in the AM peak of up to 100 vehicles. The greatest effect on traffic flows is exhibited to the south west of Harrogate on Lady Lane, where the increase is approximately 200 vehicles. These figures are similar across all three option comparisons with the standout exception to this trend being the A59 Flaxby roundabout to the west of the A1. Whilst similar flows exist in both Option 1 and 3 tests, there is a significant increase in flow at this junction in Option 2, corresponding to the housing development being located directly to the north. Consequently, due to this additional traffic the delay at junction 47 of the A1 increases in this scenario. It should be noted that the major development sites – FX3 Flaxby housing site, GH11 Green Hammerton housing site and FX4 Flaxby employment site – are only modelled to be 25% complete in 2025, limiting the impact of these sites.

In relation to traffic flows and delay around Ripon, the pattern across each of the three option tests is approximately the same, as the quantum of development coming forward in Ripon is the same for each option. The modelling shows that the majority of strategic routes seeing an increase in flow of less than 50 vehicles across the AM period.

For the PM period strategic routes around Harrogate, Knaresborough and Ripon show an almost identical pattern for increased flow across the three scenarios due to the similarity between the options. As with the AM period the A59 Flaxby roundabout to the west of the A1 presents an exception to this, due to a housing development being located to the north of this junction.

In contrast to the AM peak, Figure 6-11 to Figure 6-13 demonstrates a significant increase in traffic to the south west of Harrogate which continues beyond Lady Lane to include Beckwith Head Road and the B6162 between the Beckwith Head Road and Harlow Moor Road.

However despite this, the most notable increase in the PM period is the northbound flow on the A1(M). In the AM the increase across each scenario is between 0-50, whereas for the PM this figure is approximately 200 vehicles.

The similarities across all three scenario tests suggest that as of 2025, developments which are consistent across all three scenarios are the most significant contributors to the increase in traffic flows in both the AM and the PM.

The corresponding figures for 2035 are presented on the following pages.

Figure 6-17: 2035 Harrogate and Knaresborough - Option 1 Minus Do Minimum (AM)





Figure 6-18: 2035 Harrogate and Knaresborough - Option 2 Minus Do Minimum (AM)



Figure 6-19: 2035 Harrogate and Knaresborough - Option 3 Minus Do Minimum (AM)



Figure 6-20: 2035 Ripon - Option 1 Minus Do Minimum (AM)



Figure 6-21: 2035 Ripon - Option 2 Minus Do Minimum (AM)



Figure 6-22: 2035 Ripon - Option 3 Minus Do Minimum (AM)



Figure 6-23: 2035 Harrogate and Knaresborough - Option 1 Minus Do Minimum (PM)

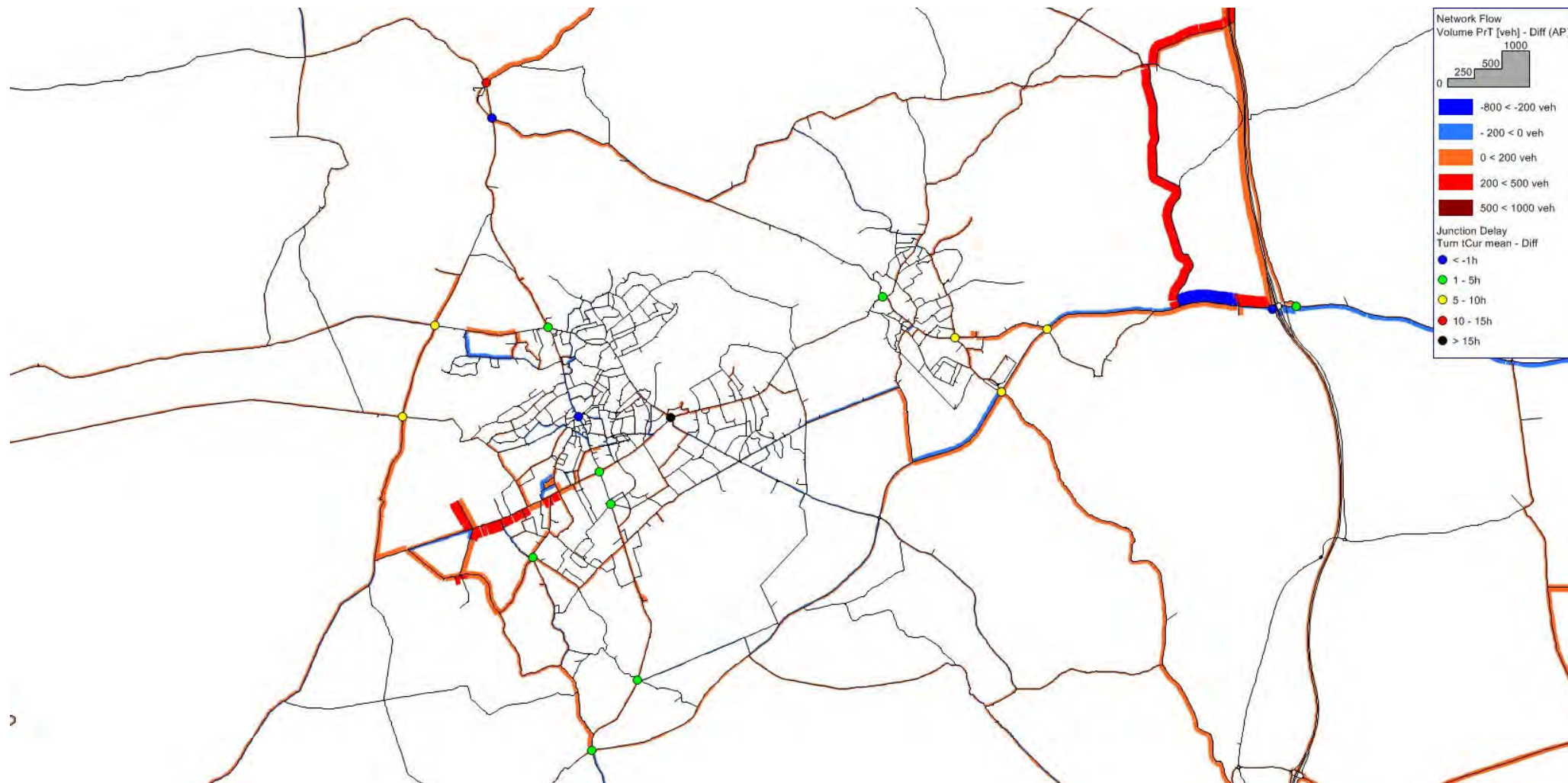


Figure 6-24: 2035 Harrogate and Knaresborough - Option 2 Minus Do Minimum (PM)



Figure 6-25: 2035 Harrogate and Knaresborough - Option 3 Minus Do Minimum (PM)

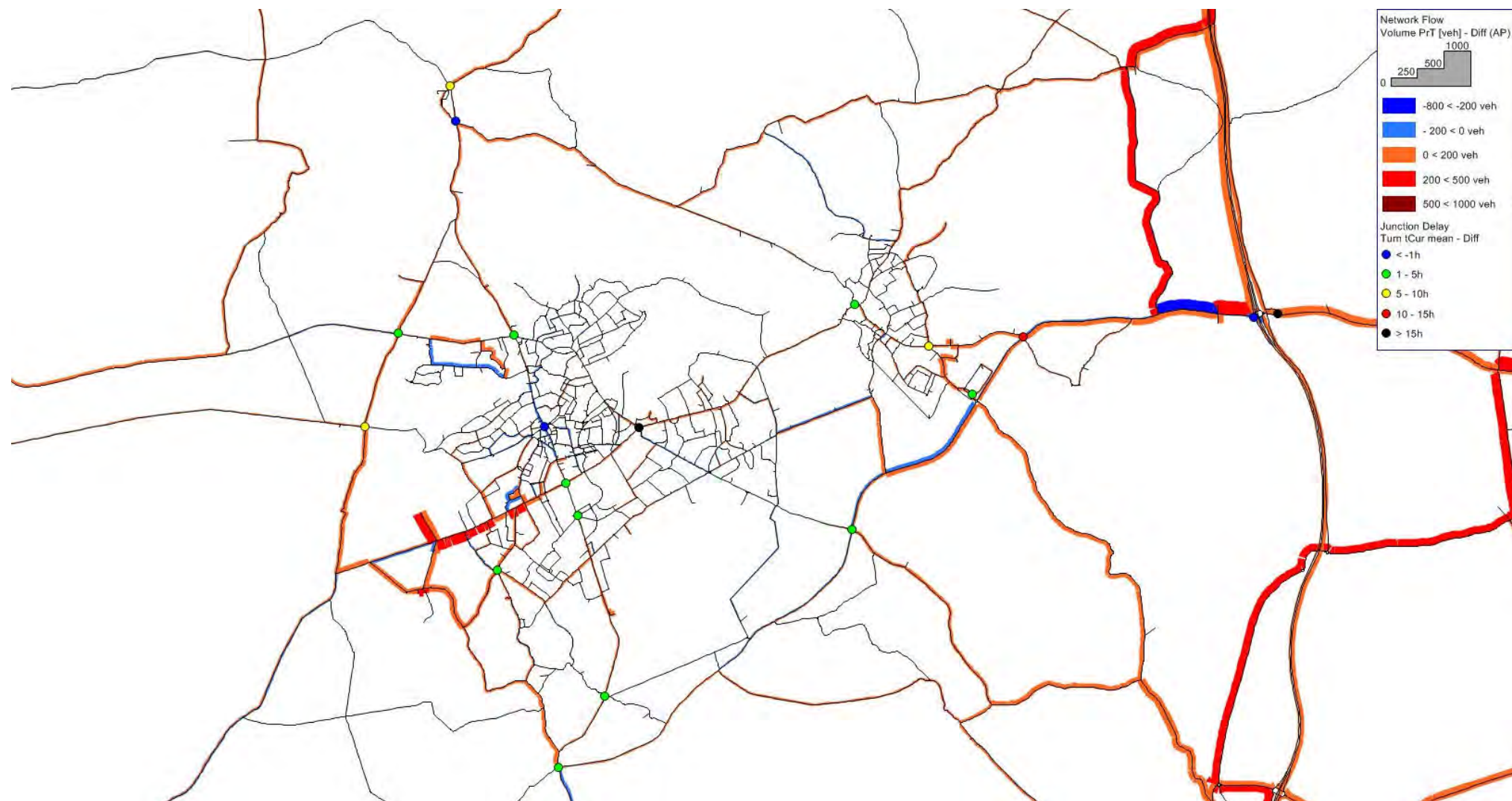




Figure 6-26: 2035 Ripon - Option 1 Minus Do Minimum (PM)

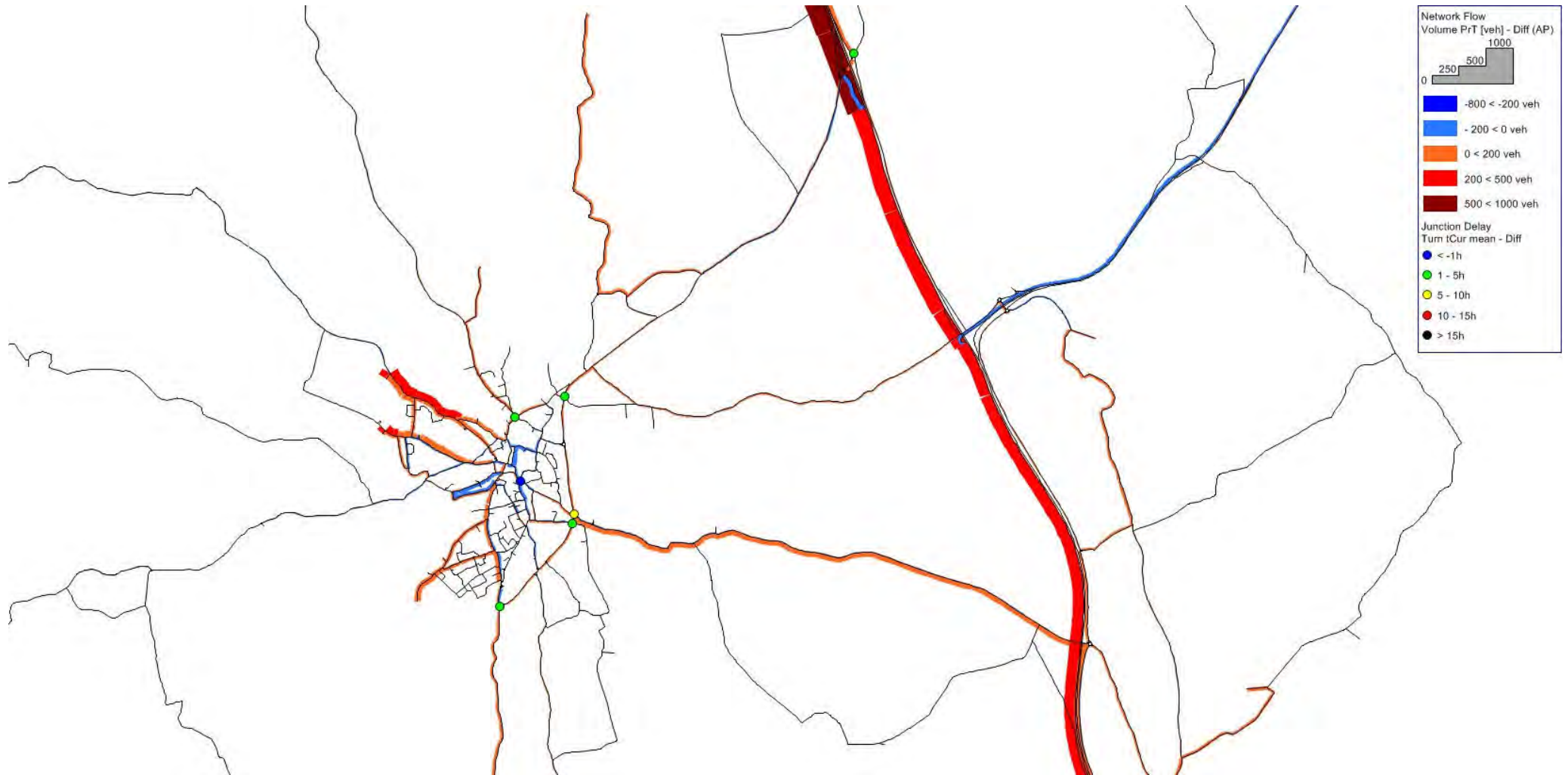


Figure 6-27: 2035 Ripon - Option 2 Minus Do Minimum (PM)



Figure 6-28: 2035 Ripon - Option 3 Minus Do Minimum v(PM)



As can be seen from the plans above, with regards to the AM comparisons between the 2035 Do Something Options and the 2035 Do Minimum, there are significant increases in traffic volumes and junction delay across all three tests.

Within Harrogate a number of developments are located in South West Harrogate. As a result there is a significant increase in traffic heading southbound on Crag Lane, as well as on Beckwith Head Road and westbound on the B6162 extending from the Beckwith Head Road Junction to Harlow Moor Road. On the bypass, there is also an increase of approximately 200 vehicles northbound between the A661 and the A59 in all three scenarios.

The modelling for all three scenarios also shows an increase in the volume of traffic on the A59 between the A658 and the Flaxby roundabout to the west of the A1. The increase in flow is seen across all three options westbound on this link and eastbound on the A59 between the Flaxby roundabout and the A1. This increase is due to the FX4 Flaxby employment site being present in all scenarios and its access point being located just to the west of Junction 47.

As expected, the most notable difference between the scenarios is the increase in traffic volume along the A59 away from the Flaxby roundabout due to the strategic housing site at Flaxby in Option 2 and the strategic housing site at Great Hammerton in Option 3. For eastbound traffic travelling along the A59 towards the motorway from the Flaxby site, Option 2 experiences an increase in flow of roughly 200-350 vehicles, compared to both option 1 and option 3 which show a decrease in flow along this stretch of roughly 100 vehicles as strategic traffic from Harrogate and Knaresborough re-routes.

The analysis also indicates that the Flaxby housing development causes a significant increase in flow travelling into Knaresborough via the A59 after the junction with the A658, as this uplift is only present in Option 2.

Further comparison between the three options also demonstrated the effects of the Green Hammerton development, with a significant increase in traffic flow to the east of the A1 junction 47 only evident in option 3. Westbound movements on the A59 from the Station Road junction to the A1 and southbound on Station Road/Cattal Street/Roman Road/Ox Moor Lane increase in flow by approximately 300 vehicles, in comparison to an increase of approximately 50 vehicles in Options 1 and 2.

This increase in flow continues down the A168 towards Junction 46 in Option 3, with Option 2 showing a similar uplift; however this is not present in Option 1. It is also notable that in Options 2 and 3 traffic from Harrogate and Knaresborough to York avoids the congestion and delay along the A59 corridor and at Junction 47 and instead diverts via Junction 46 and Tockwith Lane. This is unseen in the 2025 analysis, suggesting that the 'tipping point' when traffic will divert via alternative routes will be reached around this period, although this is heavily influenced by the level of development coming forward at the FX3 and GH1 strategic housing sites.

Figure 6-23 to Figure 6-25 also demonstrates the increase in traffic travelling via Kirk Deighton and North Deighton in Options 2 and 3 but not Option 1. This would suggest that the increase in traffic being loaded onto the network by the Green Hammerton and Flaxby development sites have caused traffic to reroute in order to avoid these areas, likely as a result of capacity limitations along the A59 corridor and at Junction 47.

With regards to key links in and around Harrogate and Knaresborough in the PM, there is an increase southbound on Beckwith Head Road and westbound on the B6162 extending from the Beckwith Head Road Junction to Harlow Moor Road, again due to the development located in South West Harrogate and corresponding with the outflow of traffic in the AM peak.

Option 2 again represents the option with the greatest increase in traffic around the Flaxby roundabout to the west of the A1, due to the Flaxby housing development. However, unlike in the AM traffic flow eastbound on the A59 reduces in Option 1 and 3, with the section between York Road and the Flaxby Roundabout experiencing a drop of over 300 vehicles. This is likely due to increased delay at junction 47, as such the traffic previously travelling this section of the A59 re-routes northbound via York road in both Option 1 and 3.

Figure 6-23 to Figure 6-25 again demonstrate the impact of the Green Hammerton development as the traffic increases displayed to the east of the A1 and North of Wetherby in Option 3 are not present in Option 1 or 2. However, as with the increase on Crag Lane mentioned above, the direction of the primary increase has shifted from the AM, representing return journeys in the PM.

In Ripon, the development sites are mostly situated to the west of the town and are consistent across each option. The main increase in traffic flow for each option is therefore found on North Road, Bondgate Green and Harrogate Road for traffic heading to/from the north, east and south respectively.

In conclusion, unlike the 2025 results the increase in disparity between the three option tests show that significant increases in traffic flow are influenced both by the developments consistent with all scenarios and those unique to individual options. The analysis also suggests that the effects on traffic patterns within central Harrogate, Knaresborough and Ripon are most closely linked to the developments present in all scenarios, whereas traffic flow near Junction 47 of the A1(M) is influenced more significantly by the strategic developments in this area, which also affect re-routing of traffic between Harrogate and York which previously would use the A59 corridor.

## **6.4 Forecast Volume to Capacity Ratio**

Analysis on the performance of junctions on the network has also been undertaken for the Do Minimum and three Local Plan scenarios. The junction capacity assessments were undertaken in the detailed model area and identify a volume capacity ratio (VCR) on the turns in the model and identify a total delay.

VCR is a ratio representing the degree of saturation of a particular stretch of road, with values closer to 0 representing free flow conditions and values approaching or greater than 100 indicating high levels of congestion. Observations on many roads has shown that delay rises considerably at v/c ratios of above 85, and that significant delays occurs at VCR ratios of above 100.

The maximum v/c out of the junction is analysed to assess specific performance issues on the links at each junction. This showed the network performance under forecast conditions, in comparison with other scenarios and the 2035 Do Minimum scenario, in order to inform HBC on the impact of the different development scenarios.

The format of the results in this section is as follows:

- Harrogate and Knaresborough – 2035 AM Peak;
- Ripon – 2035 AM Peak;
- Harrogate and Knaresborough – 2035 PM Peak; and
- Ripon – 2035 PM Peak.

A summary of the results for the 2025 scenarios is provided at the end of this section with graphics of the results provided in Appendix D.

Figure 6-29: VCR - AM - Harrogate and Knaresborough- 2035 Do Minimum

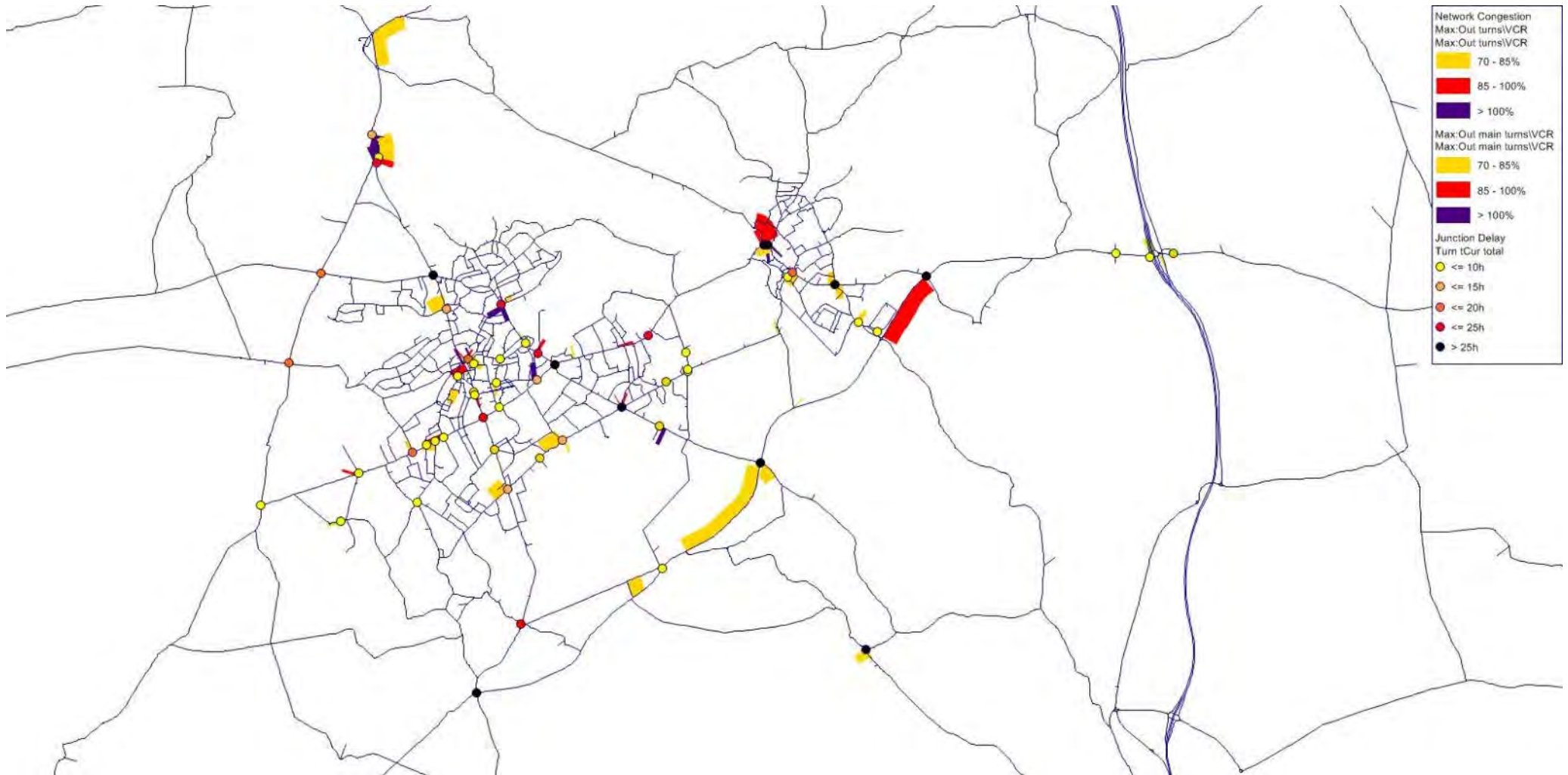


Figure 6-30: VCR - AM - Harrogate and Knaresborough - Option 1

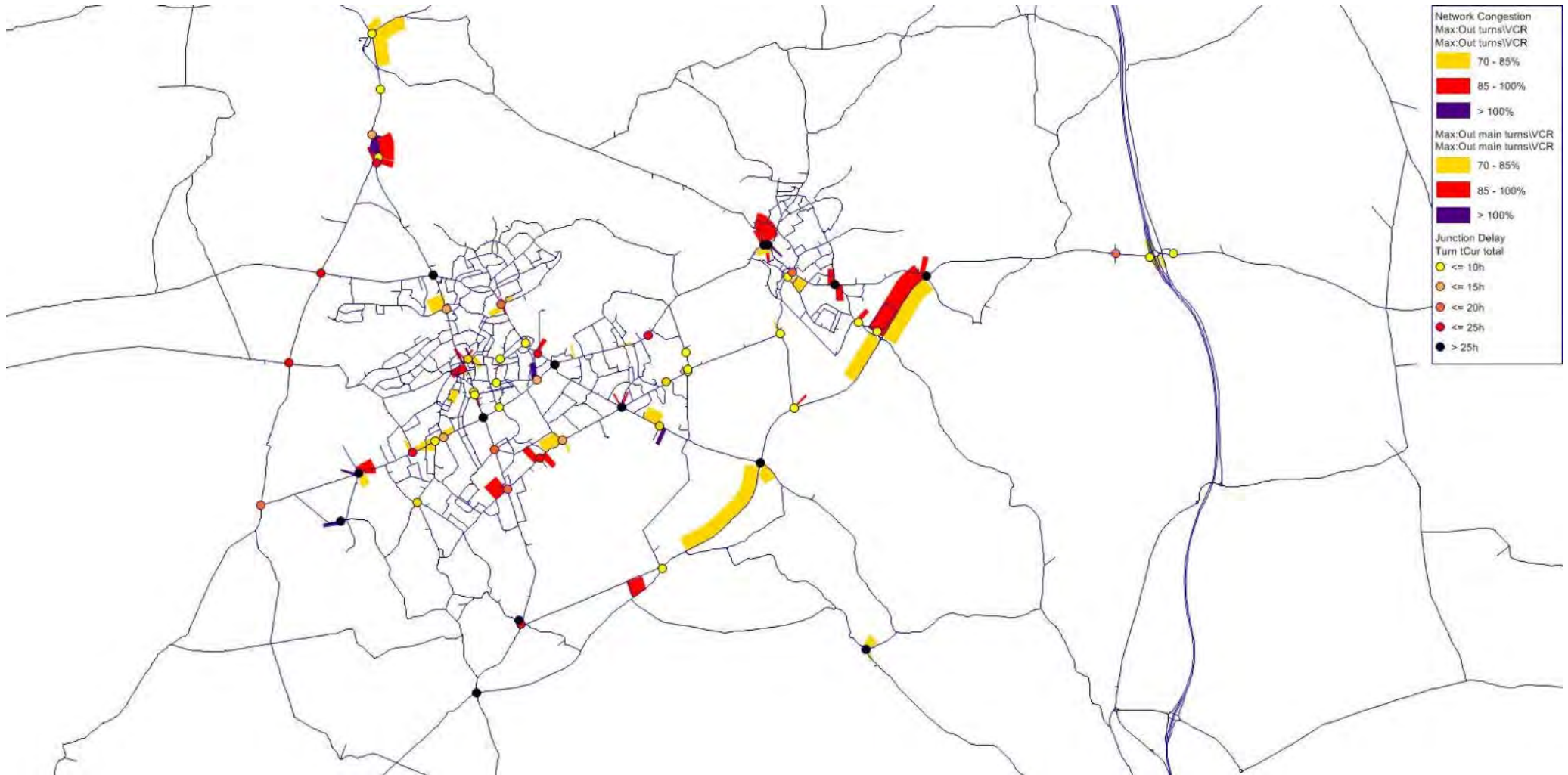


Figure 6-31: VCR - AM - Harrogate and Knaresborough - Option 2

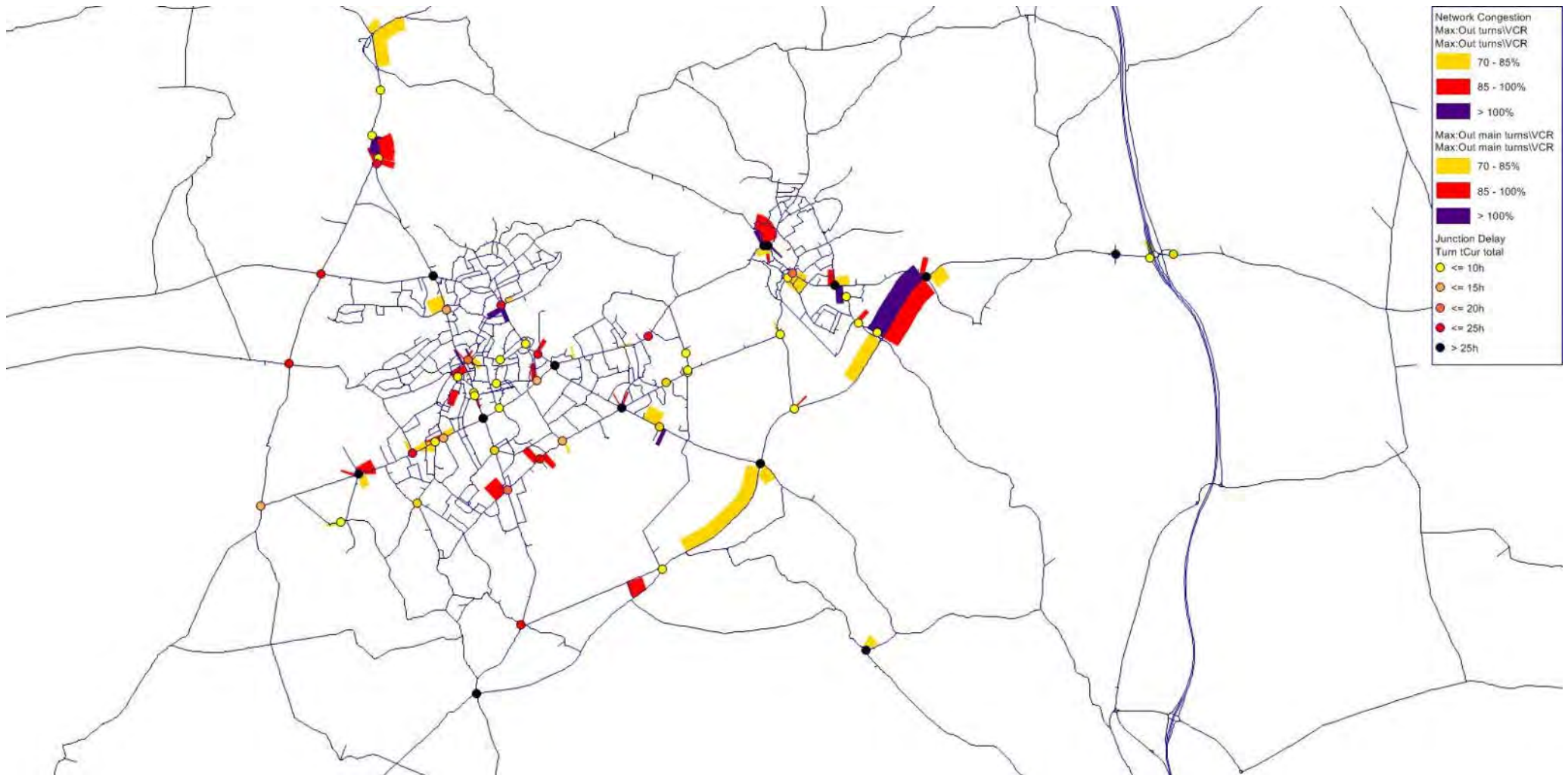
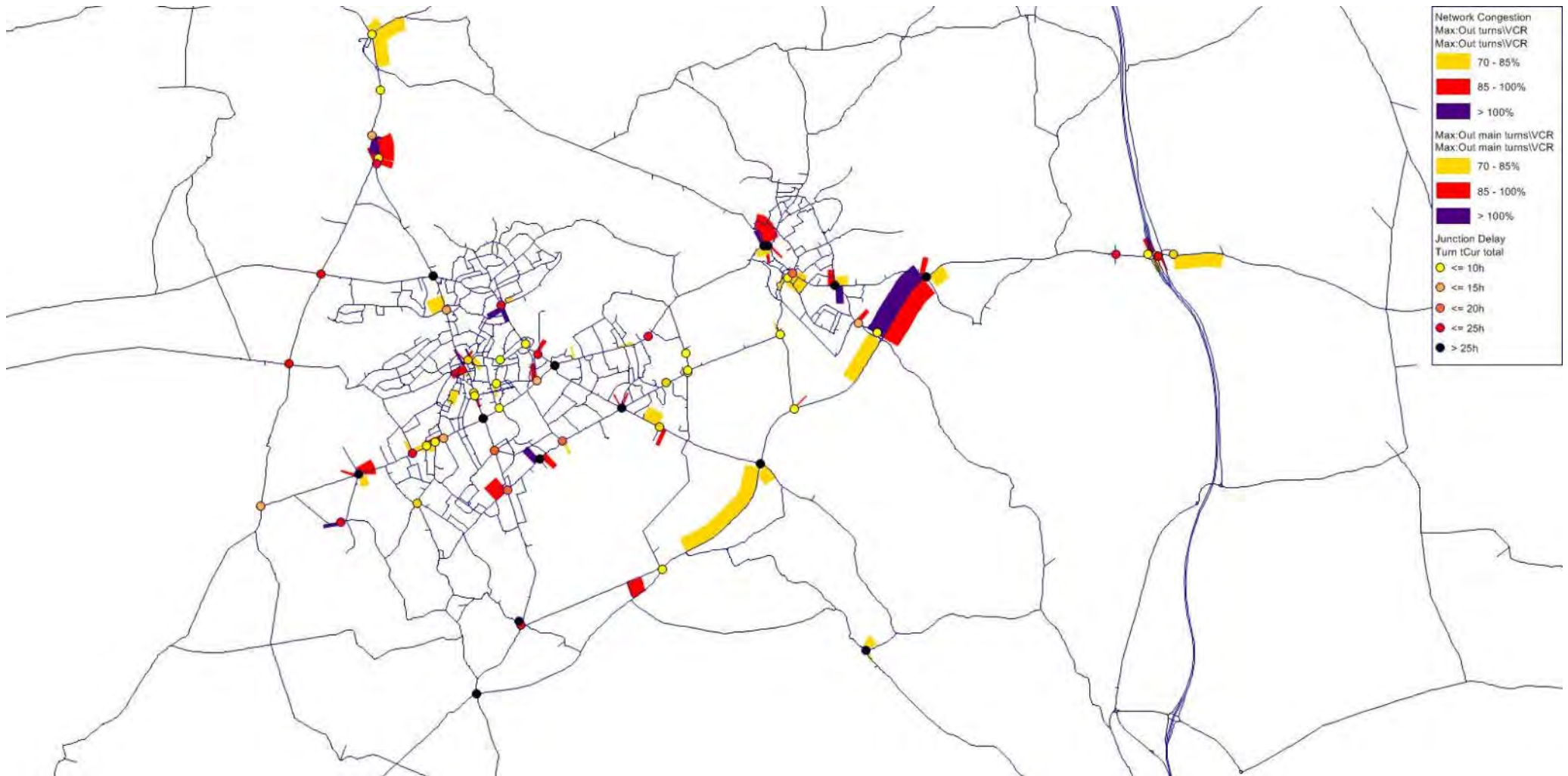




Figure 6-32: VCR - AM - Harrogate and Knaresborough - Option 3



As can be seen from Figure 6-29, the 2035 Do Minimum network shows delays and congestion at a number of junctions including the A59/A658, Bond End and A59 / B6164 junction in Knaresborough and the A658 / A661, Woodlands and A61 / Jenny Field Drive junctions in Harrogate and the A61 / Otley Road junction in Killinghall.

All Local Plan options showed relatively little development coming forward in the main Harrogate and Knaresborough urban areas, as highlighted previously in Figure 6-1 and Figure 6-2. Whilst some junctions show an increase in overall delay, the impacts of the Local Plan within Harrogate and Knaresborough are thus relatively limited and mainly around areas where development will be coming forward. The main changes as a result of the Local Plan Option 1 are as follows:

- The development sites coming forward in Pannal Ash result in congestion on the B6162 Otley Road / Crag Lane / Beckwith Head junction;
- General increases in the VCR at the Woodlands junction;
- The A61 / Otley Road junction in Killinghall shows an increase in the overall VCR;
- On the bypass, the A59 / A658 and A658 / B6164 Wetherby Road junctions shows a noted increase in VCR.

The VCRs for the different options are shown in Figure 6-30, Figure 6-31 and Figure 6-32. Given that the only difference between these options is around Junction 47 of the A1(M) which is outside of the detailed model area, the differences between these options are mainly on the bypass and in particular the A59 / A658 and A658 / B6164 Wetherby Road junctions.

The equivalent figures for the junctions in Ripon can be seen on the following pages.

Figure 6-33: VCR - AM - Ripon - 2035 Do Minimum

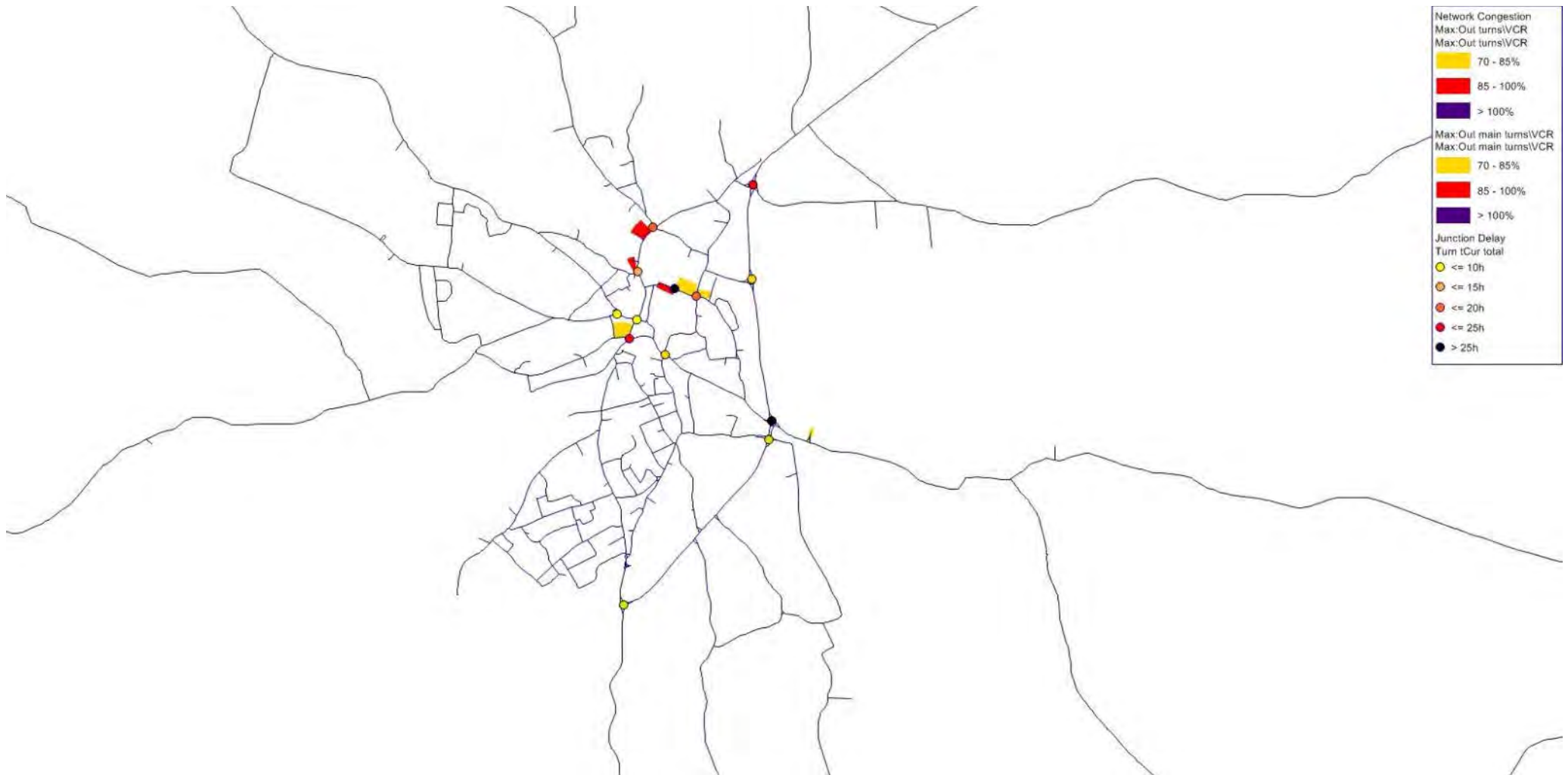


Figure 6-34: VCR - AM - Ripon - Option 1

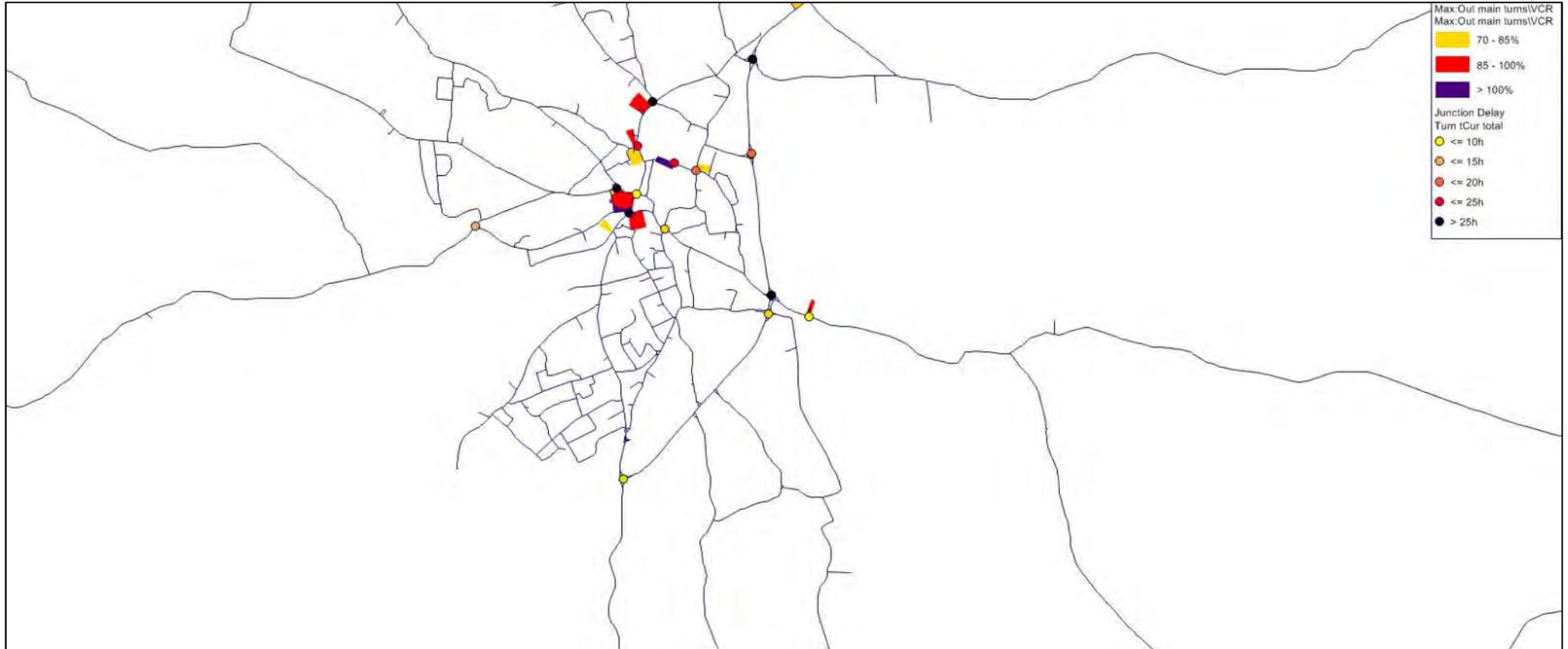


Figure 6-35: VCR - AM - Ripon - Option 2

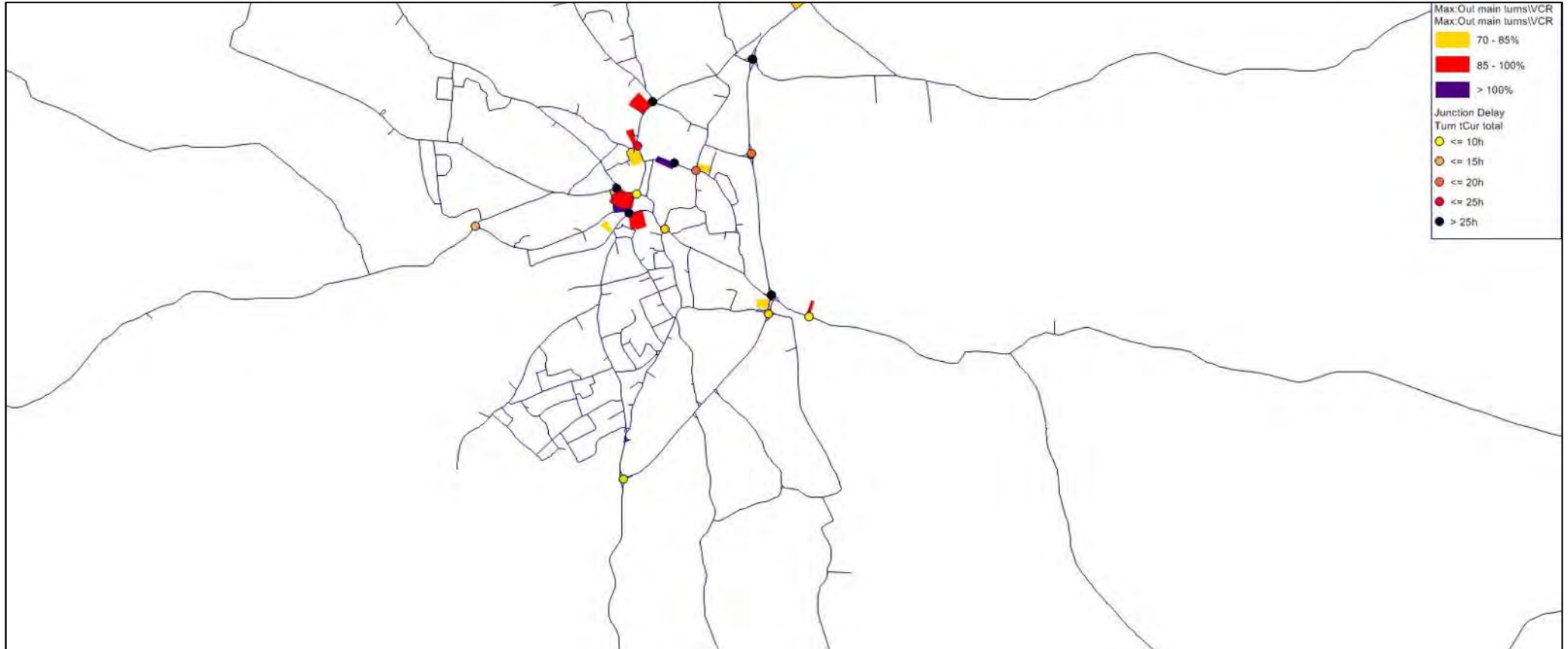


Figure 6-36: VCR - AM - Ripon - Option 3

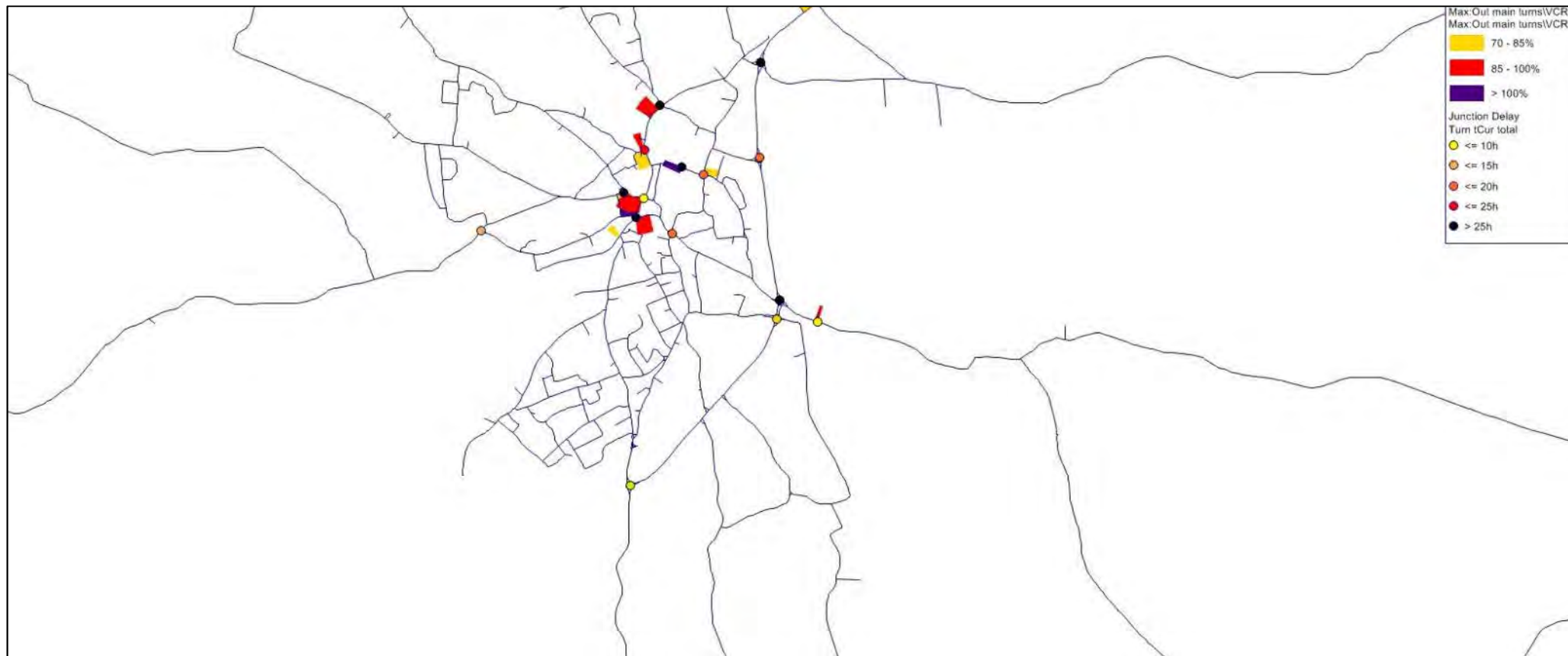


Figure 6-33 to Figure 6-36 show the 2035 traffic conditions for Ripon in the AM peak period for the Do Minimum, Option 1, Option 2 and Option 3 scenarios respectively.

In the 2035 Do Minimum scenario, an elevated VCR is noticed at some junctions within the town centre including the Clocktower junction, Allhallowgate / St Marygate and Skellbank / Water Skellgate / Low Skellgate junctions.

Figure 6-34 to Figure 6-36 show the junction performance in Ripon for Local Plan options 1, 2 and 3. As the quantum of development coming forward in Ripon is identical for each option, the impacts are very similar. The modelling particularly shows an increase in VCR at the Skellbank / Water Skellgate / Low Skellgate, Allhallowgate / St Marygate and North Street / A6108 Palace Road junctions.

The corresponding figures for the PM peak in Harrogate and Knaresborough are shown on the following pages.

Figure 6-37: VCR - PM - Harrogate and Knaresborough - Do Minimum





Figure 6-38: VCR - PM - Harrogate and Knaresborough - Option 1

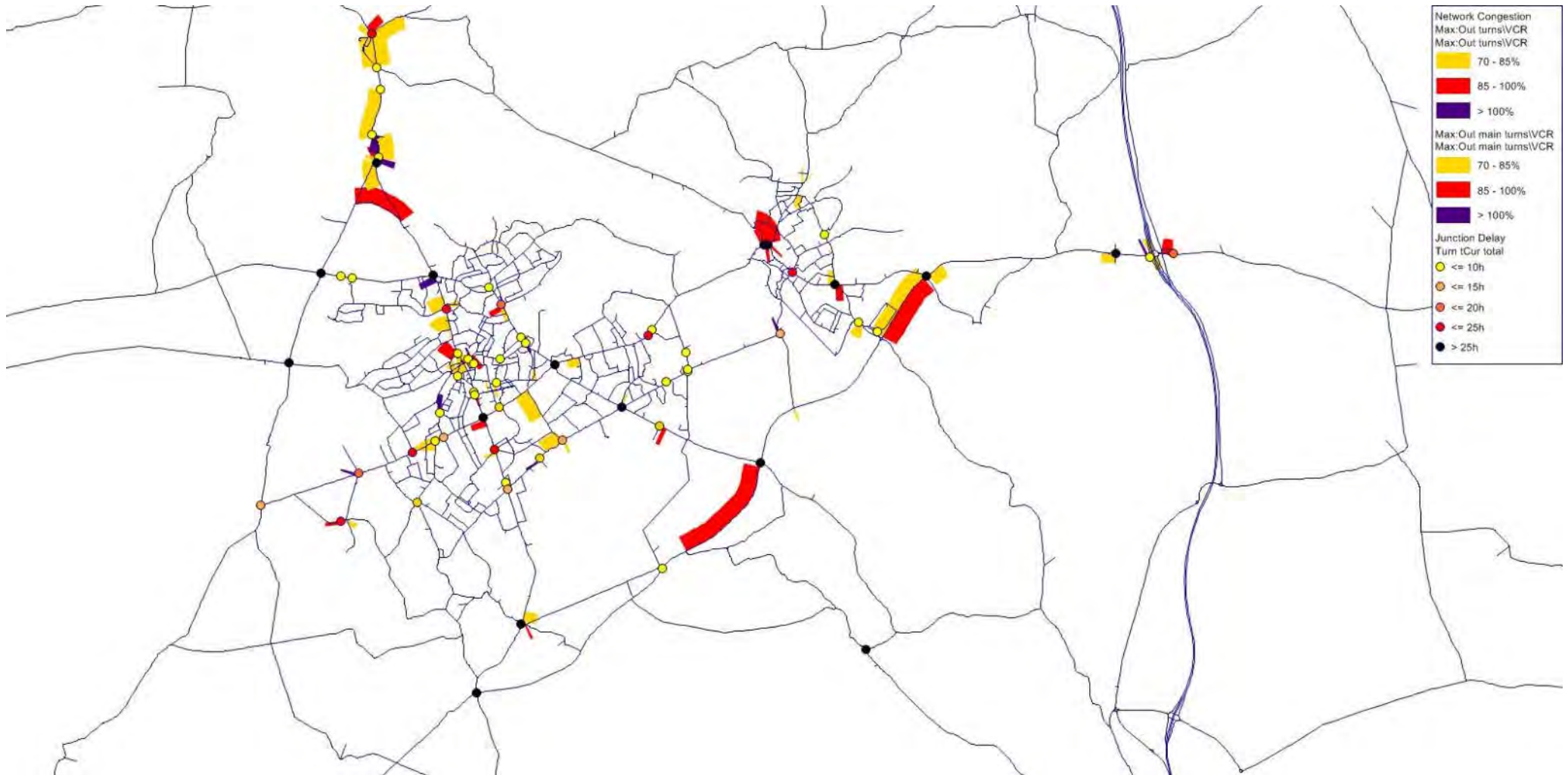


Figure 6-39: VCR - PM - Harrogate and Knaresborough - Option 2

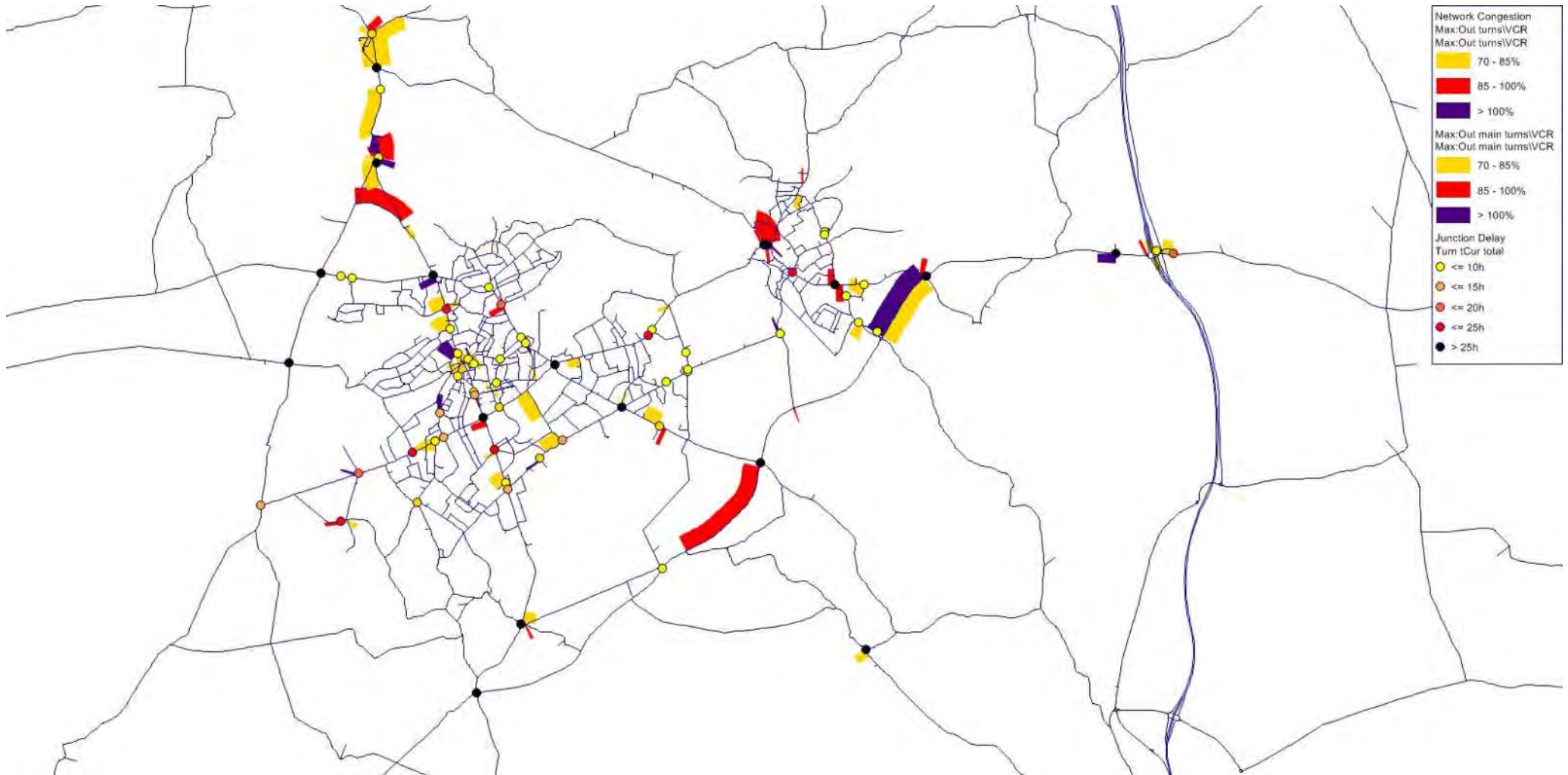


Figure 6-40: VCR - PM - Harrogate and Knaresborough - Option 3

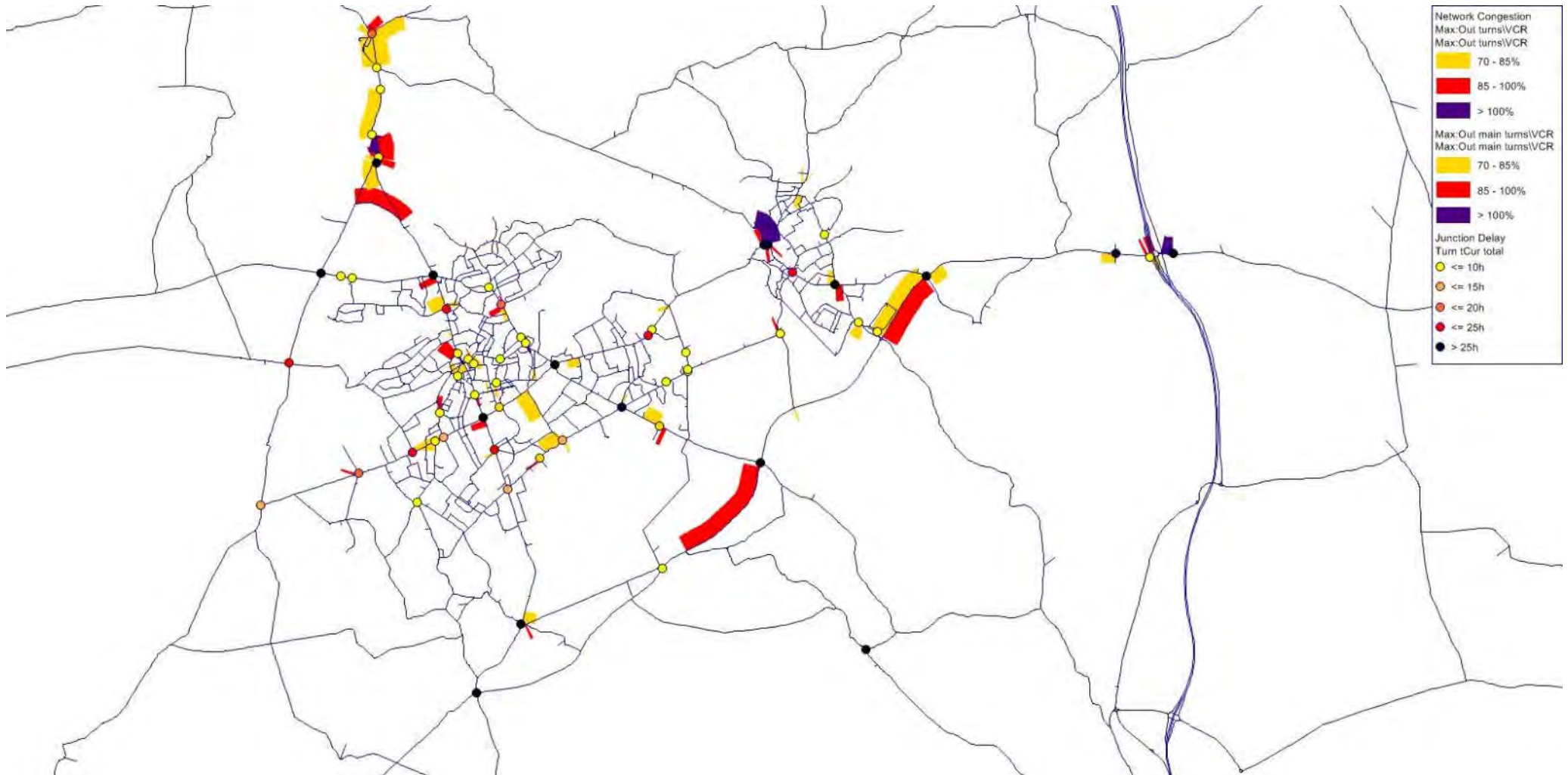


Figure 6-33 shows the junction performance for the 2035 Do Minimum scenario for Harrogate and Knaresborough in the PM peak period. As for the AM peak period, the modelling shows delay at the same junctions in Knaresborough – the A59/A658, Bond End and A59 / B6164 junctions and the junctions in the town centre, the A658 / A661 and A61 / Jenny Field Drive in Harrogate and the A61 corridor in Killinghall.

As noted previously, all Local Plan options are identical in Harrogate and showed relatively little development coming forward in the main Harrogate and Knaresborough urban areas. The main changes as a result of the Local Plan Option 1 are as follows:

- The development sites coming forward in Pannal Ash result in some congestion (although less than shown in the AM peak) at the B6162 Otley Road / Crag Lane / Beckwith Head junction and the Beckwith Road / Howhill Road junction;
- General increases in the VCR at the Woodlands junction;
- The A61 corridor in Killinghall and in particular the A61 / Otley Road junction shows an increase in the overall VCR; and
- On the bypass, the A59 / A658 and A658 / B6164 Wetherby Road junctions shows a noted increase in VCR.

The modelling also shows congestion in the area around Junction 47 of the A1(M) although as stated previously this area is in the buffer zone of the model and the effects of the Local Plan on the junction are being considered elsewhere.

As noted previously, the differences in development between Options 1, 2 and 3 is in the area around Junction 47 of the A1(M) and therefore the differences between the options are mainly limited to the effects on the bypass and in particular the A59 / A658 and A658 / B6164 Wetherby Road junctions.

The equivalent figures for the junctions in Ripon can be seen on the following pages.

Figure 6-41: VCR - PM - Ripon - Do Minimum

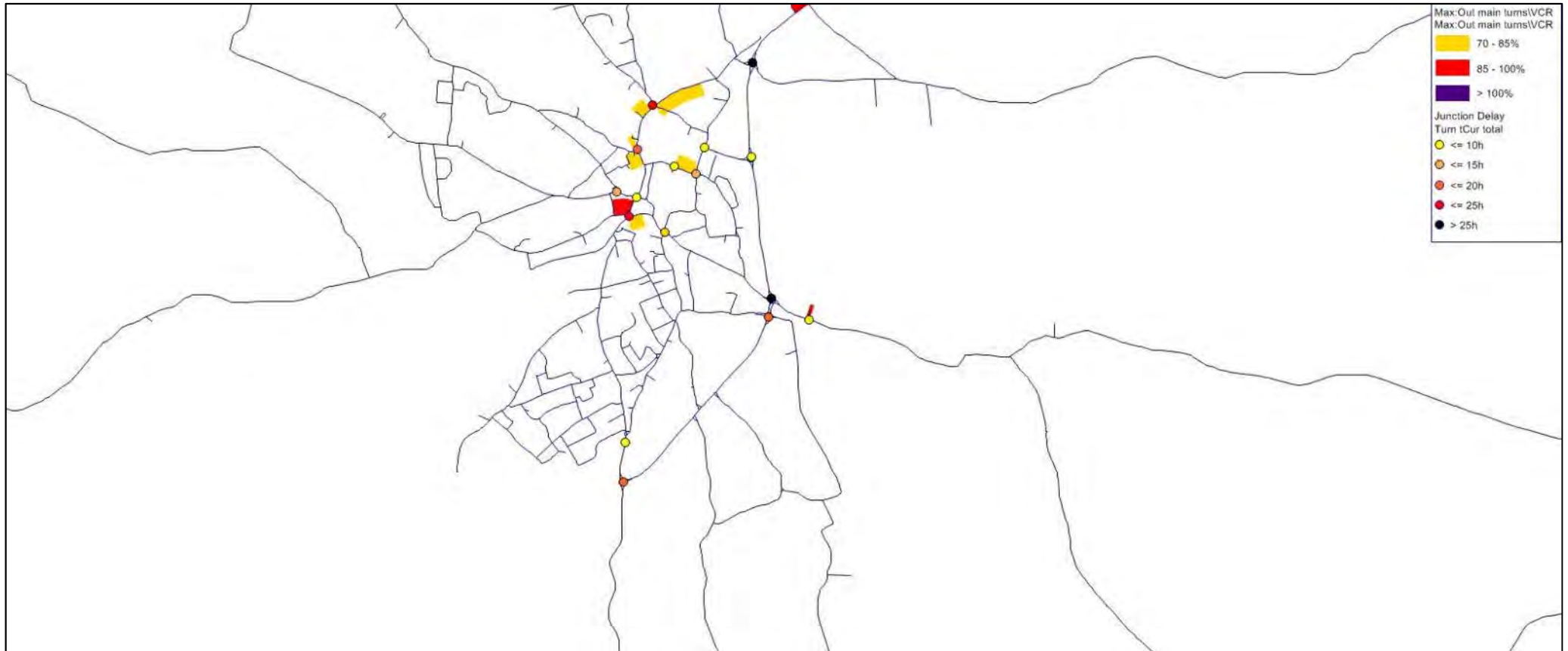


Figure 6-42: VCR - PM - Ripon - Option 1

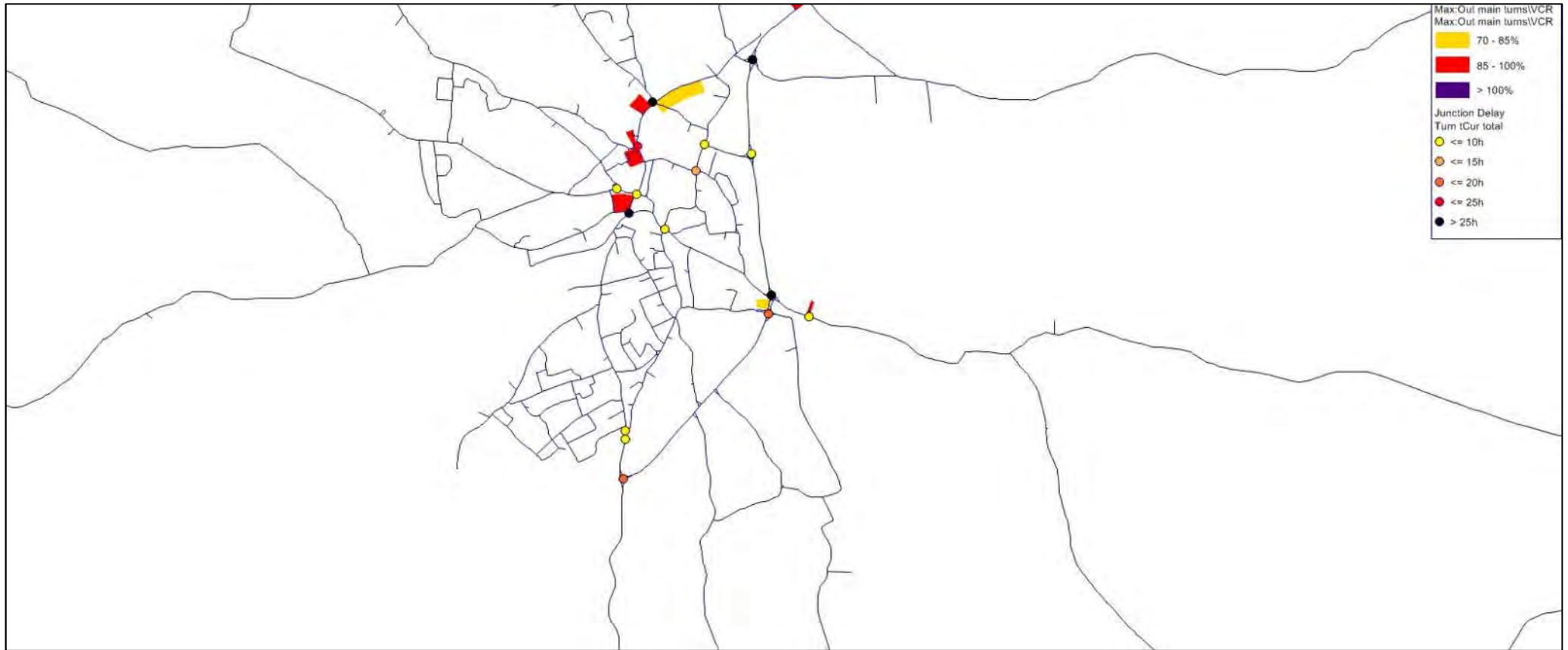
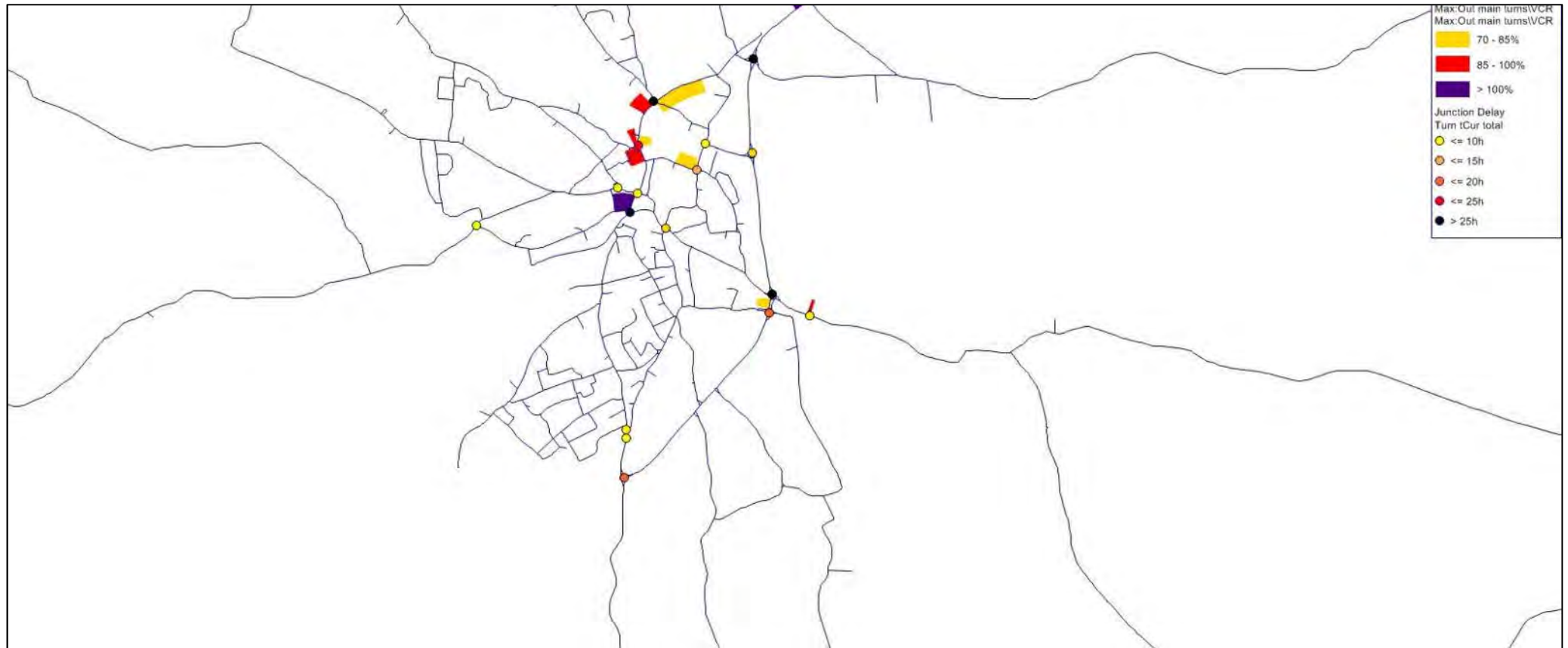


Figure 6-43: VCR - PM - Ripon - Option 2



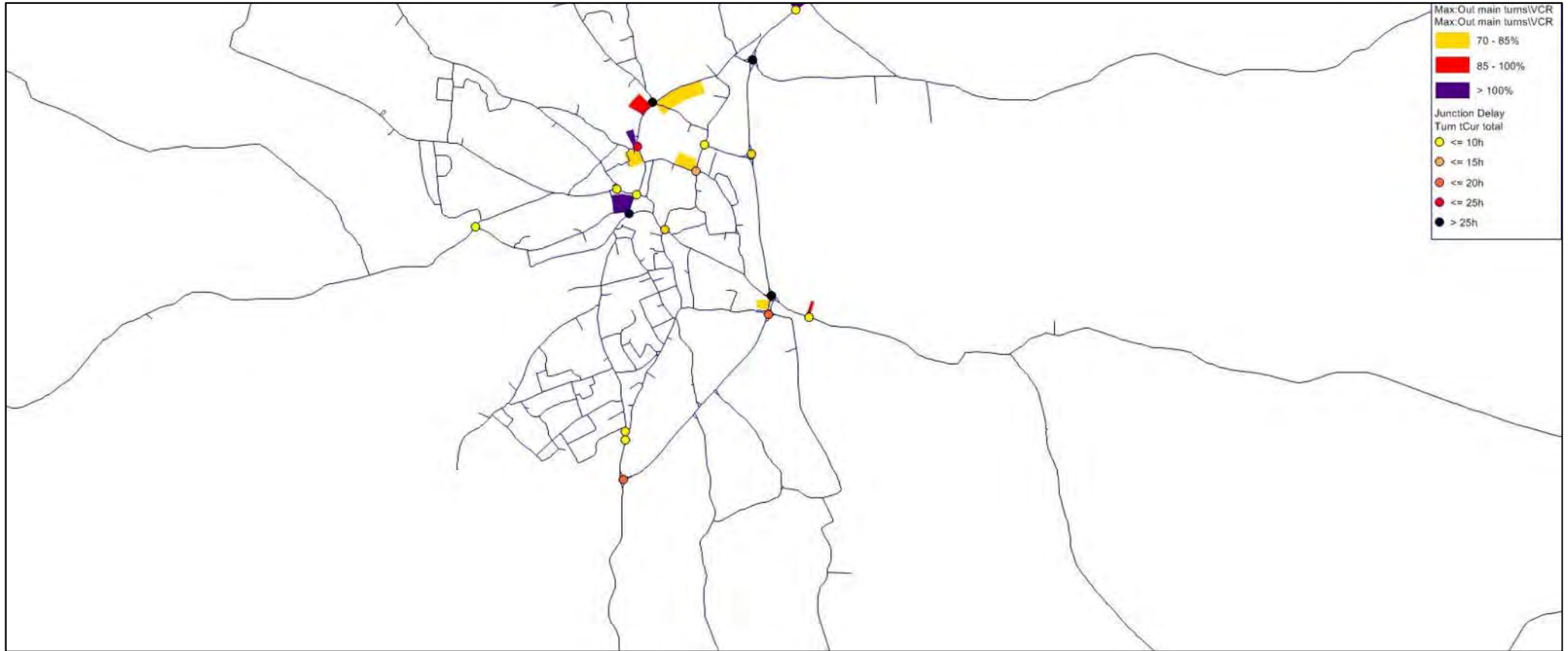


Figure 6-44: VCR - PM - Ripon - Option 3



Figure 6-41 to Figure 6-44 shows the 2035 traffic conditions for Ripon in the PM peak period for the Do Minimum, Option 1, Option 2 and Option 3 scenarios respectively.

In the 2035 Do Minimum scenario, the VCR is approaching capacity at some junctions within the town centre including the Clocktower junction, Allhallowgate / St Marygate and Skellbank / Water Skellgate / Low Skellgate junctions.

Figure 6-34 to Figure 6-36 shows the junction performance in Ripon for Local Plan Options 1, 2 and 3. As the quantum of development coming forward in Ripon is identical for each option, the impacts are very similar. The modelling particularly shows an increase in VCR at the Skellbank / Water Skellgate / Low Skellgate, Allhallowgate / St Marygate and North Street / A6108 Palace Road junctions as per the AM peak modelling, with additional VCR increases at the A61 / Bondgate Green and North Street / College Road junctions.

#### **6.4.1 Junctions Identified as Being Overcapacity**

HBC and NYCC have agreed that mitigation measures of Local Plan development will be based on the VCR value at key junctions. The following tables show the junctions where at least one turning movement is modelled to have an increase in VCR above a threshold VCR of 85 as a result of the Local Plan in 2035. It should be noted that some junctions identified multiple turning movements with a VCR of over 85 and in these cases the highest values has been used. The junction identified highlighted in the AM peak are shown in Table 6-1 with values of under 85 shown in light blue, values of between 85 and 100 shown in blue and over 100 shown in dark blue.

The tables also show which junctions which have been considered for mitigation in Section 7 or the reasoning behind not including the junction for consideration for mitigation provided by HBC. For ease of reference, the junctions shaded in grey.

Table 6-1: Change in VCR at Junctions in 2035 - AM Peak

| Model Node no. | Junction                                  | Maximum VCR at junction for: |       |       |       | Reasons for Including or excluding from mitigation   |
|----------------|---|------------------------------|-------|-------|-------|--|
|                |   | DN                           | Opt 1 | Opt 2 | Opt 3 |  |
| 19             | A6108 North Road / A6108 Palace Road      | 85.7                         | 99.3  | 99.4  | 99.4  | Included for mitigation  |
| 22             | A61 / Kings Road                          | 95.1                         | 92.7  | 94.9  | 95.1  | Worst case scenario same impact as DN, Local Plan is of nil detriment  |
| 35             | A658 / B6164 Grimbald Crag Way            | 88.1                         | 83.0  | 99.9  | 99.3  | Included for mitigation  |
| 41             | A59 York Road / A658 Roundabout           | 69.5                         | 94.4  | 100.1 | 100.1 | Included for mitigation  |
| 45             | A 59 Bond End / B6165 High Bond End       | 96.0                         | 98.6  | 100.0 | 99.9  | Bond End being assessed elsewhere through ongoing study  |
| 46             | A61 Parliament St / A61 King's Road       | 100.0                        | 100.0 | 100.0 | 100.0 | Worst case scenario same impact as DN, Local Plan is of nil detriment  |
| 49             | Hookstone Road / Hornbeam Park Ave        | 58.7                         | 100.0 | 100.0 | 99.6  | Business Park access route, would need to be dealt with by TA using specific site conditions                       |
| 50             | A59 York Road / B6164                     | 79.6                         | 91.8  | 100.0 | 98.9  | Included for mitigation  |
| 59             | A1(M) Junction 47 offslip to A59 New Road | 83.7                         | 76.3  | 78.6  | 90.9  | Junction 47 being assessed through ongoing study   |
| 60             | A59 New Rd offslip to A1(M) J47           | 70.9                         | 79.8  | 67.1  | 94.8  | Junction 47 being assessed through ongoing study   |
| 62             | B6162 Otley Road / Crag Lane              | 93.2                         | 100.0 | 100.0 | 100.0 | Included for mitigation  |
| 98             | A61 Ripon Road / Otley Road               | 92.1                         | 90.2  | 96.4  | 89.8  | Included for mitigation  |
| 456            | Cold Bath Road / St Mary's Ave            | 84.1                         | 78.8  | 85.7  | 84.0  | Worst case scenario only shows small increase over DN which is considered acceptable                               |
| 1031           | A59 Skipton Road / Woodfield Road         | 123.0                        | 84.5  | 132.8 | 96.8  | Inconsistency in AM results and acceptable ratios in PM suggest this junction can function at a satisfactory level |
| 1116           | A61 Leeds Road / Leadhall Lane            | 77.1                         | 100.0 | 100.0 | 100.0 | Included for mitigation  |
| 1378           | Westgate / Blossomgate                    | 60.1                         | 90.4  | 89.1  | 90.0  | Included for mitigation  |
| 1445           | Somerset Row / Low Skellgate              | 82.8                         | 98.1  | 100.3 | 98.3  | Included for mitigation  |
| 1464           | A59 Knaresborough Place / North Park Road | 100.3                        | 101.5 | 99.7  | 100.9 | Minimal increase over DN which is considered acceptable  |
| 1472           | A59 Skipton Road / Claro Road             | 85.4                         | 86.4  | 87.2  | 86.8  | Minimal increase over DN which is considered acceptable  |
| 1487           | North Street / Coltsgate Hill             | 86.1                         | 100.0 | 99.7  | 100.0 | Included for mitigation  |

|             |  |      |       |       |       |  |
|-------------|--|------|-------|-------|-------|--|
| 1620        | Victoria Grove / Allhalowgate                      | 95.4 | 100.2 | 100.3 | 100.1 | Minor junction linking car park to main highway network, excluded  |
| 1893        | B6265 Boroughbridge Road / Charter Road            | 82.3 | 94.3  | 93.5  | 93.7  | Site exit, not considered significant for junction assessment  |
| 1937        | A661 Wetherby Road / Hookstone Chase               | 86.0 | 92.3  | 99.4  | 94.4  | Included for mitigation  |
| 2235        | B6163 / Forest Moor Road                           | 76.5 | 81.8  | 79.3  | 85.5  | Worst case scenario only marginally over 85  |
| 2475        | Wetherby Road - Bridge over River Nidd             | 75.6 | 87.9  | 86.6  | 88.8  | Worst case scenario VCR only marginally over 85  |
| 3419        | A61 Ripon Road / Road leading to the HACS Group    | 82.5 | 84.5  | 85.7  | 84.2  | Site access, not considered significant enough for assessment  |
| 3633        | A658 / Hags Road                                   | 80.4 | 88.8  | 89.2  | 89.5  | Priority junction onto southern bypass that would form a cut through, mitigation to other congested junctions likely to reduce rat running traffic |
| 3784        | A658 / B6163 Thistle Hill                          | 77.4 | 94.5  | 96.3  | 97.9  | Included for mitigation  |
| 100091<br>7 | Howhill Quarry Road opposite Le Campsite Harrogate | 78.8 | 123.0 | 79.9  | 106.5 | Due to methodology of connecting trips to the network the impact on this junction is significantly overestimated                                   |

The location of the above junctions can be seen in Figure 6-45 in Harrogate and Figure 6-46 in Ripon.

Figure 6-45: Locations of Junctions Identified in Table 6-1 in Harrogate and Knaresborough – AM Peak

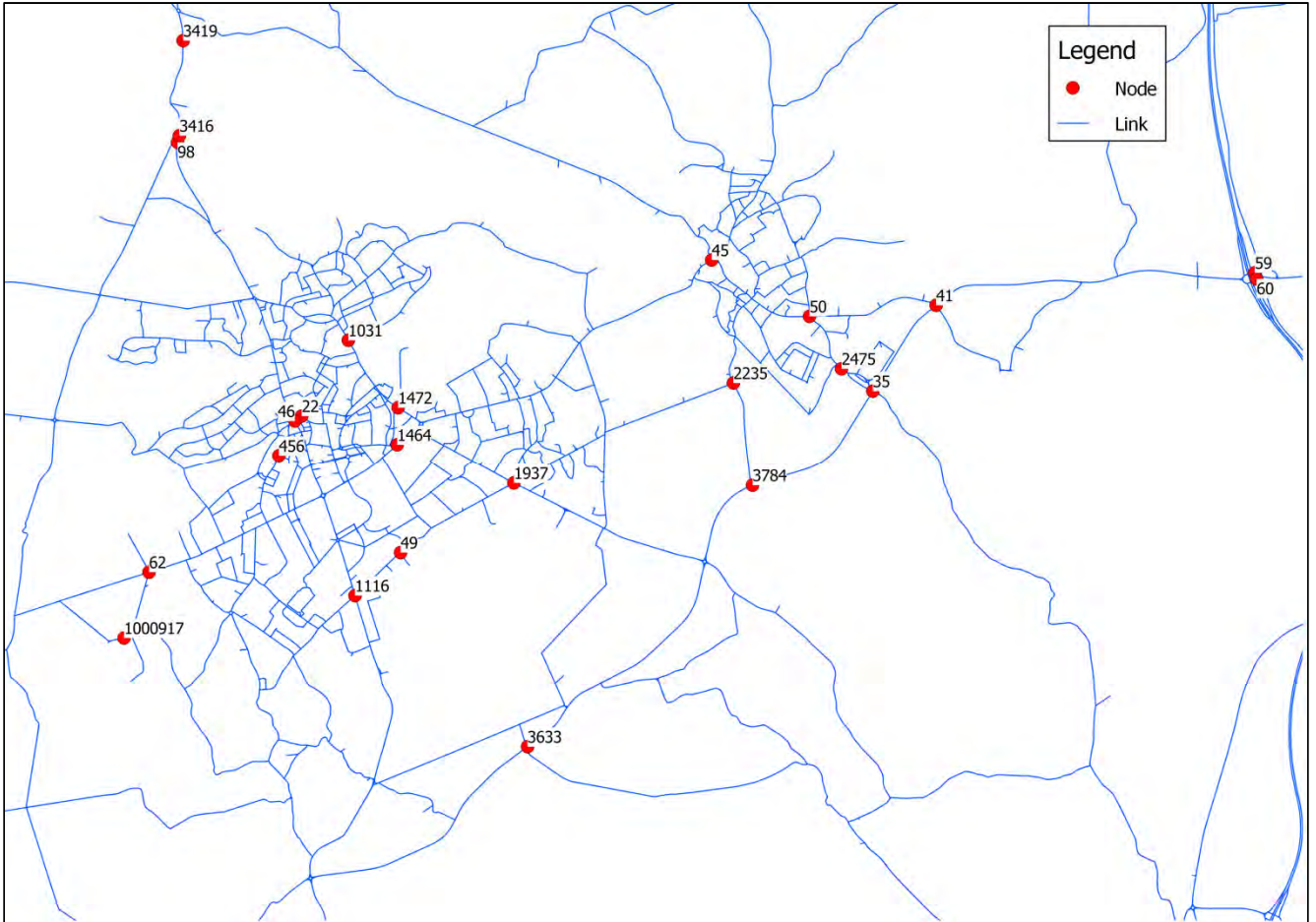
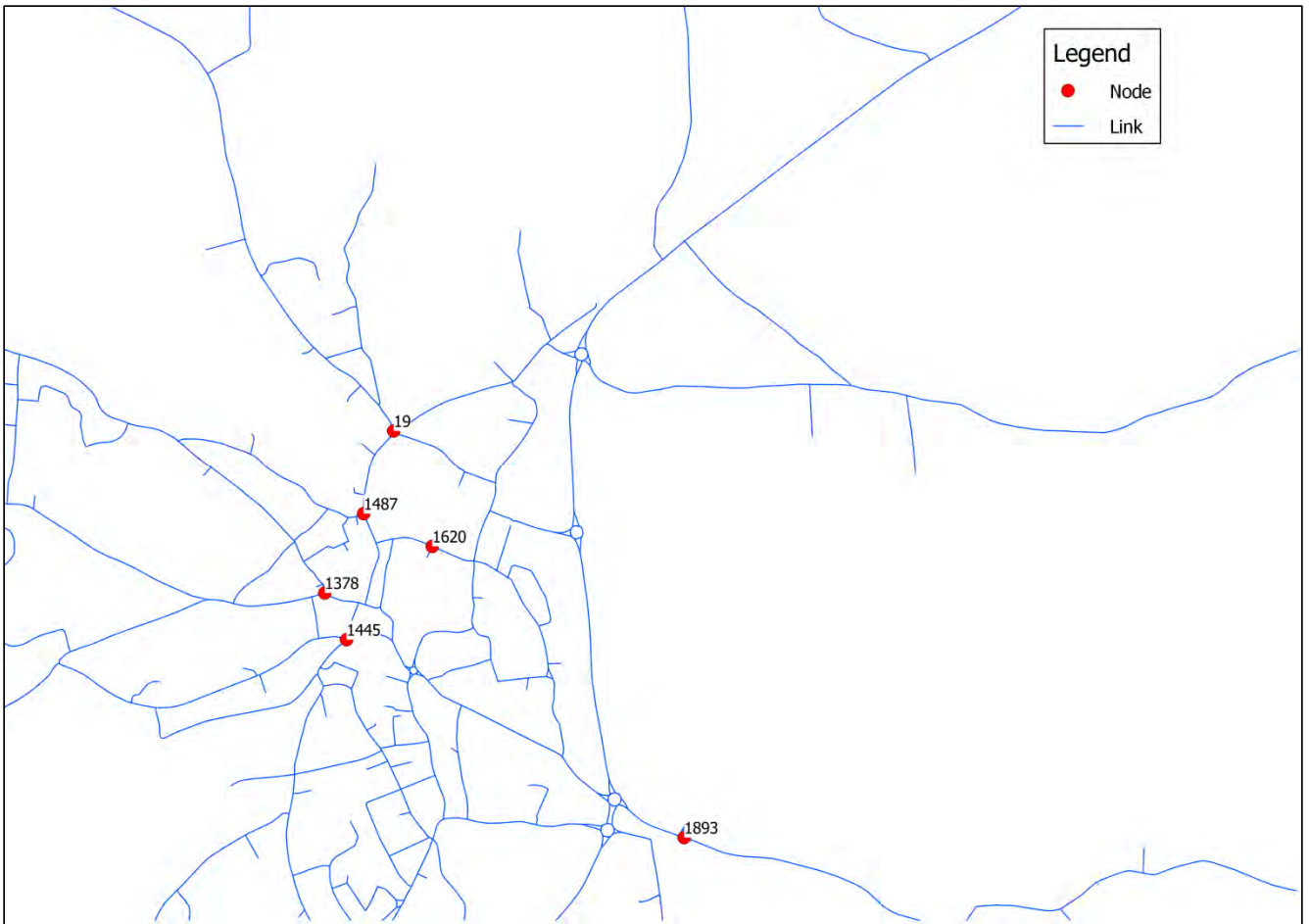


Figure 6-46: Locations of Junctions Identified in Table 6-1 in Ripon – AM Peak



The corresponding figures for the PM peak are shown in Table 6-2 with the locations shown in Figure 6-47 and Figure 6-48.

For ease of reference, the junctions shaded in grey above are considered for mitigation in as set out in Section 7

Table 6-2: Change in VCR at Junctions in 2035 - PM Peak

| Model Node no. | Junction                                   | Maximum VCR at junction for: |       |       |       | Reasons for Including or excluding from mitigation   |
|----------------|--|------------------------------|-------|-------|-------|--|
|                |  | DN                           | Opt 1 | Opt 2 | Opt 3 |  |
| 8              | A61 Leeds Road / A61 W park Roundabout     | 82.9                         | 85.6  | 86.4  | 85.8  | Worst case scenario VCR only marginally over 85  |
| 10             | A61 Ripon Road / A59 Skipton Road          | 96.8                         | 102.9 | 100.9 | 99.3  | Included for mitigation  |
| 19             | A6108 North Road / A6108 Palace Road       | 78.9                         | 91.2  | 93.8  | 93.8  | Included for mitigation  |
| 22             | A61 / Kings Road                           | 79.7                         | 85.4  | 81.5  | 81.7  | Worst case scenario VCR only marginally over 85  |
| 28             | A661 Wetherby Road / A658 Roundabout       | 92.7                         | 91.5  | 92.1  | 92.1  | Worst case scenario VCR only marginally over 85  |
| 30             | A61 Ripon Road / B6165 Roundabout          | 84.3                         | 93.3  | 89.6  | 90.8  | VCR of just over 90 in worst case scenario, junction likely to be able to continue operating acceptably. |
| 35             | A658 / B6164 Gimbald Crag Way Roundabout   | 79.9                         | 90.3  | 82.4  | 92.1  | Included for mitigation  |
| 41             | A59 York Road / A658 Roundabout            | 84.9                         | 74.5  | 100.0 | 78.0  | Included for mitigation  |
| 45             | A 59 Bond End / B6165 High Bond End        | 100.1                        | 100.0 | 100.0 | 100.0 | Bond End being assessed elsewhere through ongoing  |
| 50             | A59 York Road / B6164                      | 85.0                         | 90.9  | 93.8  | 92.1  | Included for mitigation  |
| 55             | A61 The Carr Leeds Road / Follifoot Road   | 87.3                         | 92.9  | 93.0  | 93.4  | Included for mitigation  |
| 58             | A59 offslip to A1(M) J47 onslip (west arm) | 54.0                         | 100.0 | 96.0  | 98.9  | Junction 47 being assessed through ongoing study   |
| 59             | A1(M) Junction 47 offslip to A59 New Road  | 80.7                         | 82.2  | 76.9  | 92.2  | Junction 47 being assessed through ongoing study   |
| 61             | A59 New Road / A168 offslip to A59         | 84.1                         | 85.6  | 78.8  | 100.0 | Junction 47 being assessed through ongoing study   |
| 62             | B6162 Otley Road / Crag Lane               | 101.0                        | 102.6 | 101.4 | 99.1  | Included for mitigation  |
| 98             | A61 Ripon Road / Otley Road                | 100.0                        | 102.5 | 102.4 | 101.2 | Included for mitigation  |
| 157            | A61 Ripon Road / Grainbeck Lane            | 75.6                         | 87.9  | 88.5  | 87.5  | Minor junction, impacts considered to be broadly acceptable.   |
| 357            | Cold Bath Road / W Cliffe Grove            | 97.2                         | 102.4 | 104.3 | 100.3 | Minor junction not envisaged to have a strategic impact  |
| 514            | A61 Ripon Road / Swan Road                 | 100.7                        | 96.1  | 100.7 | 98.3  | Worst case scenario same as DN   |
| 1031           | A59 Skipton Road / Woodfield Road          | 86.9                         | 85.8  | 87.1  | 86.0  | Worst case scenario shows only small increase over DN which is considered to be acceptable               |
| 1106           | A59 / Chatsworth Road                      | 100.7                        | 101.9 | 98.6  | 99.5  | Only marginal increase in VCR in worst case scenario   |

|             |  |       |       |       |       |   |
|-------------|--|-------|-------|-------|-------|---|
| 1275        | A59 Skipton Road / Regent Ave                      | 94.0  | 101.4 | 100.8 | 99.9  | Included for mitigation   |
| 1445        | Somerset Row / Low Skellgate                       | 90.6  | 100.0 | 100.0 | 100.0 | Included for mitigation   |
| 1487        | North Street / College Hill                        | 82.7  | 96.0  | 99.1  | 98.7  | Included for mitigation   |
| 1876        | A61 Hutton Bank / Hutton Lane                      | 92.8  | 96.2  | 102.9 | 100.9 | Due to methodology of connecting trips to the network the impact on this junction is significantly overestimated. The likely junction for the majority of these movements has a far higher capacity and the impact would be considered as part of the Transport Assessment process. |
| 1893        | B6265 Boroughbridge Road / Charter Road            | 86.0  | 89.3  | 92.2  | 92.0  | Site exit, not considered significant junction for assessment   |
| 2235        | B6163 Calcutt / Forest Moor Road                   | 100.7 | 101.6 | 100.8 | 99.8  | Worst case scenario shows only small increase over DN which is considered to be acceptable  |
| 2334        | A6055 Boroughbridge Road / Greengate Lane          | 85.2  | 84.7  | 87.1  | 85.5  | Worst case scenario shows only small increase over DN which is considered to be acceptable  |
| 3396        | A61 Ripon Road / Maltklin Lane                     | 107.8 | 107.0 | 107.9 | 100.6 | Worst case scenario shows only small increase over DN which is considered to be acceptable  |
| 3416        | A61 Ripon Road / footpath to Hazel Manor           | 82.0  | 84.7  | 86.4  | 86.2  | Worst case scenario VCR only marginally over 85   |
| 3419        | A61 Ripon Road / Road leading to the HACS          | 83.9  | 86.3  | 88.8  | 87.8  | Site access, not considered significant junction for  |
| 3649        | A61 / Smith Lane                                   | 90.9  | 99.0  | 100.8 | 101.7 | Minor junction, not considered to have a strategic impact   |
| 3780        | A658 / B6163                                       | 65.3  | 73.2  | 85.7  | 74.2  | Worst case scenario VCR only marginally over 85   |
| 4337        | Flaxby development sites access (west of J47)      | 50.4  | 80.5  | 100.2 | 81.5  | Due to methodology of connecting trips to the network the impact on this junction is significantly overestimated  |
| 100091<br>7 | Howhill Quarry Road opposite Le Campsite Harrogate | 37.7  | 89.7  | 91.4  | 83.5  | Due to methodology of connecting trips to the network the impact on this junction is significantly overestimated  |

Figure 6-47: Locations of Junctions Identified in Table 6-1 in Harrogate and Knaresborough – PM Peak

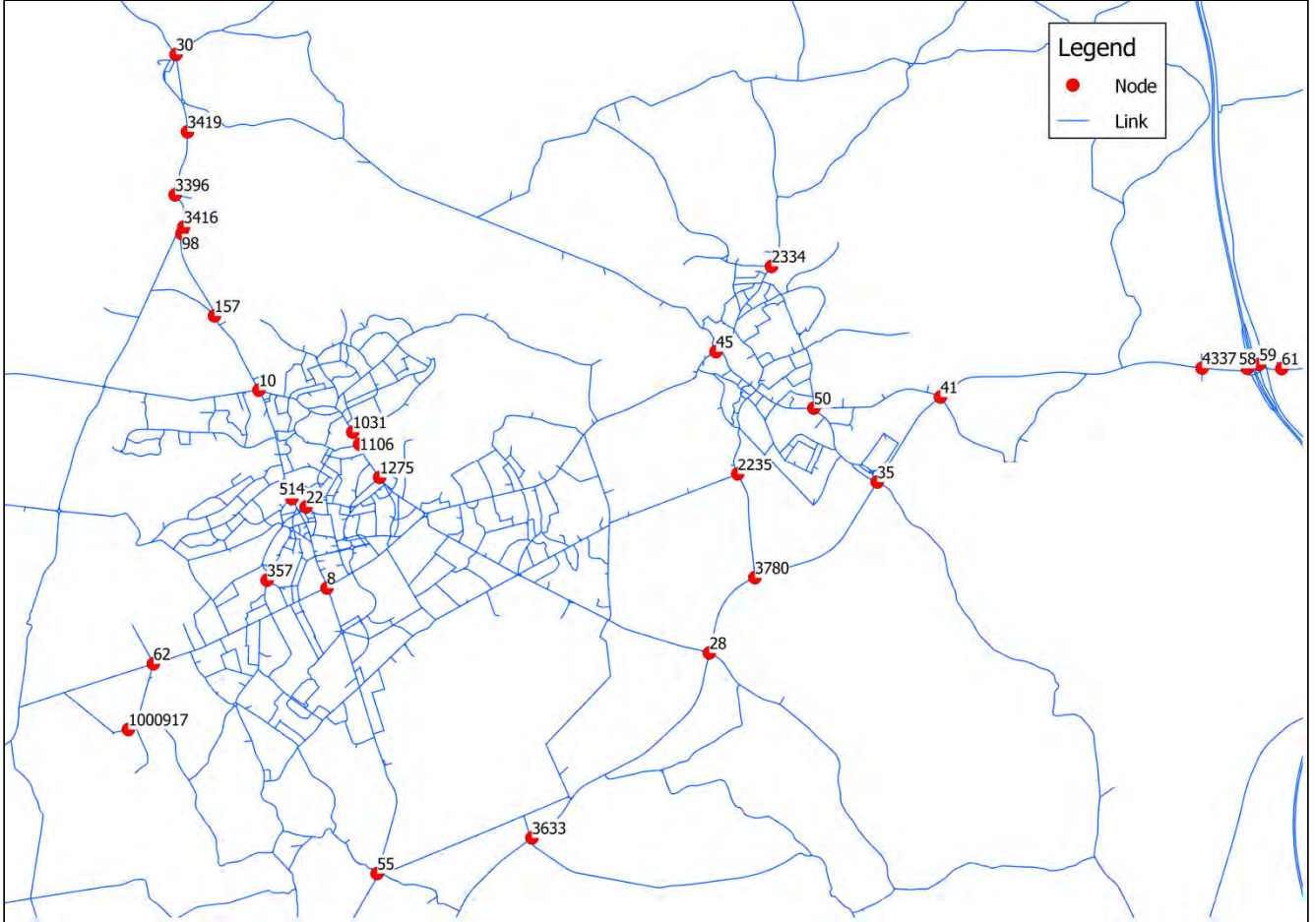
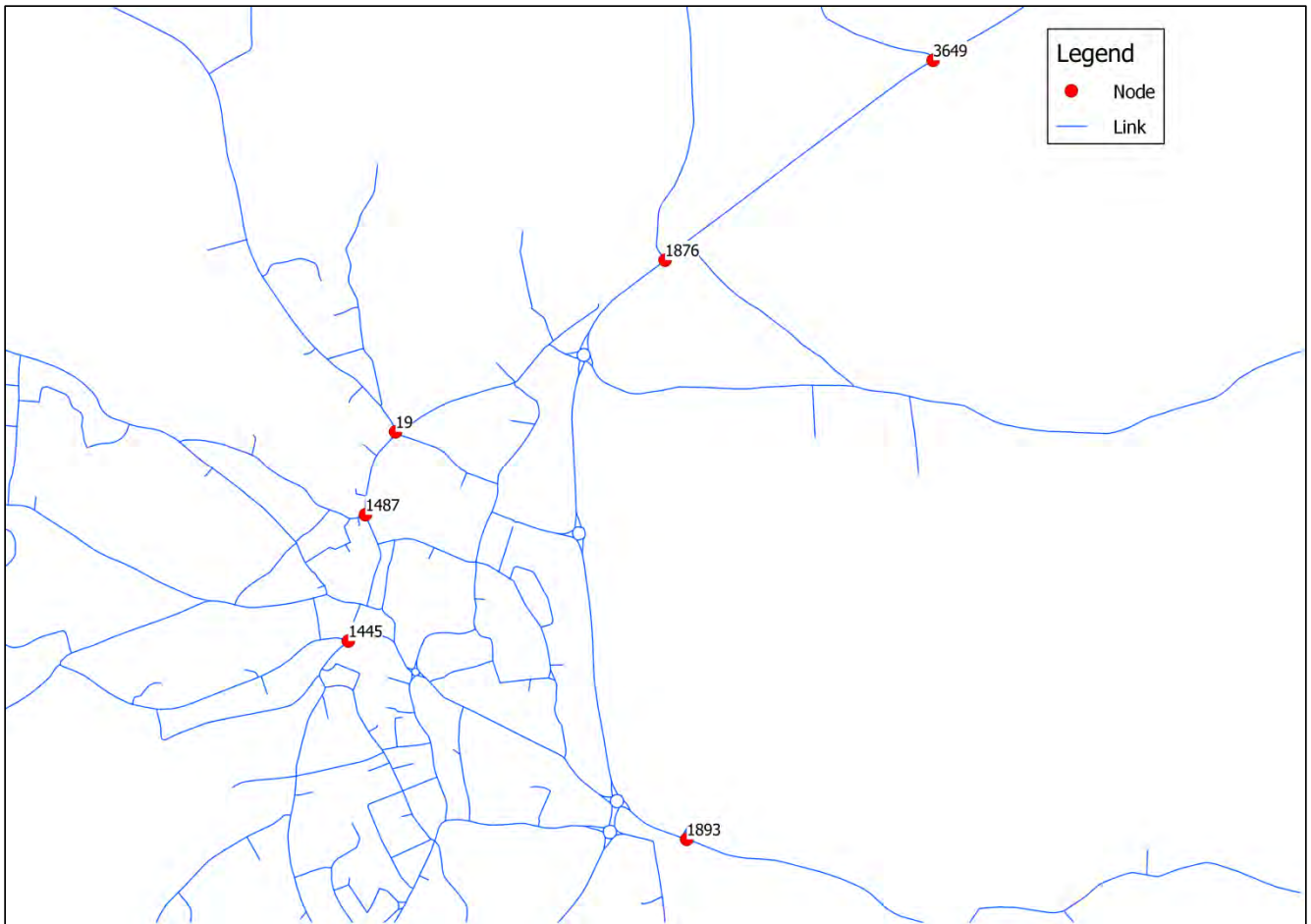




Figure 6-48: Locations of Junctions Identified in Table 6-1 in Ripon – PM Peak



#### 6.4.2 2025 Scenario Modelling Results

The corresponding results for the 2025 scenario year are presented in Appendix D.

As can be seen from the build out rates for the committed development and Local Plan sites in Appendices A and B, it is expected that all committed development sites will be fully operational in the 2025 Intermediate Year scenarios as well as the majority of Local Plan sites. The major exceptions for the Local Plan sites are the FX3 strategic housing at Flaxby, GH11 strategic housing site at Green Hammerton and the FX4 strategic employment site at Flaxby, which are all forecast to have approximately 25% of the development operational in 2025.

The broad differences between the 2025 and 2035 scenarios are therefore background traffic growth and additional traffic from these strategic sites.

As a result, the modelling impacts on junctions are similar to the 2035 scenarios identified in the section above. A commentary on the impacts in 2025 is provided in Appendix D.

Table 6-3 and Table 6-4 show the corresponding 2025 maximum VCR values for junctions identified as being overcapacity and exacerbated by the Local Plan in Table 6-1 and Table 6-2.

It should be noted that some junctions identified multiple turning movements with a VCR of over 85 and in these cases the highest values has been used. VCR values of under 85 shown in light blue, values of between 85 and 100 shown in blue and over 100 shown in dark blue.

Table 6-3: Change in VCR at Junctions in 2025 - AM Peak

| Model Node no. | Junction                                    | Maximum VCR at junction for: |       |       |       |
|----------------|---|------------------------------|-------|-------|-------|
|                |   | DN                           | Opt 1 | Opt 2 | Opt 3 |
| 19             | A6108 North Road / A6108 Palace Road        | 85.7                         | 90.1  | 90.8  | 90.8  |
| 22             | A61 / Kings Road                            | 76.4                         | 81.5  | 85.4  | 85.4  |
| 35             | A658 / B6164 Gimbald Crag Way               | 67.8                         | 73.6  | 73.2  | 73.2  |
| 41             | A59 York Road / A658 Roundabout             | 100.0                        | 97.3  | 97.1  | 97.1  |
| 45             | A 59 Bond End / B6165 High Bond End         | 100.0                        | 100.0 | 100.0 | 100.0 |
| 46             | A61 Parliament St / A61 King's Road         | 63.3                         | 79.7  | 83.9  | 83.9  |
| 49             | Hookstone Road / Hornbeam Park Ave          | 73.3                         | 77.3  | 77.5  | 77.5  |
| 50             | A59 York Road / B6164                       | 79.0                         | 83.8  | 85.5  | 85.5  |
| 59             | A1(M) Junction 47offslip to A59 New Road    | 65.3                         | 62.7  | 65.6  | 65.6  |
| 60             | A59 New Rd offslip to A1(M) J47             | 95.6                         | 104.2 | 98.8  | 107.7 |
| 62             | B6162 Otley Road / Crag Lane                | 100.0                        | 100.0 | 100.0 | 100.0 |
| 98             | A61 Ripon Road / Otley Road                 | 83.4                         | 84.7  | 84.4  | 84.5  |
| 456            | Cold Bath Road / St Mary's Ave              | 95.1                         | 105.7 | 94.8  | 98.5  |
| 1031           | A59 Skipton Road / Woodfield Road           | 72.7                         | 100.0 | 100.0 | 100.0 |
| 1116           | A61 Leeds Road / Leadhall Lane              | 53.1                         | 62.1  | 61.5  | 62.1  |
| 1378           | Westgate / Blossomgate                      | 80.7                         | 86.7  | 87.2  | 86.5  |
| 1445           | Somerset Row / Low Skellgate                | 83.8                         | 85.4  | 85.3  | 84.5  |
| 1464           | A59 Knaresborough Place / North Park Road   | 84.7                         | 88.2  | 88.9  | 88.8  |
| 1472           | A59 Skipton Road / Claro Road               | 78.5                         | 86.2  | 85.4  | 85.6  |
| 1487           | North Street / Coltsgate Hill               | 74.0                         | 83.7  | 83.1  | 82.9  |
| 1620           | Victoria Grove / Allhalowgate               | 4.7                          | 6.2   | 6.2   | 6.3   |
| 1893           | B6265 Boroughbridge Road / Charter Road     | 69.6                         | 74.4  | 78.1  | 77.1  |
| 1937           | A661 Wetherby Road / Hookstone Chase        | 80.3                         | 92.5  | 93.4  | 92.7  |
| 2235           | B6163 / Forest Moor Road                    | 74.2                         | 77.5  | 77.8  | 78.0  |
| 2475           | B 6164 Wetherby Road / footpath parallel to | 69.9                         | 72.9  | 73.2  | 73.4  |
| 3416           | A61 Ripon Road / footpath to Hazel Manor    | 81.1                         | 87.4  | 86.0  | 86.6  |
| 3419           | A61 Ripon Road / Road leading to the HACS   | 59.5                         | 71.7  | 76.3  | 73.6  |
| 3633           | A658 / Hagg's Road                          | 63.2                         | 100.8 | 100.0 | 101.7 |
| 3784           | A658 / B6163 Thistle Hill                   | 85.7                         | 90.1  | 90.8  | 90.8  |
| 100091         | Howhill Quarry Road opposite Le Campsite    | 76.4                         | 81.5  | 85.4  | 85.4  |

Table 6-4: Change in VCR at Junctions in 2025 - PM Peak

| Model Node no. | Junction                                      | Maximum VCR at junction for: |       |       |       |
|----------------|---|------------------------------|-------|-------|-------|
|                |   | DN                           | Opt 1 | Opt 2 | Opt 3 |
| 8              | A61 Leeds Road / A61 W park Roundabout        | 80.8                         | 81.1  | 80.9  | 80.9  |
| 10             | A61 Ripon Road / A59 Skipton Road             | 75.2                         | 82.4  | 79.8  | 79.8  |
| 19             | A6108 North Road / A6108 Palace Road          | 70.5                         | 82.7  | 82.8  | 82.8  |
| 22             | A61 / Kings Road                              | 87.0                         | 86.4  | 86.3  | 86.3  |
| 28             | A661 Wetherby Road / A658 Roundabout          | 74.2                         | 75.6  | 76.2  | 76.2  |
| 30             | A61 Ripon Road / B6165 Roundabout             | 73.1                         | 76.5  | 77.7  | 77.7  |
| 35             | A658 / B6164 Grimbald Crag Way Roundabout     | 88.4                         | 86.9  | 87.5  | 87.5  |
| 41             | A59 York Road / A658 Roundabout               | 100.0                        | 100.0 | 100.0 | 100.0 |
| 45             | A 59 Bond End / B6165 High Bond End           | 80.4                         | 85.9  | 84.8  | 84.8  |
| 50             | A59 York Road / B6164                         | 87.2                         | 88.2  | 87.2  | 87.2  |
| 55             | A61 The Carr Leeds Road / Follifoot Road      | 53.6                         | 75.9  | 76.0  | 76.0  |
| 58             | A59 offslip to A1(M) J47 onslip (west arm)    | 81.2                         | 81.0  | 88.7  | 88.7  |
| 59             | A1(M) Junction 47 offslip to A59 New Road     | 86.2                         | 86.3  | 93.2  | 93.2  |
| 61             | A59 New Road / A168 offslip to A59            | 99.7                         | 102.2 | 100.2 | 102.0 |
| 62             | B6162 Otley Road / Crag Lane                  | 100.0                        | 100.0 | 100.0 | 100.0 |
| 98             | A61 Ripon Road / Otley Road                   | 70.5                         | 81.1  | 83.6  | 81.3  |
| 157            | A61 Ripon Road / Grainbeck Lane               | 100.2                        | 97.7  | 90.8  | 89.9  |
| 357            | Cold Bath Road / W Cliffe Grove               | 102.3                        | 100.4 | 100.4 | 102.3 |
| 514            | A61 Ripon Road / Swan Road                    | 82.4                         | 83.1  | 83.3  | 83.5  |
| 1031           | A59 Skipton Road / Woodfield Road             | 75.2                         | 75.6  | 79.4  | 75.6  |
| 1106           | A59 / Chatsworth Road                         | 87.9                         | 94.7  | 96.9  | 95.1  |
| 1275           | A59 Skipton Road / Regent Ave                 | 74.6                         | 88.7  | 88.5  | 88.9  |
| 1445           | Somerset Row / Low Skellgate                  | 76.6                         | 97.2  | 97.6  | 92.2  |
| 1487           | North Street / College Hill                   | 77.2                         | 85.5  | 85.6  | 85.7  |
| 1876           | A61 Hutton Bank / Hutton Lane                 | 98.4                         | 101.2 | 99.6  | 100.6 |
| 1893           | B6265 Boroughbridge Road / Charter Road       | 65.7                         | 74.6  | 72.8  | 72.8  |
| 2235           | B6163 Calcutt / Forest Moor Road              | 100.6                        | 100.4 | 105.2 | 100.1 |
| 2334           | A6055 Boroughbridge Road / Greengate Lane     | 79.2                         | 81.7  | 82.0  | 81.3  |
| 3396           | A61 Ripon Road / Maltklin Lane                | 82.5                         | 83.3  | 83.7  | 82.7  |
| 3416           | A61 Ripon Road / footpath to Hazel Manor      | 65.5                         | 93.7  | 96.4  | 96.1  |
| 3419           | A61 Ripon Road / Road leading to the HACS     | 50.1                         | 55.3  | 56.8  | 56.1  |
| 3649           | A61 / Smith Lane                              | 49.4                         | 50.4  | 48.7  | 49.9  |
| 3780           | A658 / B6163                                  | 31.9                         | 80.6  | 80.8  | 51.4  |
| 4337           | Flaxby development sites access (west of J47) | 80.8                         | 81.1  | 80.9  | 80.9  |
| 100091         | Howhill Quarry Road opposite Le Campsite      | 75.2                         | 82.4  | 79.8  | 79.8  |

For ease of reference, the junctions shaded in grey above are considered for mitigation in as set out in Section 7.

## 6.5 High Level Statistics

In addition to the diagrams, overall model statistics have also been calculated to provide further insight into the forecast model performances. These statistics take the form of the total vehicle hours and vehicle kilometres within the model. The statistics cover both the entire model network and the individual modelled areas of Harrogate, Knaresborough and Ripon. The statistics are detailed in Table 6-5.

**Table 6-5: Summary Model Statistics**

| Area          | Scenario   | AM Peak    |             | PM Peak     |               |
|---------------|------------|------------|-------------|-------------|---------------|
|               |            | Vehicle KM | Vehicle Hrs | Vehicle KM  | Vehicle Hrs   |
| Overall Model | 2035 DM    | 17,888,326 | 45,359,494  | 848,369,189 | 2,153,486,211 |
|               | 2035 Opt 1 | 17,939,362 | 45,462,167  | 853,045,980 | 2,161,684,383 |
|               | 2035 Opt 2 | 18,045,410 | 45,558,420  | 858,165,890 | 2,165,882,175 |
|               | 2035 Opt 3 | 18,033,781 | 45,551,631  | 857,005,878 | 2,165,446,118 |
| Harrogate     | 2035 DM    | 57,358     | 64,079      | 6,911,712   | 7,529,662     |
|               | 2035 Opt 1 | 61,966     | 67,599      | 8,252,213   | 8,390,347     |
|               | 2035 Opt 2 | 61,969     | 68,218      | 8,211,692   | 8,197,552     |
|               | 2035 Opt 3 | 62,348     | 67,342      | 8,157,367   | 8,411,704     |
| Knaresborough | 2035 DM    | 12,774     | 13,704      | 1,391,803   | 1,815,380     |
|               | 2035 Opt 1 | 14,023     | 14,330      | 1,648,894   | 1,988,255     |
|               | 2035 Opt 2 | 14,507     | 14,947      | 2,155,061   | 2,275,961     |
|               | 2035 Opt 3 | 14,403     | 14,497      | 1,694,320   | 2,026,869     |
| Ripon         | 2035 DM    | 12,385     | 14,223      | 1,074,098   | 1,249,498     |
|               | 2035 Opt 1 | 15,443     | 15,150      | 1,376,767   | 2,755,387     |
|               | 2035 Opt 2 | 15,457     | 15,789      | 1,391,764   | 2,439,613     |
|               | 2035 Opt 3 | 15,452     | 15,703      | 1,375,874   | 2,492,896     |

As can be seen above, the Local Plan options increase the vehicle kilometres and vehicle hours within the model areas in comparison with the Do Minimum. In all cases Option 1 shows vehicle kilometres and vehicle hours to be less than Options 2 and 3 with the differences between Options 2 and 3 relatively minimal owing to there being only small differences between the options and the associated quantum of development.

## **7. Junction Mitigation Measures**

### **7.1 Introduction**

Following discussions between HBC and NYCC, it has been requested that potential mitigation measures are considered for a total of 14 junctions within the modelled area. The junctions which mitigation measures have been considered for are as follows:

1. Clocktower Junction, Ripon
2. Low Skellgate / Water Skellgate
3. A59 / Harrogate Bypass
4. Woodlands
5. Leeds Road / Hookstone Road / Leadhall Lane
6. Beckwith Head Road / Otley Road
7. A61 / Otley Road, Killinghall
8. St James Retail Pk / Harrogate Bypass
9. A61 Ripon Road / A59 Skipton Road
10. A59/B6164
11. Westgate / Blossomgate
12. North Street / Coltsgate Hill
13. A658 / B6163
14. A61 Leeds Road / Follifoot Road / Pannal Bank

The location of the junctions listed above can be seen in Figure 7-1 and Figure 7-2.

Figure 7-1: Mitigated Junctions in Harrogate and Knaresborough

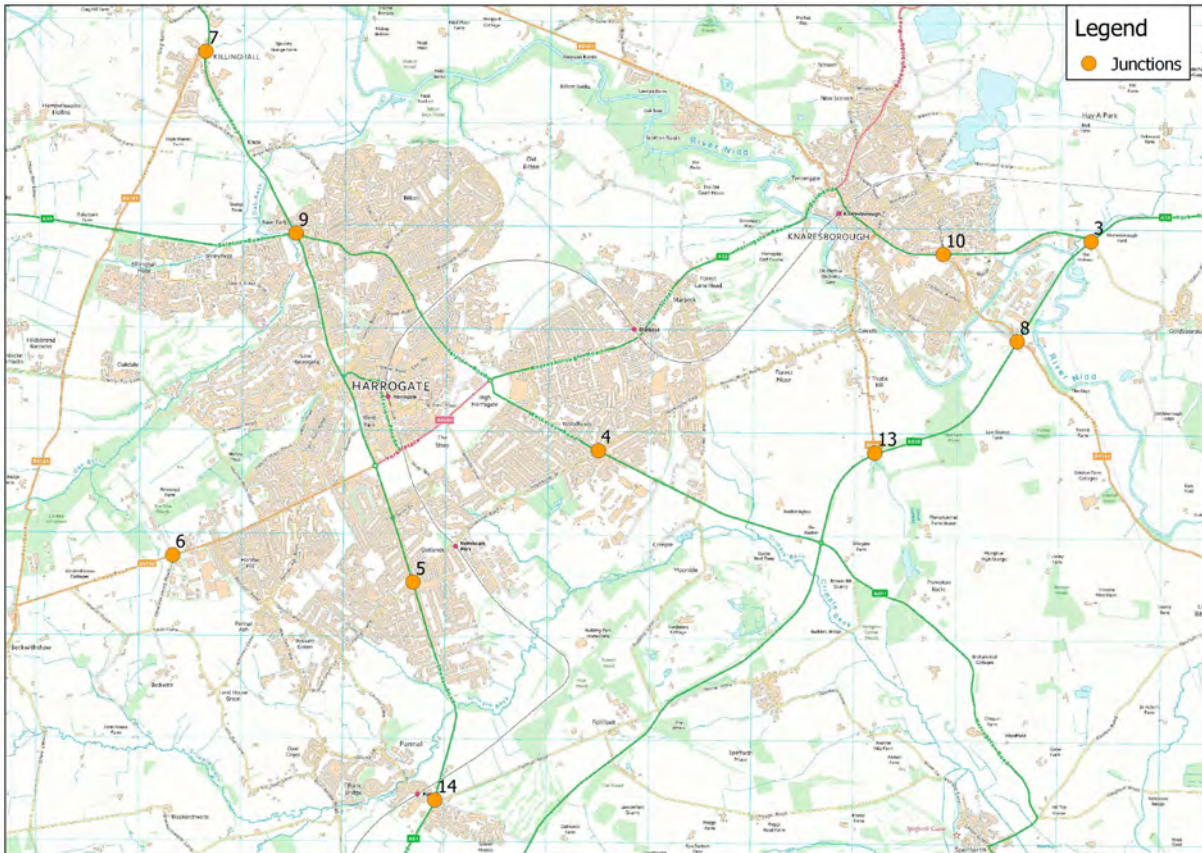


Figure 7-2: Mitigated Junctions in Ripon



Mitigation measures for these junctions have looked to bring the junction capacity in line with or below the modelling results for the Do Minimum scenario so that the Local Plan represents a situation of nil detriment on the performance of the junction.

It should be noted that the analysis in the previous section showed that mitigation would also be required for Junction 47 of the A1(M). HBC is working with Highways England to explore the future operation of junction 47 of the A1(M) and potential solutions.

NYCC is currently examining options for Bond End junction in Knaresborough to address congestion and air quality concerns. This junction is, therefore, being dealt with under separate circumstances.

## **7.2 Modelling Software**

Whilst the VISUM model has performed higher level analysis of the network performance, the junctions considered for mitigation have been modelled using more detailed Junctions 9 (for roundabouts and priority junctions) and LinSig v3 (for traffic signals) modelling software. Both Junctions 9 and LinSig v3 model the performance of individual junctions only.

Junctions 9 provides two main measurements of junction capacity and operation, namely junction operating capacity and queue length. Junction operating capacity or RFC (ratio of to flow capacity) provides the primary measure of the level of congestion at a junction and is reported for each entry arm. When the RFC exceeds a value of 1.0, the arm is considered to be operating over capacity and notable queuing will occur. As a general rule, a ratio of more than 0.85 is considered necessary as an acceptable criterion for requiring the implementation of mitigation measures this is a similar measure to VCR which is used in the analysis of junctions in section 6.

By comparison, LINSIG v3, which is used to assess signal controlled junctions provides a Degree of Saturation (DoS). This is provided for each junction arm / entry and gives a ratio of the vehicle arrival rate to the relative saturation flow-rate of an approach. A value of over 100% indicates that demand is greater than capacity, while a value of 90% or less is considered to provide an acceptable design criterion. Additionally, LINSIG v3 provides a measure of Practical Reserve Capacity (PRC) which provides a measure of the available capacity of the junction as a whole, with a positive value indicating that spare capacity is available.

Both LINSIG and JUNCTIONS 9 provides queue length outputs for each arm, and while this is not a primary measure of junction capacity, with regular queues forming but also dissipating in the case of signal controlled junctions, it does provide an indication of how the overall junction performs. Queue length is reported as the average maximum queue length over the hour long peak period being assessed.

## **7.3 Structure of Mitigations Section**

The mitigation of each junction is considered on an individual basis in the remainder of this section. For each junction the following details are provided:

- The Junctions 9 or LinSig v3 modelling results of the existing junction layout for the AM and PM peak periods using the 2035 Do Minimum traffic flows (i.e. also including committed development traffic) from the VISUM model. These results highlight which arms of the junction have capacity issues. Where traffic signals have been tested, the existing signal timings have been modelled if available; and

- The mitigation options considered for the junction. The options considered are described in the text and a drawing of the recommended mitigation option is provided in Appendix E. The capacity of the mitigated junction is also presented in this section which has been tested using the 2035 traffic flows from either Option 1, 2 or 3 (whichever traffic flows are the highest). As the junctions are mostly some distance from the area around Junction 47 where the differences between the options are, the difference in traffic flow between the options is minimal at each of the mitigated junctions.

The junctions considered for mitigation are set out in the remainder of this section.

For the purposes of the individual junction models, the following assumptions have been used:

- Unless otherwise stated existing signal timings have been used. If the signals are vehicle actuated, the maximum timings have been used;
- Intergreen timings are as per the existing signal plans provided;
- Generic lane capacity values for the road widths have been used for the LinSig models; All mitigation drawings are indicative layouts only and are based on OS Mastermap mapping provided by HBC. All mitigation drawings are provided in Appendix E; and
- In LinSig, all mitigated signal plans have been optimised for Practical Reserve Capacity.

## 7.4 Junction 1 - Clocktower Junction, Ripon

### 7.4.1 Do Minimum Scenario Junction Performance

The performance of the junction using the 2035 Do Minimum and Do Something Local Plan scenario flows from the VISUM model and the existing junction signal cycle times is presented in Table 7-1.

Table 7-1: Clocktower Junction 2035 Existing Junction Performance

|             |                                 | Do Min AM Peak |      | Do Min PM Peak |      | Do Something AM Peak |      | Do Something PM Peak |      |
|-------------|---------------------------------|----------------|------|----------------|------|----------------------|------|----------------------|------|
|             |                                 | DoS            | MMQ  | DoS            | MMQ  | DoS                  | MMQ  | DoS                  | MMQ  |
| 1/1         | Princess Road                   | 8.70%          | 0    | 10.50%         | 0.1  | 9.60%                | 0.1  | 10.70%               | 0.1  |
| 2/2+<br>2/1 | North Street Entry Ahead Left   | 104.20%        | 28.7 | 97.40%         | 19.5 | 119.80%              | 59.2 | 112.70%              | 44.6 |
| 2/3         | North Street Entry Right        | 7.00%          | 0.7  | 11.90%         | 1.1  | 8.10%                | 0.8  | 12.60%               | 1.2  |
| 3/1         | Palace Road Ahead Left Right    | 88.20%         | 19.3 | 93.30%         | 22.4 | 110.80%              | 55.4 | 102.50%              | 34.7 |
| 4/1         | North Rd Exit                   | 18.80%         | 0.1  | 19.80%         | 0.1  | 19.10%               | 0.1  | 21.10%               | 0.1  |
| 5/1         | North Street Exit               | 9.10%          | 0    | 18.20%         | 0.1  | 12.80%               | 0.1  | 20.70%               | 0.1  |
| 6/1         | Palace Road Exit                | 22.90%         | 0.1  | 28.20%         | 0.2  | 22.60%               | 0.1  | 27.00%               | 0.2  |
| 7/1+<br>7/2 | North Rd Entry Left Ahead Right | 59.10%         | 10.5 | 100.00%        | 33.3 | 63.00%               | 11.3 | 113.10%              | 74.1 |
| PRC         |                                 | -15.8%         |      | -11.2%         |      | -33.2%               |      | -25.6%               |      |

As can be seen from the above modelling results, the junction is operating over capacity in both the AM and PM peaks in the Do Minimum (i.e. with growthed background traffic flows and committed



development traffic). As can also be seen from the above modelling results, with additional traffic from the Local Plan, the junction goes further over capacity, resulting in additional queuing.

### 7.4.2 Mitigation

The mitigation options at the junction are limited with the Clocktower and close proximity of private land surrounding all sides of the junction posing significant constraints. The mitigation therefore focused on solutions within the existing highway boundary. Whilst efficiencies were found in extending the overall signal cycle time and optimising the timings, the gains were not found to be sufficient to mitigate the impacts of the Local Plan.

The proposed mitigation has thus adjusted the staging of the junction to allow the northbound and southbound movements to run in parallel with two right turn pockets provided in the centre of the junction. The current and proposed stage plans are shown in the extract below.

Figure 7-3: Current Staging Plan

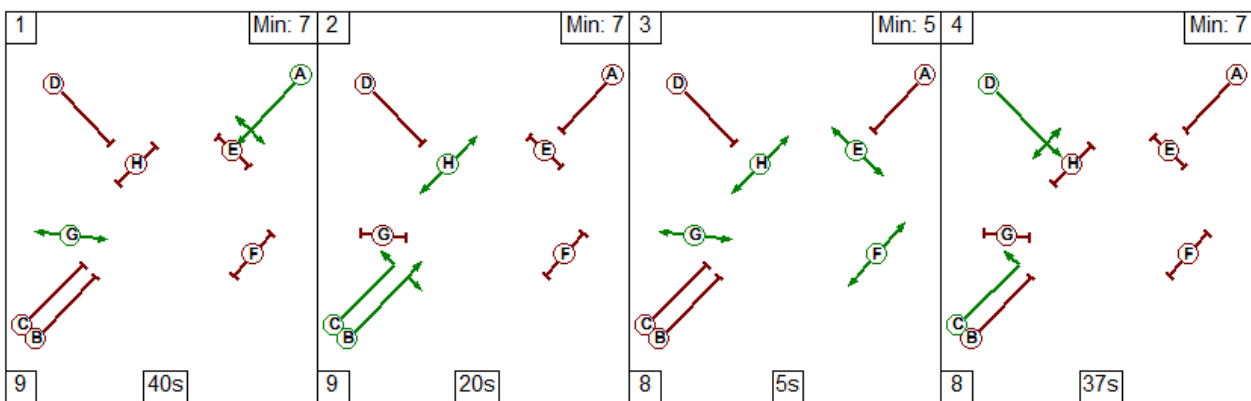
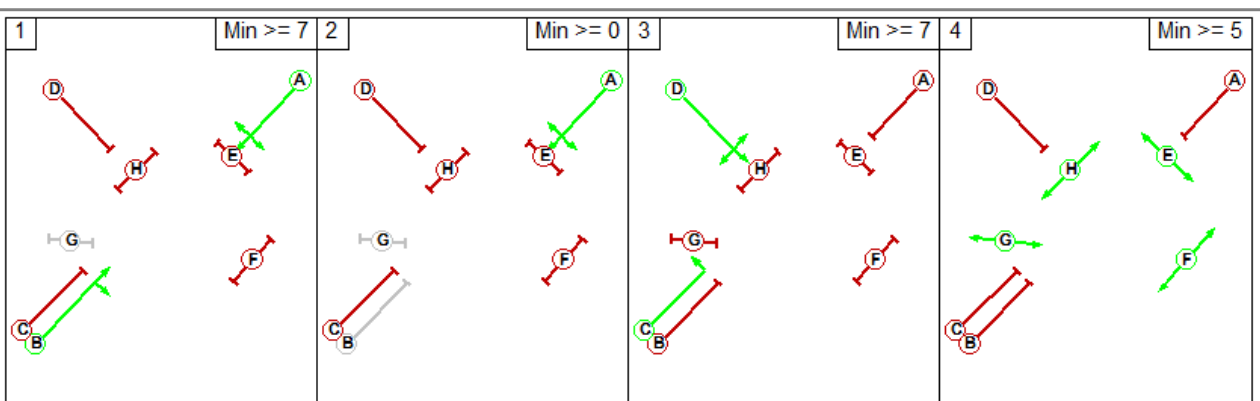


Figure 7-4: Proposed Staging Plan



To accommodate this signal plan and the northbound left turn from North Street into Palace Road during a different stage, the roadspace on the southern arm would also require redesignating as shown in the mitigation plan in Appendix E.

With the above arrangements and optimised signal timings with a 150 second cycle time, the junction capacity analysis results are as follows and show the junction to be operating within capacity. Jacobs will continue to work with NYCC to finalise proposals at this junction.

Table 7-2: Clocktower Junction Mitigated Junction Performance

|             |                                 | Do Something AM Peak |      | Do Something PM Peak |      |
|-------------|---------------------------------|----------------------|------|----------------------|------|
|             |                                 | DoS                  | MMQ  | DoS                  | MMQ  |
| 1/1         | Princess Road                   | 10.50%               | 0.1  | 10.90%               | 0.1  |
| 2/2+<br>2/1 | North Street Entry Ahead Left   | 22.70%               | 5.1  | 27.00%               | 5.5  |
| 2/3         | North Street Entry Right        | 48.80%               | 10.4 | 35.40%               | 8.4  |
| 3/1         | Palace Road Ahead Left Right    | 76.10%               | 21.2 | 87.60%               | 23.3 |
| 4/1         | North Rd Exit                   | 22.30%               | 9.5  | 22.80%               | 9.6  |
| 5/1         | North Street Exit               | 13.80%               | 0.1  | 22.60%               | 0.1  |
| 6/1         | Palace Road Exit                | 24.20%               | 9.8  | 30.50%               | 10.9 |
| 7/1+<br>7/2 | North Rd Entry Left Ahead Right | 75.70%               | 13.5 | 88.60%               | 27.5 |
| PRC         |                                 | 18.2%                |      | 1.6%                 |      |

## 7.5 Junction 2 - Low Skellgate / Water Skellgate

### 7.5.1 Do Minimum Scenario Junction Performance

The performance of the junction using the 2035 Do Minimum and Do Something Local Plan scenario flows from the VISUM model and the existing junction signal cycle times is presented in Table 7-3.

Table 7-3: Low Skellgate / Water Skellgate Existing Junction Performance

|                 |  | Do Min AM Peak |      | Do Min PM Peak |      | Do Something AM Peak |      | Do Something PM Peak |     |
|-----------------|--|----------------|------|----------------|------|----------------------|------|----------------------|-----|
|                 |  | DoS            | MMQ  | DoS            | MMQ  | DoS                  | MMQ  | DoS                  | MMQ |
| 1/1             | Low Skellgate Exit                     | 13.30%         | 0.1  | 14.60%         | 0.1  | 13.60%               | 0.1  | 16.50%               | 0.1 |
| 2/1<br>+<br>2/2 | Somerset Row Entry Right Ahead Left    | 127.00%        | 101  | 107.60%        | 41.7 | 148.40%              | 171  | 111.10%              | 52  |
| 3/1             | Water Skellgate Exit                   | 13.70%         | 0.1  | 13.30%         | 0.1  | 14.30%               | 0.1  | 13.10%               | 0.1 |
| 4/1             | Somerset Row Exit                      | 15.40%         | 0.1  | 16.60%         | 0.1  | 20.60%               | 0.1  | 13.80%               | 0.1 |
| 5/1             | High Skellgate                         | 18.40%         | 0.1  | 14.10%         | 0.1  | 16.60%               | 0.1  | 17.50%               | 0.1 |
| 6/1<br>+<br>6/2 | Water Skellgate Entry Left Ahead Right | 77.30%         | 10.1 | 73.10%         | 11.3 | 98.60%               | 22.1 | 70.70%               | 10  |
| 7/1             | Low Skellgate Entry Right Left Ahead   | 57.60%         | 8.4  | 52.50%         | 7.1  | 55.90%               | 8    | 56.30%               | 7.8 |
| PRC             |  | -41.1%         |      | -19.6%         |      | -64.9%               |      | -23.5%               |     |
| Total delay     |  | 103.17         |      | 44.2           |      | 181.67               |      | 54.86                |     |

7.5.2 Mitigation

The junction is currently part of an Air Quality Management Area (AQMA) because of Nitrogen Dioxide emissions, the main source of which is listed as road transport. The AQMA extends along High Skellgate and part of Low Skellgate.

The mitigation options at the junction are also limited with the approach angle of Low Skellgate and Somerset Row requiring stop lines at the signals to be set back (as at present) and private land surrounding all sides of the junction. The mitigation therefore focused on solutions within the existing highway boundary. Whilst efficiencies were found in extending the overall signal cycle time and optimising the timings, the gains were not found to be sufficient to mitigate the impacts of the Local Plan.

The proposed mitigation has thus adjusted the staging of the junction to allow the eastbound and westbound movements to run in parallel with two right turn pockets provided in the centre of the junction. The current and proposed stage plans are shown in the extract below. A plan of the junction layout is included in Appendix E.

Figure 7-5: Current Staging Plan

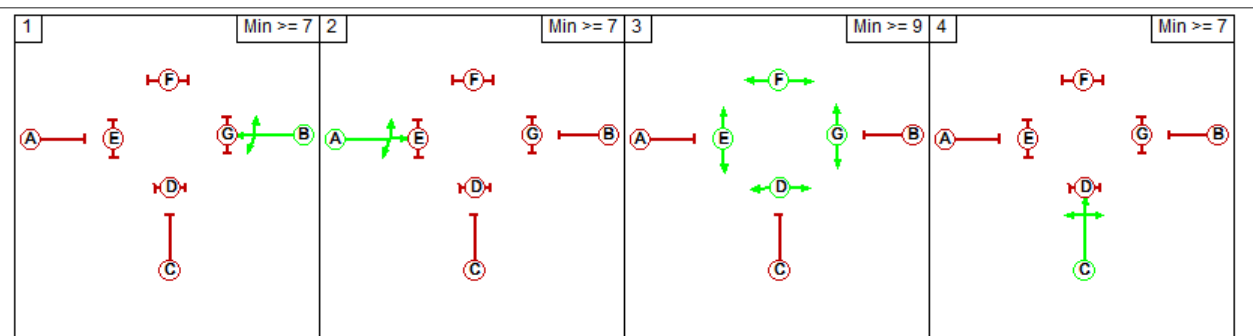
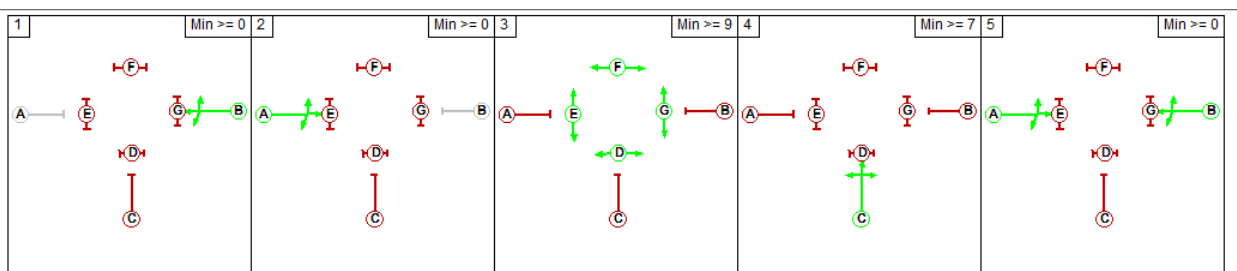


Figure 7-6: Proposed Staging Plan



With this mitigation in place the junction performance improves to above the current Do Minimum levels so that the Local Plan would be of nil detriment on the junction, as shown in the table below. As previously noted, the junction is also situated within an AQMA and the junction capacity modelling shows there to be a significant reduction in delay at the junction compared to the present modelled situation which is thus likely to result in further benefits from reduced vehicle emissions at the junction.

**Table 7-4: Low Skellgate / Water Skellgate Mitigated Junction Performance**

|             |  | Do Something AM Peak |      | Do Something PM Peak |      |
|-------------|--|----------------------|------|----------------------|------|
|             |  | DoS                  | MMQ  | DoS                  | MMQ  |
| 1/1         | Low Skellgate Exit                     | 20.20%               | 0.1  | 18.10%               | 0.1  |
| 2/1+<br>2/2 | Somerset Row Entry Right Ahead Left    | 96.90%               | 31.1 | 76.10%               | 12.6 |
| 3/1         | Water Skellgate Exit                   | 21.20%               | 0.1  | 14.50%               | 0.1  |
| 4/1         | Somerset Row Exit                      | 20.60%               | 0.1  | 13.80%               | 0.1  |
| 5/1         | High Skellgate                         | 17.20%               | 0.1  | 17.60%               | 0.1  |
| 6/1+<br>6/2 | Water Skellgate Entry Left Ahead Right | 96.90%               | 20.7 | 76.70%               | 10.8 |
| 7/1         | Low Skellgate Entry Right Left Ahead   | 97.80%               | 15.5 | 74.30%               | 9.1  |
| PRC         |  | -8.7%                |      | 17.4%                |      |
| Total delay |  | 41.00                |      | 18.11                |      |

## 7.6 Junction 3 - A59 / Harrogate Bypass

### 7.6.1 Do Minimum Scenario Junction Performance

The performance of the existing roundabout has been tested in Junction 9 software, with junction geometries obtained from the recently approved Transport Assessment for the Manse Farm development. The junction modelling results using the 2035 Do Minimum flows from the VISUM model are presented in Table 7-5.

**Table 7-5: A59 / Harrogate Bypass 2035 Do Minimum Scenario Junction Performance**

| Arm   |                        | Do Min AM Peak |     | Do Min PM Peak |     | Do Something AM Peak |     | Do Something PM Peak |     |
|-------|------------------------|----------------|-----|----------------|-----|----------------------|-----|----------------------|-----|
|       |                        | RFC            | Q   | RFC            | Q   | RFC                  | Q   | RFC                  | Q   |
| Arm 1 | A59 York Road (NE)     | 0.48           | 0.9 | 0.59           | 1.4 | 0.66                 | 1.9 | 0.68                 | 2.1 |
| Arm 2 | Goldsborough Road (SE) | 0.1            | 0.1 | 0.19           | 0.2 | 0.24                 | 0.3 | 0.25                 | 0.3 |
| Arm 3 | A658 Bypass (SW)       | 0.4            | 0.7 | 0.48           | 0.9 | 0.55                 | 1.2 | 0.55                 | 1.2 |
| Arm 4 | A59 York Road (NW)     | 0.41           | 0.7 | 0.42           | 0.7 | 0.59                 | 1.4 | 0.55                 | 1.2 |

As can be seen from the above modelling, all arms of the junction are modelled to operate well within capacity for both the Do Minimum and Do Something scenarios. This junction within the VISUM model has been reviewed and in order to calibrate the journey times in the area, the capacity of the junction was artificially reduced by reducing each arm to a one lane entry rather than the actual two lane entry on each arm. However, as can be seen from the table above, the more accurate Junctions 9 modelling shows that the junction is expected to operate well within capacity even with additional traffic from the Local Plan developments.

## 7.7 Junction 4 - Woodlands

Jacobs is working with HBC and NYCC to finalise a solution to this junction. The findings of this work will be published in due course.

## 7.8 Junction 5 - Leeds Road / Hookstone Road / Leadhall Lane

Jacobs is working with HBC and NYCC to finalise a solution to this junction. The findings of this work will be published in due course.

It is also worth noting that the VISUM modelling results showed a number of vehicles ‘rat-running’ around local streets to avoid the junction pre-mitigation. Rat-running routes will be considered when developing mitigation at this junction.

## 7.9 Junction 6 - Beckwith Head Road / Otley Road

### 7.9.1 Do Minimum Scenario Junction Performance

The junction has a committed scheme in place to signalise all arms to form a signalised crossroads. At the time of the modelling, a plan of the proposed signalised junction layout was not available and the layout has thus been assumed to be accommodated within the existing carriageway. It should also be noted that the VISUM strategic modelling added development traffic from the H49 development to the zone connector off the northern arm of the junction whereas the actual access is anticipated to be from an access of the western arm. The traffic flows used in the LinSig modelling were thus amended to take this into account.

The performance of the junction for the 2035 Do Minimum and Do Something Local Plan scenario flows is presented in Table 7-6. As an existing signal plan was not available, the results below are for the optimised signal timings.

Table 7-6: Beckwith Head Road / Otley Road 2035 Do Minimum Scenario Junction Performance

|             |  | Do Min AM Peak  |     | Do Min PM Peak  |     | Do Something AM Peak |     | Do Something PM Peak |     |
|-------------|--|-----------------|-----|-----------------|-----|----------------------|-----|----------------------|-----|
|             |  | DoS             | MMQ | DoS             | MMQ | DoS                  | MMQ | DoS                  | MMQ |
| 1/2+<br>1/1 | Beckwith Head Road (Entry)<br>Left Ahead Right | 64.0 :<br>64.0% | 4.9 | 54.6 :<br>54.6% | 4.9 | 39.2 :<br>39.2%      | 1.8 | 64.1 :<br>64.1%      | 3.2 |
| 2/1         | Otley Road WB (Exit)                           | 3.10%           | 0   | 10.70%          | 0.1 | 7.10%                | 0   | 19.80%               | 0.1 |
| 3/1         | Crag Lane (Exit)                               | 4.60%           | 0   | 6.00%           | 0   | 3.10%                | 0   | 3.70%                | 0   |
| 4/1         | Otley Road EB (Exit)                           | 19.30%          | 0.1 | 22.70%          | 0.1 | 19.60%               | 0.1 | 23.80%               | 0.2 |

|     |  |              |      |              |     |               |       |              |      |
|-----|--|--------------|------|--------------|-----|---------------|-------|--------------|------|
| 5/1 | Beckwith Head Road (Exit)              | 28.90%       | 0.2  | 11.50%       | 0.1 | 44.80%        | 0.4   | 22.90%       | 0.1  |
| 6/1 | Otley Road EB (Entry) Left Ahead Right | 12.90%       | 1.6  | 18.00%       | 2.4 | 152.70%       | 107.1 | 34.80%       | 4.2  |
| 7/1 | Crag Lane (Entry) Right Left Ahead     | 63.30%       | 3.4  | 54.30%       | 3.9 | 90.20%        | 6.6   | 66.50%       | 4.2  |
| 8/1 | Otley Road WB (Entry) Ahead Right Left | 64.00%       | 11.7 | 55.70%       | 8.8 | 78.80%        | 17.8  | 69.40%       | 13.8 |
|     | <b>PRC</b>                             | <b>40.6%</b> |      | <b>61.7%</b> |     | <b>-69.7%</b> |       | <b>29.8%</b> |      |

As can be seen from the results in the table above, the junction operates within capacity in all scenarios except the Do Something AM peak.

### 7.9.2 Mitigation

The LinSig modelling showed that the junction could not be brought within capacity within the available roadspace. Given the turning movements and available land, an additional lane of five vehicles length for right turning vehicles lane of has been added to the western Otley Road arm, with the junction subsequently modelled to operate within capacity. The layout of the mitigated junction can be found in Appendix E.

|             |   | Do Something AM Peak |              | Do Something PM Peak |              |
|-------------|---|----------------------|--------------|----------------------|--------------|
|             |   | DoS                  | MMQ          | DoS                  | MMQ          |
| 1/2+<br>1/1 | Beckwith Head Road (Entry) Left Ahead Right | 39.2 : 39.2%         | 1.8          | 64.1 : 64.1%         | 3.2          |
| 2/1         | Otley Road WB (Exit)                        | 7.10%                | 0            | 19.80%               | 0.1          |
| 3/1         | Crag Lane (Exit)                            | 3.50%                | 0            | 3.70%                | 0            |
| 4/1         | Otley Road EB (Exit)                        | 25.50%               | 0.2          | 23.80%               | 0.2          |
| 5/1         | Beckwith Head Road (Exit)                   | 47.50%               | 0.5          | 22.90%               | 0.1          |
| 6/1         | Otley Road EB (Entry) Left Ahead Right      | 69.0 : 69.0%         | 5            | 26.6 : 26.6%         | 3.1          |
| 7/1         | Crag Lane (Entry) Right Left Ahead          | 72.20%               | 4.5          | 66.50%               | 4.2          |
| 8/1         | Otley Road WB (Entry) Ahead Right Left      | 79.90%               | 18.7         | 67.40%               | 13.5         |
|             | <b>PRC</b>                                  |                      | <b>12.7%</b> |                      | <b>33.5%</b> |

## 7.10 Junction 7 – A61 / Otley Road, Killinghall

### 7.10.1 Do Minimum Scenario Junction Performance

The junction has a committed scheme in place to signalise all arms

The performance of the junction for the 2035 Do Minimum and Do Something Local Plan scenario flows is presented in Table 7-7. The signal plan proposed as part of the Penny Pot Lane development has been used but as signal timings were not available, the results below are for the optimised signal timings.

Table 7-7: A61 / Otley Road Junction 2035 Do Minimum Scenario Junction Performance

|             |                                 | Do Min AM Peak  |      | Do Min PM Peak  |      | Do Something AM Peak |      | Do Something PM Peak |      |
|-------------|---------------------------------|-----------------|------|-----------------|------|----------------------|------|----------------------|------|
|             |                                 | DoS             | MMQ  | DoS             | MMQ  | DoS                  | MMQ  | DoS                  | MMQ  |
| 1/1         | Ripon Road NB Entry Left Ahead  | 57.50%          | 10.5 | 70.90%          | 15.2 | 59.30%               | 11.1 | 72.30%               | 15.8 |
| 2/1+<br>2/2 | Ripon Road SB Entry Ahead Right | 80.7 :<br>80.7% | 11.4 | 80.4 :<br>80.4% | 13.9 | 83.5 :<br>83.5%      | 13.8 | 84.9 :<br>84.9%      | 17.8 |
| 3/1+<br>3/2 | Otley Road Entry Right Left     | 63.6 : 0.0%     | 8.5  | 70.8 : 0.0%     | 9.1  | 66.0 : 0.0%          | 8.7  | 74.0 :<br>74.0%      | 9.5  |
| 5/1         | Otley Road Exit                 | 23.70%          | 0.2  | 18.00%          | 0.1  | 23.70%               | 0.2  | 18.40%               | 0.1  |
|             | PRC                             | 11.5%           |      | 12.0%           |      | 7.8%                 |      | 6.0%                 |      |

As can be seen from the above table, the junction is modelled to operate within capacity using the already proposed staging plan. Whilst the junction is modelled within capacity it is noted that the modelled right turn movements out of Otley Road are very low (one per hour). If further capacity was required from the junction in the future, the right turn movement out of Otley Road could be prohibited for relatively little loss (with traffic diverted via Grainbeck Lane) which would thus allow a more efficient staging plan to be used at the junction.

## 7.11 Junction 8 - St James Retail Pk / Harrogate Bypass

### 7.11.1 Do Minimum Scenario Junction Performance

The performance of the junction using the 2035 Do Minimum flows from the VISUM model is presented in Table 7-8. As the traffic flows around the junction are relatively uneven, the junction has been modelled in 'lane simulation mode' which tests the capacities of individual lanes.

Table 7-8: St James Retail Park / Harrogate Bypass 2035 Existing Junction Performance

|       |                           | Do Min AM Peak | Do Min PM Peak | Do Something AM Peak | Do Something PM Peak |
|-------|---------------------------|----------------|----------------|----------------------|----------------------|
|       |                           | RFC            | RFC            | RFC                  | RFC                  |
|       | A658 North nearside       | 0.999          | 0.937          | 1.001                | 0.992                |
|       | A658 North offside        | 0.000          | 0.000          | 0                    | 0.000                |
| Arm 2 | Wetherby Rd East nearside | 0.586          | 0.814          | 0.625                | 0.946                |

|       |                          |       |       |       |       |
|-------|--------------------------|-------|-------|-------|-------|
|       | Wetherby Rd East offside | 0.598 | 0.555 | 0.504 | 0.551 |
| Arm 3 | A658 South nearside      | 0.599 | 0.590 | 0.622 | 0.585 |
|       | A658 South offside       | 0.718 | 0.732 | 0.834 | 0.695 |
| Arm 4 | B6164 West nearside      | 0.796 | 0.627 | 0.809 | 0.648 |
|       | B6164 West offside       | 0.679 | 0.924 | 0.850 | 0.929 |

As can be seen from the above, the A698 Northern arm is overcapacity in all scenarios with the modelled traffic flows showing very uneven lane usage. The Local Plan development is also modelled to result in the eastern Wetherby Road arm going over capacity in the PM peak with Local Plan development in place whilst the western B6164 arm would go slightly further over capacity.

### 7.11.2 Mitigation

In the immediate vicinity around the junction there is land within the designated highway boundary. The initial modelling showed that lane usage on the northern A698 and eastern Wetherby Road arms was relatively uneven and therefore the Local Plan impacts can be mitigated by permitting ahead movements to use both lanes. This requires some widening of the exits of the respective arms as shown in the mitigation plan in Appendix E. The B6164 western arm showed a slight increase in RFC in the PM peak which can be mitigated to below the Do Minimum situation levels by increasing the flare length in both lanes on the approach to the junction. The resultant junction design is shown in Appendix E with the modelling results set out below.

**Table 7-9: St James Retail Park / Harrogate Bypass 2035 Proposed Junction Performance**

|       |                           | Do Something<br>AM Peak | Do Something<br>PM Peak |
|-------|---------------------------|-------------------------|-------------------------|
|       |                           | RFC                     | RFC                     |
| Arm 1 | A658 North nearside       | 0.745                   | 0.712                   |
|       | A658 North offside        | 0.783                   | 0.745                   |
| Arm 2 | Wetherby Rd East nearside | 0.602                   | 0.711                   |
|       | Wetherby Rd East offside  | 0.561                   | 0.725                   |
| Arm 3 | A658 South nearside       | 0.58                    | 0.579                   |
|       | A658 South offside        | 0.835                   | 0.698                   |
| Arm 4 | B6164 West nearside       | 0.785                   | 0.623                   |
|       | B6164 West offside        | 0.837                   | 0.915                   |

## 7.12 Junction 9 – A61 Ripon Road / A59 Skipton Road

### 7.12.1 Do Minimum Scenario Junction Performance

The A59 / A61 junction has a committed scheme in place for improvements to the roundabout which was put forward as part of the planning consent for the proposed adjacent supermarket development. The junction dimensions used in the modelling have thus been extracted from the junction capacity analysis carried out in the Transport Assessment.

The performance of the junction using the 2035 Do Minimum flows from the VISUM model is presented in Table 7-10.



**Table 7-10: Ripon Road / A59 2035 Do Minimum Scenario Junction Performance**

|       |                     | Do Min AM Peak |     | Do Min PM Peak |     | Do Something AM Peak |     | Do Something PM Peak |     |
|-------|---------------------|----------------|-----|----------------|-----|----------------------|-----|----------------------|-----|
|       |                     | RFC            | Q   | RFC            | Q   | RFC                  | Q   | RFC                  | Q   |
| Arm 1 | A59 Skipton Rd East | 0.64           | 1.7 | 0.86           | 5.6 | 0.65                 | 1.8 | 0.89                 | 7   |
| Arm 2 | A61 Ripon Rd South  | 0.27           | 0.4 | 0.34           | 0.5 | 0.27                 | 0.4 | 0.33                 | 0.5 |
| Arm 3 | A59 Skipton Rd West | 0.03           | 0   | 0.04           | 0   | 0.03                 | 0   | 0.04                 | 0   |
| Arm 4 | A61 Ripon Rd North  | 0.5            | 1   | 0.55           | 1.2 | 0.54                 | 1.2 | 0.57                 | 1.3 |

As can be seen from the above, the eastern A59 arm is operating slightly overcapacity in the PM peak periods for the Do Minimum and Do Something Local Plan scenarios.

### 7.12.2 Mitigation

The mitigation options for the eastern A59 arm are limited. Of the dimensions modelled in Junction 9, only the entry width (i.e. the width of the arm adjacent to the stopline at the roundabout) could easily be changed, with changes to any of the other modelled geometries requiring significant works. The modelled entry width for the proposed junction scheme is 7.76m (i.e. which produces an RFC of 0.89 in the Do Something scenario). The Junctions 9 analysis shows that if the entry width was widened to 7.84m, then the RFC for this arm would be reduced to 0.88, but the entry width would need to widen to 8.58m to reduce the RFC to 0.87 (which require more extensive works to be carried out at the junction).

Whilst the slight differences in entry widths are modelled to slightly reduce the RFC, it is likely that in real world conditions, these changes would actually have a negligible impact on the capacity of the junction. Thus given the junction is only slightly over capacity and the sensitivity of the modelling to relatively minor changes in the entry width, it is proposed that no junction mitigation measures are required for the A59/A61 junction.

### 7.13 Junction 10 - A59/B6164

Jacobs is working with HBC and NYCC to finalise a solution to this junction. The findings of this work will be published in due course.

### 7.14 Junction 11 - Westgate / Blossomgate

Jacobs is working with HBC and NYCC to finalise a solution to this junction. The findings of this work will be published in due course.

### 7.15 Junction 12 - North Street / Coltsgate Hill

Jacobs is working with HBC and NYCC to finalise a solution to this junction. The findings of this work will be published in due course.

### **7.16 Junction 13 - A658 / B6163**

Jacobs is working with HBC and NYCC to finalise a solution to this junction. The findings of this work will be published in due course.

### **7.17 Junction 14 - A61 Leeds Road / Follifoot Road / Pannal Bank**

Jacobs is working with HBC and NYCC to finalise a solution to this junction. The findings of this work will be published in due course.

## 8. Summary

HBC commissioned Jacobs to use the VISUM Harrogate District Transport Model to determine the impacts of three Local Plan growth options to determine the resultant transport impacts and future infrastructure requirements. The study builds on a high level modelling exercise undertaken previously which examined two test options – one test with development focussed in the main urban areas of Harrogate, Knaresborough and Ripon and the other option which would create a new settlement of up to 3,000 homes within the A1(M) corridor.

This stage has undertaken more depth modelling of a Do Minimum Scenario and three Local Plan options in 2025 and 2035 future year scenarios. The options considered are as follows:

- Do Minimum – existing traffic and committed development only;
- Option 1 – Local Plan option 1 Urban Growth and Do Minimum scenario traffic;
- Option 2 – Local Plan Option 2 Flaxby and Do Minimum scenario traffic; and
- Option 3 – Local Plan Option 3 Green Hammerton and Do Minimum scenario traffic.

The location and quantum of Local Plan and committed development was provided by HBC. The assumptions made to determine trip generations and trip distributions for each site are set out in section 5 along with the methodology used to develop the 2025 and 2035 future year traffic forecasts.

When analysing the increase in traffic in the future assessment years, all three Local Plan options show significant increases in traffic volumes and junction delay are present across all three tests.

In Harrogate there is a significant number of development sites coming forward in South West Harrogate with the resulting increase in traffic in all scenarios, particularly towards the town centre and heading south towards the A61 via Hill Top Lane and Burn Bridge Lane.

All three scenarios also experience a sustainable increase in volume of traffic on the A59 between the A658 and the Flaxby roundabout to the west of the A1. The increase in flow is equal across all three options westbound on this link and eastbound on the A59 between the Flaxby roundabout and the A1 (Approx 500 and 300-400 respectively). This is due to the Flaxby employment site being present in all scenarios and its access point being located at this junction. However, the degree of this uplift varies significantly across each scenario for the remaining links around this area. The development sites elsewhere in Harrogate and Knaresborough are smaller with relatively small increases in traffic.

The most notable difference between the scenarios is the strategic sites. The difference is particularly evident on the A59 between Flaxby and Harrogate/ Knaresborough. The modelling shows that capacity along the A59 corridor and at Junction 47 of the A1(M) is key to vehicle routing. The committed scheme to signalise this junction has been coded into the model but there is some re-routing of traffic from Harrogate and Knaresborough towards York via Junction 46 of the A1(M) to avoid congestion along the A59 corridor.

It should be noted that the analysis in the previous section showed that mitigation would also be required for Junction 47 of the A1(M). HBC is working with Highways England to explore the future operation of junction 47 of the A1(M) and potential solutions.

In Ripon the major increase in traffic is associated with the Local Plan development sites to the west of the town centre, resulting in increased traffic flows along North Road (for traffic heading towards Junction 50 of the A1(M)), B6265 Bondate Green (for traffic heading to Junction 48 of the A1(M) at Boroughbridge) and along Harrogate Road (for traffic using the A61 to travel to the south. This implies that junction 47 of the A1(M) will be a substantial constraint

A review of the operational capacities of junctions within the detailed model area was also undertaken in Section 6.4. In Harrogate the modelling of the 2035 Do Minimum scenario (i.e. with background traffic growth and committed development included) showed a number of junctions approaching capacity in both the AM and particularly the PM peaks. These junctions were mainly in the town centre with the A61 junction at Killinghall and the junctions on the Harrogate Southern Bypass also modelled to be approaching capacity.

The Local Plan sites in Harrogate were consistent across each option, resulting in similar modelling results within the town for each option. The development coming forward in Harrogate was also relatively limited and mainly concentrated to the South West of the town.

With traffic from Local Plan development sites added, there was an increase in the Volume Capacity Ratio (VCR) at the following junctions:

- The junctions in the town centre;
- The junctions around the South West Harrogate development sites;
- The Woodlands Junction; and
- The A61 corridor and the A61 / Otley Road (Killinghall) junction in particular.

In Knaresborough, the Do Minimum modelling shows there to be issues in the Do Minimum Scenario at the Bond End and A59 / B6164 Chain Lane junction. As for Harrogate, there are relatively few Local Plan development sites within the town. The addition of traffic from the Local Plan thus mainly affects the operation of the A59 within the town, particularly at the A59 / B6164 Chain Lane junction.

On the bypass, the Do Minimum modelling results show there to be congestion issues at the A59 / A658, A658 / B6164 Wetherby Road and A668 / A651 junction. The congestion issues intensify during the Local Plan scenarios, particularly options 2 and 3 which both include strategic housing sites at Flaxby and Green Hammerton, increasing the number of vehicles using the corridor.

In Ripon, the VCR is approaching capacity at some junctions within the town centre including the Clocktower junction, Allhallowgate / St Marygate and Skellbank / Water Skellgate / Low Skellgate junctions. As for Harrogate and Knaresborough, the quantum of Local Plan in Ripon is consistent across each option with similar modelling results for all options.

The modelling particularly shows an increase in VCR at the Skellbank / Water Skellgate / Low Skellgate, Allhallowgate / St Marygate and North Street / A6108 Palace Road junctions as per the AM peak modelling, with additional VCR increases at the A61 / Bondgate Green and North Street / College Road junctions.

To mitigate the impacts of the Local Plan, HBC and NYCC have identified fourteen junctions which require mitigation with further modelling undertaken in Junctions 9 or LinSig v3 modelling software which provides further detail of the impacts at the junction. The impacts at eight junctions have been shown to be within capacity or physical mitigation proposed for the junctions. Jacobs, HBC and NYCC will continue working on mitigation measures for the remaining six junctions which will be published in due course. Discounting the effects of traffic from committed developments and background traffic

growth, from the work undertaken thus far it does not appear that major new roads are required to deliver the Local Plan growth.

## Appendix A. Committed Development Sites

Committed Developments Included in Do Minimum Scenario

| Application Number | Proposed Land Use       | GFA (m2) of space | Site Area (Hectare) | No of Dwellings/ Beds | Proportion of development complete in 2025 2035 | Source of Trip Rates | Trip Rates (Per 100m2)   |       |                 |       | 2035 Trip Generations |      |         |      | Development connected into zone | Zone connection assumptions | Changes to Distribution  |   |
|--------------------|-------------------------|-------------------|---------------------|-----------------------|---|----------------------|--|-------|-----------------|-------|-----------------------|------|---------|------|---------------------------------|-----------------------------|--|---|
|                    |                         |                   |                     |                       |   |                      | Weekday AM Rate  |       | Weekday PM Rate |       | AM Peak               |      | PM Peak |      |                                 |                             |  |   |
|                    |                         |                   |                     |                       |   |                      | Arr  | Dept  | Arr             | Dept  | Arr                   | Dept | Arr     | Dept |                                 |                             |  |   |
| 11/02438/REPMJA    | Housing                 |                   |                     | 130                   | 1   | 1                    | Trip Generations taken from TA   |       |                 |       |                       | 33   | 133     | 93   | 56                              | 4024                        | To be connected to 4024, the zone which it is situated   | Distribution of zone is kept the same as no change to land use      |
| 11/02438/REPMJA    | Offices                 |                   |                     |                       | 1   | 1                    | Trip Generations taken from TA   |       |                 |       |                       | 22   | 2       | 3    | 18                              | 4024                        | To be connected to 4024, the zone which it is situated   | Distribution of zone is kept the same as no change to land use      |
| 11/02438/REPMJA    | B8 Warehousing          | 0                 |                     |                       | 1   | 1                    | Trip Generations taken from TA   |       |                 |       |                       | 0    | 0       | 0    | 0                               | 4024                        | To be connected to 4024, the zone which it is situated   | Distribution of zone is kept the same as no change to land use      |
| 12/03764/FULMAJ    | Holiday Accommodation   |                   |                     | 106                   | 1   | 1                    | Trip generations provided by HBC   |       |                 |       |                       | 3    | 4       | 8    | 7                               | 4203                        | To be connected to 4203, the zone which it is situated   | Insignificant trips to alter distribution                           |
| 12/03959/FULMAJ    | Housing                 |                   |                     | 74                    | 1   | 1                    | Trip generations provided by HBC   |       |                 |       |                       | 24   | 30      | 28   | 25                              | 1419                        | To be connected to 1419, the zone which it is situated   | Distribution of zone is kept the same as no change to land use      |
| 12/04462/FULMAJ    | Hotels                  |                   |                     |                       | 1   | 1                    | Trip generations provided by HBC   |       |                 |       |                       | 19   | 29      | 44   | 28                              | 1503                        | To be connected to 1503, the zone which it is situated   | Distribution of zone is kept the same as no change to land use      |
| 13/00535/EIAMAJ    | B1 Offices              | 10,323            |                     |                       | 1   | 1                    | Trip Generations taken from TA   |       |                 |       |                       | 44   | 8       | 61   | 15                              | 2306                        | To be connected to 2306, the zone which it is situated   | Distribution of zone is kept the same as no change to land use      |
| 13/00535/EIAMAJ    | Primary School          | -                 | -                   | 126                   | 1   | 1                    | Trip Generations taken from TA   |       |                 |       |                       | 45   | 33      | 0    | 0                               | 2306                        | To be connected to 2306, the zone which it is situated   | Distribution of zone is kept the same as no change to land use      |
| 13/00535/EIAMAJ    | B8 Warehousing          | 1,147             |                     |                       | 1   | 1                    | Trip Generations taken from TA   |       |                 |       |                       | 3    | 1       | 2    | 1                               | 2306                        | To be connected to 2306, the zone which it is situated   | Distribution of zone is kept the same as no change to land use      |
| 13/00535/EIAMAJ    | Neighbourhood Centre    | -                 | -                   |                       | 1   | 1                    | Trip Generations taken from TA   |       |                 |       |                       | 0    | 0       | 0    | 0                               | 2306                        | To be connected to 2306, the zone which it is situated   | Distribution of zone is kept the same as no change to land use      |
| 13/00535/EIAMAJ    | Housing                 | -                 | -                   | 600                   | 1   | 1                    | Trip Generations taken from TA   |       |                 |       |                       | 120  | 310     | 257  | 142                             | 2306                        | To be connected to 2306, the zone which it is situated   | Distribution of zone is kept the same as no change to land use      |
| 13/02897/OUTMAJ    | Housing                 |                   |                     | 62                    | 1   | 1                    | Trip generations provided by HBC   |       |                 |       |                       | 14   | 54      | 38   | 20                              | 1428                        | To be connected to 1428, the zone which it is situated   | Distribution of zone is kept the same as no change to land use      |
| 13/03623/FULMAJ    | Sheltered Accommodation |                   |                     | 76                    | 1   | 1                    | Trip generations provided by HBC   |       |                 |       |                       | 11   | 11      | 11   | 11                              | 2202                        | To be connected to 2202, the zone which it is situated   | Insignificant trips to alter distribution                           |
| 13/04655/FULMAJ    | Retirement Flats        |                   |                     | 33                    | 1   | 1                    | Trip generations provided by HBC   |       |                 |       |                       | 2    | 2       | 3    | 2                               | 1020                        | To be connected to 1020, the zone which it is situated   | Distribution of zone is kept the same as no change to land use      |
| 14/00128/OUTMAJ    | Housing                 |                   |                     | 65                    | 1   | 1                    | Trip generations provided by HBC   |       |                 |       |                       | 16   | 35      | 32   | 20                              | 1422                        | To be connected to 1422, the zone which it is situated   | Distribution of zone changed to suit new land use                   |
| 14/00259/OUTMAJ    | Housing                 |                   |                     | 124                   | 1   | 1                    | Trip generations provided by HBC   |       |                 |       |                       | 19   | 57      | 53   | 28                              | 1027                        | To be connected to 1027, the zone which it is situated   | Distribution of zone is kept the same as no change to land use      |
| 14/00854/OUTMAJ    | Housing                 |                   |                     | 210                   | 1   | 1                    | Trip generations provided by HBC   |       |                 |       |                       | 31   | 96      | 90   | 53                              | 1005                        | To be connected to 1005, the zone which it is situated   | Distribution of zone is kept the same as no change to land use      |
| 14/00969/FULMAJ    | Food Superstore         | 1,536             |                     |                       | 1   | 1                    | Trips taken from TA  | 1.204 | 0.809           | 3.147 | 3.665                 | 18   | 12      | 48   | 56                              | 3111                        | To be connected to 3111, the zone which it is situated   | Distribution of zone is kept the same as no change to land use      |
| 14/01179/FULMAJ    | Exhibition Centre       |                   |                     |                       | 1   | 1                    | Trip generations provided by HBC   | 0.358 | 0.082           | 0.12  | 0.623                 | 3    | 1       | 1    | 6                               | 1608                        | To be connected to 1608, the zone which it is situated   | Distribution of zone is kept the same as no change to land use      |
| 14/01253/FULMAJ    | Nurses homes            |                   |                     | 55                    | 1   | 11                   | Trip generations provided by HBC   |       |                 |       |                       | 16   | 4       | 3    | 9                               | 1422                        | To be connected to 1422, the zone which it is situated   | Distribution of zone is kept the same as no change to land use      |
| 14/01385/FULMAJ    | Spa Complex             |                   |                     |                       | 1   | 1                    | Trip generations provided by HBC   |       |                 |       |                       | 25   | 5       | 10   | 20                              | 4214                        | To be connected to 4212, the zone which it is situated   | Distribution of zone is kept the same as no change to land use      |
| 14/01697/FULMAJ    | Cinema                  |                   |                     |                       | 1   | 1                    | Trip generations provided by HBC for the AM peak and trips used for the AM |       |                 |       |                       | 10   | 0       | 57   | 44                              | 1502                        | Use zone 1023 to represent parking area  | Distribution of zone is kept the same as no change to land use      |
| 14/02269/FULMAJ    | Housing                 |                   |                     | 25                    | 1   | 1                    | Trip generations provided by HBC   |       |                 |       |                       | 3    | 7       | 6    | 5                               | 1114                        | To be connected to 1114, the zone which it is situated   | Distribution of zone is kept the same as no change to land use      |
| 14/02737/EIAMAJ    | Housing                 |                   |                     | 600                   | 1   | 1                    | TA used for PM peak TRICS used for AM                                      | 0.159 | 0.42            |       |                       | 95   | 252     | 266  | 142                             | 1030                        | To be connected to 1030, the zone which it is situated   | Distribution of zone is kept the same as no change to land use      |
| 14/02804/OUTMAJ    | Park and Rail           |                   |                     | 120                   | 1   | 1                    | Trip generations provided by HBC   |       |                 |       |                       | 116  | 37      | 34   | 114                             | 1227                        | To be connected to 1227, the zone which it is situated   | Distribution of zone is kept the same as no change to land use      |
| 14/02944/OUTMAJ    | Housing                 |                   |                     | 135                   | 1   | 1                    | Trip generations provided by HBC   |       |                 |       |                       | 20   | 62      | 58   | 34                              | 1005                        | To be connected to 1005, the zone which it is situated   | Distribution of zone is kept the same as no change to land use      |
| 14/03118/FULMAJ    | Retail                  |                   |                     |                       | 1   | 1                    | Trip generations provided by HBC   |       |                 |       |                       | 8    | 4       | 14   | 16                              | 2304                        | use connector 2304 - connector 2304 distributed 25% of traffic to north of zone. 75% to retail park access | Distribution of zone is kept the same as no change to land use      |
| 14/03527/FULMAJ    | Spa Complex             |                   |                     |                       | 1   | 1                    | Trip Generations taken from TA   |       |                 |       |                       | 27   | 0       | 0    | 27                              | 1609                        | To be connected to 1609, the zone which it is situated   | Distribution of zone is kept the same as no change to land use      |
| 14/03634/FULMAJ    | Nurses homes            |                   |                     | 55                    | 1   | 1                    | Trip generations provided by HBC   |       |                 |       |                       | 1    | -2      | 1    | 1                               | 3002                        | To be connected to 3002, the zone which it is situated   | Distribution of zone is kept the same as no change to land use      |
| 14/04003/OUTMAJ    | Housing                 |                   |                     | 176                   | 1   | 1                    | Trip generations provided by HBC   |       |                 |       |                       | 27   | 79      | 74   | 43                              | 4023                        | To be connected to 4023, the zone which it is situated   | Distribution of zone is kept the same as no change to land use      |
| 14/04837/REMMJA    | Housing                 |                   |                     | 39                    | 1   | 1                    | Trip generations provided by HBC   |       |                 |       |                       | 7    | 26      | 18   | 11                              | 1031                        | Trips to be split 50:50 and connected to zones 1031 and 1431   | Distribution of zone is kept the same as no change to land use      |
| 14/04837/REMMJA    | Housing                 |                   |                     | 39                    | 1   | 1                    | Trip generations provided by HBC   |       |                 |       |                       | 7    | 26      | 18   | 11                              | 1431                        | Trips to be split 50:50 and connected to zones 1031 and 1431   | Distribution of zone is kept the same as no change to land use      |
| 14/04929/REMMJA    | Housing                 |                   |                     | 164                   | 1   | 1                    | Trip generations provided by HBC   |       |                 |       |                       | 53   | 66      | 66   | 61                              | 2001                        | To be connected to 2001, the zone which it is situated   | Zone distribution changed from agricultural to housing distribution |
| 14/04981/REMMJA    | Nurses homes            |                   |                     |                       | 1   | 1                    | Trip generations provided by HBC   |       |                 |       |                       | 87   | 52      | 54   | 81                              | 1224                        | To be connected to 1224, the zone which it is situated   | Distribution of zone is kept the same as no change to land use      |
| 14/04985/REMMJA    | B1 Offices              |                   |                     |                       | 1   | 1                    | Trip generations provided by HBC   |       |                 |       |                       | 21   | 0       | 0    | 3                               | 1018                        | To be connected to 1018, the zone which it is situated   | Distribution of zone is kept the same as no change to land use      |
| 14/05165/OUTMAJ    | Housing                 |                   |                     | 150                   | 1   | 1                    | Trip generations provided by HBC   |       |                 |       |                       | 23   | 75      | 81   | 41                              | 3005                        | To be connected to 3005, the zone which it is situated   | Distribution of zone is kept the same as no change to land use      |
| 14/05211/FULMAJ    | Secondary School        |                   |                     |                       | 1   | 1                    | Trip Generations taken from TA   |       |                 |       |                       | 35   | 22      | 0    | 9                               | 1424                        | To be connected to 1424, the zone which it is situated   | Distribution of zone is kept the same as no change to land use      |
| 15/00937/FULMAJ    | B8 Warehousing          |                   |                     |                       | 1   | 1                    | Trip generations provided by HBC   |       |                 |       |                       | 46   | 0       | 0    | 46                              | 1424                        | To be connected to 1424, the zone which it is situated   | Distribution of zone is kept the same as no change to land use      |
| 15/01330/FULMAJ    | Retail                  |                   |                     |                       | 1   | 1                    | Trip generations provided by HBC   |       |                 |       |                       | 7    | 11      | 0    | 0                               | 1606                        | To be connected to 1606, the zone which it is situated   | Distribution of zone is kept the same as no change to land use      |
| 15/03051/OUTMAJ    | Housing                 |                   |                     | 25                    | 1   | 1                    | Trip generations provided by HBC   |       |                 |       |                       | 2    | 4       | 4    | 2                               | 1029                        | To be connected to 1029, the zone which it is situated   | Distribution of zone is kept the same as no change to land use      |
| 14/02612/FULMAJ    | Housing                 |                   |                     | 56                    | 1   | 1                    | Trip generations provided by HBC   |       |                 |       |                       | 8    | 23      | 23   | 11                              | 1506                        | To be connected to 1506, the zone which it is situated   | Distribution of zone is kept the same as no change to land use      |
| 15/02228/OUTMAJ    | Housing                 |                   |                     | 80                    | 1   | 1                    | Trip generations provided by HBC   |       |                 |       |                       | 14   | 55      | 37   | 21                              | 1029                        | To be connected to 1029, the zone which it is situated   | Distribution of zone is kept the same as no change to land use      |
| 14/04315/FULMAJ    | Housing                 |                   |                     | 85                    | 1   | 1                    | Trip generations provided by HBC   |       |                 |       |                       | 2    | 27      | 35   | 12                              | 4023                        | To be connected to 4023, the zone which it is situated   | Distribution of zone is kept the same as no change to land use      |
| 15/04622/OUTMAJ    | Housing                 |                   |                     | 6                     | 1   | 1                    | Trip generations provided by HBC   |       |                 |       |                       | 3    | 3       | 6    | 6                               | 1029                        | To be connected to 1029, the zone which it is situated   | Distribution of zone is kept the same as no change to land use      |
| 13/02786/EIAMAJ    | Housing                 |                   |                     | 180                   | 1   | 1                    | Trip Generations taken from TA   |       |                 |       |                       | 26   | 78      | 72   | 38                              | 1029                        | To be connected to 1029, the zone which it is situated   | Distribution of zone is kept the same as no change to land use      |
| 13/02786/EIAMAJ    | Housing                 |                   |                     | 90                    | 1   | 1                    | Trip Generations taken from TA   |       |                 |       |                       | 13   | 39      | 36   | 19                              | 1029                        | To be connected to 1029, the zone which it is situated   | Distribution of zone is kept the same as no change to land use      |
| 13/02786/EIAMAJ    | Housing                 |                   |                     | 90                    | 1   | 1                    | Trip Generations taken from TA   |       |                 |       |                       | 13   | 39      | 36   | 19                              | 1029                        | To be connected to 1029, the zone which it is situated   | Distribution of zone is kept the same as no change to land use      |
| 13/02786/EIAMAJ    | Housing                 |                   |                     | 90                    | 1   | 1                    | Trip Generations taken from TA   |       |                 |       |                       | 13   | 39      | 36   | 19                              | 1029                        | To be connected to 1029, the zone which it is situated   | Distribution of zone is kept the same as no change to land use      |
| 13/02786/EIAMAJ    | Primary School          |                   |                     |                       | 1   | 1                    | Trip Generations taken from TA   |       |                 |       |                       | 0    | 0       | 0    | 0                               | 1029                        | To be connected to 1029, the zone which it is situated   | Distribution of zone is kept the same as no change to land use      |
| 11/01947/FULMAJ    | Hotels                  |                   |                     | 60                    | 1   | 1                    | Trip generations determined via TRICS                                      | 0.135 | 0.277           | 0.192 | 0.091                 | 8    | 17      | 12   | 5                               | 3203                        | To be connected to 1029, the zone which it is situated   | Distribution of zone is kept the same as no change to land use      |
| 12/02099/FULMAJ    | Housing                 |                   |                     | 13                    | 1   | 1                    | Trip generations determined via TRICS                                      | 0.159 | 0.42            | 0.391 | 0.191                 | 2    | 5       | 5    | 2                               | 1003                        | To be connected to 1003, the zone which it is situated   | Distribution of zone is kept the same as no change to land use      |
| 12/04650/REMMJA    | Housing                 |                   |                     | 12                    | 1   | 1                    | Trip generations determined via TRICS                                      | 0.159 | 0.42            | 0.391 | 0.191                 | 2    | 5       | 5    | 2                               | 4311                        | To be connected to 4311, the zone which it is situated   | Distribution of zone is kept the same as no change to land use      |
| 12/04653/OUTMAJ    | Housing                 |                   |                     | 16                    | 1   | 1                    | Trip generations determined via TRICS                                      | 0.159 | 0.42            | 0.391 | 0.191                 | 3    | 7       | 6    | 3                               | 4209                        | To be connected to 4209, the zone which it is situated   | Distribution of zone is kept the same as no change to land use      |
| 13/00437/REMMJA    | Housing                 |                   |                     | 46                    | 1   | 1                    | Trip generations determined via TRICS                                      | 0.159 | 0.42            | 0.391 | 0.191                 | 7    | 19      | 18   | 9                               | 1028                        | To be connected to 1028, the zone which it is situated   | Distribution of zone is kept the same as no change to land use      |
| 13/00965/FULMAJ    | Housing                 |                   |                     | 10                    | 1   | 1                    | Trip generations determined via TRICS                                      | 0.159 | 0.42            | 0.391 | 0.191                 | 2    | 4       | 4    | 2                               | 2002                        | To be connected to 2002, the zone which it is situated   | Distribution of zone is kept the same as no change to land use      |
| 13/01297/FULMAJ    | Housing                 |                   |                     | 20                    | 1   | 1                    | Trip generations determined via TRICS                                      | 0.159 | 0.42            | 0.391 | 0.191                 | 3    | 8       | 8    | 4                               | 1606                        | To be connected to 1606, the zone which it is situated   | Distribution of zone is kept the same as no change to land use      |
| 13/02488/FULMAJ    | Housing                 |                   |                     | 11                    | 1   | 1                    | Trip generations determined via TRICS                                      | 0.159 | 0.42            | 0.391 | 0.191                 | 2    | 5       | 4    | 2                               | 1018                        | To be connected to 1018, the zone which it is situated   | Distribution of zone is kept the same as no change to land use      |
| 13/04943/REMMJA    | Housing                 |                   |                     | 50                    | 1   | 1                    | Trip generations determined via TRICS                                      | 0.159 | 0.42            | 0.391 | 0.191                 | 8    | 21      | 20   | 10                              | 1102                        | To be connected to 1102, the zone which it is situated   | Distribution of zone is kept the same as no change to land use      |
| 14/02523/FULMAJ    | Housing                 |                   |                     | 13                    | 1   | 1                    | Trip generations determined via TRICS                                      | 0.159 | 0.42            | 0.391 | 0.191                 | 2    | 5       | 5    | 2                               | 1506                        | To be connected to 1506, the zone which it is situated   | Distribution of zone is kept the same as no change to land use      |

|                 |  |       |   |    |   |   |   |       |       |       |       |    |    |     |     |      |  |  |
|-----------------|--|-------|---|----|---|---|---|-------|-------|-------|-------|----|----|-----|-----|------|--|--|
| 14/03144/DVCMU  | Holiday Accommodation                      |       |   | 31 | 1 | 1 | trip generations determined via TRICS                                 | 0.016 | 0.03  | 0.099 | 0.108 | 0  | 1  | 3   | 3   | 4024 | Be connected to zone to north east-4024  | Distribution of zone is kept the same as no change to land use |
| 14/03251/REMMU  | Housing                                    |       |   | 88 | 1 | 1 | trip generations determined via TRICS                                 | 0.159 | 0.42  | 0.391 | 0.191 | 14 | 37 | 34  | 17  | 1424 | To be connected to 1424, the zone which it is situated   | Distribution of zone is kept the same as no change to land use |
| 14/03251/REMMU  | Mixed Affordable Houses (Flats and Houses) |       |   | 38 | 1 | 1 | trip generations determined via TRICS                                 | 0.159 | 0.42  | 0.391 | 0.191 | 6  | 16 | 15  | 7   | 1424 | To be connected to 1424, the zone which it is situated   | Distribution of zone is kept the same as no change to land use |
| 14/03510/FULMAJ | Housing                                    |       |   | 23 | 1 | 1 | trip generations determined via TRICS                                 | 0.159 | 0.42  | 0.391 | 0.191 | 4  | 10 | 9   | 4   | 1503 | To be connected to 1503, the zone which it is situated   | Distribution of zone is kept the same as no change to land use |
| 14/04648/REMMU  | Housing                                    |       |   | 27 | 1 | 1 | trip generations determined via TRICS                                 | 0.159 | 0.42  | 0.391 | 0.191 | 4  | 11 | 11  | 5   | 4206 | To be connected to 4206, the zone which it is situated   | Distribution of zone is kept the same as no change to land use |
| 14/05219/FULMAJ | Housing                                    |       |   | 18 | 1 | 1 | trip generations determined via TRICS                                 | 0.159 | 0.42  | 0.391 | 0.191 | 3  | 8  | 7   | 3   | 4307 | To be connected to 4307, the zone which it is situated   | Distribution of zone is kept the same as no change to land use |
| 15/00429/FULMAJ | Housing                                    |       |   | 14 | 1 | 1 | trip generations determined via TRICS                                 | 0.159 | 0.42  | 0.391 | 0.191 | 2  | 6  | 5   | 3   | 1402 | To be connected to 1402 to the east, the zone which it is situated   | Distribution of zone is kept the same as no change to land use |
| 12/02099/FULMAJ | Tennis Club                                |       | 0 |    | 1 | 1 | trip generations determined via TRICS                                 | 1.656 | 0.993 | 5.629 | 4.305 | 0  | 0  | -1  | -1  | 1003 | To be connected to 1003, the zone which it is situated   | Distribution of zone is kept the same as no change to land use |
| 12/02192/FULMAJ | Tennis Club                                |       | 3 |    | 1 | 1 | trip generations determined via TRICS                                 | 1.656 | 0.993 | 5.629 | 4.305 | 2  | 1  | 6   | 4   | 1424 | To be connected to 1424, the zone which it is situated   | Distribution of zone is kept the same as no change to land use |
| 09/02704/FULMAJ | Food Superstore                            | 7,345 |   |    | 1 | 1 | trip generations determined via TRICS                                 |       |       |       |       | 0  | 0  | 19  | 21  | 1009 | 50% of traffic to be loaded on 1010 connector. Connector for 1009 to be relocated to A59 to the north and 50% of development traffic to be loaded on | Distribution of zone is kept the same as no change to land use |
| 09/02704/FULMAJ | Food Superstore                            |       |   |    |   |   | trip generations determined via TRICS                                 |       |       |       |       | 0  | 0  | 19  | 21  | 1010 | 50% of traffic to be loaded on 1010 connector. Connector for 1009 to be relocated to A59 to the north and 50% of development traffic to be loaded on | Distribution of zone is kept the same as no change to land use |
| 11/01947/FULMAJ | Food Superstore                            | 2,359 |   |    | 1 | 1 | trip generations determined via TRICS Assumptions made on floor space | 2.845 | 2.092 | 5.732 | 5.768 | 67 | 49 | 135 | 136 | 3203 | To be connected to 3203, the zone which it is situated   | Distribution of zone is kept the same as no change to land use |
| 11/01947/FULMAJ | B1 Offices                                 | 4,088 |   |    | 1 | 1 | trip generations determined via TRICS Assumptions made on floor space | 1.819 | 0.242 | 0.195 | 1.463 | 74 | 10 | 8   | 60  | 3203 | To be connected to 3203, the zone which it is situated   | Distribution of zone is kept the same as no change to land use |
| 11/01947/FULMAJ | B2 Industrial Unit                         | 1,930 |   |    | 1 | 1 | trip generations determined via TRICS Assumptions made on floor space | 0.714 | 0.351 | 0.153 | 0.506 | 14 | 7  | 3   | 10  | 3203 | To be connected to 3203, the zone which it is situated   | Distribution of zone is kept the same as no change to land use |
| 11/01947/FULMAJ | Car Show Rooms                             | 400   |   |    |   |   | trip generations determined via TRICS Assumptions made on floor space | 0.986 | 0.613 | 1.464 | 1.620 | 4  | 2  | 6   | 7   | 3203 | To be connected to 3203, the zone which it is situated   | Distribution of zone is kept the same as no change to land use |
| 11/01947/FULMAJ | DIY Superstore                             | 4,237 |   |    | 1 | 1 | trip generations determined via TRICS Assumptions made on floor space | 0.986 | 0.613 | 1.464 | 1.620 | 42 | 26 | 62  | 69  | 3203 | To be connected to 3203, the zone which it is situated   | Distribution of zone is kept the same as no change to land use |
| 13/02423/REPMAJ | B8 Warehousing                             | 1,600 |   |    | 1 | 1 | trip generations determined via TRICS                                 | 0.301 | 0.192 | 0.125 | 0.25  | 5  | 3  | 2   | 4   | 4023 | To be connected to 4023, the zone which it is situated   | Distribution of zone is kept the same as no change to land use |
| 13/04031/FULMAJ | B1 Offices                                 | 568   |   |    | 1 | 1 | trip generations determined via TRICS Assumptions made on floor space | 1.819 | 0.242 | 0.195 | 1.463 | 10 | 1  | 1   | 8   | 2209 | To be connected to 2209, the zone which it is situated   | Distribution of zone is kept the same as no change to land use |
| 13/04031/FULMAJ | B2 Industrial Unit                         | 568   |   |    | 1 | 1 | trip generations determined via TRICS Assumptions made on floor space | 0.714 | 0.351 | 0.153 | 0.506 | 4  | 2  | 1   | 3   | 2209 | To be connected to 2209, the zone which it is situated   | Distribution of zone is kept the same as no change to land use |
| 13/04031/FULMAJ | B8 Warehousing                             | 568   |   |    | 1 | 1 | trip generations determined via TRICS Assumptions made on floor space | 0.301 | 0.192 | 0.125 | 0.25  | 2  | 1  | 1   | 1   | 2209 | To be connected to 2209, the zone which it is situated   | Distribution of zone is kept the same as no change to land use |
| 14/03343/FULMAJ | B8 Warehousing                             | 893   |   |    | 1 | 1 | trip generations determined via TRICS                                 | 0.301 | 0.192 | 0.125 | 0.25  | 3  | 2  | 1   | 2   | 1424 | To be connected to 1424, the zone which it is situated   | Distribution of zone is kept the same as no change to land use |
| 14/03343/FULMAJ | B1 Offices                                 | 1,341 |   |    | 1 | 1 | trip generations determined via TRICS                                 | 1.819 | 0.242 | 0.195 | 1.463 | 24 | 3  | 3   | 20  | 1424 | To be connected to 1424, the zone which it is situated   | Distribution of zone is kept the same as no change to land use |
| 14/05340/DVCMU  | B8 Warehousing                             | 8,511 |   |    | 1 | 1 | trip generations determined via TRICS                                 | 0.301 | 0.192 | 0.125 | 0.25  | 26 | 16 | 11  | 21  | 4311 | To be connected to the west of 4311, the zone which it is situated   | Distribution of zone is kept the same as no change to land use |
| 14/05340/DVCMU  | B1 Offices                                 | 8,511 |   |    | 1 | 1 | trip generations determined via TRICS                                 | 0.714 | 0.351 | 0.153 | 0.506 | 61 | 30 | 13  | 43  | 4311 | To be connected to the west of 4311, the zone which it is situated   | Distribution of zone is kept the same as no change to land use |



## **Appendix B. Local Plan Option Sites Committed Development Details**

Local Plan Developments included in Options

| Local Plan option number | Site Ref No. | Type of Development | GFA SOM of employment | No. of homes | Proportion of development complete by | Trip Rates |       |         |      | 2035 Trip Generations |      |         |                  | Development connected into zone   | Zone connection assumptions  | Changes to distribution |
|--------------------------|--------------|---------------------|-----------------------|--------------|---------------------------------------|------------|-------|---------|------|-----------------------|------|---------|------------------|---|--|-------------------------|
|                          |              |                     |                       |              |                                       | AM Peak    |       | PM Peak |      | AM Peak               |      | PM Peak |                  |   |  |                         |
|                          |              |                     |                       |              |                                       | 2025       | 2035  | Arr     | Dept | Arr                   | Dept | Arr     | Dept             |   |  |                         |
| H3                       | Housing      | 92                  | 1                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 15   | 39                    | 36   | 18      | 1422             | Traffic from site added onto zone where site is located   | As per existing distribution of existing zone                              |                         |
| H6                       | Housing      | 44                  | 1                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 7    | 18                    | 17   | 8       | 1206             | Traffic from site added onto zone where site is located   | As per existing distribution of existing zone                              |                         |
| H17                      | Housing      | 11                  | 1                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 2    | 5                     | 4    | 2       | 1204             | Traffic from site added onto zone where site is located   | As per existing distribution of existing zone                              |                         |
| H18                      | Housing      | 25                  | 1                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 4    | 11                    | 10   | 5       | 1029             | Traffic from site added onto zone where site is located   | As per existing distribution of existing zone                              |                         |
| H21                      | Housing      | 73                  | 0.178                 | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 12   | 31                    | 29   | 14      | 1425             | Traffic from site added onto zone where site is located   | As per existing distribution of existing zone                              |                         |
| H21                      | Housing      | 100                 | 1                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 16   | 42                    | 39   | 19      | 1425             | Traffic from site added onto zone where site is located   | As per existing distribution of existing zone                              |                         |
| H36                      | Housing      | 172                 | 1                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 27   | 72                    | 67   | 33      | 1208             | Traffic from site added onto zone where site is located   | As per existing distribution of existing zone                              |                         |
| H46                      | Housing      | 110                 | 1                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 17   | 46                    | 43   | 21      | 1212             | Traffic from site added onto zone where site is located   | Zone changed to reflect distributions of nearby zone 1204                  |                         |
| H49                      | Housing      | 361                 | 0.332                 | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 57   | 152                   | 141  | 69      | 1027             | Traffic from site added onto zone where site is located   | As per existing distribution of existing zone                              |                         |
| H49                      | Housing      | 361                 | 0                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 57   | 152                   | 141  | 69      | 1027             | Traffic from site added onto zone where site is located   | As per existing distribution of existing zone                              |                         |
| H63                      | Housing      | 50                  | 0                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 8    | 21                    | 20   | 10      | 1111             | Traffic from site added onto zone where site is located   | As per existing distribution of existing zone                              |                         |
| H65                      | Housing      | 52                  | 1                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 8    | 22                    | 20   | 10      | 1028             | Traffic from site added onto zone where site is located   | As per existing distribution of existing zone                              |                         |
| K21                      | Housing      | 81                  | 1                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 13   | 34                    | 32   | 15      | 2006             | Traffic from site added onto zone where site is located   | Rural zone, distributions changed to those of nearby residential zone 2306 |                         |
| K22                      | Housing      | 58                  | 1                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 9    | 24                    | 23   | 11      | 2006             | Traffic from site added onto zone where site is located   | Rural zone, distributions changed to those of nearby residential zone 2306 |                         |
| K25                      | Housing      | 402                 | 0.448                 | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 64   | 169                   | 157  | 77      | 2306             | Traffic loaded onto connector west of junction with A59 to represent likely point of access   | As per existing distribution of existing zone                              |                         |
| R1                       | Housing      | 30                  | 1                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 2    | 4                     | 4    | 2       | 3108             | Traffic from site added onto zone where site is located   | As per existing distribution of existing zone                              |                         |
| R6                       | Housing      | 20                  | 1                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 4    | 8                     | 8    | 4       | 3002             | Traffic from site added onto zone where site is located   | As per existing distribution of existing zone                              |                         |
| R8                       | Housing      | 150                 | 0                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 24   | 63                    | 59   | 29      | 3209             | Traffic from site added onto zone where site is located   | Rural zone, distributions changed to those of nearby zone 3201             |                         |
| R8                       | Housing      | 280                 | 0.643                 | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 45   | 118                   | 109  | 53      | 3209             | Traffic from site added onto zone where site is located   | Rural zone, distributions changed to those of nearby zone 3201             |                         |
| R23                      | Housing      | 98                  | 1                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 16   | 41                    | 38   | 19      | 3101             | Traffic from site added onto zone where site is located   | As per existing distribution of existing zone                              |                         |
| R24                      | Housing      | 196                 | 0.612                 | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 31   | 82                    | 77   | 37      | 3006             | Traffic from site added onto zone where site is located   | Rural zone, distributions changed to those of nearby zone 3004             |                         |
| R25                      | Housing      | 270                 | 0.444                 | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 43   | 113                   | 106  | 52      | 3005             | Traffic from site split between zones 3005 and 3006 to represent likely different access points from the site   | Rural zone, distributions changed to those of nearby zone 3004             |                         |
| R25                      | Housing      | 270                 | 0                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 43   | 113                   | 106  | 52      | 3006             | Traffic from site added onto zone where site is located   | As per existing distribution of existing zone                              |                         |
| R25                      | Housing      | 52                  | 1                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 8    | 22                    | 20   | 10      | 4003             | Traffic from site added onto zone where site is located   | As per existing distribution of existing zone                              |                         |
| B4                       | Housing      | 171                 | 1                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 27   | 72                    | 67   | 33      | 4009             | Site is located in zone 4024 however connector would not represent movements on the A1(M) Junction 48 roundabout correctly. Traffic from site therefore added to relocated connector for nearby rural zone 4009 | As per existing distribution of existing zone                              |                         |
| B7                       | Housing      | 145                 | 1                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 23   | 61                    | 57   | 28      | 4002             | Traffic from site added onto zone where site is located   | As per existing distribution of existing zone                              |                         |
| B11                      | Housing      | 10                  | 1                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 2    | 4                     | 4    | 2       | 4024             | Site is located in zone 4022 however connector would not represent movements on the A1(M) Junction 48 roundabout correctly. Traffic from site therefore added to connector for nearby zone 4024                 | As per existing distribution of existing zone                              |                         |
| M4                       | Housing      | 80                  | 1                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 13   | 34                    | 31   | 15      | 4214             | Traffic from site added onto zone where site is located   | As per existing distribution of existing zone                              |                         |
| M8                       | Housing      | 49                  | 1                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 2    | 12                    | 12   | 6       | 4214             | Traffic from site added onto zone where site is located   | As per existing distribution of existing zone                              |                         |
| P7                       | Housing      | 13                  | 1                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 2    | 5                     | 5    | 2       | 4210             | Traffic from site added onto zone where site is located   | As per existing distribution of existing zone                              |                         |
| F1                       | Housing      | 78                  | 1                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 12   | 33                    | 30   | 15      | 4210             | Traffic from site added onto zone where site is located   | As per existing distribution of existing zone                              |                         |
| BW1                      | Housing      | 42                  | 1                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 6    | 17                    | 16   | 8       | 4307             | Traffic from site added onto zone where site is located   | As per existing distribution of existing zone                              |                         |
| BW9                      | Housing      | 18                  | 1                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 3    | 8                     | 7    | 3       | 4306             | Traffic from site added onto zone where site is located   | As per existing distribution of existing zone                              |                         |
| BW2                      | Housing      | 40                  | 1                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 6    | 17                    | 16   | 8       | 4307             | Traffic from site added onto zone where site is located   | As per existing distribution of existing zone                              |                         |
| BM4                      | Housing      | 16                  | 1                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 3    | 7                     | 6    | 3       | 4307             | Traffic from site added onto zone where site is located   | As per existing distribution of existing zone                              |                         |
| DC1                      | Housing      | 8                   | 1                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 1    | 3                     | 3    | 2       | 4309             | Traffic from site added onto zone where site is located   | As per existing distribution of existing zone                              |                         |
| D81                      | Housing      | 42                  | 1                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 7    | 18                    | 16   | 8       | 4309             | Traffic from site added onto zone where site is located   | As per existing distribution of existing zone                              |                         |
| D81                      | Housing      | 9                   | 1                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 1    | 4                     | 4    | 2       | 4307             | Traffic from site added onto zone where site is located   | As per existing distribution of existing zone                              |                         |
| D88                      | Housing      | 58                  | 1                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 14   | 37                    | 34   | 17      | 4307             | Traffic from site added onto zone where site is located   | As per existing distribution of existing zone                              |                         |
| HM7                      | Housing      | 30                  | 1                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 5    | 13                    | 12   | 6       | 4306             | Traffic from site added onto zone where site is located   | As per existing distribution of existing zone                              |                         |
| KL6                      | Housing      | 72                  | 1                     | 1            | 0                                     | 0          | 0     | 0       | 11   | 30                    | 28   | 14      | 1031             | Site is located in zone 1428 however trips have been assigned to zone 1031 which is more representative of likely site access   | As per existing distribution of existing zone                              |                         |
| KL13                     | Housing      | 73                  | 1                     | 1            | 0                                     | 0          | 0     | 0       | 12   | 31                    | 29   | 14      | 1431             | Site is located in zone 1428 however trips have been assigned to zone 1431 which is more representative of likely site access   | As per existing distribution of existing zone                              |                         |
| KL4                      | Housing      | 43                  | 1                     | 1            | 0                                     | 0          | 0     | 0       | 7    | 18                    | 17   | 8       | 1431             | Site is located in zone 1428 however trips have been assigned to zone 1431 which is more representative of likely site access   | As per existing distribution of existing zone                              |                         |
| PN13                     | Housing      | 254                 | 1                     | 1            | 0                                     | 0          | 0     | 0       | 40   | 107                   | 99   | 49      | 1606             | Site is located in zone 1224 however trips have been assigned to zone 1606 which is more representative of likely site access   | As per existing distribution of existing zone                              |                         |
| GB2                      | Housing      | 11                  | 1                     | 1            | 0                                     | 0          | 0     | 0       | 2    | 5                     | 4    | 2       | 4408             | Traffic from site added onto zone where site is located   | As per existing distribution of existing zone                              |                         |
| KH4                      | Housing      | 14                  | 1                     | 1            | 0                                     | 0          | 0     | 0       | 2    | 6                     | 5    | 3       | 4015             | Trips loaded as per arrangements for GH11 site  | Bespoke distribution provided by HBC - methodology set out in report       |                         |
| KH4                      | Housing      | 4                   | 1                     | 1            | 0                                     | 0          | 0     | 0       | 1    | 2                     | 2    | 1       | 4013             | Trips loaded as per arrangements for GH11 site  | Bespoke distribution provided by HBC - methodology set out in report       |                         |
| GO1                      | Housing      | 39                  | 1                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 6    | 16                    | 15   | 7       | 4011             | Traffic from site added onto zone where site is located   | As per existing distribution of existing zone                              |                         |
| MG6                      | Housing      | 10                  | 1                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 2    | 4                     | 4    | 2       | 4010             | Traffic from site added onto zone where site is located   | As per existing distribution of existing zone                              |                         |
| DF2                      | Housing      | 62                  | 1                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 10   | 26                    | 24   | 12      | 4004             | Traffic from site added onto zone where site is located   | As per existing distribution of existing zone                              |                         |
| DF4                      | Housing      | 42                  | 1                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 4    | 11                    | 11   | 5       | 4004             | Traffic from site added onto zone where site is located   | As per existing distribution of existing zone                              |                         |
| KH1                      | Housing      | 36                  | 1                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 6    | 15                    | 14   | 7       | 4007             | Traffic from site added onto zone where site is located   | As per existing distribution of existing zone                              |                         |
| SB1                      | Housing      | 52                  | 1                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 8    | 22                    | 20   | 10      | 3401             | Traffic from site added onto zone where site is located   | As per existing distribution of existing zone                              |                         |
| NS1                      | Housing      | 64                  | 1                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 9    | 23                    | 21   | 10      | 4203             | Traffic from site added onto zone where site is located   | As per existing distribution of existing zone                              |                         |
| NS3                      | Housing      | 134                 | 0.896                 | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 21   | 56                    | 52   | 26      | 4303             | Traffic from site added onto zone where site is located   | As per existing distribution of existing zone                              |                         |
| RN2                      | Housing      | 14                  | 1                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 2    | 6                     | 5    | 3       | 4006             | Traffic from site added onto zone where site is located   | As per existing distribution of existing zone                              |                         |
| RN3                      | Housing      | 15                  | 1                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 2    | 6                     | 6    | 3       | 4006             | Traffic from site added onto zone where site is located   | As per existing distribution of existing zone                              |                         |
| SV1                      | Housing      | 57                  | 1                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 9    | 24                    | 22   | 11      | 4301             | Traffic from site added onto zone where site is located   | As per existing distribution of existing zone                              |                         |
| KM4                      | Housing      | 31                  | 1                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 5    | 13                    | 12   | 6       | 4215             | Traffic from site added onto zone where site is located   | As per existing distribution of existing zone                              |                         |
| SB5                      | Housing      | 24                  | 1                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 4    | 10                    | 9    | 5       | 4309             | Traffic from site added onto zone where site is located   | As per existing distribution of existing zone                              |                         |
| SB1                      | Housing      | 45                  | 1                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 7    | 19                    | 18   | 9       | 4309             | Traffic from site added onto zone where site is located   | As per existing distribution of existing zone                              |                         |
| SP5                      | Housing      | 80                  | 1                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 13   | 34                    | 31   | 15      | 4401             | Traffic from site added onto zone where site is located   | As per existing distribution of existing zone                              |                         |
| SP4                      | Housing      | 22                  | 1                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 3    | 9                     | 9    | 4       | 4401             | Traffic from site added onto zone where site is located   | As per existing distribution of existing zone                              |                         |
| H56                      | Housing      | 139                 | 1                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 22   | 58                    | 54   | 27      | 1005             | Site is located in zone 1008. Traffic added to zone 1005 to better represent likely access point  | As per existing distribution of existing zone                              |                         |
| TW8                      | Housing      | 126                 | 1                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 20   | 53                    | 49   | 24      | 4017             | Traffic from site added onto zone where site is located   | As per existing distribution of existing zone                              |                         |
| H70                      | Housing      | 193                 | 1                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 31   | 81                    | 75   | 37      | 1029             | Zone connector relocated to be more representative of site access point   | As per existing distribution of existing zone                              |                         |
| H70                      | Housing      | 0                   | 0                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 0    | 0                     | 0    | 0       | 1029             | Zone connector relocated to be more representative of site access point   | As per existing distribution of existing zone                              |                         |
| H51                      | Housing      | 300                 | 1                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 48   | 126                   | 117  | 57      | 1029             | Zone connector relocated to be more representative of site access point   | As per existing distribution of existing zone                              |                         |
| H51                      | Housing      | 390                 | 0                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 62   | 164                   | 152  | 74      | 1029             | Zone connector relocated to be more representative of site access point   | As per existing distribution of existing zone                              |                         |
| BM3                      | Housing      | 20                  | 1                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 3    | 8                     | 8    | 4       | 4307             | Traffic from site added onto zone where site is located   | As per existing distribution of existing zone                              |                         |
| KL2                      | Housing      | 19                  | 1                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 3    | 8                     | 7    | 4       | 1431             | Site is located in zone 1031. Traffic from site split between zones 1031 and 1431 to represent likely movements and routes towards site   | As per existing distribution of existing zone                              |                         |
| K12                      | Housing      | 14                  | 1                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 2    | 6                     | 5    | 3       | 4013             | Traffic from site added onto zone where site is located   | As per existing distribution of existing zone                              |                         |
| H37                      | Housing      | 100                 | 1                     | 1            | 0.159                                 | 0.42       | 0.391 | 0.191   | 16   | 42                    | 39   | 19      | 1506             | Traffic from site added onto zone where site is located   | As per existing distribution of existing zone                              |                         |
| Windfall sites           | Housing      | 7                   | 0.5                   | 1            |                                       |            |       |         | 1    | 3                     | 3    | 1       | within Harrogate |   | As per above assumptions   |                         |
| H16                      | B1A office   | 18,800              | 1                     | 1            | 1.819                                 | 0.242      | 0.195 | 1.463   | 342  | 45                    | 37   | 275     | 1605             | Traffic from site added onto zone where site is located   | Rural zone, distributions changed to those of nearby zone 3004             |                         |
|                          |              |                     |                       |              |                                       |            |       |         |      |                       |      |         |                  |   |  |                         |

## **Appendix C. Local Plan Sites Location Plan Committed Development Details**

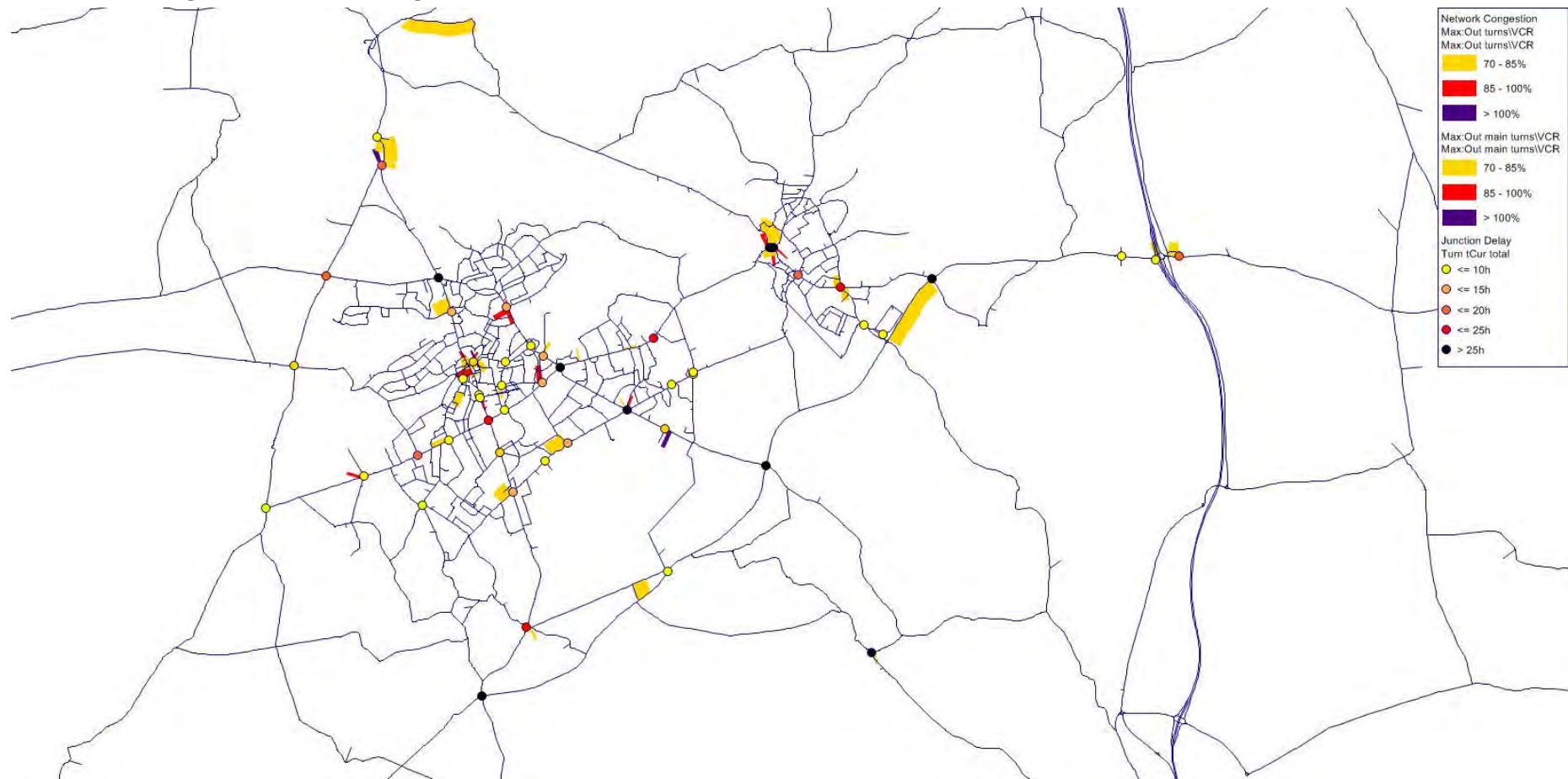


## Appendix D. 2025 Forecast Volume to Capacity Ratio

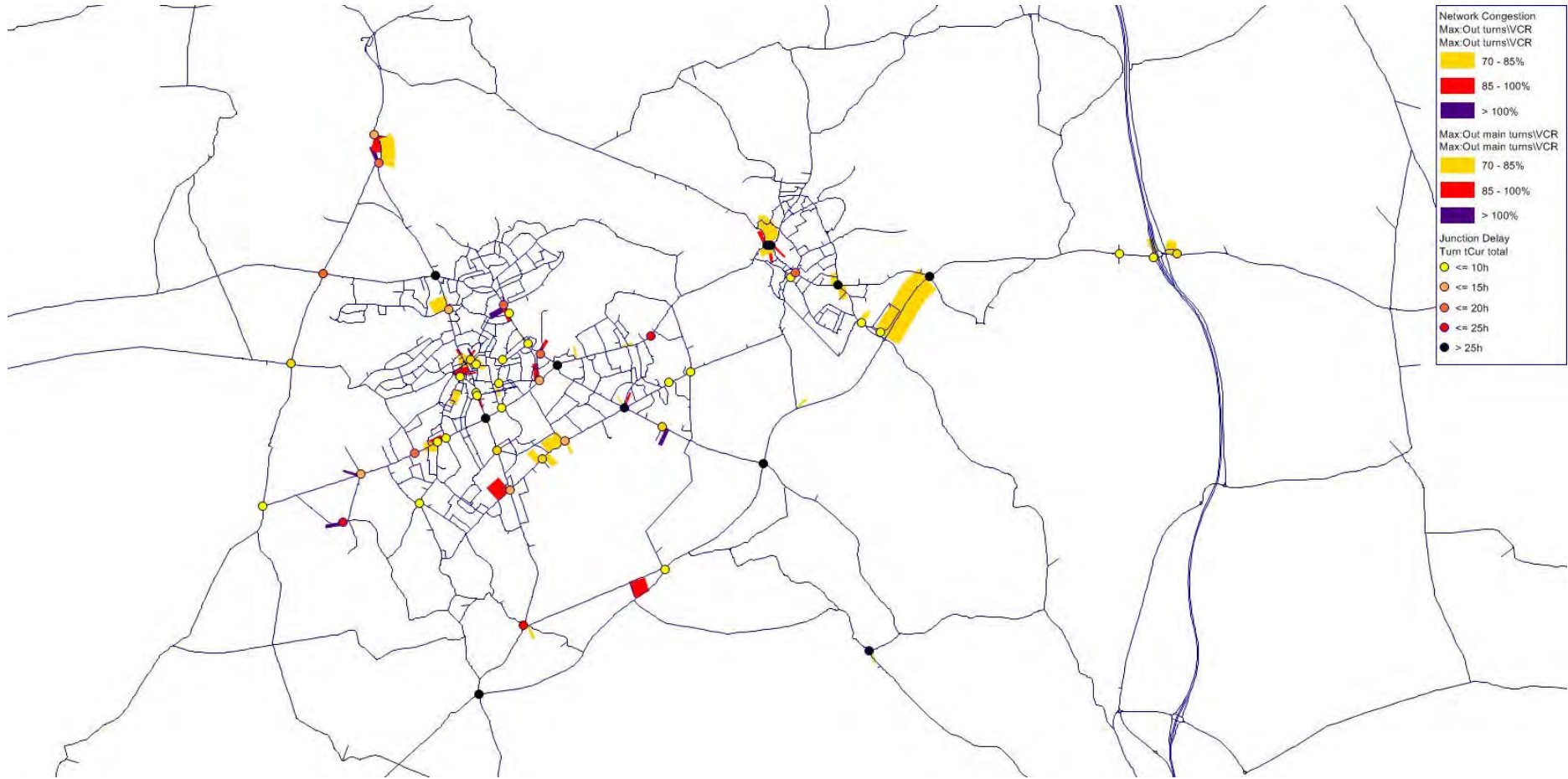
# Harrogate Borough Transport Model Local Plan Testing - Phase 2

## Appendix – 2025 Junction Capacity Results

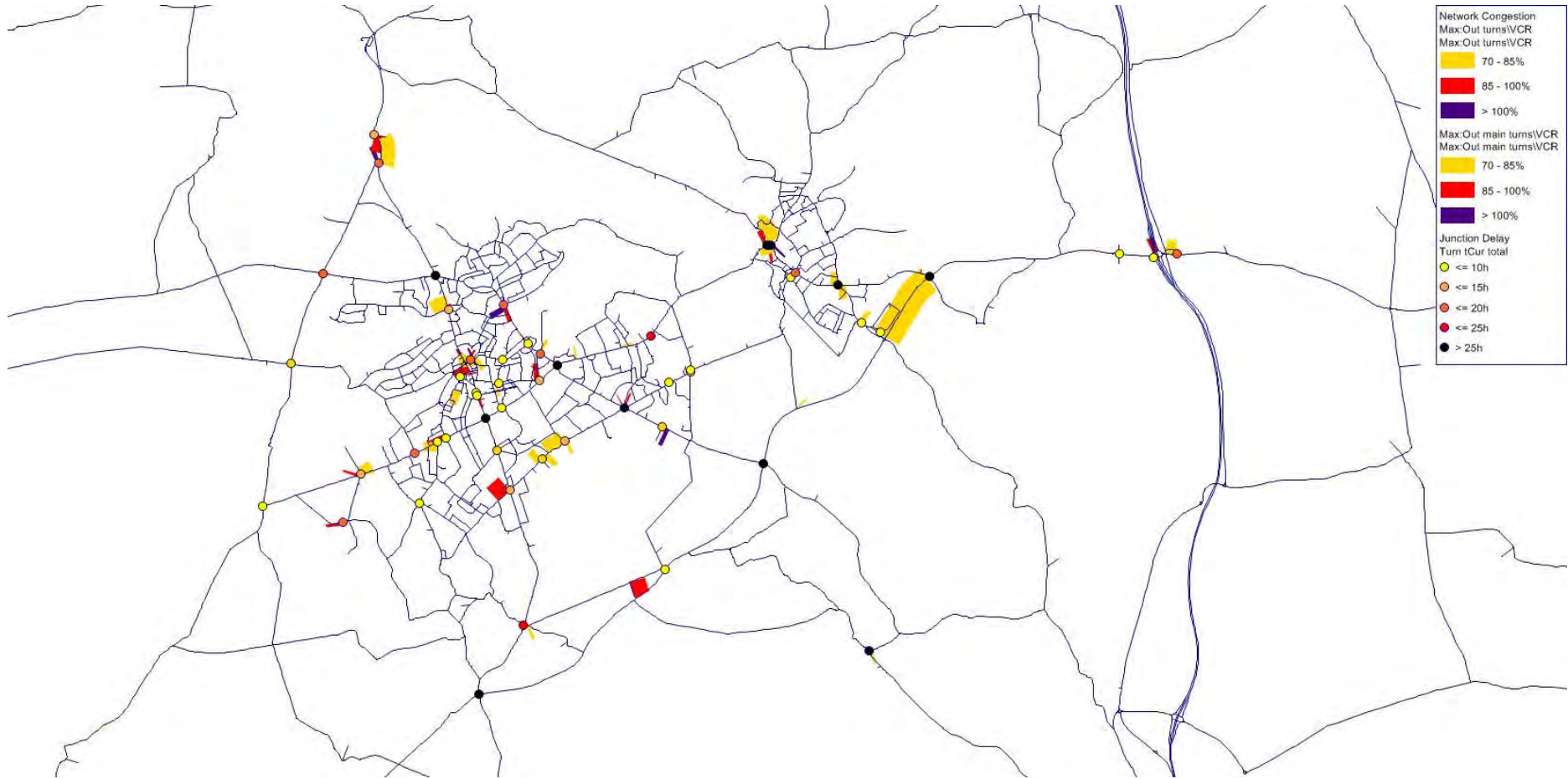
### VCR - AM - Harrogate and Knaresborough- 2025 Do Minimum



VCR - AM - Harrogate and Knaresborough- 2025 Option 1



VCR - AM - Harrogate and Knaresborough- 2025 Option 3





### **Commentary on 2025 Harrogate AM peak junction capacity results:**

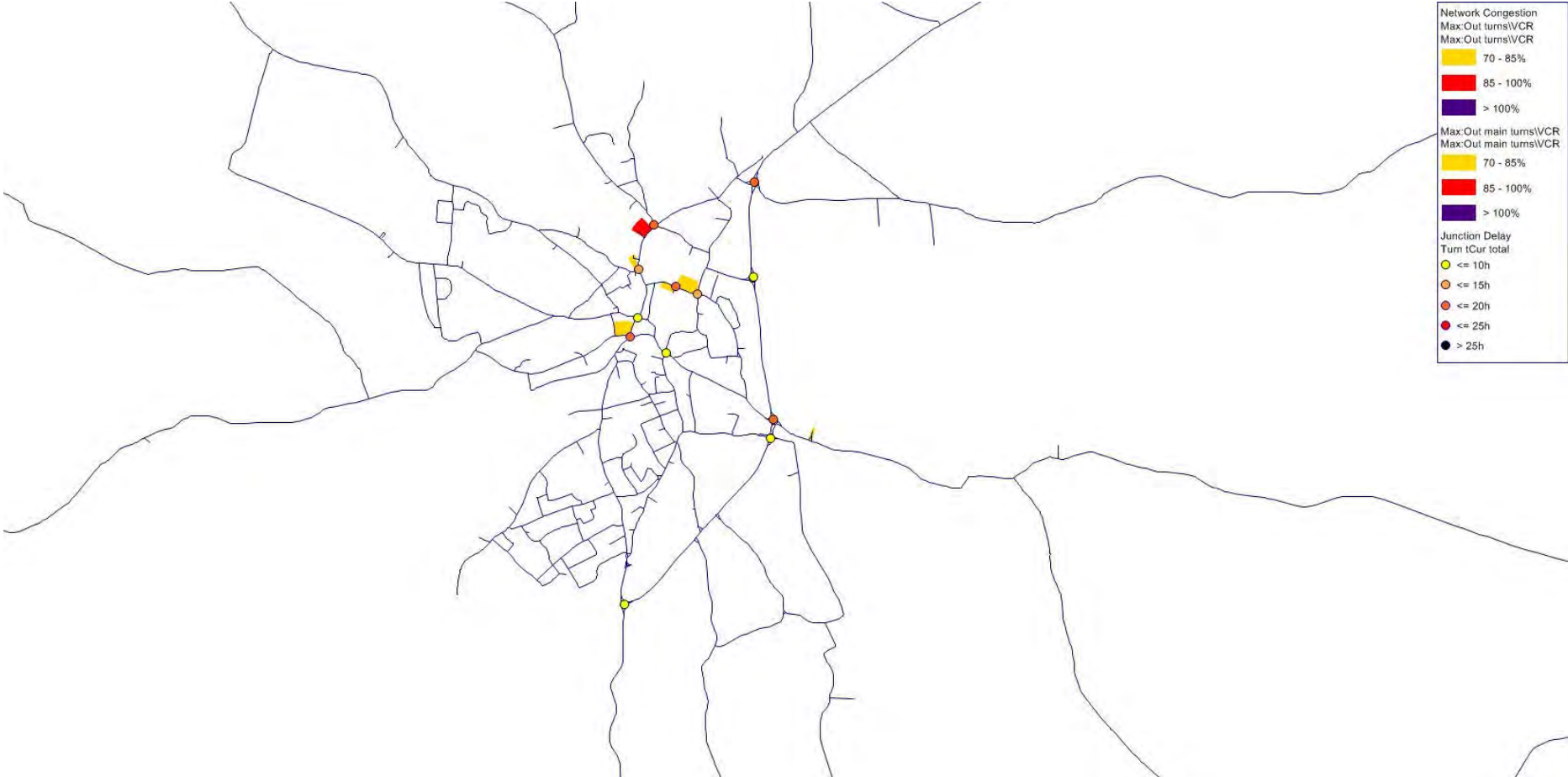
The Do Minimum network shows delays and congestion at a number of junctions including the A59/A658, Bond End and A59 / B6164 junction in Knaresborough and the A658 / A661, Prince of Wales and A61 / Jenny Field Drive junctions in Harrogate and the A61 / Otley Road junction in Killinghall.

As relatively little development comes forward in the centre of Harrogate and Knaresborough, the differences between Option 1 of the Local Plan and the Do Minimum scenario are relatively limited and mainly around areas where development will be coming forward. The main changes as a result of the Local Plan Option 1 are as follows:

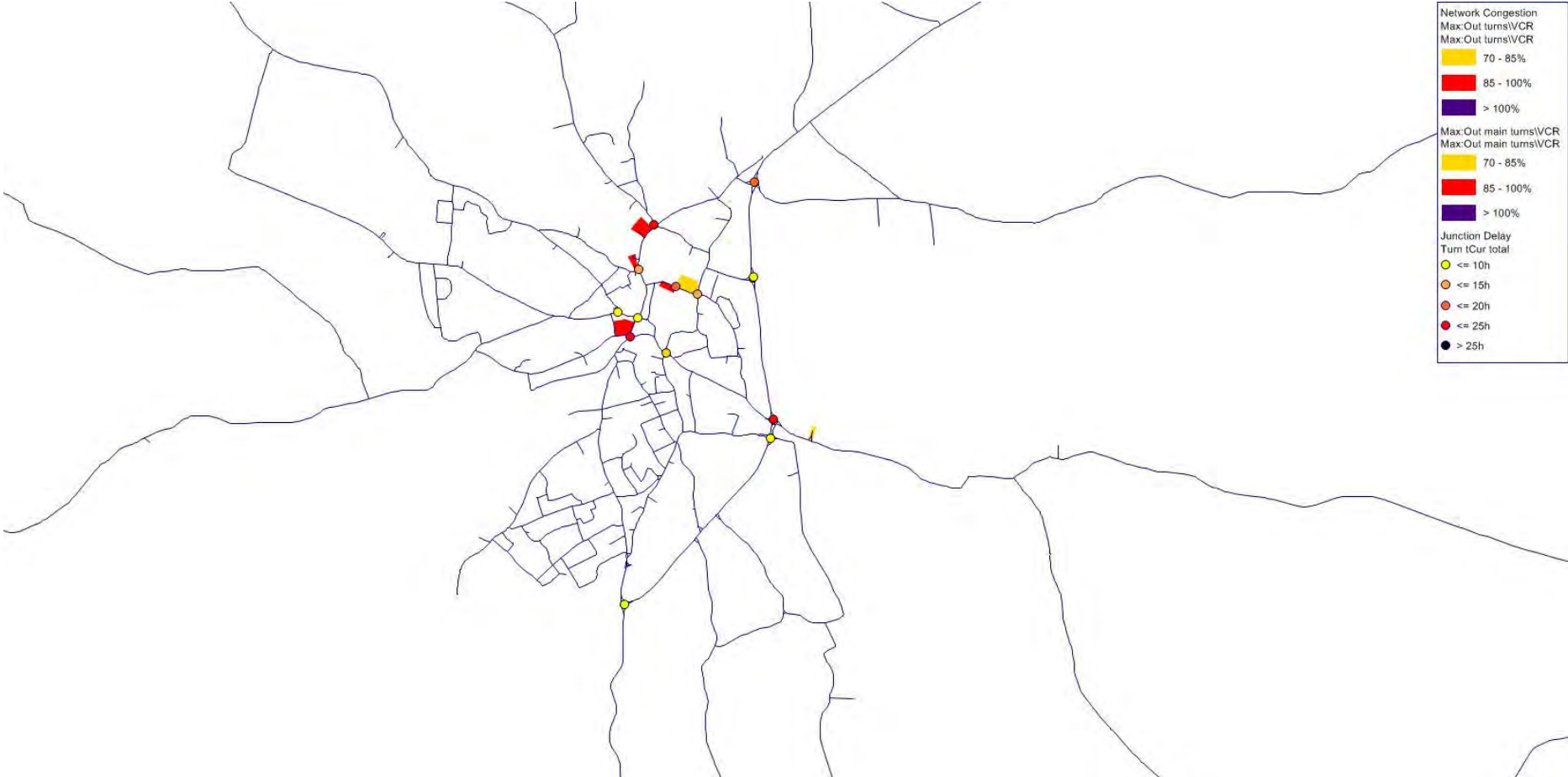
- The development sites coming forward in Pannal Ash result in some congestion at the B6162 Otley Road / Crag Lane / Beckwith Head junction although the impacts are limited compared to the 2035 scenario;
- General increases in the VCR at the Prince of Wales junction;
- The A61 / Otley Road corridor through Killinghall shows an increase in the overall VCR; and
- The Woodfield Road / Kings Road junction shows an increase in the overall VCR.

As for the 2035 scenario, given that the sites in Knaresborough and Harrogate are identical for each option, the differences between the options are limited to the A59 corridor and the A59 / A658 junction.

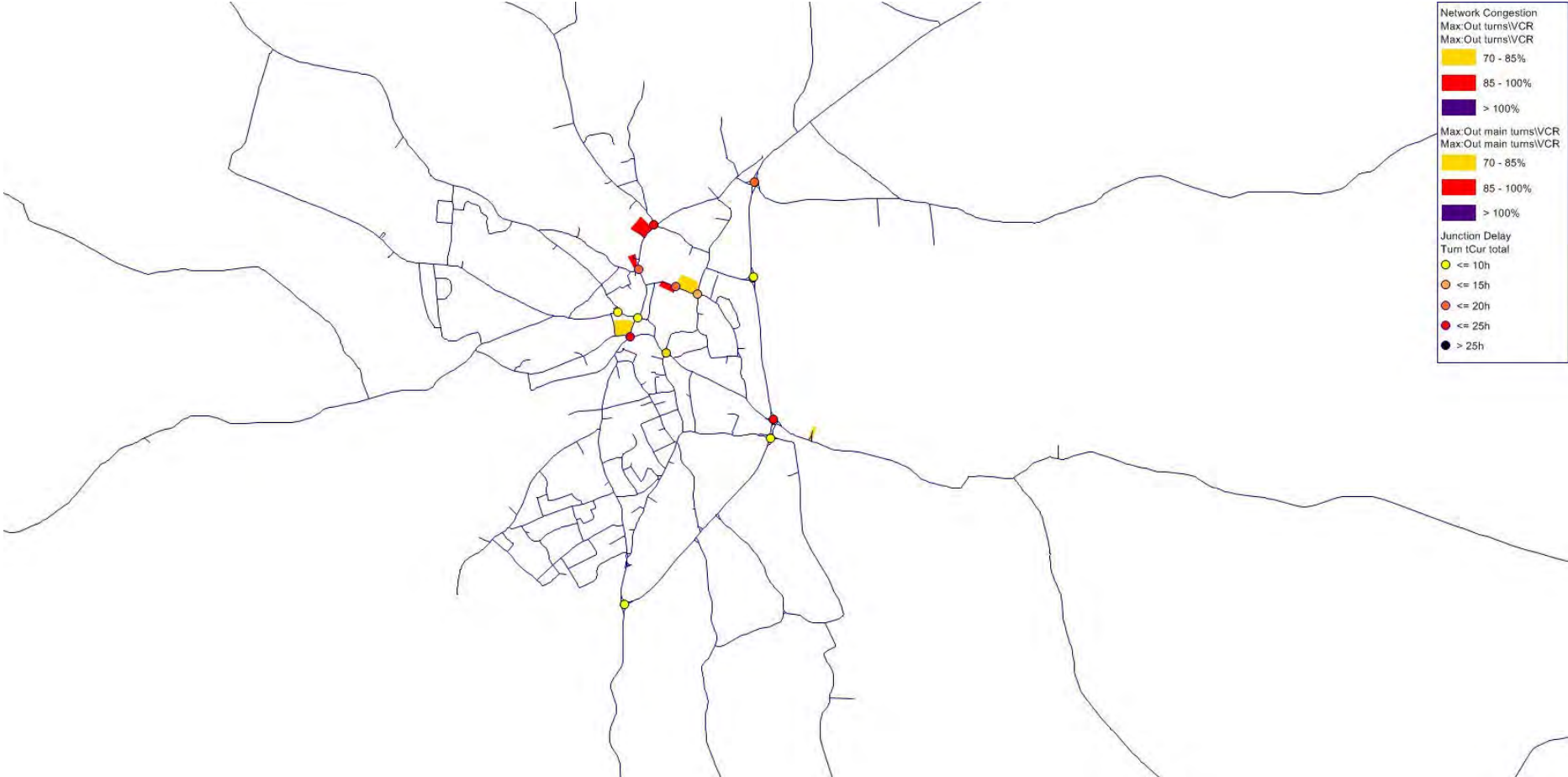
VCR - AM - Ripon- 2025 Do Minimum



VCR - AM - Ripon- 2025 Option 1



VCR - AM - Ripon- 2025 Option 3

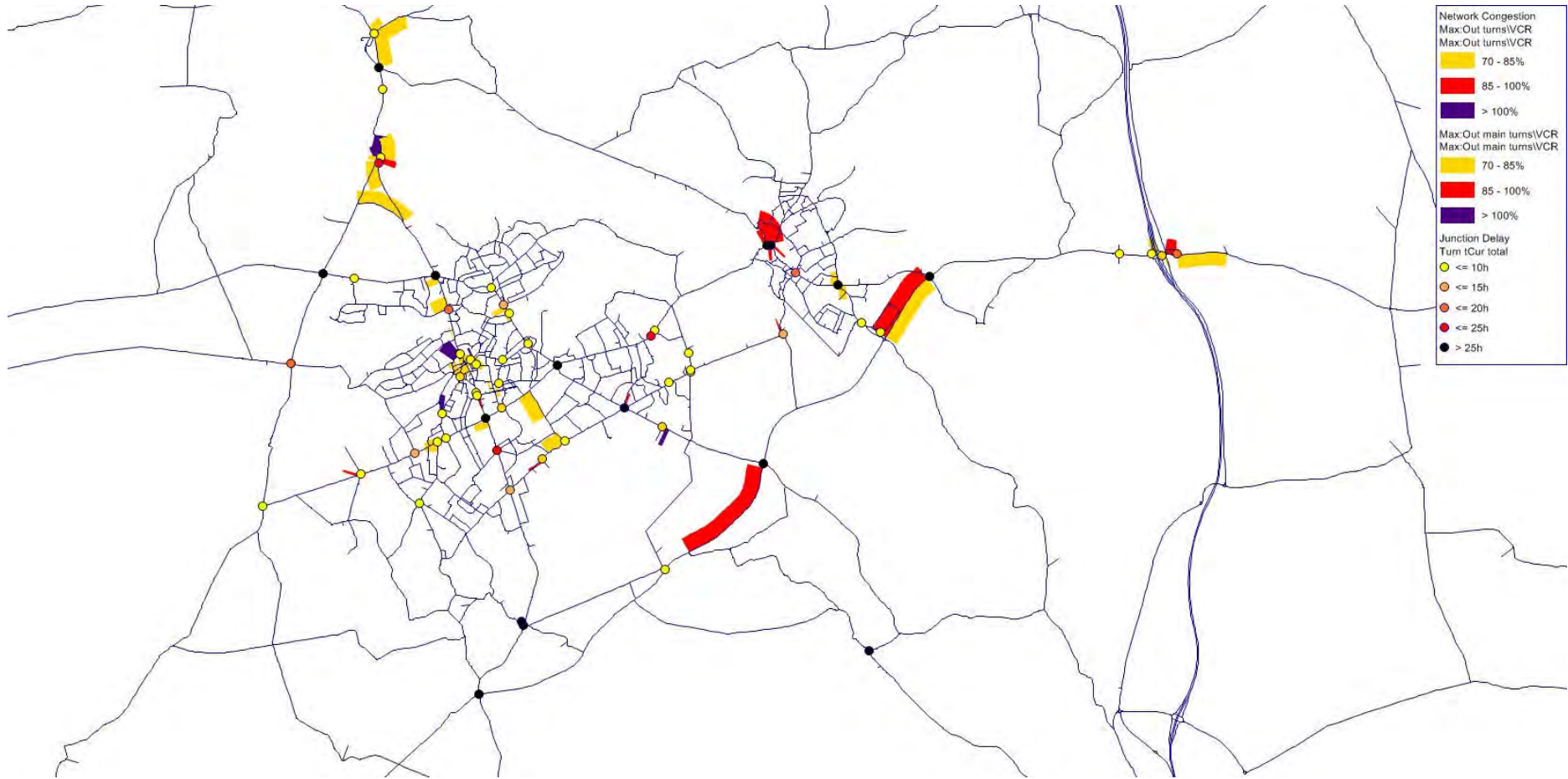


**Commentary on 2025 Ripon AM peak junction capacity results:**

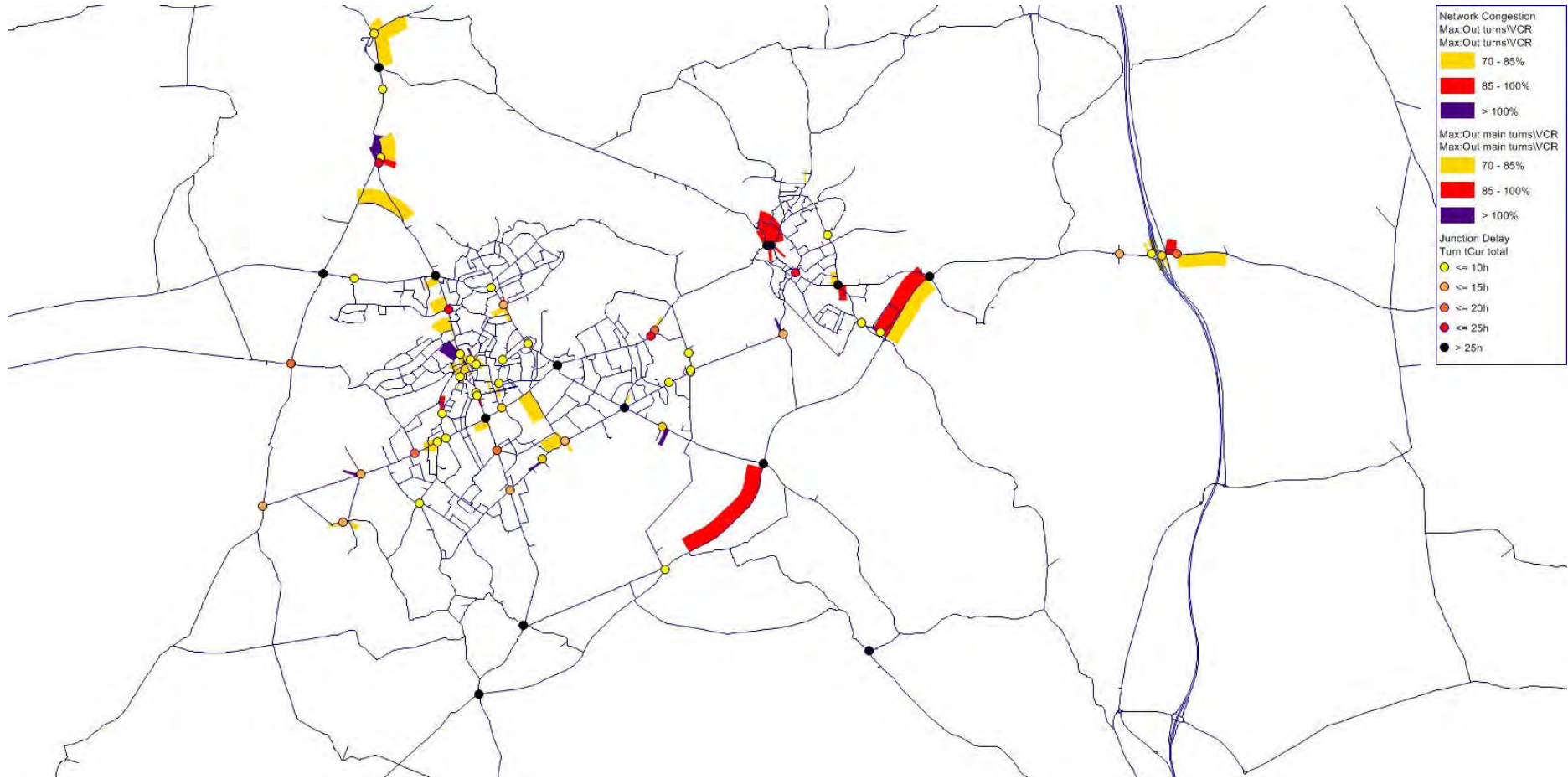
In the 2035 Do Minimum scenario, the modelling shows that some junctions are approaching capacity, most notably the Clocktower junction, Allhallowgate / St Marygate and Skellbank / Water Skellgate / Low Skellgate and College Road / North Street junctions.

For the Local Plan option scenarios, the results in each instance are again similar given the distance of Ripon from Junction 47 of the A1(M) where the differences are between the options. The modelling highlights that the performance of the College Road / North Street and Skellbank / Water Skellgate / Low Skellgate junctions deteriorates to above the 85 VCR threshold in all Local Plan options.

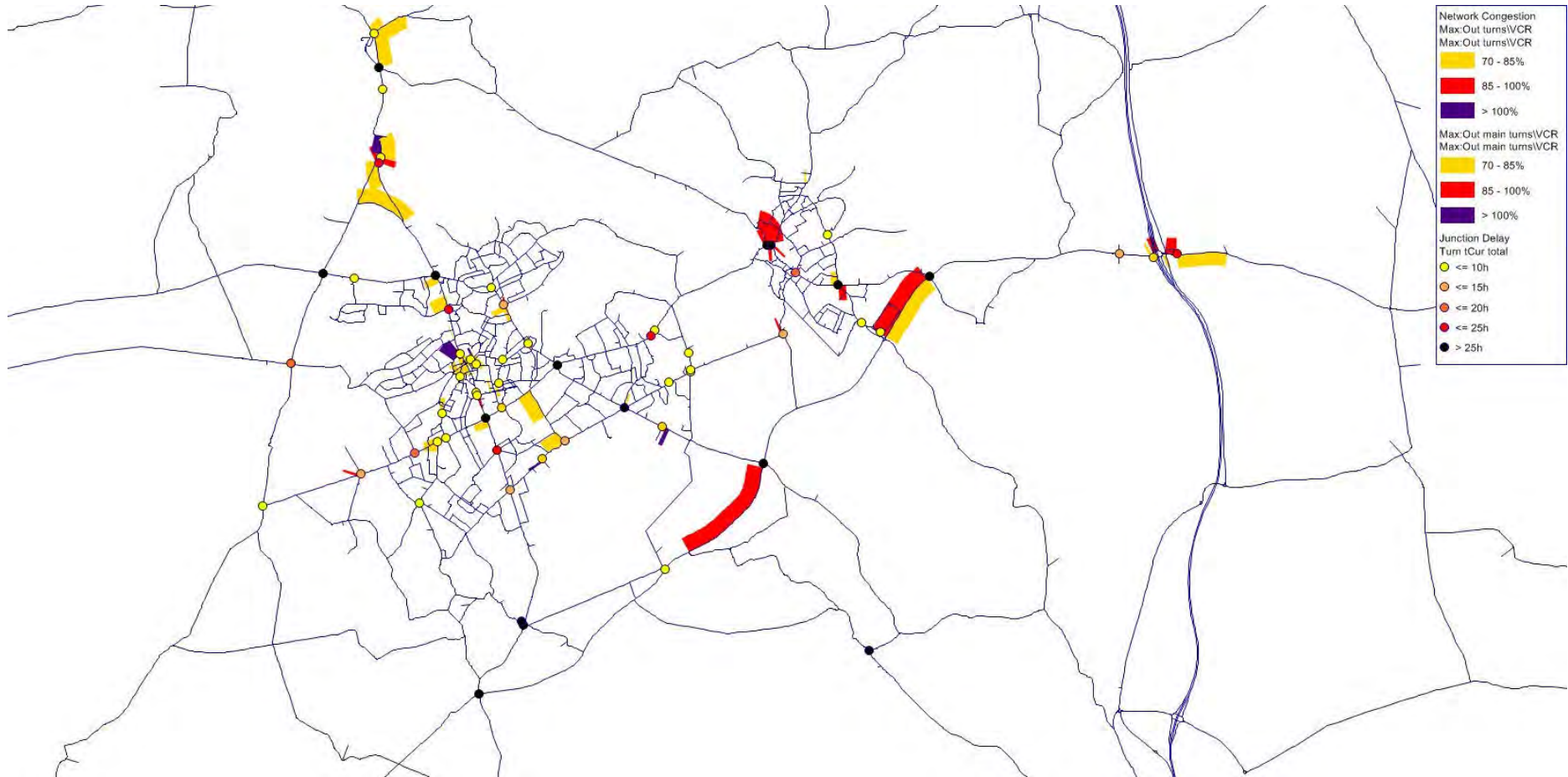
# VCR - PM - Harrogate and Knaresborough - 2025 Do Minimum



# VCR - PM - Harrogate and Knaresborough- 2025 Option 1



VCR - PM - Harrogate and Knaresborough- 2025 Option 3





### **Commentary on 2025 Harrogate PM peak junction capacity results:**

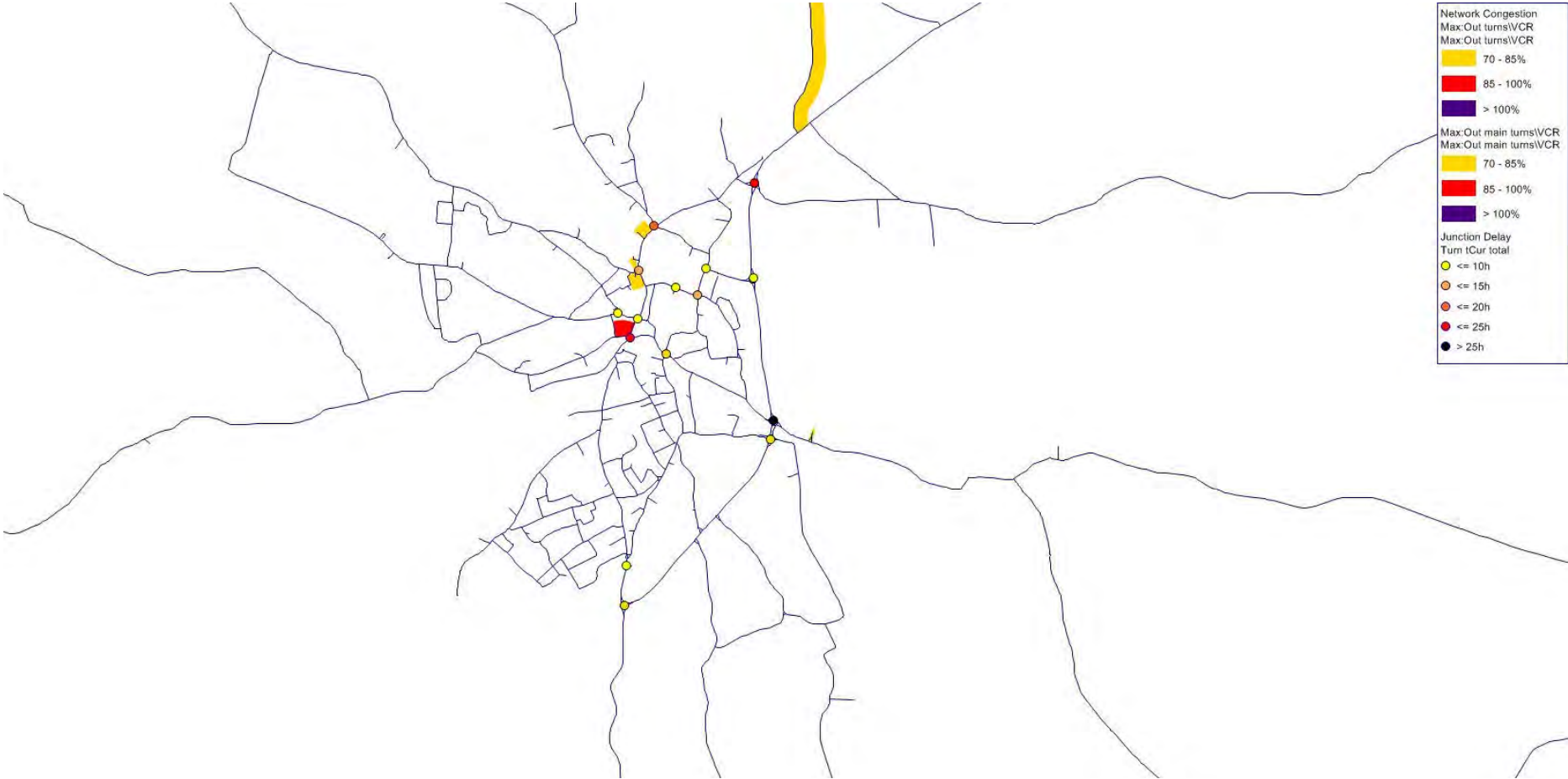
As for the AM peak period, the Do Minimum scenario, including background growth and committed development, shows delay at the same junctions in Knaresborough – the A59/A658, Bond End and A59 / B6164 junctions and in Harrogate the VCR is approaching capacity at the junctions in the town centre and the Prince of Wales, A59 / A61, the A658 / A661 and A61 / Jenny Field Drive junctions and along the A61 corridor in Killinghall.

As noted previously, all Local Plan options are identical in Harrogate and showed relatively little development coming forward in the main Harrogate and Knaresborough urban areas. The main changes as a result of the Local Plan Option 1 are as follows:

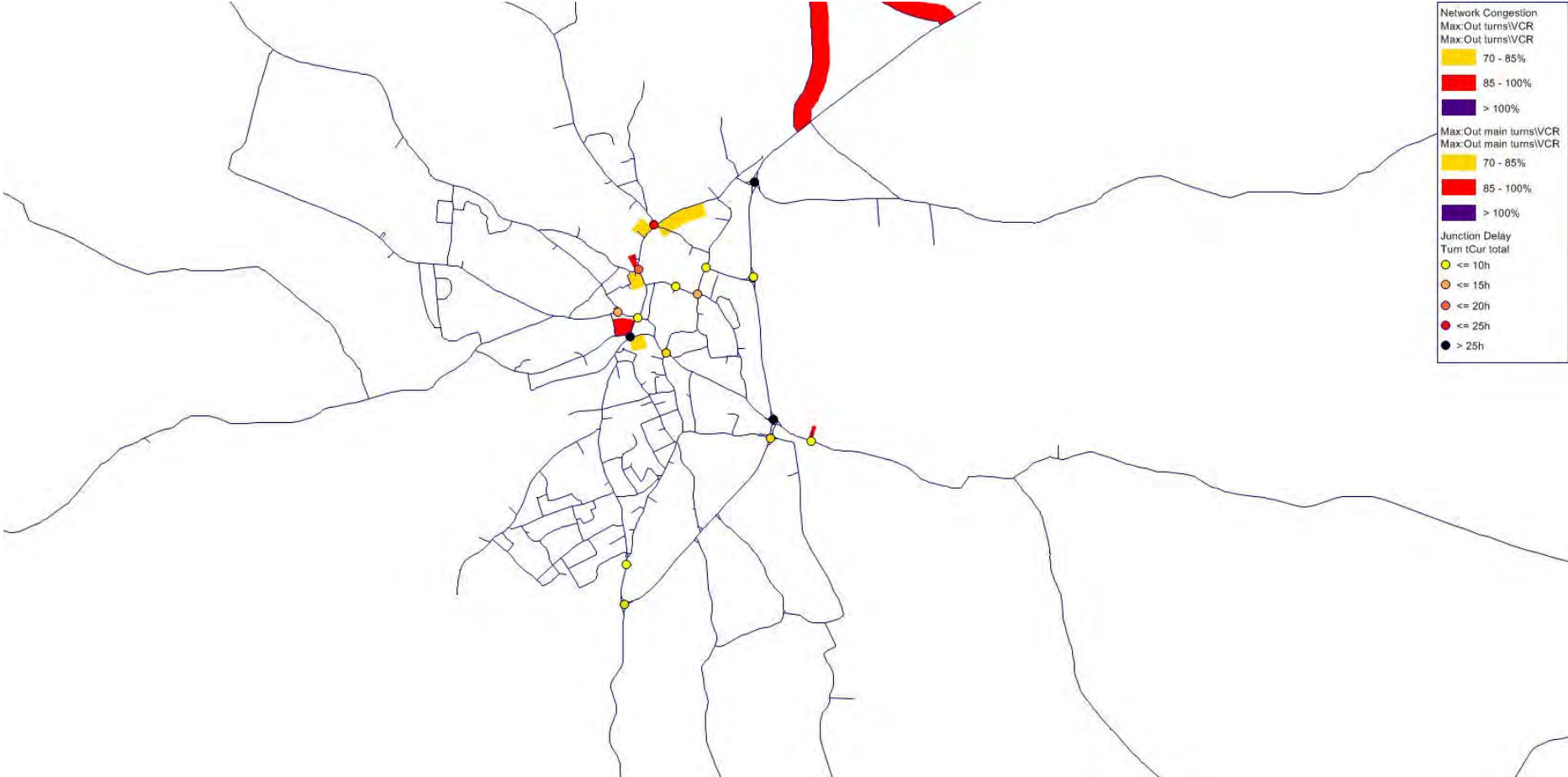
- The development sites coming forward in Pannal Ash result in some congestion (although less than shown in the AM peak) at the B6162 Otley Road / Crag Lane / Beckwith Head junction and the Beckwith Road / Howhill Road junction;
- An increase in the VCR at the Chain Lane / A59 junction in Knaresborough; and
- The A61 corridor in Killinghall and in particular the A61 / Otley Road junction shows an increase in the overall VCR.

As noted previously, the differences in development between Options 1, 2 and 3 is in the area around Junction 47 of the A1(M) and only around 25% of the major strategic developments are expected to come forward for the 2025 Intermediate Year scenario, thus meaning there are only limited difference between the options.

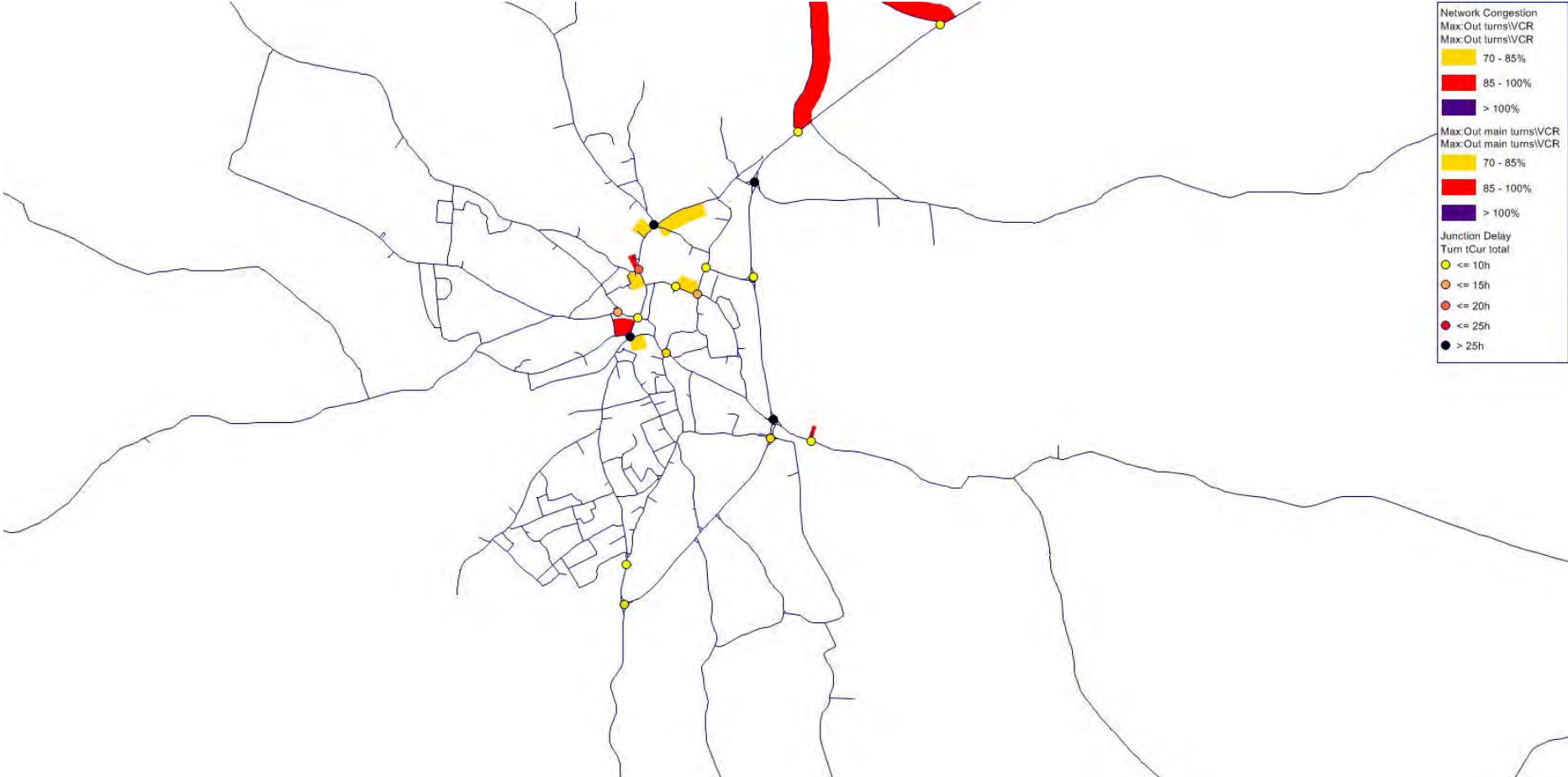
VCR - PM - Ripon- 2025 Do Minimum



VCR - PM - Ripon- 2025 Option 1



VCR - PM - Ripon- 2025 Option 3

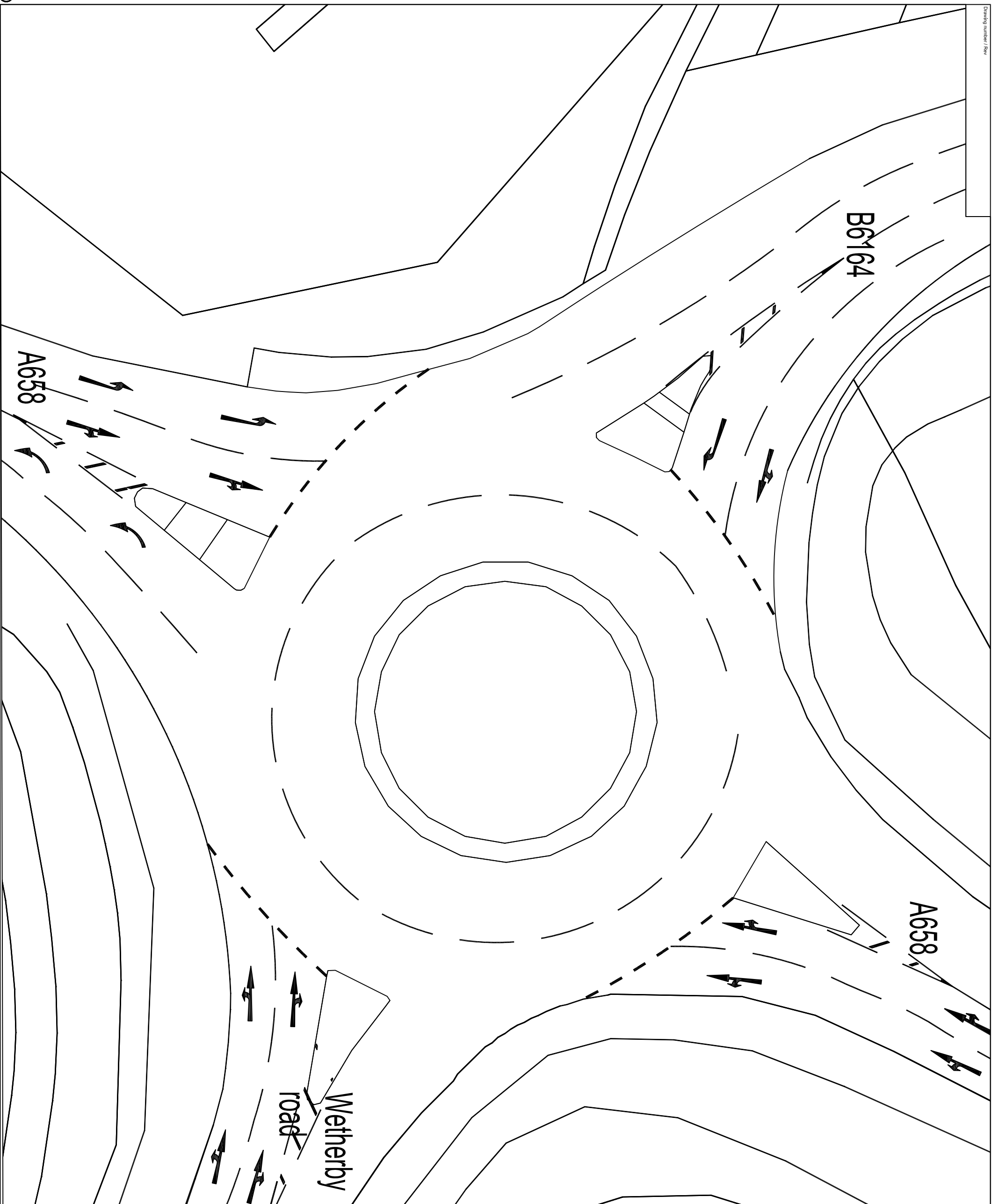


**Commentary on 2025 Ripon PM peak junction capacity results:**



In the 2035 Do Minimum scenario, the VCR is approaching capacity at some junctions within the town centre including the Clocktower junction, Allhallowgate / St Marygate and Skellbank / Water Skellgate / Low Skellgate and College Road / North Street junctions.

The Local Plan option tests in Ripon show an increase in the VCR at the Clocktower junction, North Street / College Road and Skellbank / Water Skellgate / Low Skellgate junctions.

## Appendix E. Junction Mitigation Plans



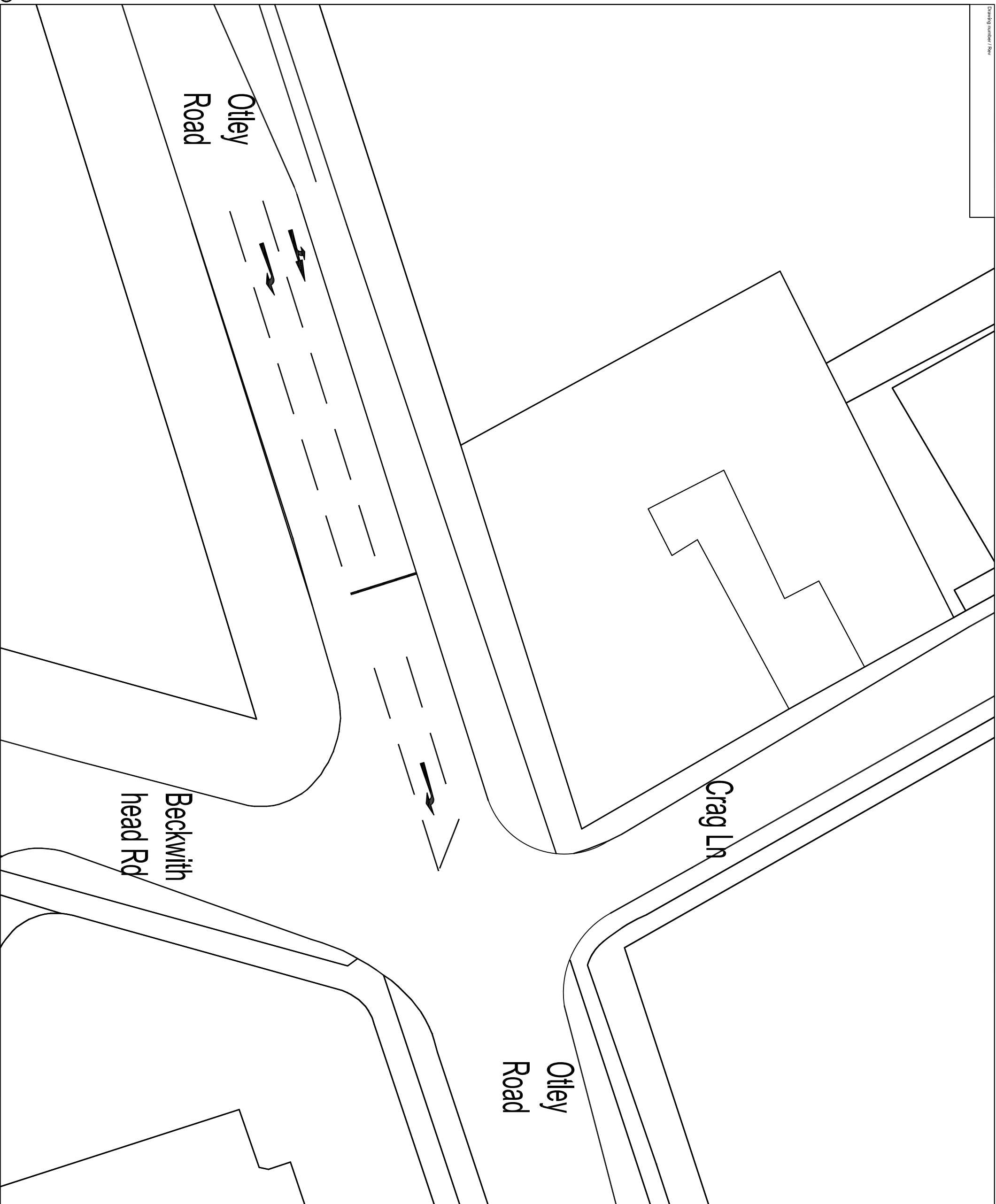
**Key:**

-  Grey Lines are existing Junction layout
-  Grey Lines are existing Junction layout



**Notes:**

- A658 Northern Arm changed both lanes to allow for ahead traffic
- A658 Southern Arm exit altered to allow two lane exit which is then merged, space taken from highway verge
- Eastern Wetherby Road lanes changed to allow ahead traffic, land taken from verge to allow for two lanes
- B6164 Arm widened to two lanes exit all the way to retail park roundabout. Land taken from verge
- B6164 entry arm widened to increase effective flare length

|  |           |                     |       |         |       |       |
|--|-----------|---------------------|-------|---------|-------|-------|
| Rev  | Rev. Date | Purpose of revision | Drawn | Checked | Rev'd | App'd |
|  |           |                     |       |         |       |       |
| <p style="text-align: center;"><b>JACOBS</b></p> <p style="text-align: center;">Stoddlegate House, Trinity Gardens, Harrogate, North Yorkshire, HG1 2JH<br/>       Tel: +44(0)1974 211241 Fax: +44(0)1974 211240<br/>       www.jacobs.com</p> |           |                     |       |         |       |       |
| <p style="text-align: center;">Harrogate Borough Council</p>   |           |                     |       |         |       |       |
| <p style="text-align: center;">Harrogate Borough Transport Model</p>   |           |                     |       |         |       |       |
| <p style="text-align: center;">Wetherby Rd/A658 Junction Redesign</p>  |           |                     |       |         |       |       |
| <p style="text-align: center;">Draft</p>   |           |                     |       |         |       |       |
| <p style="text-align: center;">DO NOT SCALE</p>  |           |                     |       |         |       |       |
| <p style="text-align: center;">0</p>   |           |                     |       |         |       |       |



**Key:**

|   |   |
|---|---|
|  | Grey Lines are existing Junction layout |
|  | Grey Lines are existing Junction layout |

**Notes:**

Land taken from stray to allow space for two lanes on the Otley Road Eastern arm.  
 Addition of a 30m right turn lane on Otley Road Eastern Arm.  
 Addition of 12m right turn box on Otley Road Eastern Arm.  
 Addition of signals - Signals indicative layout has not yet been provided.

**Notes:** No signal layout provided. Only increase in capacity is shown.

| Rev | Rev. Date | Purpose of revision | Drawn | Checked | Rev'd | App'd |
|-----|-----------|---------------------|-------|---------|-------|-------|
|     |           |                     |       |         |       |       |

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 www.jacobs.com

Client: Harrogate Borough Council

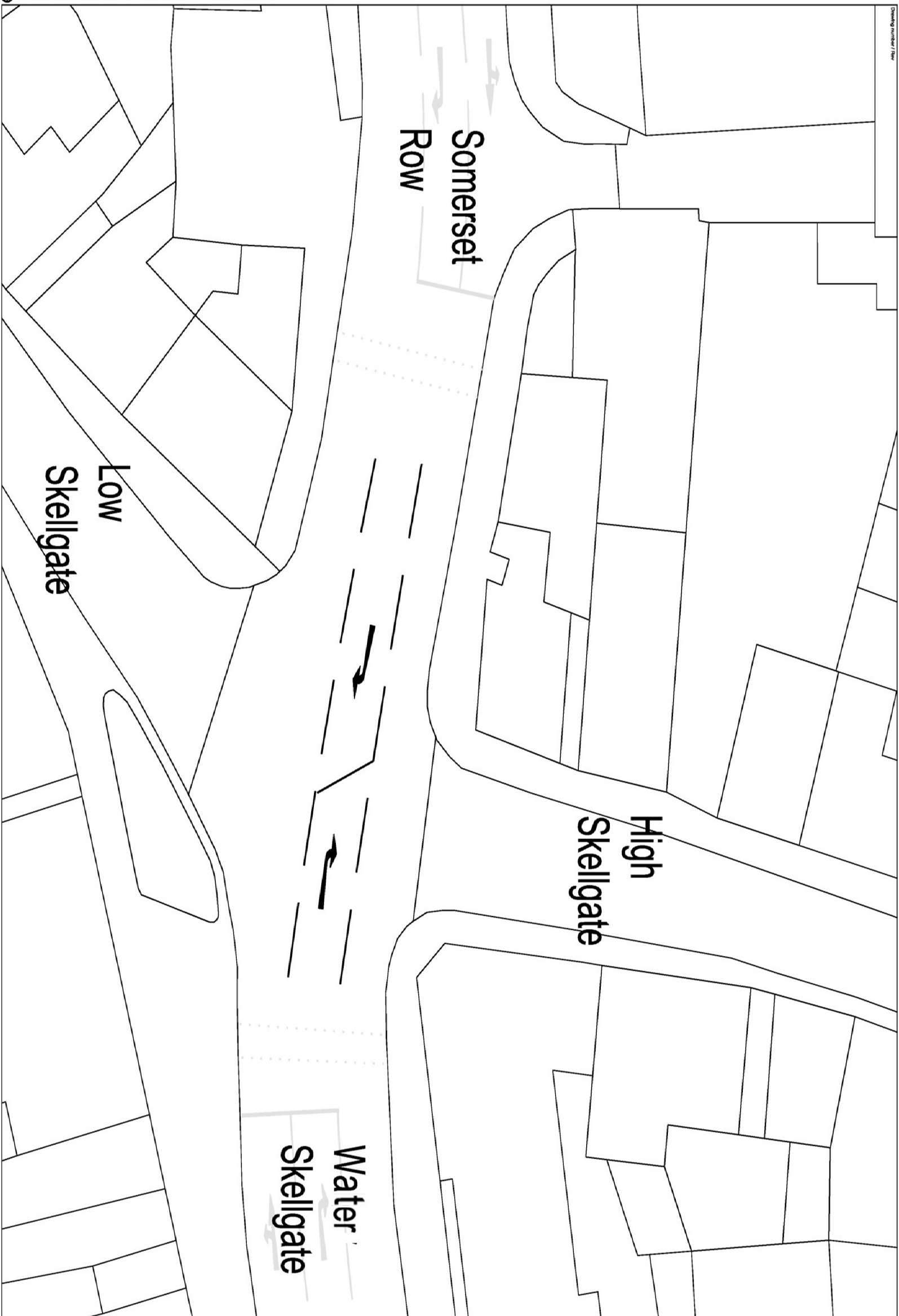
Project: Harrogate Borough Transport Model

Drawing title: Otley Rd/Crag Ln Junction Redesign

|                |            |              |
|----------------|------------|--------------|
| Drawing status | Draft      |              |
| Scale          | 1:500 @ A3 | DO NOT SCALE |
| Jacobs No.     | B2295001   |              |
| Client no.     |            |              |
| Drawing number |            | Rev          |
|                |            | 0            |

This drawing is not to be used in whole or part other than for the intended purpose and project as defined on this drawing. Refer to the contract for full terms and conditions.





**Key:**  
 Grey Lines are existing Junction layout  
 Grey Lines are existing Junction layout

**Notes:**  
 10m Right turn box added for turners from Water Skelligate arm to High Skelligate  
 15m Right turn box added for turners from Somerset Row to High Skelligate

**Notes:**  
 Grey indicates existing layout which is unchanged and provided for context only  
 Black indicates a change in Junction layout

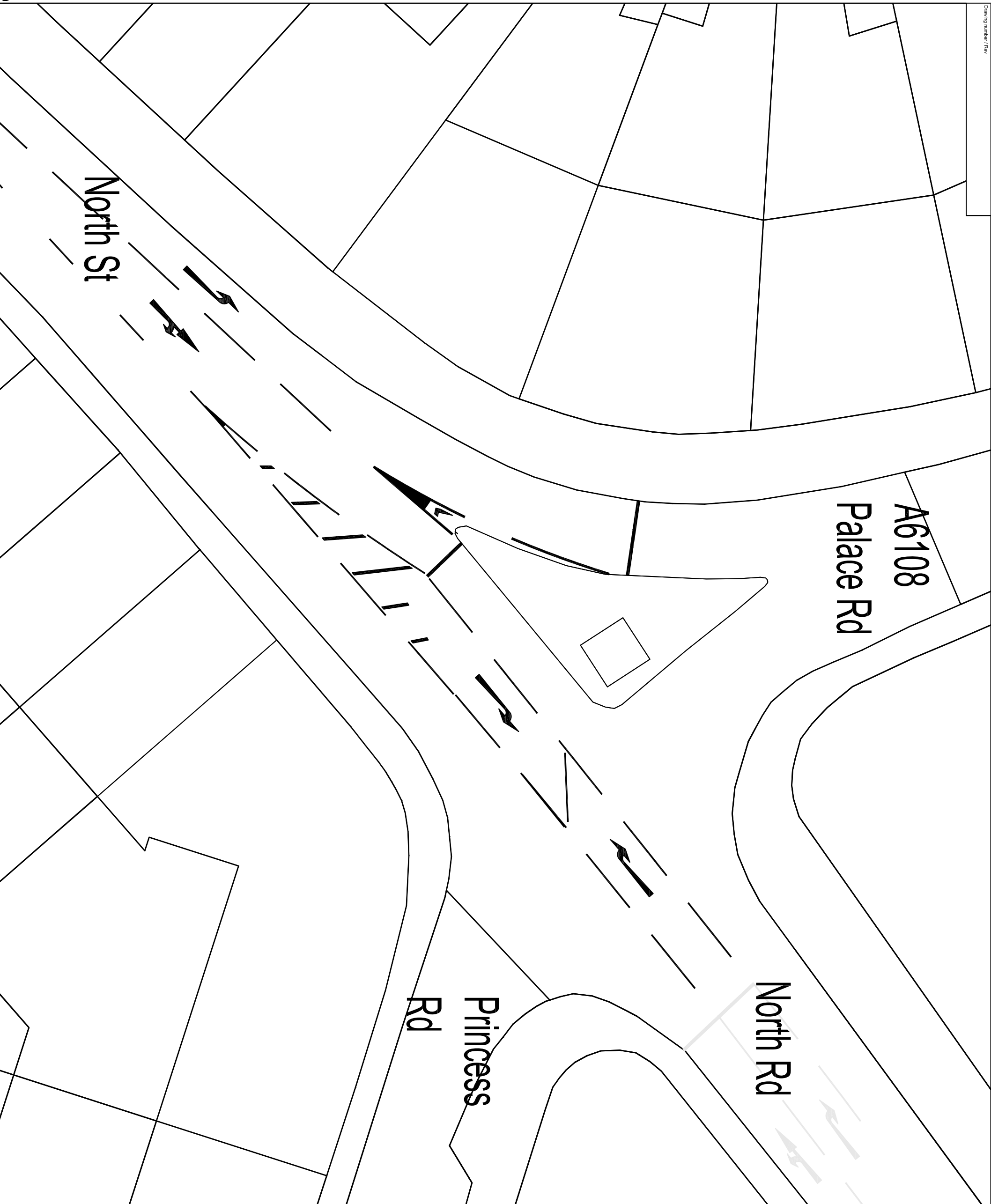
|       |         |          |          |
|-------|---------|----------|----------|
| Drawn | Checked | Reviewed | Approved |
|       |         |          |          |

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 100 Brooklands Avenue, Woking, Surrey, GU24 0JH  
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 www.jacobs.com



Client: Hamrogate Borough Council  
 Project: Hamrogate Borough Transport Model  
 Drawing title: High Skelligate/B6265/Low Skelligate Junction Redesign

|                |               |              |
|----------------|---------------|--------------|
| Scale          | Next to Scale | DO NOT SCALE |
| Drawing number | 1320626500    |              |
| Client ref.    |               |              |
| Revision       | 0             |              |

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**Key:**

-  Grey Lines are existing Junction layout
-  Grey Lines are existing Junction layout

**Notes:**

- North Street Western arm left lane changed to left turning traffic only and right lane changed to ahead and right traffic
- 12m Right turn box added for turners from North St
- Western arm to Princess Road
- 15m Right turn box added for turners from North St eastern arm to A6108 after the stop line
- Change to signal sequence

|   |           |                     |       |         |         |          |
|---|-----------|---------------------|-------|---------|---------|----------|
| Rev   | Rev. Date | Purpose of revision | Drawn | Checked | Revised | Approved |
|   |           |                     |       |         |         |          |
| <p align="center"> <br/>                 Studio: 10, Trinity Gardens, Newcastle Upon Tyne, NE1 7JH<br/>                 Tel: +44(0)191 241 2411 Fax: +44(0)191 241 2401<br/>                 www.jacobs.com             </p> |           |                     |       |         |         |          |
| Client: Harrogate Borough Council   |           |                     |       |         |         |          |
| Project: Harrogate Borough Transport Model  |           |                     |       |         |         |          |
| Drawing title: A6108/Palace Road Junction Redesign  |           |                     |       |         |         |          |
| Drawing status: Draft   |           |                     |       |         |         |          |
| Scale: 1:500 @ A3 DO NOT SCALE  |           |                     |       |         |         |          |
| Jacobs No: 62295001   |           |                     |       |         |         |          |
| Client no:  |           |                     |       |         |         |          |
| Drawing number: 0   |           |                     |       |         |         |          |
| Rev: 0  |           |                     |       |         |         |          |

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