South Heywood Economic Corridor:

Transport Assessment

Model Development Report

November 2010

Produced for

Rochdale MBC

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Executive Summary

In July 2010, The Impact Partnership supported by Mouchel, was commissioned by Rochdale Metropolitan Borough Council (RMBC) to carry out an assessment of transport proposals for the South Heywood Economic Corridor to support the RMBC Local Development Framework (LDF) Core Strategy.

A local traffic model was created for the Heywood area, derived initially from a version of the Greater Manchester (GM) Highway Model previously developed for the Highways Agency.

The resultant local model covers the areas which will be impacted by the Heywood proposals and includes sections of the adjoining motorway network. The Heywood local model has the same structure as the GM model, with AM peak, PM Peak and average Inter Peak periods modelled individually. The demand matrices in each period are composed of three user classes: cars, light goods vehicles and heavy goods vehicles.

[A supplementary micro simulation model was also created for the M62 Motorway Junction 19 interchanges. This is reported in a separate document]

Initial checks on the suitability of this local Heywood model identified a number of deficiencies, as might be expected when converting a very large, conurbation model for this more detailed application. These included a relatively coarse zoning system, poor representation of heavy goods vehicle trips (principally relating to the existing distribution centre) and inaccurate modelling of traffic flows and travel times.

These issues were all resolved through refinement or enhancement of the model and the model rechecked against standard model validation guidelines and criteria. It is shown in this report that the improved version of the model exceeds or comes close to meeting these validation criteria in all cases, in particular, the extent to which it replicates observed traffic flows and speeds in the study area.

This has demonstrated that the local traffic model is sufficiently accurate and robust enough to provide a sound basis for forecasting the effects of future land use and network changes as part of the LDF process.

Future year networks and matrices were developed in the production forecasts for the design year of 2023. In these forecasts, account was taken of background traffic growth, the new traffic resulting from the Heywood developments and the new link road.

Traffic forecasts were then prepared for three separate scenarios:

- **Completion of the link road** to M62 in isolation (tested at the 2008 Base Year)
- **Completion of the South Heywood development proposals** (excluding the link road) at the Design Year of 2023; and

- **Completion of the South Heywood development proposals** (including the link road) at 2023

The results indicate the new link road is likely to be effective in providing a direct link to the M62 Motorway from the Heywood industrial uses and helping to reduce the need for local business traffic to travel via the M66 Motorway, as is the case at present. This is evident in significant reductions in the distances travelled by heavy goods vehicles as a result of the new road. This in turn will reduce carbon emissions and air pollution locally.

Despite the growth in housing and industrial businesses as envisaged in the development strategy, the proposals for improving the road network also help protect the local communities and the link road will provide greater flexibility over the way the existing roads are managed. The new link road will provide immediate reductions in the traffic on important roads such as Middleton Road and Manchester Road.

The new road however is unlikely to act as a short-cut between the M66 and M62 motorways, a concerned raised by some local residents. With the scale of development proposed, the capacity of the improved road system will be well utilised to the extent that relatively little would be gained by through trips cutting through the area.

The analysis of the M62 Motorway interchange Junction 19 (reported separately) indicates that the roundabout will continue to function satisfactorily after completion of the Heywood development proposals, with no significant congestion or delay.

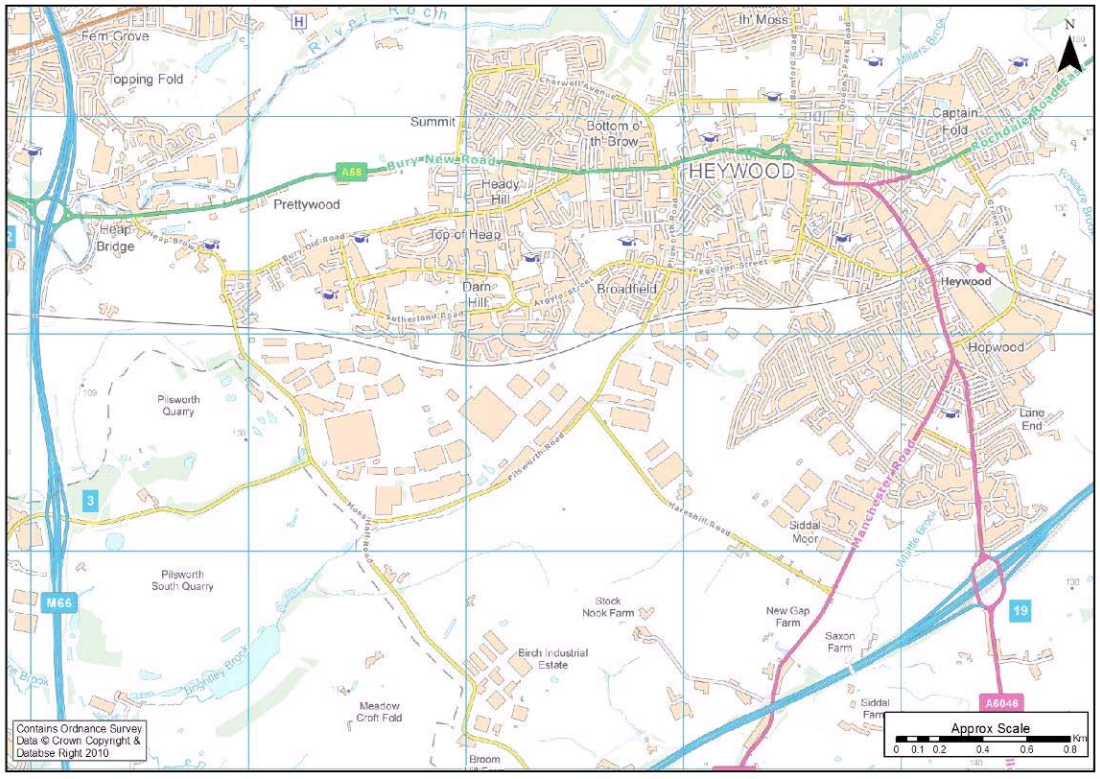
1 Introduction

1.1 Background

In July 2010, The Impact Partnership supported by Mouchel, was commissioned by Rochdale Metropolitan Borough Council (RMBC) to carry out a transport assessment of proposals for the South Heywood Economic Corridor.

The concept of mixed development and a link road has been promoted in RMBC's Local Development Framework (LDF) Core Strategy Preferred Options document in 2009, but further examination of the proposal is needed before it is submitted to the Secretary of State in 2011. Prior to that, public consultation on the proposals is planned for November 2010. The South Heywood Economic Corridor development area is shown in Figure 1-1.

Figure 1-1 *South Heywood Economic Corridor*



There should be comprehensive and holistic spatial planning to link the need for the road with the need for additional land. Land development will itself generate further traffic, although consideration should be given to sustainable modes of development and movement. The most appropriate means to address such integrated is in the form of a master plan.

As part of the overall study, a local traffic model has been developed for the Heywood area to provide:

- a depiction of present day traffic demands and issues and;

- forecasts defining the impact of the proposed Heywood developments

This report describes the development of the local traffic model and the results of the subsequent forecasting processes.

1.2 Study Objectives

The objectives in developing the local traffic model are as follows:

- The development of a local (Heywood area) traffic model to a standard suitable to support public consultation and Examination in Public (EIP) in respect of the LDF development strategy;
- The depiction of baseline highway travel demands in the area to help define existing conditions and issues;
- The production of traffic forecasts that incorporate future growth in demand and the impact of the proposed land use developments; and
- The production of future year traffic data for application in highway design studies and the appraisal of the development impacts.

1.3 Structure of this report

This report describes the process of developing the local traffic model for the Heywood area and the assessment of its quality or “fitness-for-purpose” in support of the overall LDF programme.

Chapter 2 - provides a brief overview of the various steps in construction of the local traffic model

Chapter 3 - describes the stages of model calibration and validation and provides reports on the extent to which the model meets the normal fitness-for-purpose criteria

Chapter 4 - describes the development of the future year network and matrices

Chapter 5 – provides a series of traffic forecasts to show the effects of both the proposed link road and the overall land use development proposals

Chapter 6 – presents a summary of the model development and forecasting process.

2 Overview of Traffic Model Development Process

2.1 Introduction

To develop a new traffic model is a relatively costly exercise but for the Heywood study, it was possible to derive a local model from existing sources, namely the Greater Manchester (GM) highway model. Hence significant savings in time and cost were achieved.

The process involved the creation of what is termed an isolation model taken from the parent model, followed by refinement and calibration to enhance its quality for application to this study.

In order to test future scenarios, the Base Year model was updated to include:

- Construction of the proposed link road;
- Background traffic growth up to the year 2023 (the year of completion for the proposed developments); and
- Completion of the Heywood development proposals including the link road

2.2 The Greater Manchester Highway Model

The Greater Manchester highway model had originally been created by the Greater Manchester authorities for the Transport Innovation Fund (TIF). Subsequently, Mouchel had been appointed by the Highways Agency (HA) to develop a separate version of the model to support the design and appraisal of what it termed the Manchester Managed Motorway package, including various improvement schemes for the M60 and M62 Motorways. These include the application of Dynamic Hard Shoulder (DHS) operation which effectively adds an additional lane during peak periods.

The value of this model version is that it had been extensively re-calibrated and re-validated for HA purposes and therefore provided a credible basis from which to develop the local Heywood model.

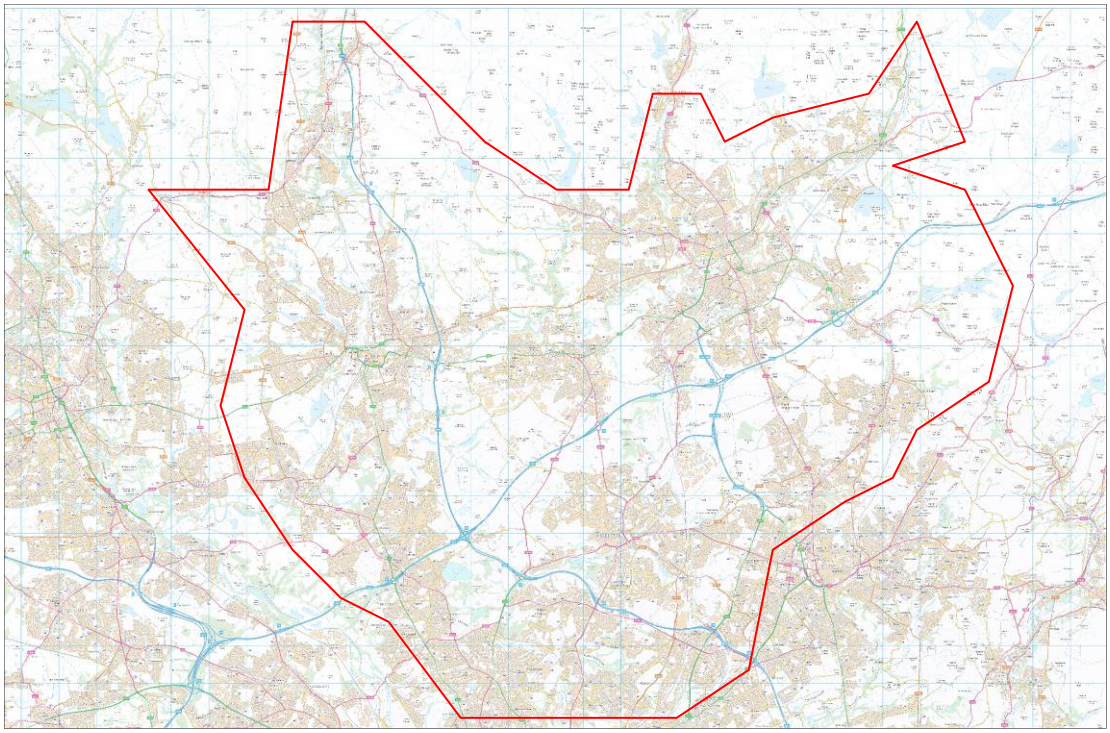
This application was endorsed by both the HA and the Greater Manchester authorities, the latter through a formal licensing agreement.

2.3 Study Area Definition

In order to define a suitable boundary for the local model, the proposed link road was coded into the full GM highway model and assignments run to gauge the extent of changes in network flows (reassignment).

This identified an area that includes most of Rochdale and parts of the adjoining authorities, together with sections of the M60, M62 and M66 Motorways. The boundary defined for the local model isolation is shown below in Figure 2-1.

Figure 2-1 *Local Model Definition*



The results of these preliminary assignments (in terms of network flow changes) are illustrated in Appendix A1. Further analysis was also undertaken to check the logic of traffic routing within the model, as reported in Appendix A2.

2.4 Derivation of the Heywood Local Model

Based on the boundary shown above, a cordon was defined within which the GM model network was extracted. This cordoning also created local demand matrices, including all internal trips and those crossing the cordon itself.

Both the GM and the local Heywood models are SATURN-based, representative of a 2008 Base Year and include separate models for three time periods, namely:

- AM Peak Hour (08:00-0900)
- Average Inter-Peak Hour (10:00-14:00)
- PM Peak Hour (16:00-17:00)

The models also include separate user classes for the following vehicle types:

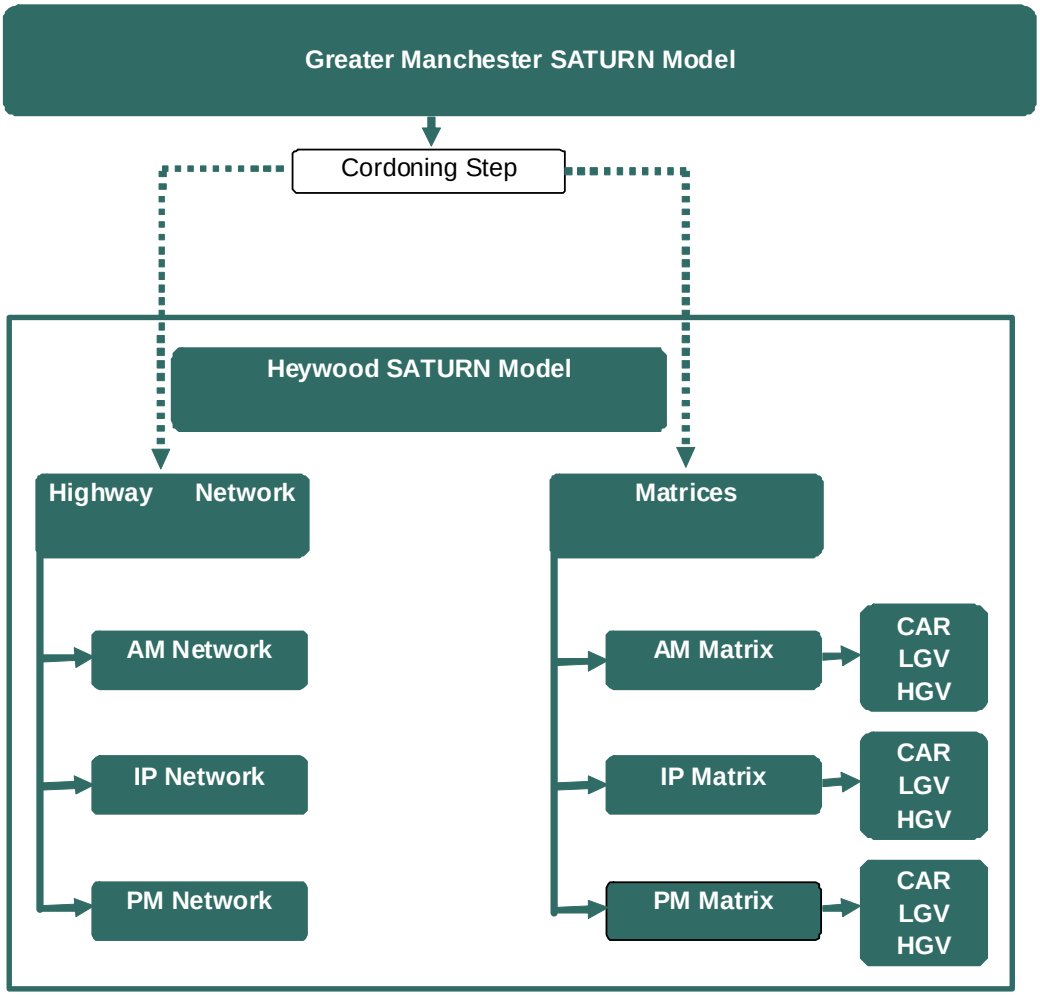
- Cars
- light goods vehicles; and
- Heavy goods vehicles

The assignment process in the local model is consistent with that of the GM model and uses capacity restrained, equilibrium assignment. Within the model area, all

junctions are therefore defined as simulation nodes reflecting the form of control and capacity characteristics of individual junctions.

The structure of the Heywood SATURN model is shown in **Figure 2-2** below.

Figure 2-2 *Structure of Heywood SATURN Model*



2.5 Local Model Calibration and Validation

Initial tests were undertaken to assess how well the local model replicated traffic flows and travel times within the study area, based on data available from the earlier GM model database or other sources.

Not surprisingly, this demonstrated that further refinement and calibration was required for the local Heywood application. The modifications required included the redefinition of local zones, revisions to the HGV demand estimates and matrix manipulation whereby travel demand matrices are adjusted to better match observed flows.

As a result of these changes, the local model was substantially improved and able to demonstrate an acceptable standard of validation in the context of its intended application.

2.6 Forecasting

The procedures adopted in forecasting were designed to reflect the context of the overall study that is the early stages of plan formulation as part of the overall LDF process. Hence, it was judged that at this stage, it should be sufficient for the forecasts to be indicative (in the knowledge that the proposals themselves may change) but realistic enough to inform the subsequent public consultation and EIP procedures.

In practical terms, a simplified demand forecasting process was adopted which at this stage, does not explore the potential demand responses, such as redistribution, mode change or trip retiming that might occur in the longer term.

The facility to test such responses is available through the TIF modelling platform by running the highway model in tandem with the Strategic Planning Model (GMSPM-2) as has been the case for the TIF study itself and the HA studies. However, this is a relatively elaborate and costly process which would add relatively little to the assessment at this time.

Future demand estimates were therefore derived in two stages:

- First, the application of locally-derived growth factors to reflect background traffic growth; and
- Second, the addition of new trips representing the proposed Heywood development scheme.

In the second case, the proposed link road from the Heywood site to the M62 Motorway (Junction 19) was also included in the future year network. Separate forecasts were also run with the inclusion of only the link road into the base year model, to help identify its specific effects on local traffic patterns.

3 Model Calibration and Validation

3.1 Introduction

To assess the quality of the local Heywood model, preliminary validation checks were undertaken. These demonstrated that the model fell some way short of the desired standard and as described below, a number of steps were taken to refine and improve the model.

3.2 Preliminary Model Validation

Guidelines setting out the criteria for model validation are published by the Department for Transport (DfT) in the Design Manual for Roads & Bridges (DMRB) and the DfT website TAG (Transport Appraisal Guidance). These provide guidance on good practice but ultimately, it is for the modeller to judge whether a model is fit for purpose.

These criteria relate to comparisons between modelled and observed link flows and to comparisons between modelled and observed travel times. Data were therefore assembled in terms of 2008 traffic counts and journey time observations.

Traffic counts were taken from the database compiled for the earlier HA study database and additional counts in the Heywood area supplied by the Greater Manchester Transportation Unit (GMTU). In total, nearly 450 sites were included in the count database and these are identified in Appendix B1.

Journey time observations were derived from the TrafficMaster database, again via GMTU, for 16 routes crossing the Heywood study area, as shown in Appendix B2.

The results of this preliminary validation are summarised below.

3.2.1 Preliminary Model – Link Flow Validation

For link flow validation, of the order of 85% of all modelled/ observed flow comparisons should meet the DMRB criteria. These include simple percentage criteria and a statistical test referred to as the GEH test (used to compare sets of traffic flows to show the accuracy of modelled and observed traffic flows). As shown below in **Table 3–1**, the preliminary validation results do not reach the desired 85 percentile level.

The validation results are also shown graphically in Appendix C.

Table 3–1 *Preliminary Model Validation Results*

Model Period	Total number of counts	FLOW passing DMRB (Links)	GEH passing DMRB (links)	Pass DMRB criteria?	
				Flows	GEH
AM Peak	447	353 (79%)	349 (78%)	×	×
Inter-Peak	447	375 (84%)	364 (81%)	×	×
PM Peak	447	343 (77%)	344 (77%)	×	×

Modelled flows were also examined at M62 Junction 19 to assess the validity of the model for the more detailed capacity analysis. This comparison is summarised in **Table 3–2** below which shows that the preliminary validation results only partially meet the desired 85 percentile level at M62 Junction 19.

Table 3–2 *Preliminary Model Validation Results- M62 Motorway, Junction 19*

Model Period	Total number of counts	FLOW passing DMRB (Links)	GEH passing DMRB (links)	Pass DMRB criteria?	
				Flows	GEH
AM Peak	13	11 (85%)	10 (77%)	✓	×
Inter-Peak	13	12 (92%)	12 (92%)	✓	✓
PM Peak	13	10 (77%)	10 (77%)	×	×

The detailed flow comparisons for M62 Junction 19 can be seen Appendix D.

3.2.2 Preliminary Model - Journey Time Validation

For journey time validation, comparisons should be made between observed and modelled times on a selection of representative routes within the study area in each of the modelled periods. Guidance suggests that over 85 percent of modelled journey times should be within ±15% or one minute (whichever is lower) of the observed journey times.

Journey time observations were assembled for a number of routes within the study area, as shown below in **Figure 3-1** and described in **Table 3–3**.

Figure 3-1 *Journey Time Routes*

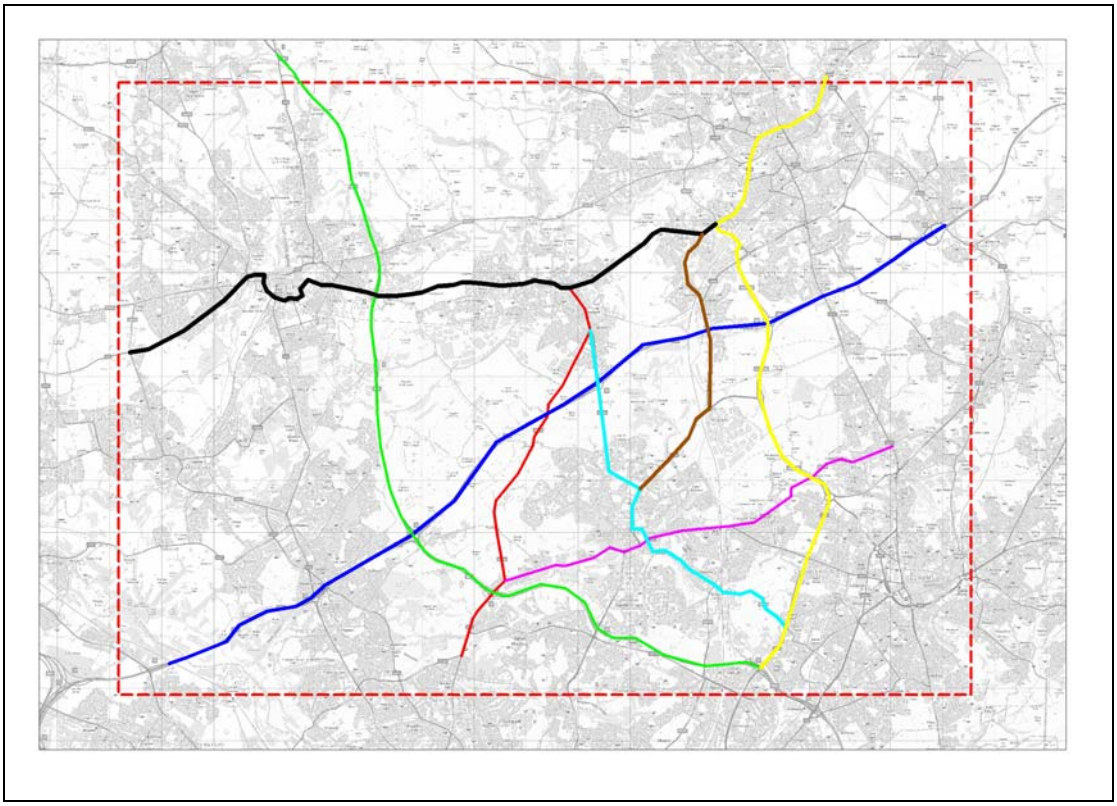


Table 3–3 *Journey Time Route Descriptions*

Route	Description
Red	Extends north and south between the A6104 Victoria Ave./A576 Middleton Rd junction and the A58 York St/A6046 Church St junction.
Blue	Runs along the motorway between M60 J17 and M62 J21
Green	Runs along the motorway between M60 J21 and M56 J1
Purple	Stretches east and west between A6065 Heywood Old Rd/A576 Manchester Old Rd junction and the A671 Rochdale Rd/B5195 Middleton Rd junction.
Turquoise	Extends between A663 Broadway/Foxdenton Ln and A6046 Middleton Rd/A6046 Manchester Rd/A6045 Manchester Rd
Yellow	Runs north and south between M60 J21 and the A664 Albert Royds St/A58 Halifax Rd junction
Black	Runs between the B6292 Ainsworth Rd/A58 Bury and Bolton Rd junction and the A58 Manchester Rd/A664 Edinburgh Way junction
Brown	Extends between A664 Rochdale Rd/A6046 Hollin Ln and A664 Manchester Rd/A58 Bolton Rd

The preliminary journey time validation results are been summarised in **Table 3–4** below. The validation results show that the modelled journey times are not sufficiently representative of those observed.

Table 3–4 *Preliminary Journey Time Validation results of the Heywood model*

Model Period	Number of routes	Number of Routes within DMRB criteria	Pass DMRB criteria?
AM Peak	16	12 (75%)	×
Inter-Peak	16	12 (75%)	×
PM Peak	16	10 (63%)	×

Detailed journey time validation results are presented in Appendix E.

3.3 Shortcomings of the Preliminary Model

The assessment of the local Heywood model in its preliminary form indicated that it was not sufficiently accurate for the assessment planned, largely in terms of the relatively poor standard of link flow validation. This was very much as expected given the purpose of the original GMTU/ HA which was for essentially strategic policy or scheme assessment.

More detailed analyses were therefore undertaken to determine the reasons for these deficiencies and refinement of the model undertaken as described below.

3.3.1 Model Refinement - Zoning System in Heywood Area

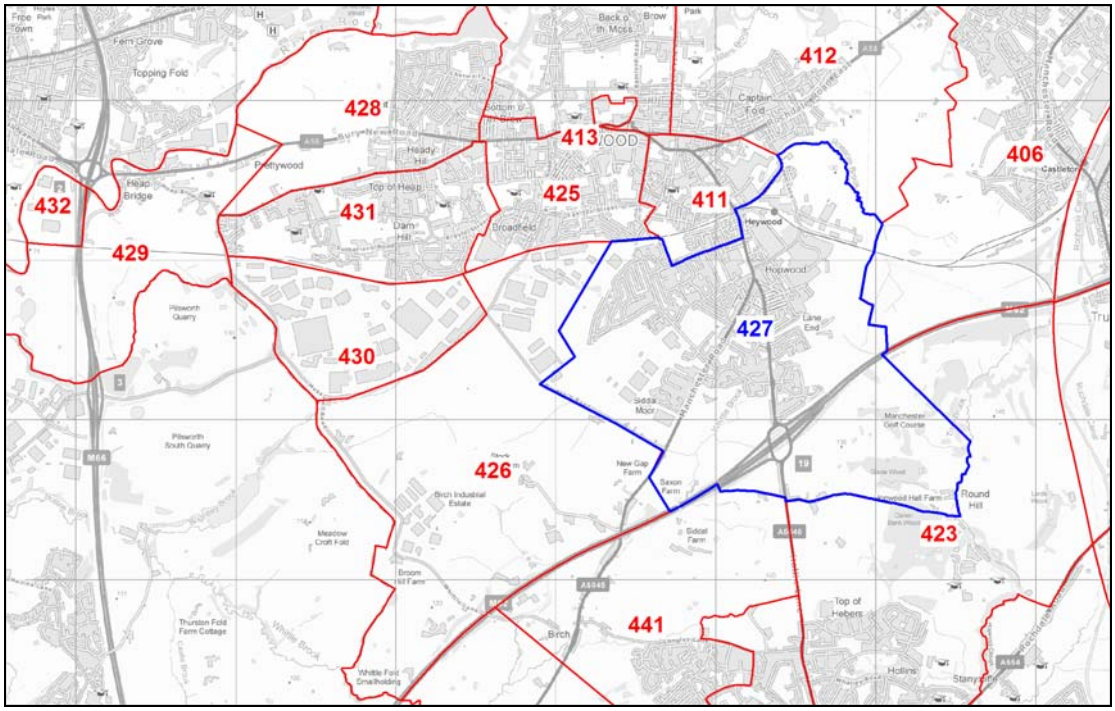
When the zone plan for the original model was reviewed, it was found that there was a single zone (zone 427) covering a large area of the Heywood area (Manchester Road, A6046). This zone contains a variety of land uses, including residential areas, school and hospital, all of which tend to exhibit different trip making characteristics.

A single zone 430 is used to represent the whole Heywood Distribution Centre, while this centre has two loading roads for two separate parts.

A single zone 426 is used to represent two business parks at Moss Hall Road and Hareshill Road.

It was considered that these zones should be split into smaller zones to better represent these individual land uses. The original zone plan is shown in **Figure 3-2** below.

Figure 3-2.*Current traffic Model Zoning, Heywood Area*



3.3.2 Heavy Goods Vehicle Movements to/ from Heywood Distribution Centre

The existing Heywood distribution centre is well established and generates a significant level of heavy goods vehicle (HGV) traffic. However, on closer inspection of the model, it was found that there was no HGV flows to/ from the Heywood distribution centre in the original model. This is a shortcoming inherited from the Greater Manchester model and again illustrates the need for further refinement when used in a local application.

3.3.3 Validation Criteria

The validation results for AM and PM peak hour models did not generally meet the criteria set out in DMRB for flow and journey time validation. Adjustments were therefore required in the local model to both the demand matrices and the highway network specification

3.4 Model Enhancement

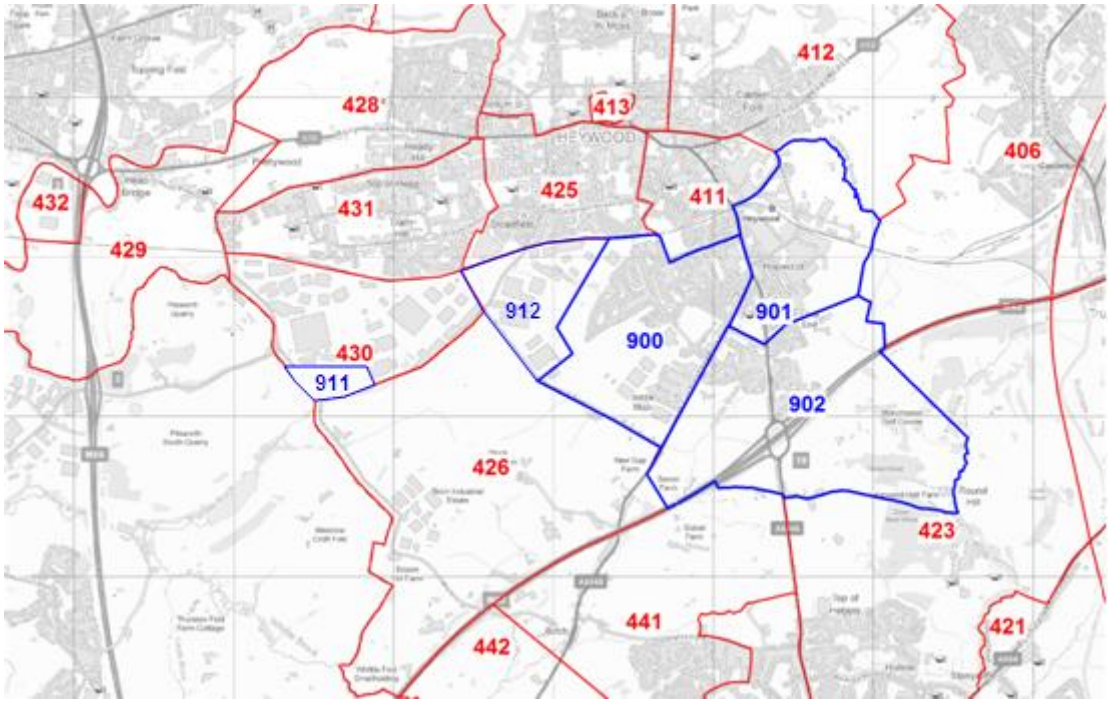
The weaknesses identified in the context of the local Heywood model were rectified as described below.

3.4.1 Zoning System

The zoning system in the GM/ HA model was too coarse in the Heywood area to be reused for this study. The main Heywood zone (zone 427) was therefore split into three smaller zones (900, 901 and 902) so that the amount of traffic loading into each area of Heywood is represented more accurately.

Current Heywood Distribution Centre (zone 430) is split into two zones: Zone 430 is loaded to Pilsworth Road and Moss Hall Road and a new zone 911 has a dedicated access to Moss Hall road. Zone 426 is split into two zones: Zone 426 is loaded to Moss Hall Road and a new zone 912 is loaded to Hareshill Road. This will help to model traffic flow/loading points more accurately, particularly on Pilsworth Road, Hareshill Road and Moss Hall Road. The loading points onto the network were also reviewed and amended where necessary. The enhanced zoning arrangement is shown in **Figure 3-3** below.

Figure 3-3 *Enhanced Local Zone Definition*



3.4.2 *Distribution Centre HGV Matrices*

As the model contained no HGVs to/ from the Heywood distribution centre, an HGV matrix was constructed, based on data taken from the Transport Assessment for the Heywood Distribution Park developed by WSP in 2003.

The main inputs that were required for the HGV Heywood matrix were the HGV flow and the Origin and Destination of the HGV flow for the AM, IP and PM periods:

The forecast 2009 HGV flows to/ from the distribution centre were extracted from the Transport Assessment for the Heywood Distribution Park (see **Table 3–5**), developed by WSP in 2003.

Table 3–5 *Heywood Distribution Centre - 2009 HGV Forecasts (WSP TA 2003)*

Period	To Heywood Distribution Park (Number of HGVs)	From Heywood Distribution Park (Number of HGVs)
AM Peak	51	95
Inter-Peak	Not available	Not available
PM Peak	151	24

The original data from the report includes:

- Proposed Traffic Flows (Base 2004, 2009 and 2019);
- The expected pattern (distribution) of traffic from the proposed developments; and
- Traffic Counts (2003) at some key locations including Gate House Site Access, Pilsworth Road/M66, Pilsworth Road/Hareshill Road;

The forecast HGV flows was converted to 2008 (model base year) then converted to Passenger Car Units (1 HGV = 2.3 pcu) to be used in the SATURN model;

As Inter Peak data is not available, it was assumed that the HGV flow in the Inter Peak has the same relationship with the HGV flow in the AM, as observed from the GMTU data in study area (HGV flow in Inter Peak is 1.14 times that in the AM)

The resulting 2008 HGV flows are shown in **Table 3–6** below;

Table 3–6 *Heywood Distribution Centre – Estimated 2008 HGV Flows (pcu)*

Period	To Heywood Distribution Park (pcu)	From Heywood Distribution Park (pcu)
AM Peak	97	181
Inter-Peak	111	207
PM Peak	288	46

The Origin and Destination of the HGV flow was assumed to be as follows, based on discussions with WSP:

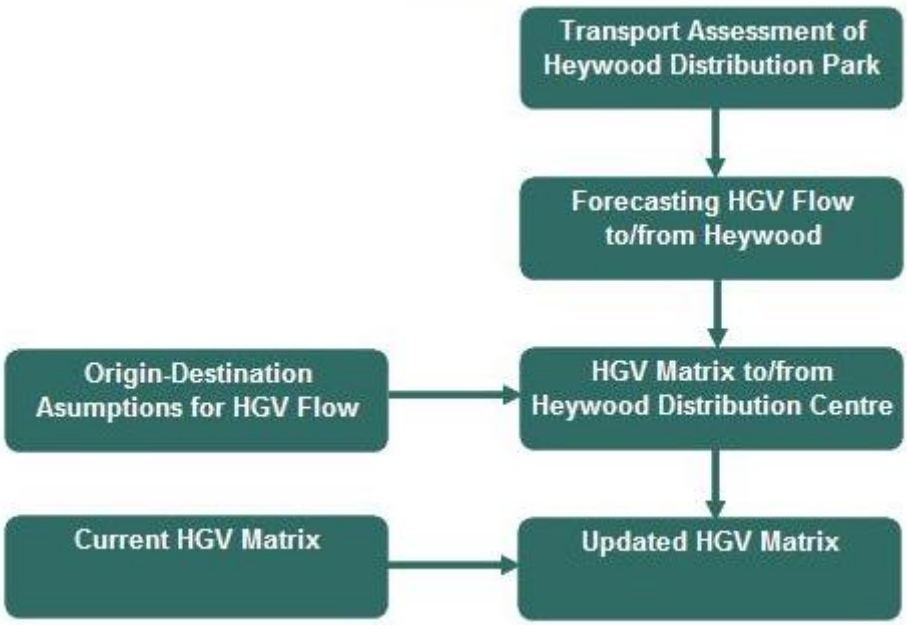
- Origins: the HGV flows to the distribution centre are from the areas/ routes such as: Leeds, Liverpool, M60, M66, Manchester; and

- Destination: the HGV flows from the distribution centre are to serve nearby areas such as Manchester City Centre, Oldham, Rochdale, Bury and Bolton, Leeds and Liverpool;

The O-D HGV matrix for the distribution centre was added to the original HGV matrix to produce an amended matrix.

The process of estimating the HGV matrix is summarised below in **Figure 3-4**.

Figure 3-4 *Updating HGV matrix for Heywood distribution Centre*



3.4.3 Model Calibration

As the original model did not fully meet the validation criteria, there was a need to calibrate the primary Heywood model to derive more representative flows and journey times.

Calibration is the process of checking/ revising/ adjusting parameters in the model to better reproduce observed traffic flows in the study area. The principal steps in the calibration process were:

- Checking/ revising the physical characteristics of the network;
- Adjustment of the demand matrices mathematically (a matrix 'estimation' process) whereby origin/ destination estimates are adjusted iteratively and balanced against 'target' flows; and
- Comparing the outputs with observed data.

This process was repeated with both the network and the (prior) matrix until the Heywood model validation achieved a satisfactory standard.

For the network calibration, detailed checks were carried out which identified a number of junctions where the signal timings were not appropriate. The signal timing were therefore optimized based on the traffic flow at these junctions; and

For the matrix calibration, all available data (traffic counts) from the GM model in the study area were used in matrix estimation to produce a more accurate demand matrix. The final trip totals in the prior matrix are shown in **Table 3–7** below.

Table 3–7 *Base Year Matrix Totals (PCUs)*

Model Period	Vehicle Type			
	Car	LGV	HGV	Total
AM Peak	95495	12081	10026	117603
Inter-Peak	74619	11728	11269	97618
PM Peak	111042	9966	5077	126087

The sector to sector trip matrices are shown below in **Table 3–8**, **Table 3–9**, and **Table 3–10** for the AM Peak, average Inter Peak and PM Peak hours respectively.

Table 3–8 *Sector to Sector Total Trips – AM Peak Hour (pcus)*

Zone	Rochdale	Bury	Oldham	Manchester	Salford	UK
Rochdale	19155	1900	1907	1203	63	8261
Bury	1563	13163	212	1234	180	8007
Oldham	1833	187	2235	326	2	5408
Manchester	990	558	286	2747	210	6015
Salford	45	209	6	227	82	1022
UK	6276	7309	4546	4485	950	14803

Table 3–9 *Sector to Sector Total Trips – Average Inter Peak Hour (pcus)*

Zone	Rochdale	Bury	Oldham	Manchester	Salford	UK
Rochdale	15606	1360	1527	891	5	5194
Bury	1667	10676	119	957	126	5899
Oldham	1825	133	1595	258	13	4205
Manchester	1277	633	338	1375	166	4833
Salford	80	194	5	177	41	790
UK	4912	6338	3997	4423	924	15060

Table 3–10 *Sector to Sector Total Trips – PM Peak Hour (pcus)*

Zone	Rochdale	Bury	Oldham	Manchester	Salford	UK
Rochdale	19931	1929	2217	719	6	6905
Bury	2673	11767	249	754	171	8355
Oldham	2349	242	2368	178	2	4726
Manchester	2393	1147	345	2277	241	5162
Salford	36	139	1	52	32	1000
UK	8401	9249	5054	5517	1558	17943

3.5 Final Validation Results

Following the refinements to the model described above, the earlier validation checks were repeated to assess the quality and suitability of the revised model.

3.5.1 Final Model - Link Flow Validation

The validation results improved significantly in all cases by the enhancement process. The results for the three model periods are summarised in ***Table 3–11***.

It can be seen that a significantly greater proportion of links flows now meet the DMRB criteria or are close to the target of 85%.

Table 3–11 *Final Model Validation Results*

Model Period	Total number of counts	FLOW passing DMRB (Links)	GEH passing DMRB (links)	Pass DMRB criteria?	
				Flows	GEH
AM Peak	447	379 (85%)	371 (83%)	✓	×
Inter-Peak	447	400 (89%)	390 (87%)	✓	✓
PM Peak	447	377 (84%)	374 (84%)	×	×

Full validation results for all links in Heywood model is presented in Appendix G1.

Similar comparisons for link flows at M62 Junction 19 also demonstrated a substantial level of improvement, as shown below in **Table 3-12.**

Table 3–12 *Final Model Validation Results - M62 Junction 19*

Model Period	Total number of counts	FLOW passing DMRB (Links)	GEH passing DMRB (links)	Pass DMRB criteria?	
				Flows	GEH
AM Peak	13	11 (85%)	12 (92%)	✓	✓
Inter-Peak	13	12 (92%)	12 (92%)	✓	✓
PM Peak	13	11 (85%)	11 (85%)	✓	✓

Full validation results for all links in Heywood model are presented in Appendix G3.

3.5.2 *Final Model – Journey Time Validation*

The model refinements were also effective in improving the representation of journey times within the study area, as shown in **Table 3–13** below.

Table 3–13 *Final Validation Journey Time Results*

Model Period	Number of routes	Number of Routes within DMRB criteria	Pass DMRB criteria?
AM Peak	16	14 (88%)	✓
Inter-Peak	16	15 (94%)	✓
PM Peak	16	14 (88%)	✓

Full details of the journey time validation of the improved Heywood model can be seen in Appendix G2.

3.5.3 Routing Checks

Further checks were undertaken (select link analyses) on all major routes in the network to ensure that the routes used between origin and destination pairs were realistic. The results of this analysis can be seen in Appendix I.

3.5.4 Junction Delay Checking

Individual junction delays were also checked for each of the model periods to assess the scale of delay reported. Details of this analysis are presented in Appendix J.

3.5.5 Network Flow Plots

In order to record the outputs from the validated Base Year model, traffic flows were plotted for the study area network as shown in **Figure 3-5**, **Figure 3-6** and **Figure 3-7** respectively**.**

Figure 3-5 *Flow Plot for Heywood Study Area – AM peak hour*

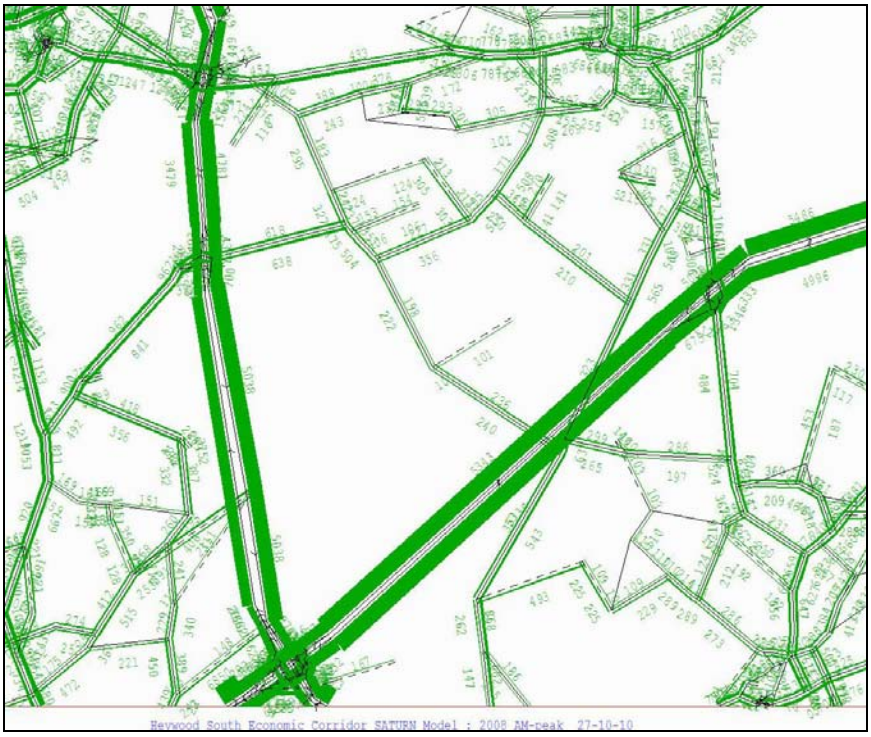


Figure 3-6 *Flow Plot for Heywood Study Area – average Inter Peak hour*

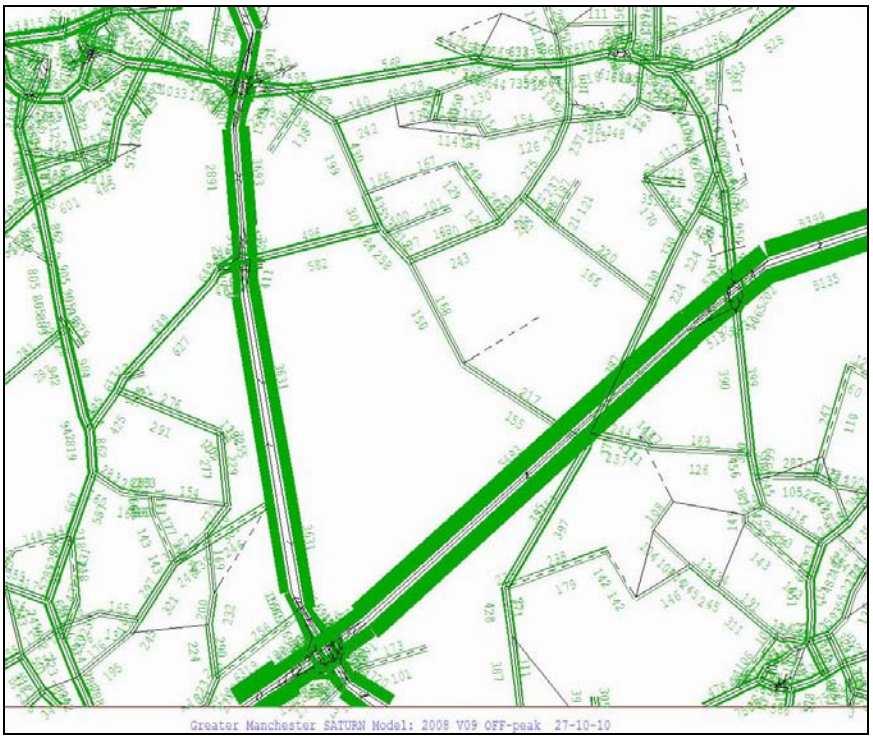
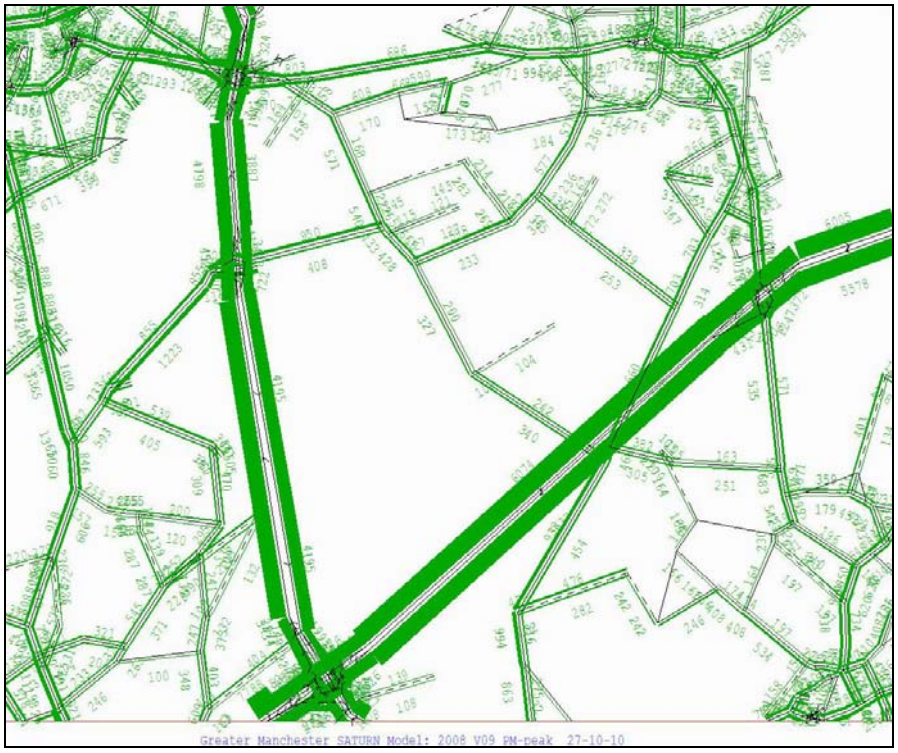


Figure 3-7 *Flow Plot for Heywood Study Area – PM peak hour*



Similar illustrations are also provided for M62 Junction 19, again for each model period, in **Figure 3-8**, **Figure 3-9** and **Figure 3-10** respectively.

Figure 3-8 *Flow Plot for M62 Junction 19 – AM peak hour*

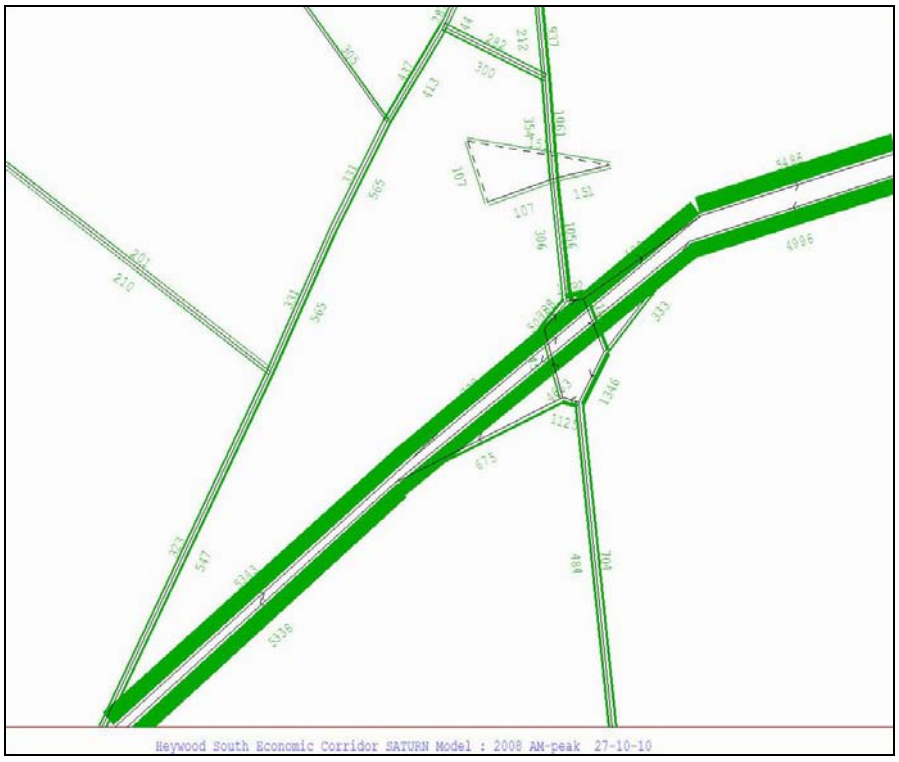


Figure 3-9 *Flow Plot for M62 Junction 19 – average Inter Peak hour*

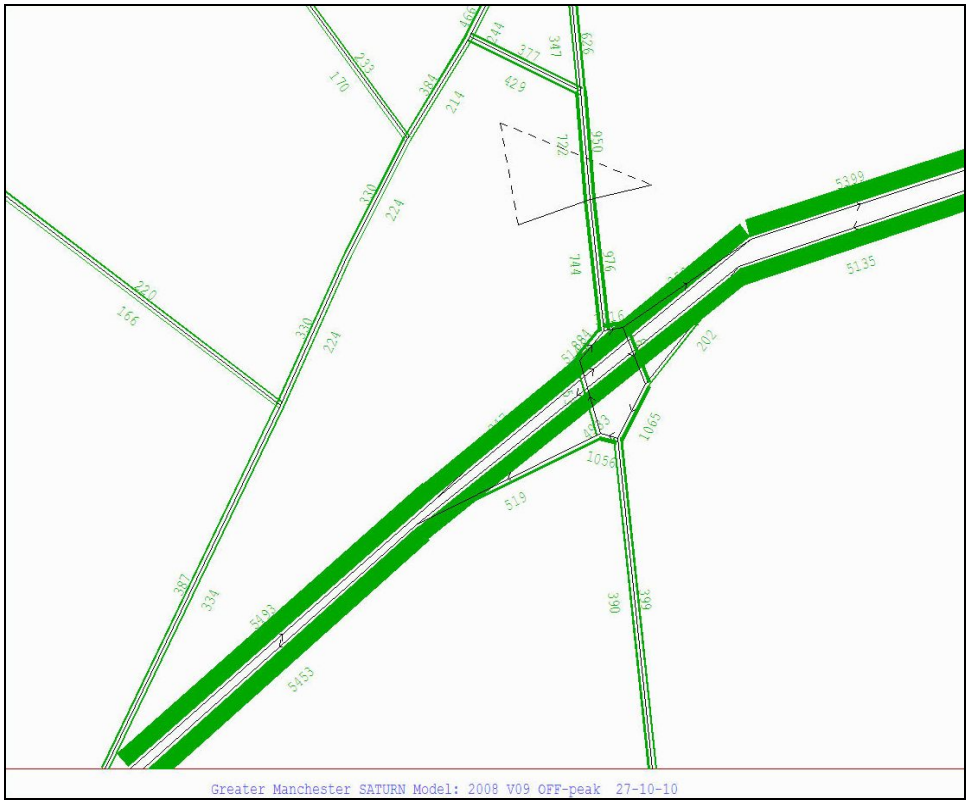
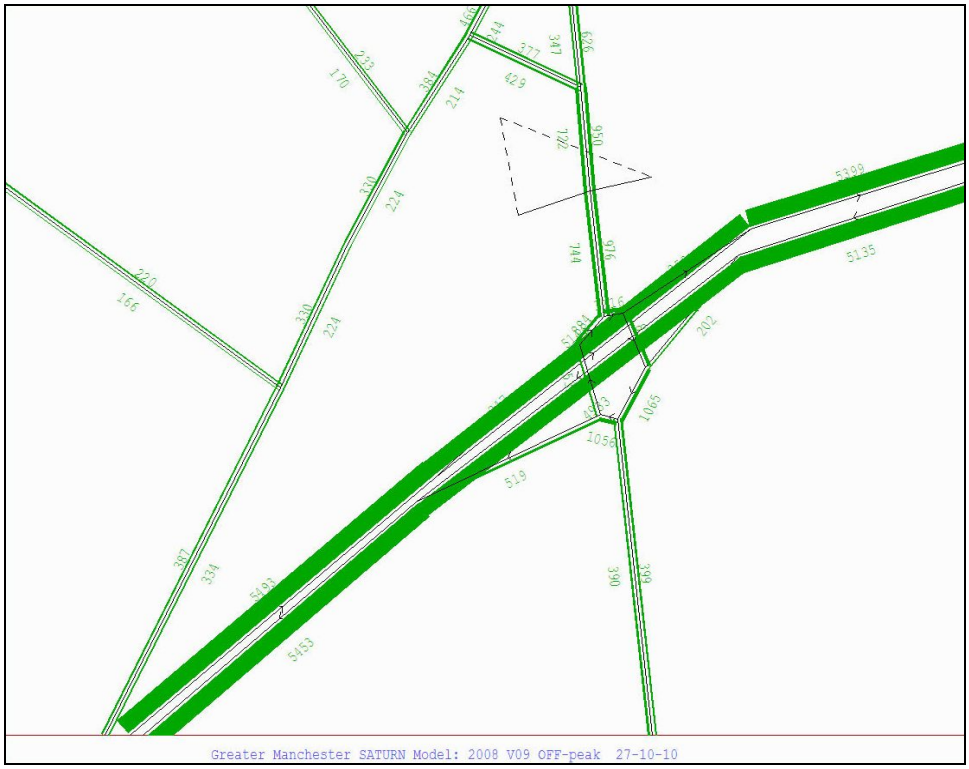


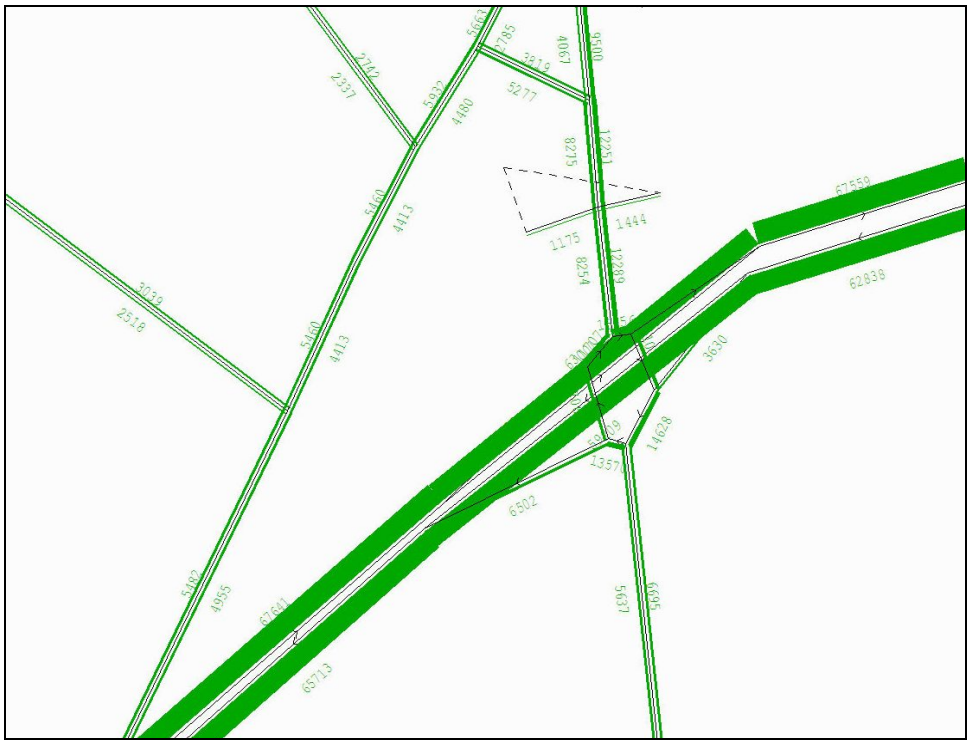
Figure 3-10 *Flow Plot for M62 Junction 19 – PM peak hour*



The flows are converted into AADT (vehicles/day) for the study area (***Figure 3-11***) and Junction 19 M62 (***Figure 3-12***).

Figure 3-11 *Flow Plot for Heywood Study Area – AADT Flows (vehicles)*

Figure 3-12 *Flow Plot for M62 Junction 19 – AADT Flows (vehicles)*



3.6 Model Validation Summary

This chapter of the report describes the process developing and calibrating the Base Year model for the Heywood study area.

The model was initially derived from the GM/ HA strategic highway model to provide a practical, workable forecasting model to assess the impact of the proposed Core Strategy development package, including a new link road to the M62 Motorway Junction 19.

Initial checks on the accuracy and suitability of the model indicated that it provided a relatively poor representation of traffic demands and travel conditions in the area and further refinement was therefore undertaken to refine and improve the model. These refinements included:

- Revisions to certain traffic zone boundaries;
- The addition of heavy goods vehicle trips to the zone representing the existing Heywood distribution centre; and
- Manipulation of the demand matrix (through matrix estimation techniques) to better reflect observed traffic flows and travel times.

The revised model was assessed against the guidelines published by the DfT for model validation, principally through comparisons of observed and modelled flows and journey times. This underlined the value of the refinements undertaken and demonstrated that the model met or came close to meeting these guidelines in all three modelled periods.

Supplementary checks also showed that the model replicates traffic conditions very closely in the vicinity of the M62 Junction 19 which is in many respects the focal point of the proposed development impact.

On the basis of these validation reports, it is judged that the local model developed for the Heywood study provides a sound basis for forecasting and evaluation of the development proposals.

4 Forecasting and Option Testing

4.1 Future Year Network

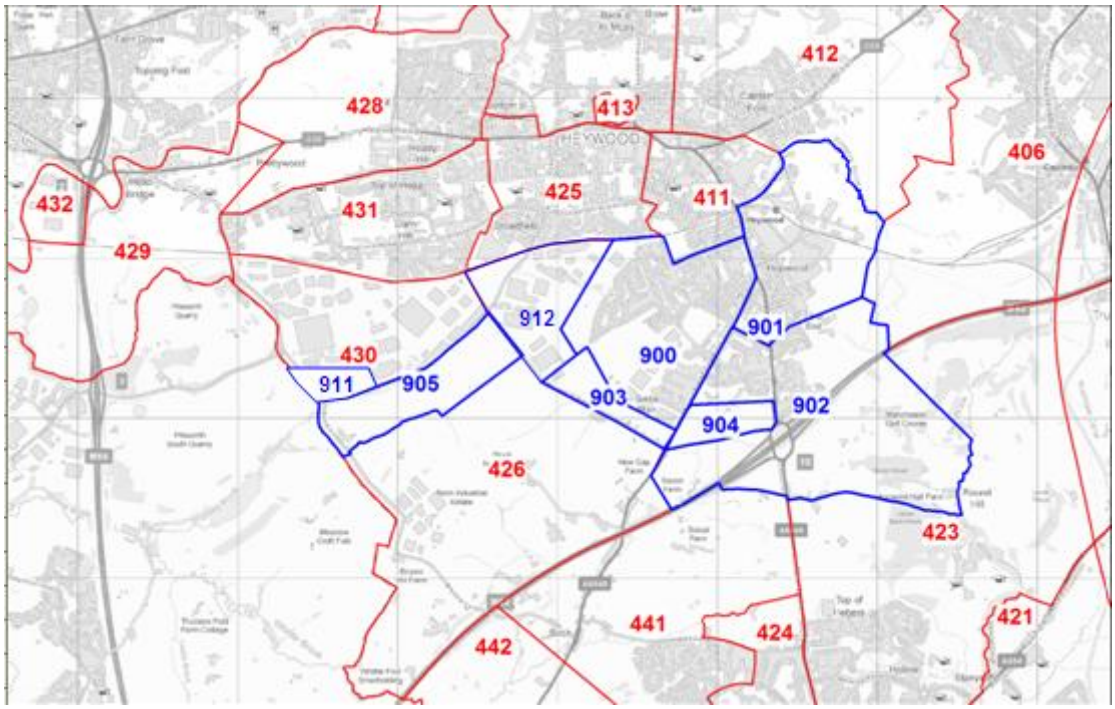
4.1.1 *Development Zones*

Based on planning documents supplied by Rochdale MBC, three zones have been added to the model to represent the proposed development sites. Zone 904 was added to represent the proposed residential development (site 1a) and district centre (site 1c). It was assumed that this site would be accessed from Manchester Road, to the north of the proposed signalised junction, and the access was therefore modelled in this position.

Sites 3a, 3b and 3c (residential and employment developments) have been represented by new zone 903, which has been added in the approximate location of the 'new highway' marked on Master plan. This location is representative of all these sites as they are all likely to access the network between the proposed signals at Manchester Road/ Hareshill Road and Hareshill Road/ Pilsworth Road.

A new zone (905) has been added to represent the employment sites (4A and 4B) to the west. It has been assumed that these sites will be accessed from Pilsworth Road and a zone connector has therefore been modelled onto the network in this location. The resulting forecasting zone plan is shown below in **Figure 4-1**.

Figure 4-1 *Forecasting Zone Plan*



4.1.2 Highway Improvements

The proposed scheme link between Manchester Road and M62 Junction 19 was coded in the model with reference to the drawing 'Option 3 Alignment A3/Heywood/001'. Initial staging arrangements and intergreens were assumed for the tie in with Junction 19 and for the proposed traffic signals at Manchester Road/ Hareshill Road and Hareshill Road/ Pilsworth Road.

4.2 Future Year Travel Demands

4.2.1 TEMPRO growth factors

The TEMPRO growth factors were taken from dataset 6.1 with a base year of 2008 and future year of 2023 and these are shown in **Table 4–1** below.

Table 4–1 *Origin and Destination TEMPRO Growth Rates*

Sector	Area Level	Description/ Name	AM Peak		IP Peak		PM Peak	
			Origin	Dest.	Origin	Dest.	Origin	Dest.
1	Authority	Rochdale	1.087	1.136	1.112	1.154	1.154	1.154
2	Authority	Bury	1.082	1.135	1.108	1.136	1.132	1.134
3	Authority	Oldham	1.084	1.134	1.109	1.203	1.215	1.209
4	Authority	Manchester	1.333	1.149	1.241	1.136	1.133	1.135
5	Authority	Salford	1.261	1.154	1.207	1.143	1.140	1.141
6	GB	GB	1.132	1.132	1.132	1.184	1.191	1.187

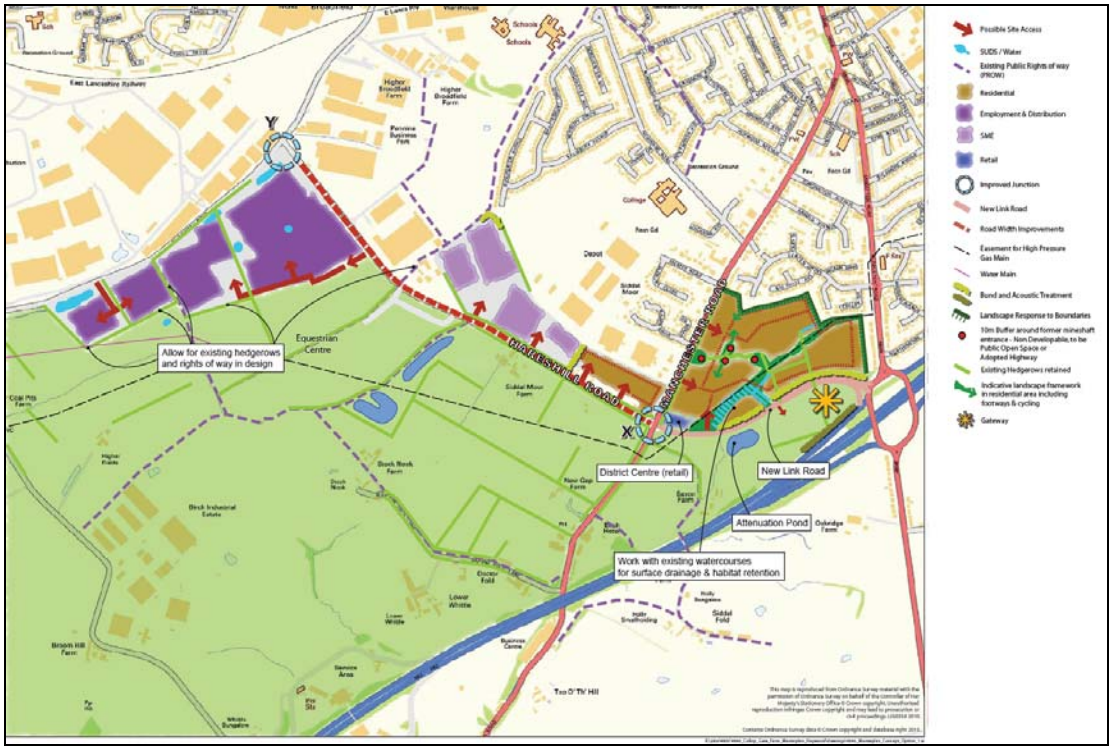
4.2.2 Kingsway Business Park

The Kingsway Business Park was committed in 2004 and construction should be finished by 2023, although only limited development has been completed so far. As the latest version of the TEMPRO dataset (Version 6.1, released in 2010) is used to growth factor the matrices, this will include traffic likely to be generated by the Kingsway Business Park by the year 2023, the design year for this assessment.

4.2.3 *Development Trips*

The Masterplan for the proposed development sites is shown in **Figure 4-2** below.

Figure 4-2 *Masterplan for Development*



Summary of Land Use

The following land uses (taken from the above Masterplan) have been assumed for this study:

- Plot 1A – Residential Development comprising 459 units (mix of 3-5 bed semi-detached and detached properties);
- Plot 1C - Supermarket with an assumed Gross Floor Area (GFA) of 400m²;
- Plot 3A – Residential Development comprising 97 units (mix of 3-4 bed semi-detached and detached properties);
- Plot 3B and 3C – Industrial Land Use (assumed 31,710m² GFA); and
- Plot 4A and 4B – Employment and Distribution Land Use (assumed 77,425m² GFA).

Trip Rates

The TRICS (Trip Rate Information Computer System) database was interrogated to extract trip rates for the above land uses for the AM Peak hour, Average Inter Peak hour and PM Peak hour. The trip rates are shown in **Table 4–2** below and the TRICS output is presented in Appendix K.

***Table 4–2** Development Trip Rates*

Plot	AM Arrival	AM Dep.	AM Total	IP Arrival	IP Dep.	IP Total	PM Arrival	PM Dep.	PM Total
Plot 1A (per unit)	0.16	0.38	0.53	0.17	0.18	0.35	0.34	0.21	0.55
Plot 1C (per 100m² GFA)	7.42	7.08	14.5	7.24	7.07	14.31	7.57	7.88	15.45
Plot 3A (per unit)	0.16	0.38	0.53	0.17	0.18	0.35	0.34	0.23	0.55
Plot 3B & 3C (per 100m² GFA)	0.248	0.114	0.362	0.115	0.137	0.253	0.091	0.198	0.289
Plot 4A (per 100m² GFA)	0.346	0.091	0.437	0.117	0.147	0.264	0.038	0.268	0.306
Plot 4B (per 100m² GFA)	0.334	0.116	0.385	0.106	0.123	0.229	0.157	0.296	0.347

The development trips were calculated by multiplying the trip rates presented above by the assumed numbers of unit or Gross Floor Areas (GFA) to produce the trip generation estimated in **Table 4–3** below.

***Table 4–3** Development Trip Totals*

Plot	AM Arrival	AM Dep.	AM Total	IP Arrival	IP Dep.	IP Total	PM Arrival	PM Dep.	PM Total
Plot 1A	71	171	242	78	82	160	157	96	252
Plot 1C	102	98	200	100	98	198	105	109	213
Plot 3A	10	25	35	11	12	23	23	15	37
Plot 3B & 3C	79	36	115	37	44	80	29	63	92
Plot 4A	203	53	256	69	86	155	22	157	179
Plot 4B	63	22	72	20	23	43	30	56	65

Trip Distribution

The development trips for each plot were assigned to one of three zones that were defined for the forecasting network (903, 904 and 905). The development trips originating from or travelling to each development zone were then distributed to

reflect the existing trip patterns in other, nearby zones of a similar land use to produce the origin-destination trip matrix for the development traffic.

4.2.4 *Future Year Matrices*

The TEMPRO Growth Factor and Development Trips were used to update the base matrices to create forecasting matrices. The 2023 Do Something trip totals are shown in **Table 4–4** below.

Table 4–4 *Future Year Trip Totals (PCUs)*

Model Period	Vehicle Type			
	Car	LGV	HGV	Total
AM Peak	108962	17404	11169	137535
Inter-Peak	87465	16883	12531	116880
PM Peak	129894	14342	5639	149876

The Do Something 2023 sector to sector trip totals are shown in **Table 4–5**,

Table 4–6 and **Table 4–7** for the AM peak hour, average Inter Peak hour and PM peak hour respectively.

Table 4–5 *Sector to Sector Total Trips (PCUs) – AM Peak Hour*

Zone	Rochdale	Bury	Oldham	Manchester	Salford	UK	South Heywood Dev.
Rochdale	21862	2143	2146	1369	70	9441	226
Bury	1821	14915	250	1385	203	9102	170
Oldham	2083	212	2548	365	2	6201	76
Manchester	1244	692	360	3447	269	7519	85
Salford	54	254	7	279	100	1255	14
UK	7324	8487	5301	5206	1120	17092	346
South Heywood Dev.	117	94	41	37	6	196	0

Table 4–6 *Sector to Sector Total Trips (PCUs) – Average Inter Peak Hour*

Zone	Rochdale	Bury	Oldham	Manchester	Salford	UK	South Heywood Dev.
Rochdale	18442	1598	1779	1049	5	6044	124
Bury	1980	12326	139	1112	147	6856	96
Oldham	2232	164	1950	324	16	5129	39
Manchester	1480	727	393	1606	194	5600	37
Salford	105	226	6	211	49	934	6
UK	5917	7744	4828	5311	1136	18028	209
South Heywood Dev.	141	105	48	44	7	235	0

Table 4–7 *Sector to Sector Total Trips (PCUs) – PM Peak Hour*

Zone	Rochdale	Bury	Oldham	Manchester	Salford	UK	South Heywood Dev.
Rochdale	23217	2238	2549	833	6	8007	110
Bury	3087	13314	280	848	194	9489	83
Oldham	2926	307	2947	222	2	5890	35
Manchester	2689	1279	389	2593	270	5849	38
Salford	41	159	1	62	37	1148	4
UK	10191	11265	6142	6668	1895	21617	188
South Heywood Dev.	198	137	67	51	10	303	0

5 Future Year Forecasts

5.1 Introduction

This chapter of the report presents the results of the local model forecasting process and therefore provides data that may be used in the design stages of the study, for evaluation or for public consultation.

It is assumed for the future that the Heywood Corridor development proposals will be essentially complete by the year 2023 and this has been adopted as the Design Year.

The analysis concentrates on the results for three principal cases:

- **Completion of the link road** to M62 in isolation (tested at the 2008 Base Year) This forecasts is designed to show the impact of the link on existing traffic patterns;
- **Completion of the South Heywood development proposals** (excluding the link road) at the Design Year of 2023, to help demonstrate the impact of just the land use changes; and
- **Completion of the South Heywood development proposals** (including the link road) at the Design Year of 2023 to show the effects of the complete development strategy.

5.2 Link Road Forecasts (2008)

The hourly and daily traffic (AADT) flows predicted to travel on the proposed link road are shown in **Table 5-1** for the 2008 Base scenario. The AADT are derived from factors applied to the three individual period models.

These forecasts indicate the potential for daily 2-way flows on the link road of nearly 14,000 vehicles.

Table 5–1 *Link Road Forecasts (2008)*

Direction	AM (pcus)	IP (pcus)	PM (pcus)	AADT (vehicle)
Eastbound	732	416	496	6576
Westbound	416	472	884	7088
TOTAL	1148	888	1380	13664

The results indicate the new link would attract a significant amount of general traffic, including heavy goods vehicles.

AADT Flows for the Base scenario (without link road) and Do-Something scenario (with link road) are shown in **Figure 5-1** and **Figure 5-2** below.

Figure 5-1 *Link Road Forecasts* ***(****AADT 2008)*

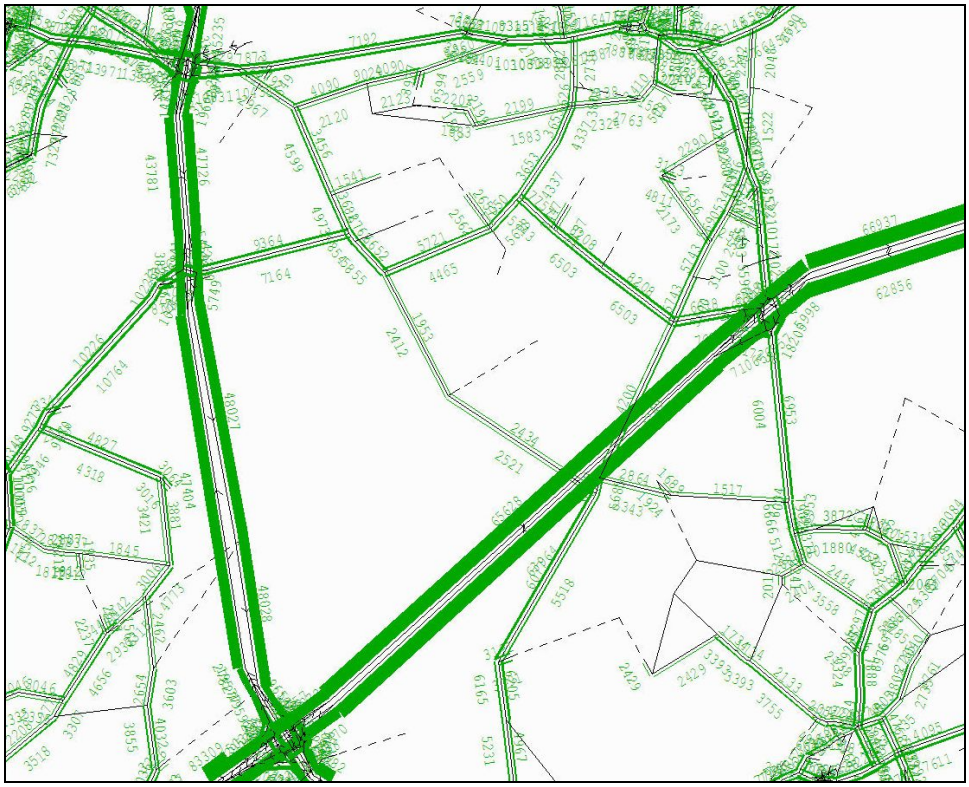
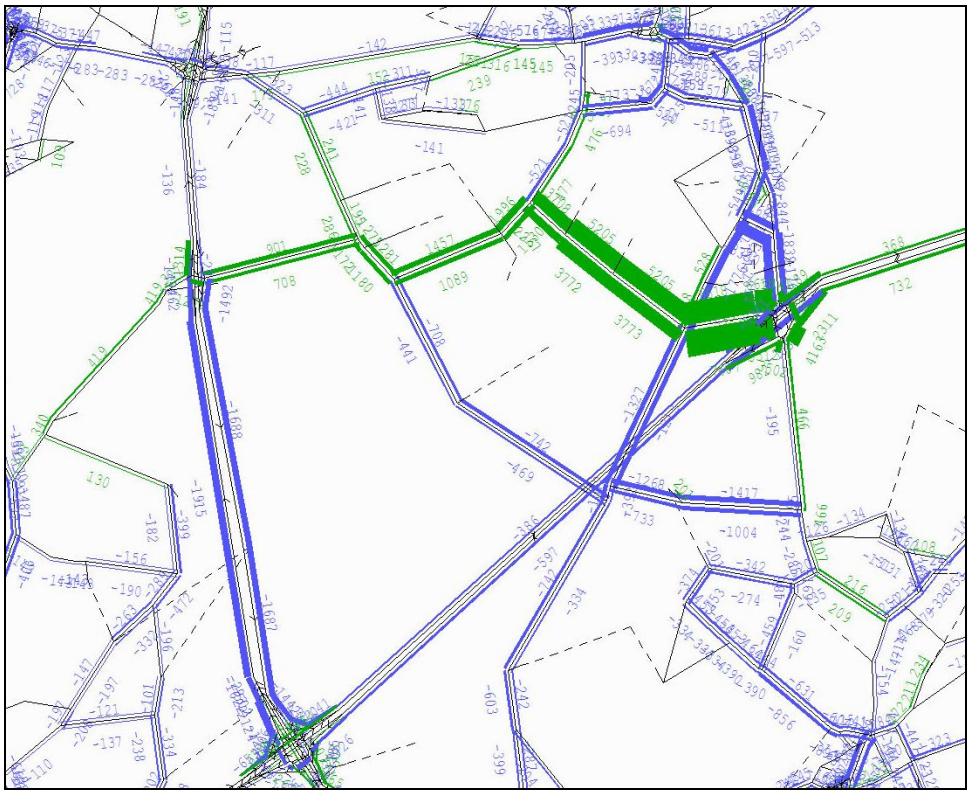


Figure 5-2 *Link Road Flow Changes (2008 Base with/ without Link Road - AADT)*



AADT HGV Flows for the 2008 Base scenario (with link road) are shown in **Figure 5-3** and the flow differences that result from the addition of the link road are shown in **Figure 5-4.**

Figure 5-3 *AADT HGV Flows 2008 Base (with link road)*

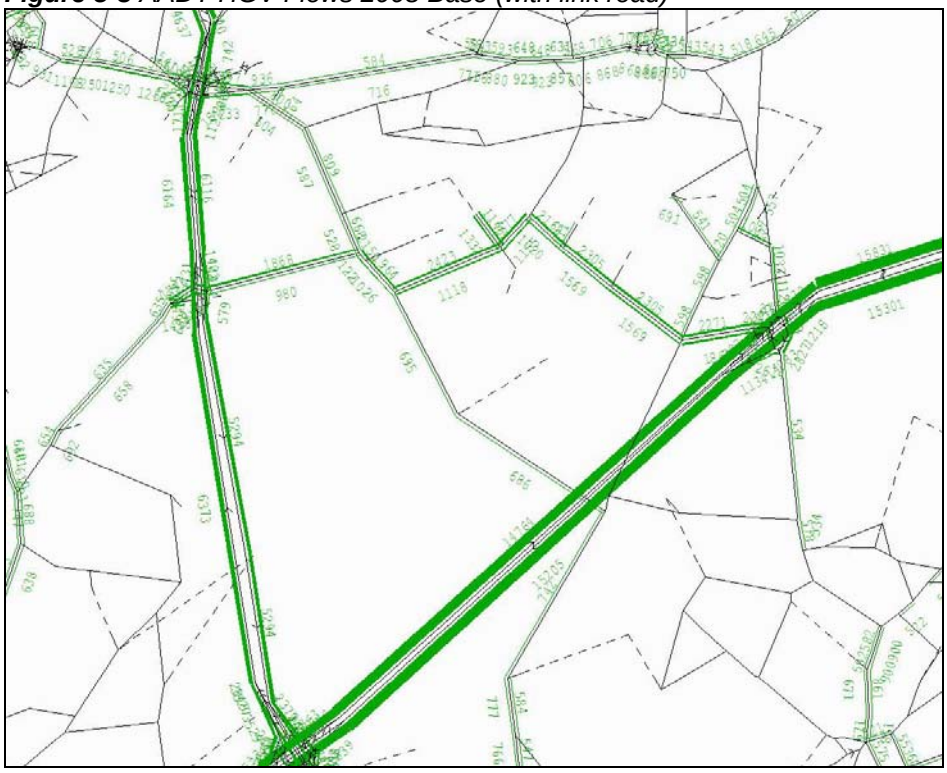
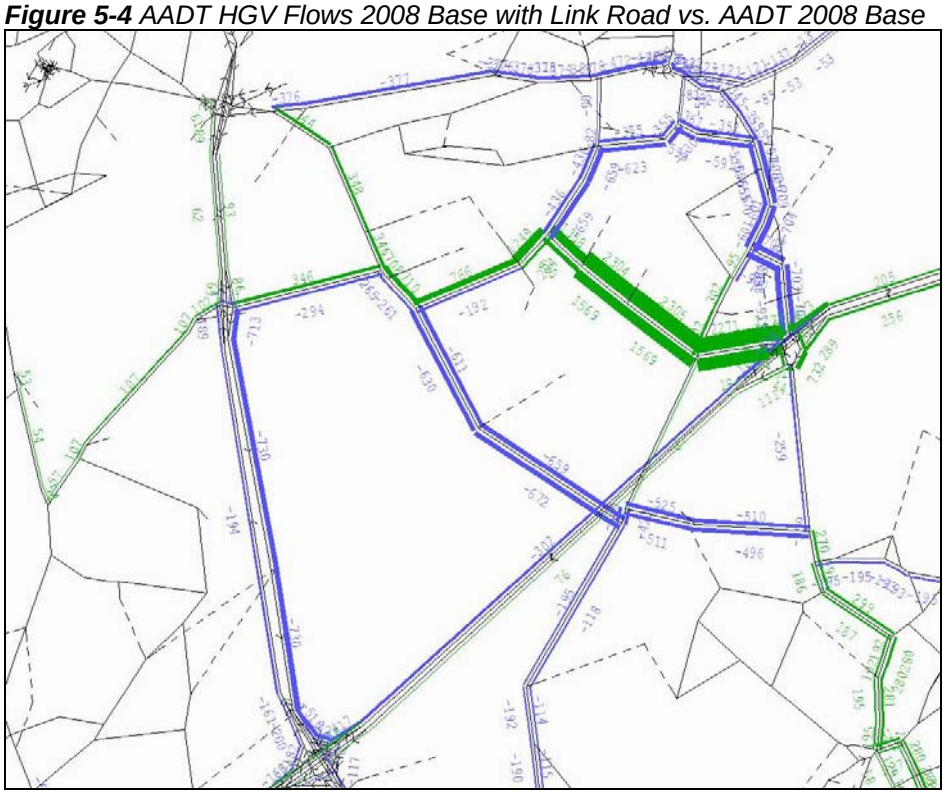


Figure 5-4 *AADT HGV Flows 2008 Base with Link Road vs. AADT 2008 Base*



5.3 Development Forecasts 2023 (excluding link road)

Figure 5-5 *Forecast Flows* ***(****AADT 2023)*

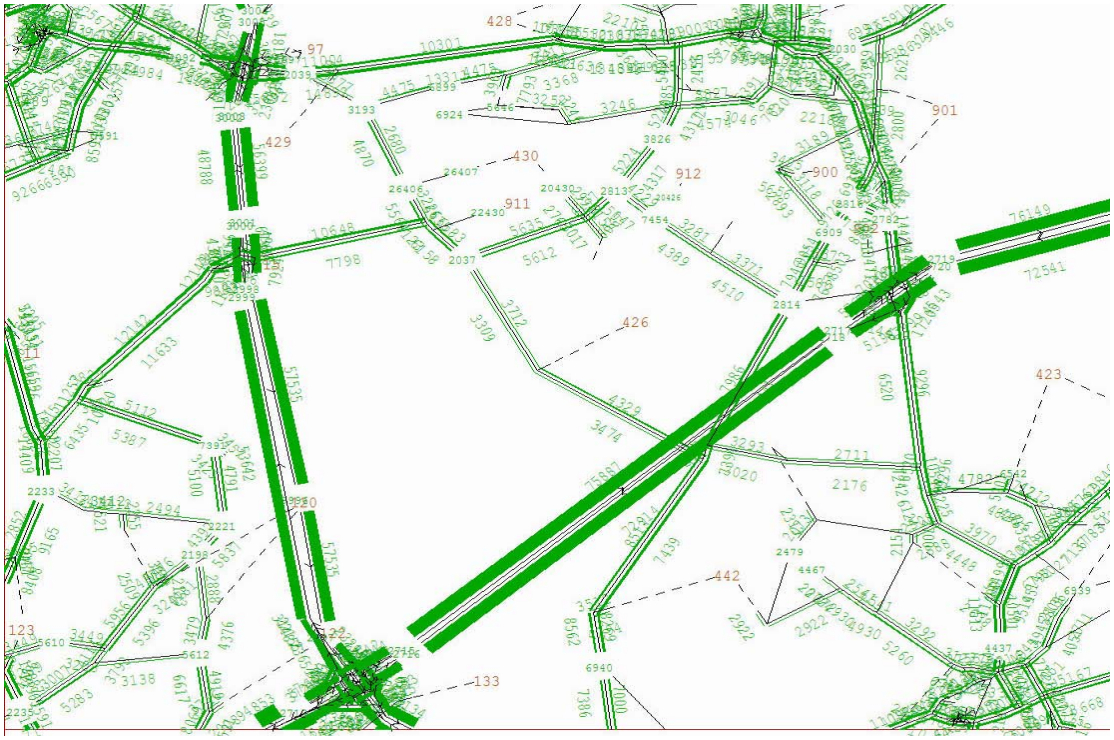


Figure 5-6 *Flow Changes (2023 Forecast / 2008 without Link Road - AADT)*

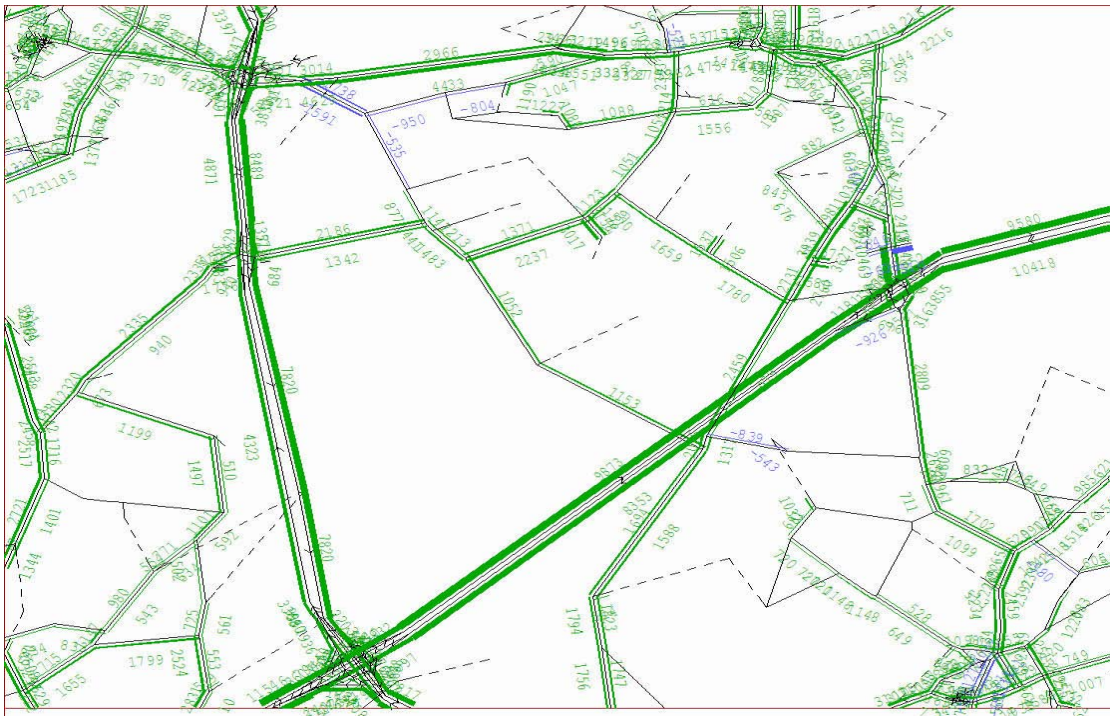


Figure 5-7 *AADT HGV Flows 2023 Forecast (without link road)*

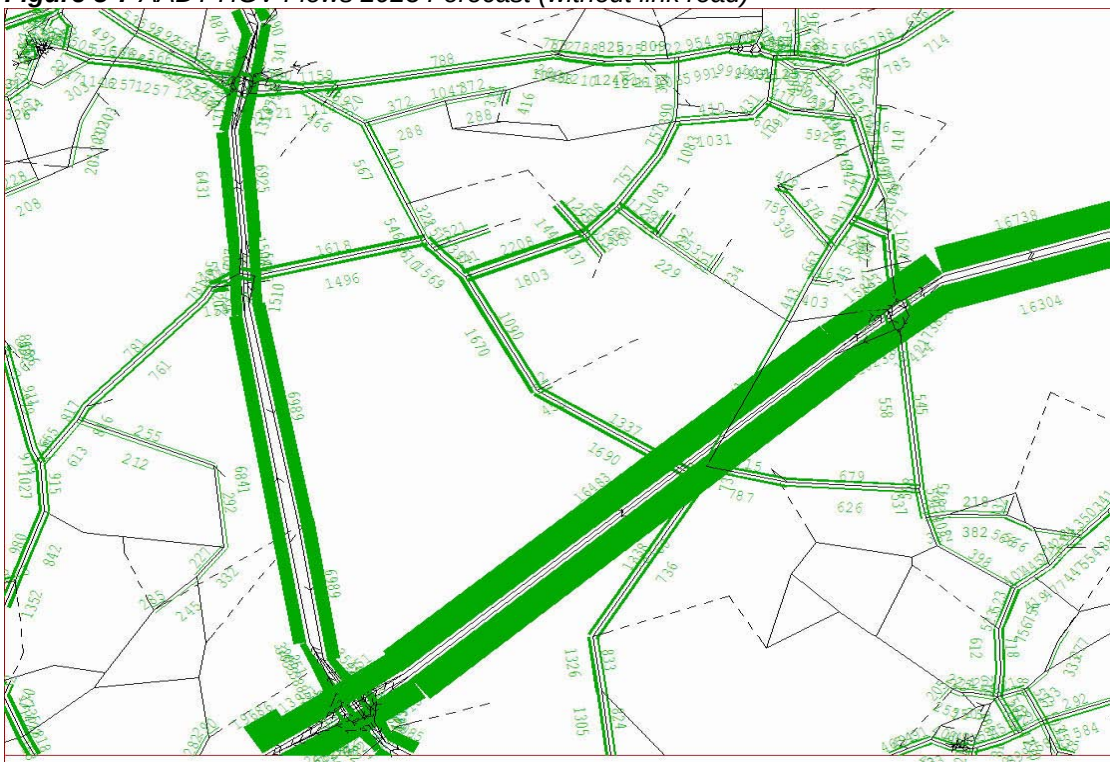
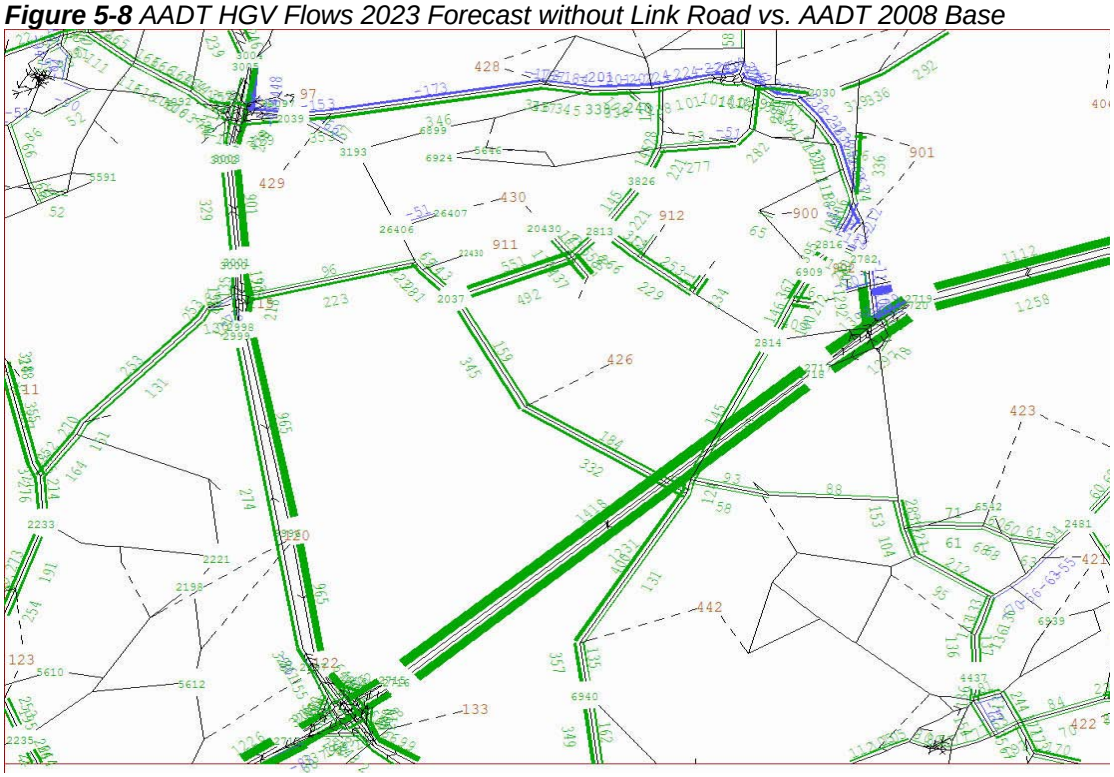


Figure 5-8 *AADT HGV Flows 2023 Forecast without Link Road vs. AADT 2008 Base*



5.4 Development Forecasts 2023 (including link road)

Forecasts for the Design Year of 2023 assuming completion of the South Heywood development package but without provision of the link road are reported below. These show an increased demand on the link road of over 15,000 vehicles per day.

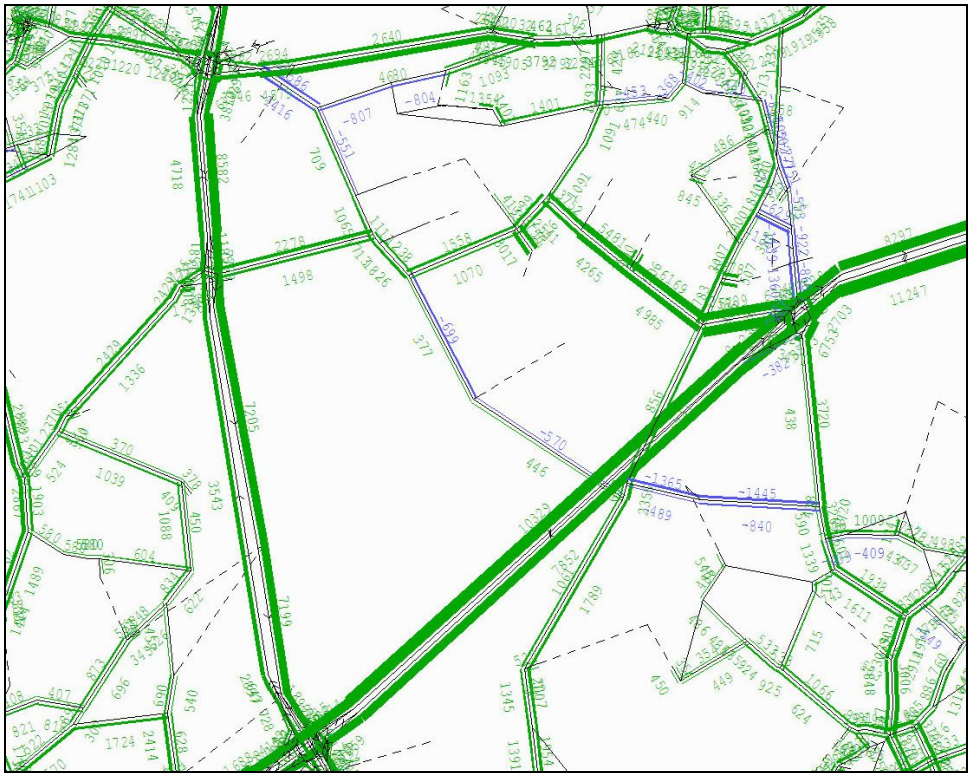
Table 5–2 *Link Road Forecasts (2023)*

Direction	AM (pcus)	IP (pcus)	PM (pcus)	AADT (vehicle)
Eastbound	733	438	507	6712
Westbound	695	696	805	8784
TOTAL	1428	1134	1312	15496

AADT Flows for the 2023 scenario (with the link road) is shown in **Figure 5-9** and the flow differences that result from the addition of the link road and development traffic are shown in **Figure 5-10**.

Figure 5-9 *Flow Forecasts – Development with Link Road (2023 –AADT)*

Figure 5-10 *Flow Changes (2023 Forecast / 2008 without Link Road - AADT)*



AADT HGV Flows for the 2023 Forecasting scenario are shown in **Figure 5-11** and the flow differences that result from the addition of the link road and development flows are shown in **Figure 5-12**.

Figure 5-11 *AADT HGV 2023 Forecasting Flows*

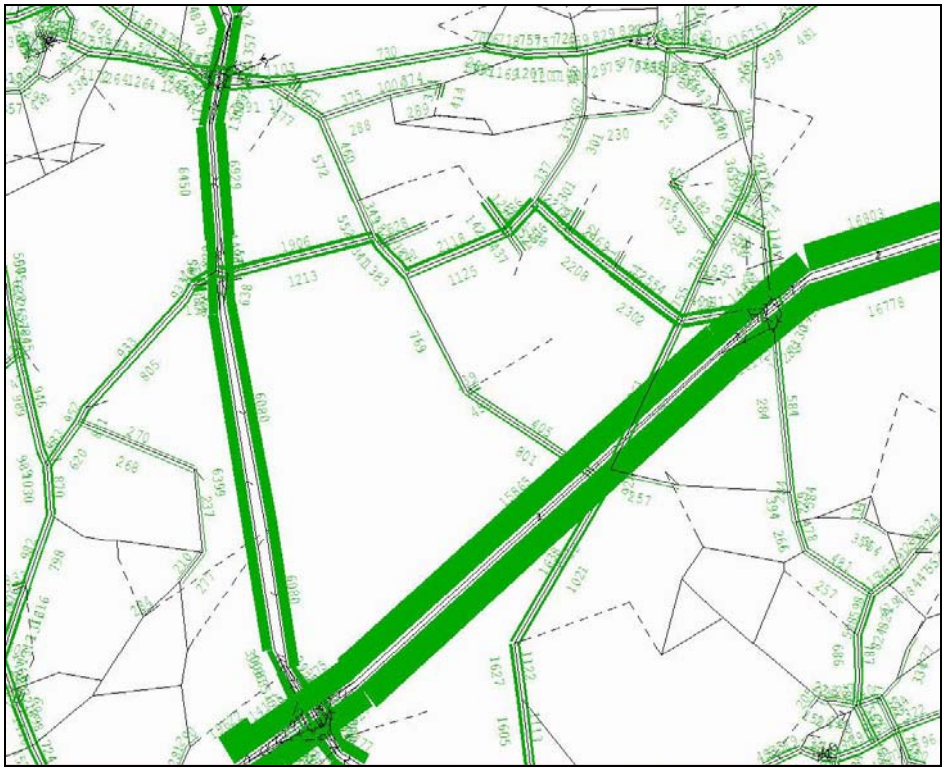
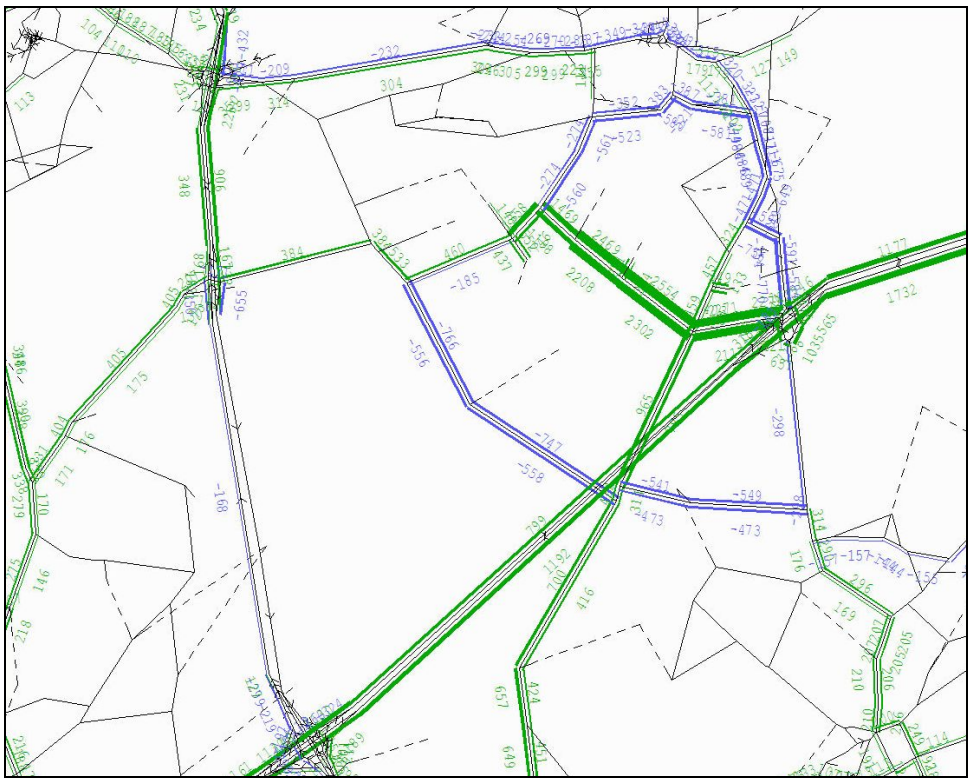


Figure 5-12 *AADT HGV 2023 Forecasting vs. AADT Base 2008*



Detailed forecasting results are presented in Appendix H.

5.5 Impact of development proposals

Whilst the development proposals have attracted support from some local residents and businesses, concerns over its impact have been raised by a large number of others. These relate to both the land use proposals and to the provision of the new link road to the M62 Motorway.

The issue raised in earlier public consultation have included the following:

- *What evidence the link would improve existing flows in Heywood?*
- *The link will not reduce HGV problems*
- *Majority of HGV's on Middleton Road heading for Green Lane industrial estate*
- *No investigation of HGV in/ out of Heywood area*
- *Congestion on Manchester Road; signals will make it worse*
- *More HGV from M62, hence more problems on Hareshill Road*
- *Hareshill Road very narrow/ unsuitable/need to remove width restriction*
- *House likely to be demolished on Hareshill Road*
- *More noise, fumes and vibration on Hareshill Road*
- *Rat-runs between M66 J3 and M62 J19 to avoid congestion at M66/ M62*
- *What impact on M62/ M60/ M66?*

In order to assess the effects of the core strategy proposals, the results of the traffic modelling study presented in this report can be used to gauge the likely changes in traffic movements in and around the Heywood area.

5.5.1 Effects on the local road network

The first set of forecasts were based on the effects of the **link road alone**, assuming it were to be built today. The impact of this new link is:

- A large transfer of traffic to the improved Hareshill Road/ link road to M62
- A reduction in flows on sections of the M66 and M62 motorways; and
- Further reductions on local roads, principally Middleton Road, Moss Hall Road/ Langley Lane

Most of this change is due to the improved access to the motorway network at M62 J19, avoiding the need for Heywood traffic to travel to M66 J3. This change is also seen in the pattern of HGV trips, many of which start or finish their journeys in Heywood.

A consequence of this is a substantial reduction in the distance driven by heavy goods vehicles in particular. For the HGV trips within the modelled study area, the savings resulting from the provision of the new link road would amount to about 2 million kilometres/ year. As well as the direct savings to business, in terms of reduced operating costs, these savings will also translate into environmental benefits with similar reductions in carbon emissions and air pollution.

Construction of the link road alone does provide a potential short-cut for through trips between the M66 and M62 motorways. The number of through trips taking this route is however fairly small, perhaps 1,200 vehicles a day and makes up less than 10% of the total traffic on the new road.

In the second set of forecasts, the modelling looks ahead to the design year of 2023 and adds the effects of background traffic growth and the new traffic resulting from the Heywood development proposals. However, these proposals **exclude the new link road** in order to highlight the impacts of the new housing and employment in isolation.

The main changes that are seen include:

- Increased traffic volumes on Pilsworth Road (to M66 J3)
- Increased traffic volumes on the A58 Bury New Road; and
- Increased flows on Manchester Road in the Heywood residential areas

These forecasts show that without the provision of the link road, development traffic, both commuters and goods vehicles are constrained to use the routes currently available, with the potential for worsening conditions on some of those roads, particularly in the more residential areas.

In the final set of forecasts, the modelling again examines the design year of 2023 and includes background traffic growth and the new traffic resulting from the Heywood development proposals. However, these proposals **include the new link road** in order to show the effects of the overall package.

The principal changes in this forecast are:

- Increased traffic volumes on Pilsworth Road (to M66 J3)
- Increased traffic volumes on the A58 Bury New Road; and
- Significant reductions in traffic on Manchester Road and Middleton Road in the Heywood residential areas

The effects of including the link road in the Heywood strategy are principally that it creates a more direct link to the M62 Motorway, improving the attractiveness of the development sites to industry, and helps to protect the residential to the east of the new link, reducing the levels of traffic in the more vulnerable areas.

The savings in the distances travelled by heavy goods vehicles are again evident in this forecast but by 2023 and with the additional developments in place, the link road will save over 3 million HGV kilometres/ year.

The potential for short-cutting trips between the motorways (mentioned above) largely disappears when the additional capacity of the road system is taken up by new development traffic. By the year 2023, with all future developments in place, the scale of through trips reduces to negligible levels, to less than 1% of the traffic on the new link road. Hence through traffic need not be an issue of concern

5.5.2 Impact on M62 Motorway, Junction 19

Separate analyses have been undertaken to focus on the impact of the Heywood proposals at the M62 Motorway Junction 19 which will be connected to Hareshill Road by the new link road.

This assessment was aimed at addressing any concerns that might be raised by the Highways Agency over the capacity and operation of this motorway intersection. The findings of this work are reported in a separate document, *M62 J19 Operational Assessment Report* (November 2010).

Briefly, this capacity study utilised a separate model of Junction 19 which allowed a more detailed assessment of queues and delays at the motorway following the completion of the Heywood developments and construction of the associated link road.

This found that the junction, which is relatively uncongested at present, continues to function satisfactorily with these developments in place. The design of the new link road currently includes partial traffic signal control on the junction roundabout, largely as a safeguard against queues which might extend back on to the motorway itself. Sensitivity tests have illustrated that there might be some flexibility in the design and operation of this junction in association with the design of the proposed link road. Further analyses might therefore be worthwhile in order to optimize the layout and design or to assess how improvements might be phased to keep pace with the South Heywood developments.

6 Summary

The South Heywood SATURN model has been built to support the assessment of transport proposals for the South Heywood Economic Corridor. The validation results indicate that the local traffic model is sufficiently accurate and robust to provide inputs for forecasting the effects of future land use and highway network changes as part of the LDF process.

The results indicate the new link road is likely to be effective in providing a direct link to the M62 Motorway from the Heywood industrial uses and helping to reduce the need for local business traffic to travel via the M66 Motorway, as is the case at present. This is evident in significant reductions in the distances travelled by heavy goods vehicles as a result of the new road. This in turn will reduce carbon emissions and air pollution locally.

The new link road will provide immediate reductions in the traffic on important roads such as Middleton Road and Manchester Road. The new link road also helps to reduce traffic pressure in Heywood town centre.

The new link will not attract rat runs cutting the corner M62/M66. The new road mainly serves the development and the local community in Heywood.

The development will not have an adverse impact on Junction 19 M62. The analyses indicate with the new link road, junction 19 M62 still operates without significant delay, even at a design year of 2023.