DEVON COUNTY COUNCIL

CULLOMPTON TRAFFIC MODEL

FORECASTING REPORT

MAY 2013

CONTENTS

TABLES

FIGURES

1. INTRODUCTION

1.1 Background

1.1.1 Devon County Council have developed a new traffic model for Cullompton to identify and design transport schemes and measures to support the LDF / Local Plan process and to assist in the improvement of M5 Junction 28.

1.1.2 A new SATURN highway assignment model has been developed for the working weekday AM and PM peak hours and an average inter peak hour for the 2012 base year. The network is based on the previous Cullompton model developed by Parsons Brinckerhoff in 2007 for DCC, and updated to represent 2012 conditions. The previous zoning was retained as it provides the appropriate level of detail for present trip generation and attraction and the likely future development areas.

1.1.3 To fulfil the requirements of the new traffic model a comprehensive survey and data collection programme has been completed as described in the accompanying Report of Surveys.

1.1.4 The development and validation of the base year transport model is described in the Local Model Validation Report in which the data presented shows that the model meets the required DMRB / WebTAG validation criteria of networks, traffic flows, journey time, model convergence and trip distribution.

1.1.5 This report describes the use of the traffic model in producing traffic forecasts for future developments and highway improvements.

1.2 Planning Context

1.2.1 The traffic forecasting has been based on the Mid Devon District Council Local Development Framework (LDF) publication 'Allocations & Infrastructure Development Plan Document' (AIDPD), dated January 2011. This plan envisages the provision by 2026 of 1,665 dwellings and 55,000 sqm of office, industrial units and warehousing, mostly in north west Cullompton.

2. DEMAND FORECASTING

2.1 Procedure

2.1.1 Forecast demand for the future 2026 reference case has been derived from highway trip rates applied to the housing and employment development at each identified site. The AIDPD identified development to 2026 and all of this development was modelled explicitly it was not necessary to apply additional traffic growth for traffic with Cullompton origins or destinations. However, TEMPRO growth of 16.7% between 2012 and 2026 was applied to through traffic to allow for development growth in Exeter, Tiverton and other nearby areas. Fuel price and income growth factors were not considered applicable for congested peak hour conditions and so additional background traffic growth was also not applied.

2.1.2 Distributions of trips for each of the future development areas were applied using the base year matrix distributions for the corresponding or nearby proxy zones. The zone to zone movements and trip ends for future development was then added to the base year matrices and the Furness trip end balancing method used to produce forecast trip matrices. This method revises the trip distributions according to forecast trip end totals taking into account the disposition of new housing and employment development. Forecast highway demand for the reference case has been assigned to the future highway network including various identified improvements.

2.2 Future Land Use

2.2.1 The AIDPD plan envisages the provision by 2026 of 1,665 dwellings and 55,000 sqm of office, light industry and warehousing, mostly in north west Cullompton as shown in Table 1.

Table 1: AIDPD Development to 2026

Location	Traffic Zone	No. of Dwellings (35% Affordable)	Office (sqm)	Industrial Units (sqm)	Warehousing (sqm)
North West Cullompton	26	1,100	5,000	35,000	
Knowle Lane	27	340			
Court Farm	8	150			
Padbrook	18	30			
Exeter Road	17	45			
Week Farm	28				15,000
All		1,665	5,000	35,000	15,000

.

2.3 Trip Generation

2.3.1 Traffic generation of the future development was estimated from traffic trip rates used in the Tiverton traffic modelling study (found using TRICS), Table 2, giving total traffic generation in the modelled peak hours shown in Table 3. Estimates of inbound and outbound trip generation for each site were made for car travel for each model period (07:00 to 08:00 hours and 08:00 to 09:00 hours AM peak hours, 17:00 to 18:00 hours PM peak hours and the average inter peak hour 10:00 to 16:00 hours).

2.3.2 A total of 720 car trips from and 502 car trips to future development are estimated in the 08:00 to 09:00 hours AM peak hour. Most departures would be from the residential development whereas about half of arrivals would be to the new employment. In the PM peak hour total arriving car trips are estimated at 684 and departures at 632 and there would be about 400 car trips arriving and departing in the average inter peak hour.

Table 2: Traffic Generation Trip Rates

Model Time Period	Direction	Dwellings (35% Affordable (veh/unit/hr)	Office (veh/100 sqm/hr)	Industrial Units (veh/100 sqm/hr)	Ware-housing (veh/100 sqm/hr)
AM 07-08 hrs Peak Hour	Arrivals	0.10	1.06	0.34	0.15
	Departures	0.30	0.18	0.06	0.11
AM 08-09 hrs Peak Hour	Arrivals	0.14	2.42	0.33	0.17
	Departures	0.40	0.28	0.08	0.10
AM 17-18 hrs Peak Hour	Arrivals	0.38	0.37	0.07	0.10
	Departures	0.21	1.96	0.44	0.16
Ave. 10-16 hrs IP Hour	Arrivals	0.20	0.39	0.11	0.14
	Departures	0.19	0.45	0.11	0.15

Table 3: 2026 Traffic Generation (vehicles/hour)

Model Time Period	Direction	Dwellings	Office	Industrial Units	Ware-housing	All Develop-ment
AM 07-08 hrs Peak Hour	Arrivals	174	53	119	23	369
	Departures	508	9	21	17	554
AM 08-09 hrs Peak Hour	Arrivals	240	121	116	26	502
	Departures	663	14	28	15	720
AM 17-18 hrs Peak Hour	Arrivals	626	19	25	15	684
	Departures	356	98	154	24	632
Ave. 10-16 hrs IP Hour	Arrivals	332	20	39	21	411
	Departures	315	23	39	23	398

2.4 Trip Distribution

2.4.1 Base year trip matrix proportions were used for the distribution of trips for future development for trips within the model area. Base year proportions for development in zones with existing development were directly used, but nearby proxy zones had to be specified for new development zones as follows:

- North West Cullompton – new zone 26 uses proxy zone 8;
- Knowle Lane – new zone 27 uses proxy zone 23;
- Week Farm – new zone 28 uses proxy zone 2.

2.4.2 The trip ends for future development were then added to the 2012 base matrices trip ends for the car user classes (UC1 to UC3) and the Furness trip end balancing method used to produce forecast trip matrices. Distributions of future development origins were added to the base year matrices to provide an initial estimate of future year matrices. The Furness method revised the trip distributions according to forecast trip ends so that the effects of the dispositions of future housing and employment were taken into account.

2.4.3 The revised car trip matrices after trip end balancing were then divided into the three car user classes (UC1 – commuting, UC2 – business and UC3 – other purposes) using the proportions of total trips in the base year matrices arriving at and departing from the zones used for the distribution of new development trips.

2.5 Future Trip Matrices

2.5.1 The resulting 2026 trip matrix totals and trip totals for all the future development are shown in Table 4. Trip matrix totals for all user classes are forecast to increase by 21% to 25% from 2012 to 2026. No increases are shown for the LGV and HGV user classes as these amounts are difficult to estimate accurately, the amounts will be small and have been effectively included in the car user classes so total trips are not underestimated.

2.5.2 Trip end totals by sector for the 2012 base and 2026 forecast years are shown on Figure 1 for the AM peak hours and on Figure 2 for the PM peak hour and average inter peak hour. The largest increases are to and from the development areas, the M5 and the town centre. There is very little growth forecast in some outlying areas.

Table 4: Forecast Trip Matrix Summary

	UC1 Car Work	UC2 Car Business	UC3 Car Other	UC4 LGV	UC5 HGV	All
2012:						
AM 07 Peak	2691	88	2715	207	219	5920
AM 08 Peak	2650	381	3696	192	74	6992
PM Peak	2864	422	4409	119	45	7858
Inter Peak	1055	606	3757	226	339	5983
Development:						
AM 07 Peak	689	34	617	0	0	1340
AM 08 Peak	704	52	969	0	0	1725
PM Peak	755	59	1115	0	0	1929
Inter Peak	233	100	931	0	0	1264
2026:						
AM 07 Peak	3380	122	3332	207	219	7260 (+23%)
AM 08 Peak	3354	433	4665	192	74	8717 (+25%)
PM Peak	3619	481	5523	119	45	9787 (+25%)
Inter Peak	1287	706	4688	226	339	7247 (+21%)

Note: Trip matrix totals, vehicles per hour.

Figure 1: 2012 & 2026 Trip Ends – AM Peak Hours

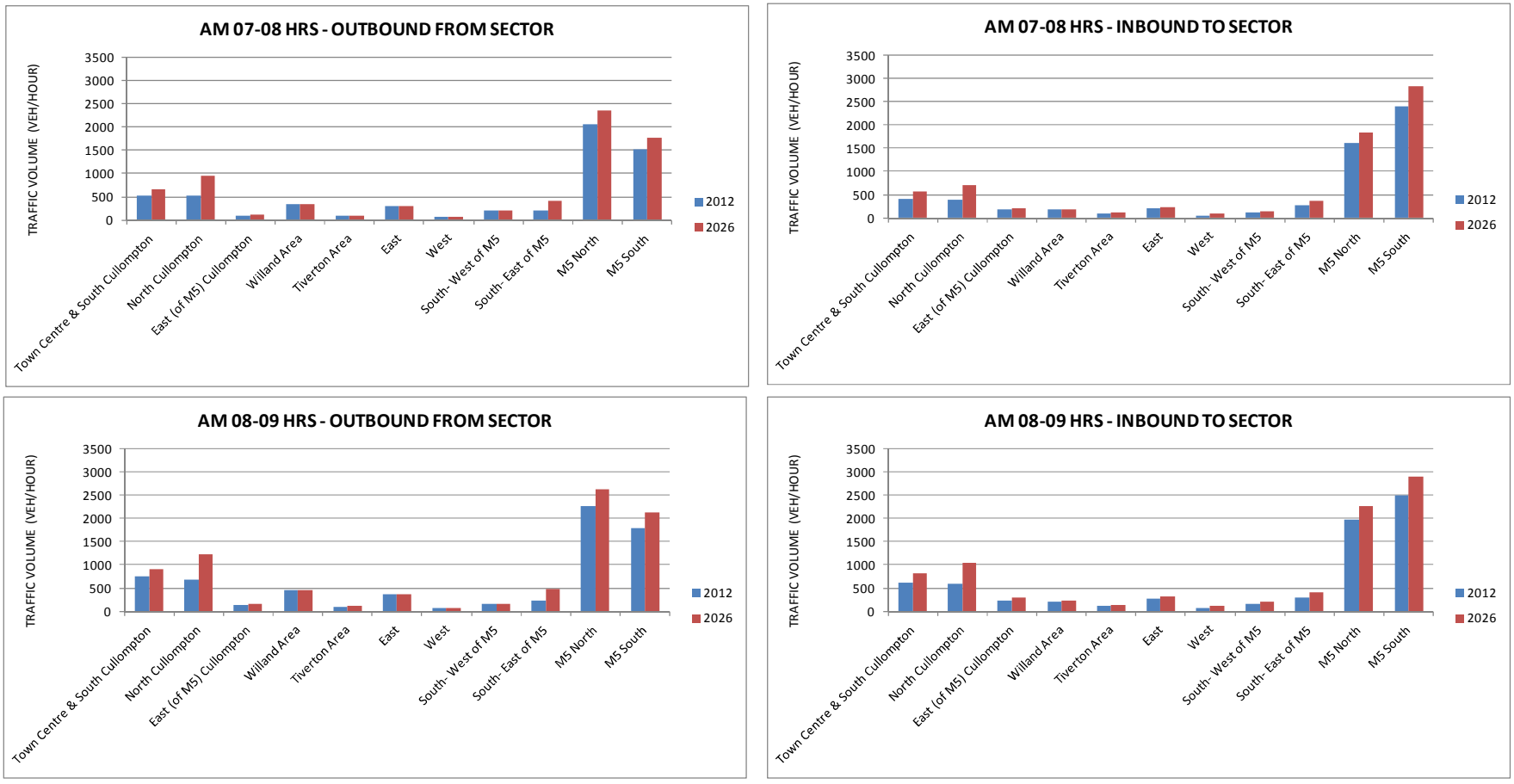
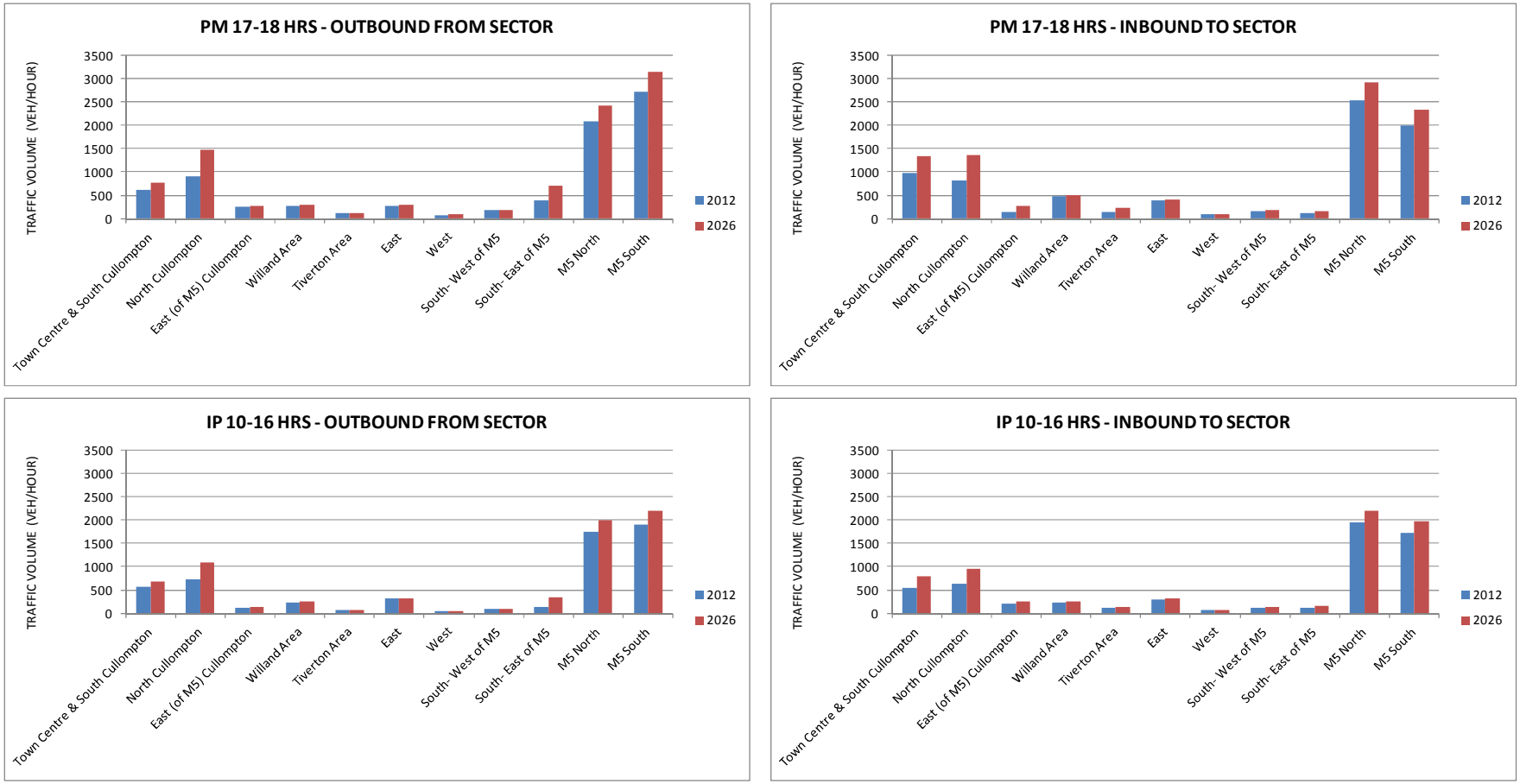


Figure 2: 2012 & 2026 Trip Ends – PM Peak & IP Hours



3. TRAFFIC FORECASTS

3.1 Highway Improvements

3.1.1 Traffic assignments for the 2026 forecast year were carried out with the following planned improvements to the highway network:

- Eastern Relief Road between Meadow Lane and Station Road, as shown on Figure 3;
- Western Relief Road;
- M5 Junction 28 as shown on Figure 4, comprising signalisation of the overbridge / southbound slip roads junction and remodelled overbridge / northbound slip road roundabout.

3.2 Traffic Performance

3.2.1 The total trips on the highway network are forecast to increase by 25% in the 08:00 to 09:00 hours AM and PM peak hours between 2012 and 2026 and total travel time increases by 39% in the 08:00 to 09:00 hours AM peak hour and by 30% in the PM peak hour. There would be some over capacity queuing in 2026, the highest occurring in the 08:00 to 09:00 hours AM peak hour. The increase in over capacity queues would be higher in the PM peak. However, total delay is low compared with the number of vehicles trips, the delays are spread around the network and there are no junctions with excessive delay.

Table 5: SATURN Simulation Summary Results

	AM 07-08 Hrs	AM 08-09 Hrs	PM 17-18 Hrs	IP 10-16 Hrs
2012:				
Transient Queues (pcu-hrs)	18	27	29	16
Over Capacity Queues (pcu-hrs)	0	0	0	0
Total Travel Time (pcu-hrs)	877	984	1,078	781
Travel Distance (pcu-kms)	89,284 (14,089)	98,553 (15,820)	107,164 (16,461)	80,422 (10,412)
Average Speed (kph)	101.8 (71.4)	100.2 (67.6)	99.4 (65.5)	103.0 (68.5)
Trips Loaded (pcu)	5,920	6,992	7,858	5,983
2026:				
Transient Queues (pcu-hrs)	38	55	47	25
Over Capacity Queues (pcu-hrs)	14	84	9	0
Total Travel Time (pcu-hrs)	1,132	1,365	1,404	967
Travel Distance (pcu-kms)	109,098 (20,443)	121.603 (24,507)	131,103 (24,920)	96,561 (15,921)
Average Speed (kph)	96.4 (63.5)	89.1 (51.6)	93.4 (59.3)	99.9 (66.7)
Trips Loaded (pcu)	7,260	8,717	9,787	7,247

Note: Figures in brackets for travel distance and average speed exclude M5 mainline and slip roads.

3.3 Forecast Traffic Flows

3.3.1 Modelled traffic flows are shown on Figure 5 to Figure 8 and vehicle turning movements at M5 Junction 28 are shown on Figure 9. The main impacts of the future development on the highway network are:

- The proposed Eastern Distributor road would divert considerable traffic amounts from the High Street. Northbound traffic flows on Fore Street in the 08:00 to 09:00 hours AM peak hour would reduce by 350 vehicles per hour with a northbound volume of 430 vehicles per hour on the new road. The southbound traffic volume in the PM peak hour would be 320 vehicles per hour;
- The Eastern Distributor road would also divert traffic from Higher Street to Millenium Way with an increase of around 200 vehicle per hour in both directions for most of the day;
- Total traffic at M5 Junction 28 would increase between 2012 and 2026 by 23% in the 07:00 to 08:00 hours AM peak hour, 20% in the 08:00 to 09:00 hours AM peak hour, by 16% in the PM peak hour and by 14% in the average inter peak hour. The largest increases would be for movements to and from M5 south;
- Elsewhere traffic flow increases are in general consistent with the increase in the level of development although above average traffic increases are forecast on the B3181 Broadclyst road, particularly in the northbound direction.

3.4 Traffic Model Convergence

3.4.1 Assignment convergence of the traffic model met the DMRB / WebTAG convergence criteria in each time periods. Delta values were near or equal to 0% and in all cases there were at least four iterations when 100% of flows on links changed by less than 5%.

3.4.2 These results represent very good levels of convergence in the 2026 forecast year which would be expected for a small, uncongested network.

Table 6: Convergence Results – 2026 Forecasts

Loop No. (MASL)	Delta (%) / No. of Assignment Iterations				P - % of Link Flows Differing by < 5%			
	AM 07	AM 08	PM	IP	AM 07	AM 08	PM	IP
1	0.0125/ 3	0.0046/ 3	0.0360/ 6	0.0046/ 3				
2	0.183/ 3	0.0222/ 3	0.0483/ 5	0.0222/ 3	91.5	85.1	66.9	85.1
3	0.0169/ 4	0.0142/ 3	0.0048/ 3	0.0142/ 3	90.4	90.1	88.5	90.1
4	0.0143/ 5	0.0059/ 3	0.0027/ 8	0.0059/ 3	91.5	83.4	94	83.4
5	0.0125/ 5	0.0015/ 3	0.0020/ 8	0.0015/ 3	94	96.9	97.8	96.9
6	0.0111/ 5	0.0001/ 4	0.0006/ 8	0.0001/ 4	96.2	97.2	98.6	97.2
7	0.0099/ 5	0.0001/ 3	0.0008/ 9	0.0001/ 3	96.5	99.2	100	99.2
8	0.0107/ 3	0.0000/ 3	0.0005/10	0.0000/ 3	100	99.8	99.8	99.8
9	0.0100/ 3	0.0000/ 3 *	0.0006/10 *	0.0000/ 3 *	100	100 *	100 *	100 *
10	0.0094/ 3	0.0000/ 3	0.0004/10	0.0000/ 3	100	100	100	100
11	0.0089/ 3 *	0.0000/ 3	0.0003/10	0.0000/ 3	100 *	100	100	100
12	0.0084/ 3	0.0000/ 3	0.0003/ 9	0.0000/ 3	100	100	100	100
13	0.0079/ 3	0.0000/ 3 *	0.0004/ 4 *	0.0000/ 3 *	100	100 *	100 *	100 *
14	0.0076/ 3	0.0000/ 3	0.0002/10	0.0000/ 3	100	100	100	100
15	0.0072/ 3 *	0.0000/ 3	0.0003/11	0.0000/ 3	100 *	100	100	100
16	0.0069/ 3	0.0000/ 3	0.0002/12	0.0000/ 3	100	100	100	100
17	0.0066/ 3				100			
18	0.0063/ 3				100			

Note: * denotes signal update.

Figure 3: Eastern Relief Road Preliminary Scheme

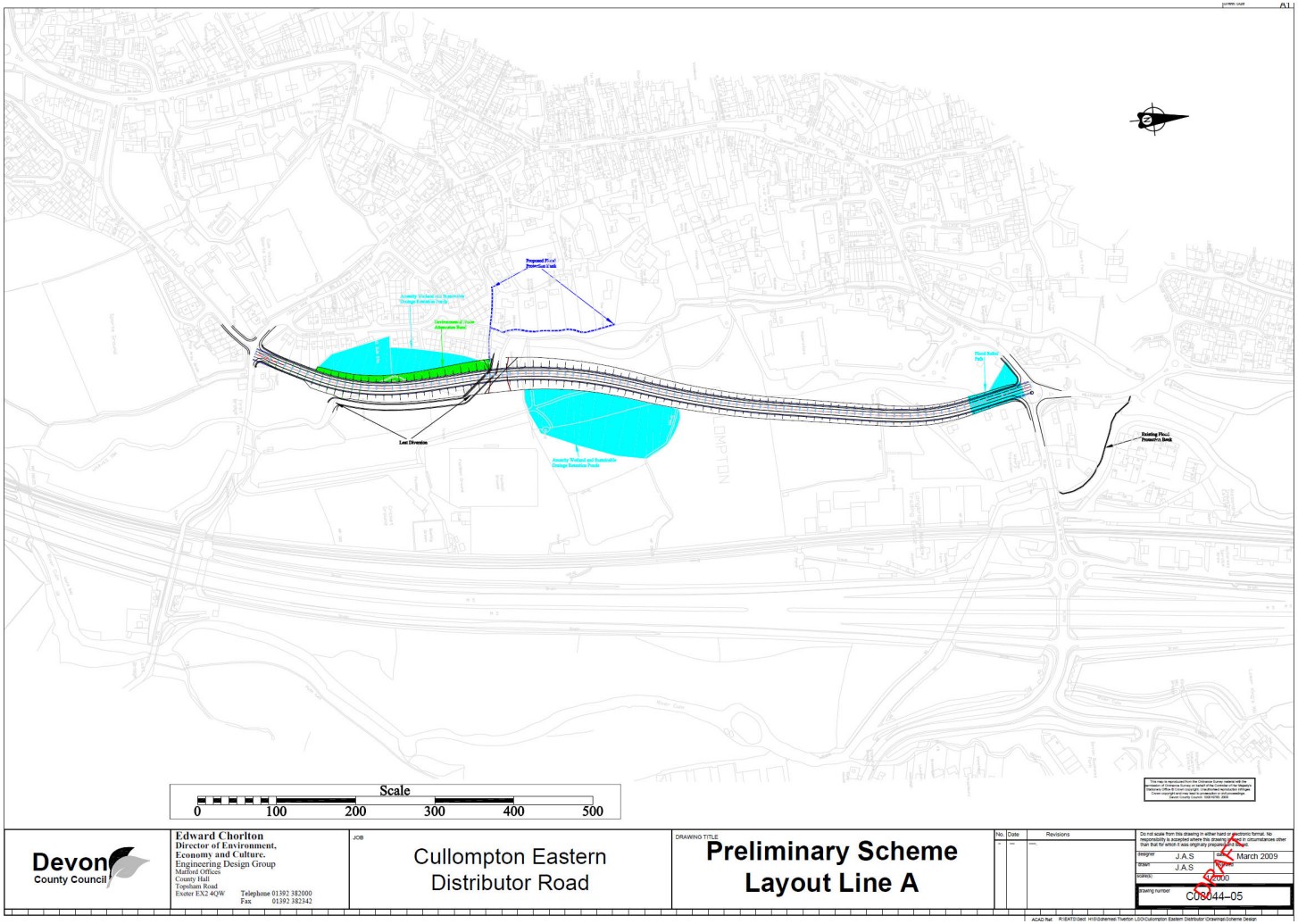


Figure 4: M5 Junction 28 Improvement Proposal

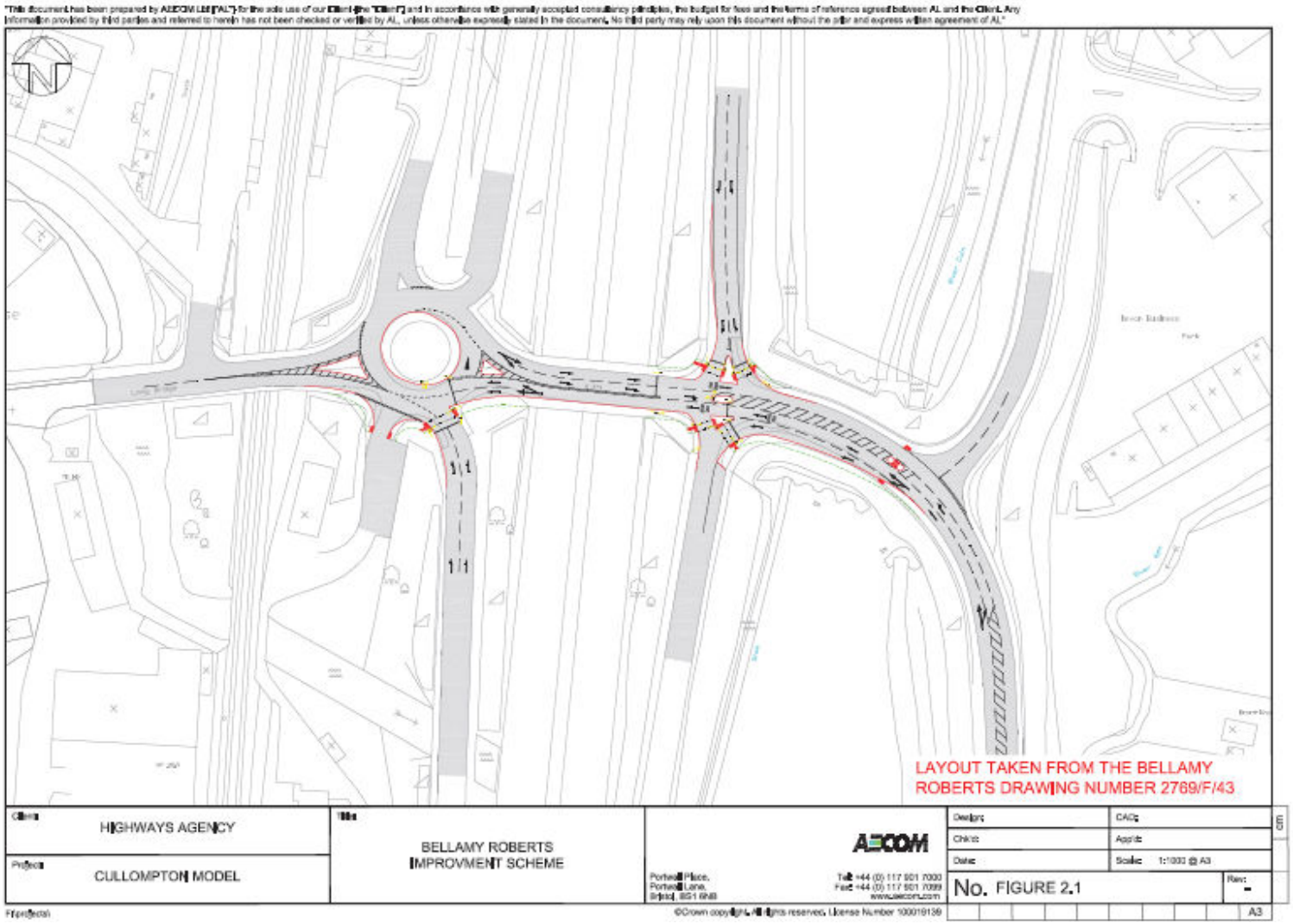


Figure 5: 2012 & 2026 Traffic Flows : 07-08 AM Peak Hour

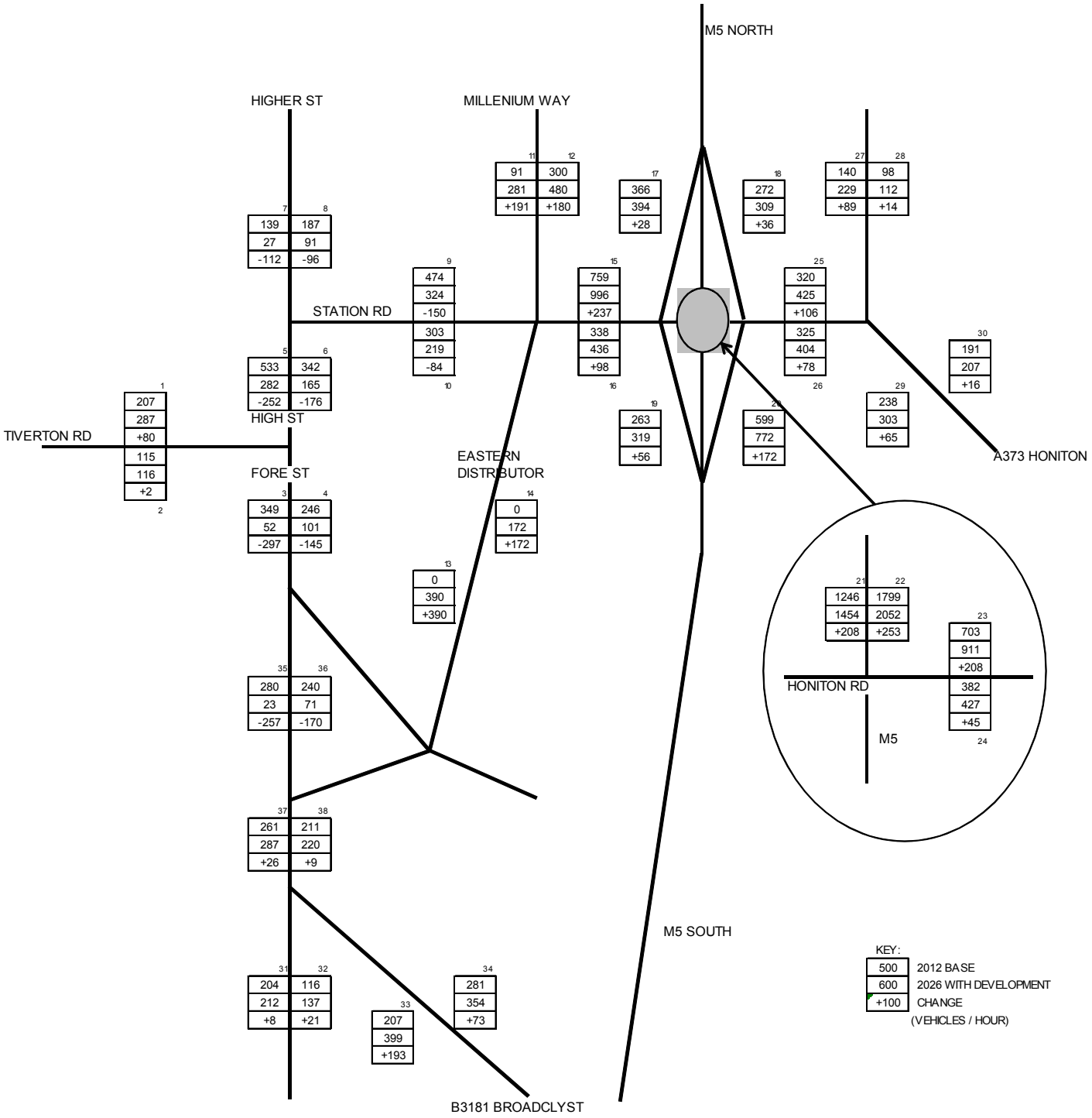


Figure 6: 2012 & 2026 Traffic Flows : 08-09 AM Peak Hour

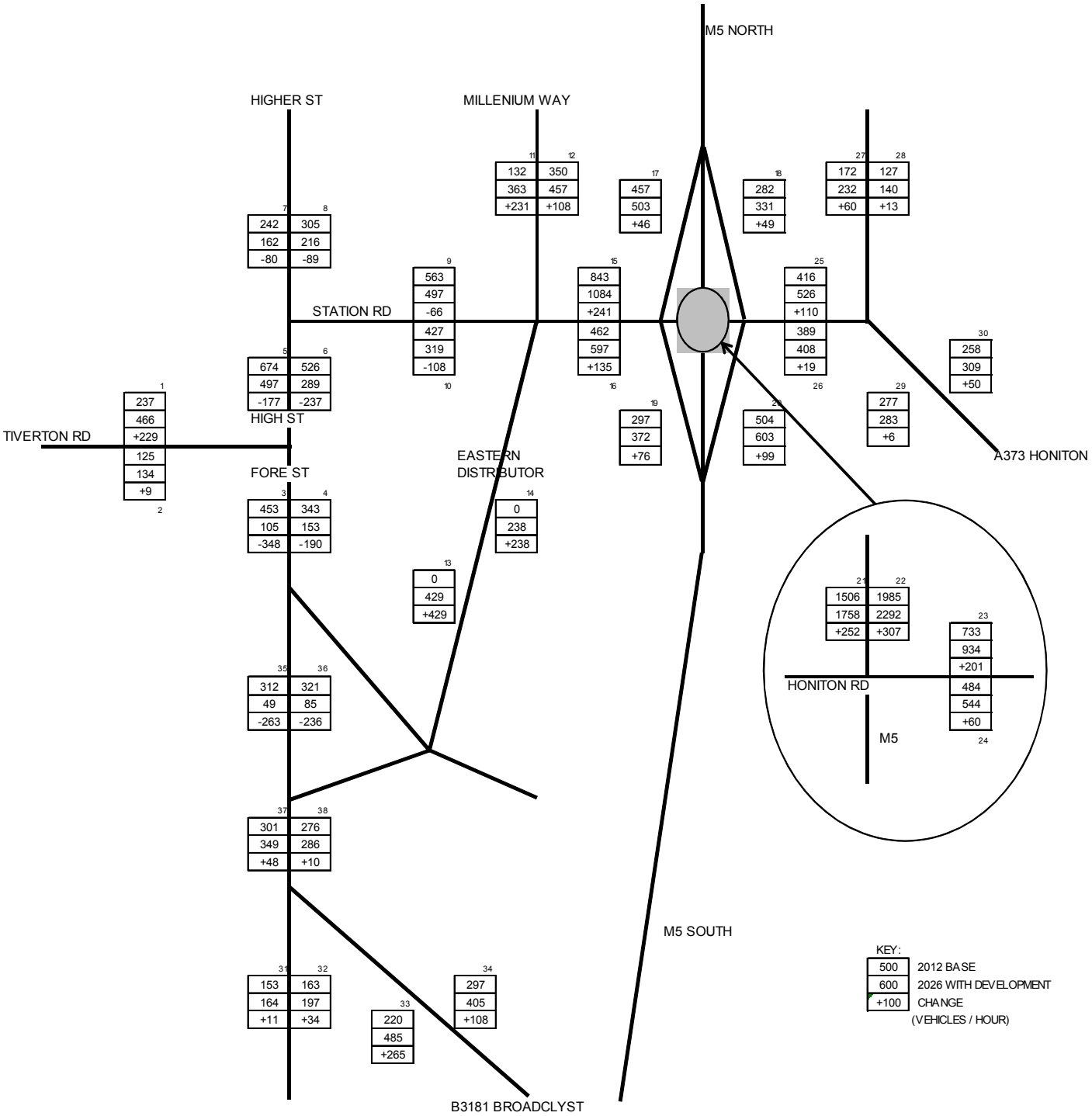


Figure 7: 2012 & 2026 Traffic Flows : 17-18 PM Peak Hour

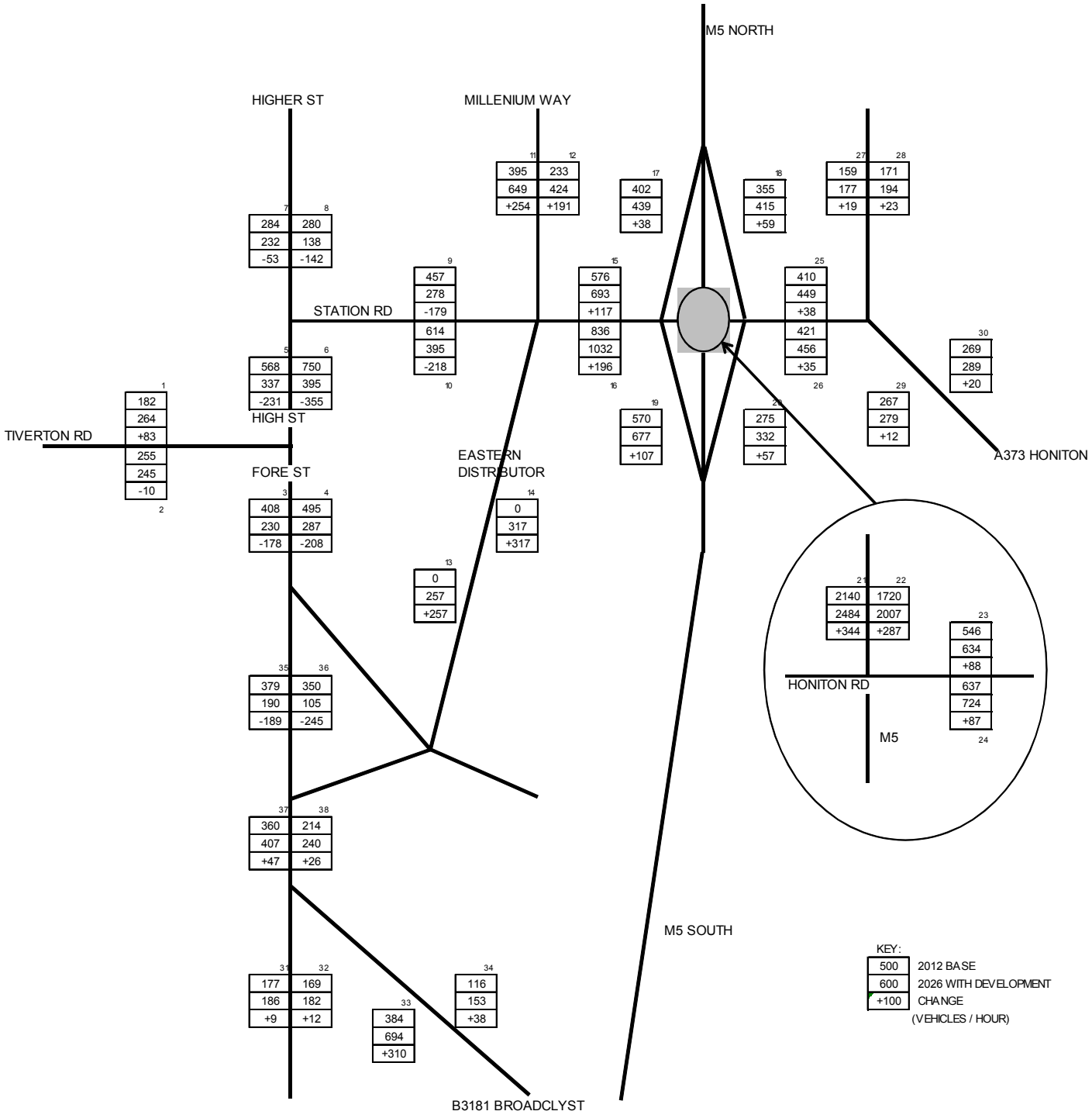


Figure 8: 2012 & 2026 Traffic Flows : 10-16 Average IP Peak Hour

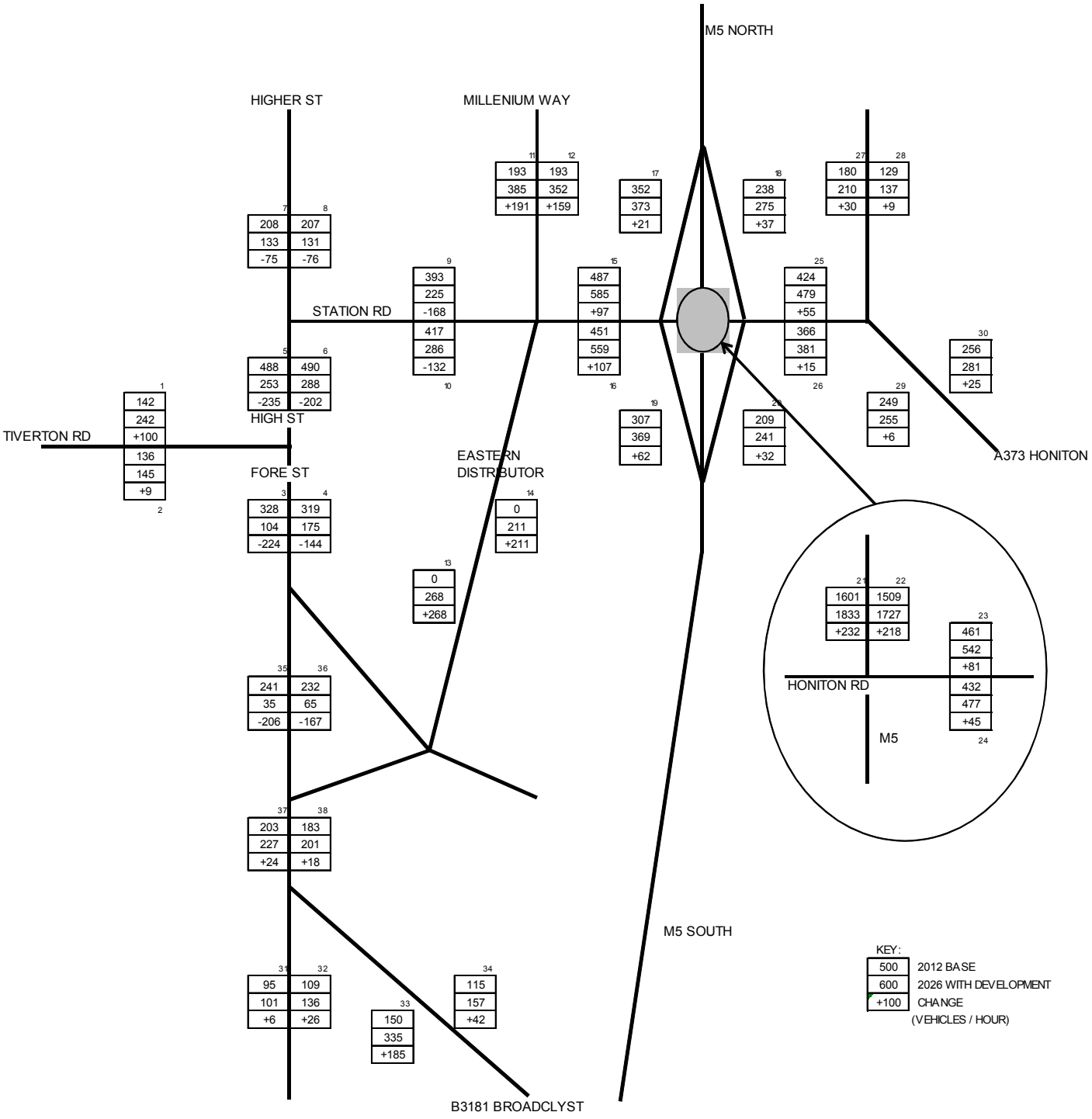


Figure 9: Traffic Flows at M5 Junction 28

2012 AM 08

From\To	tation Roa	Services	M5 North	oniton Roa	M5 South	Total
Station Rc	0	4	229	252	359	843
Services	24	0	108	34	33	200
M5 North	155	52	0	75	0	282
Honiton R	139	18	120	0	112	389
M5 South	144	98	0	55	0	297
Total	462	171	457	416	504	2011

2026 AM 08

From\To	Station Road	Services	M5 North	Honiton Road	M5 South	Total
Station Road	0	5	254	350	452	1062
Services	33	0	106	35	34	208
M5 North	206	52	0	93	0	351
Honiton Road	157	19	127	0	123	426
M5 South	215	98	0	59	0	372
Total	610	175	488	538	609	2420
						20%

2012 PM

From\To	tation Roa	Services	M5 North	oniton Roa	M5 South	Total
Station Rc	0	5	171	255	145	576
Services	11	0	118	10	50	190
M5 North	236	60	0	59	0	355
Honiton R	212	16	113	0	80	421
M5 South	377	108	0	86	0	570
Total	836	189	402	410	275	2112

2026 PM

From\To	Station Road	Services	M5 North	Honiton Road	M5 South	Total
Station Road	0	6	202	286	198	693
Services	23	0	119	11	50	203
M5 North	291	60	0	64	0	415
Honiton Road	237	17	118	0	83	456
M5 South	481	108	0	88	0	677
Total	1032	192	439	449	332	2444
						16%

2012 AM07

From\To	tation Roa	Services	M5 North	oniton Roa	M5 South	Total
Station Rc	0	15	166	146	432	759
Services	13	0	84	8	47	152
M5 North	131	46	0	95	0	272
Honiton R	77	11	116	0	121	325
M5 South	116	77	0	70	0	263
Total	338	148	366	320	599	1771

2026 AM07

From\To	Station Road	Services	M5 North	Honiton Road	M5 South	Total
Station Road	0	24	189	238	545	996
Services	20	0	83	13	41	158
M5 North	163	46	0	100	0	309
Honiton Road	85	12	122	0	185	404
M5 South	168	76	0	74	0	319
Total	436	158	394	425	772	2185
						23%

2012 IP

From\To	tation Roa	Services	M5 North	oniton Roa	M5 South	Total
Station Rc	0	4	130	223	130	487
Services	25	0	126	27	24	202
M5 North	99	22	0	117	0	238
Honiton R	184	32	95	0	55	366
M5 South	143	106	0	57	0	307
Total	451	164	352	424	209	1600

2026 IP

From\To	Station Road	Services	M5 North	Honiton Road	M5 South	Total
Station Road	0	6	150	267	162	585
Services	32	0	126	28	23	210
M5 North	130	22	0	122	0	275
Honiton Road	195	33	97	0	56	381
M5 South	201	106	0	62	0	369
Total	559	166	373	479	241	1818
						14%